

DISTORTION IN TRANSFORMERS

SOME DIFFICULTIES

(A Talk from 3LO, Melbourne, by H. K. Love.)

The incessant demand for faithful reproduction of sound waves in all their forms, that is music, voice, etc., has led investigators to make a deep study of the requirements for audio frequency transformers. The musical scale which the average transformer is called upon to handle runs in a straight line of frequencies of from approximately 16 vibrations or cycles per second up to 8000. The human voice covers the range of, roughly, from 125 cycles to, say, 280 cycles, so that it will be seen that a transformer which may give excellent reproduction of the voice is only being called upon to amplify a very small portion of the frequencies that have to be provided for.

The lowest note of a pipe organ is about 16 cycles per second; this note is so low in frequency or vibrates so slowly that it is more frequently easier to feel it than to hear it. A transformer is rarely expected to handle frequencies of such a low order as 16 per second. The pianoforte range starts from a frequency of about 275 and runs up to a shade over a 1000 cycles per second. The top notes of the violin go even higher. In addition to the provision which has to be made in an amplifying transformer for the natural musical frequencies a big margin must be allowed for what is termed the harmonic range. This is explained in the following way:—If the top note of the piano is struck it emits a sound wave of, say, about 1100 cycles, but it also emits harmonic sound waves which are, to put it simply, multiples of the original note both above and below the true frequency. It is on this account that a big overlap of amplifying ability must be allowed for in any transformer which may be used to step up or step down audio frequency currents corresponding to anything within the range of frequencies previously mentioned.

An Ideal Transformer.

It would be ideal if a transformer could be designed which would give a straight line amplification curve over the whole frequency band, but I am afraid that so far this has not been possible. Most transformers are designed to amplify correctly from 50 cycles to about 6000. Even within this range of frequencies there is a decided drop of as much as 10 degrees between the frequencies of 300 and 50 cycles per second, and on the upper range a drop of 3 or 4 degrees from 4000 to 8000 cycles per second. The best transformer of present-day design should at least have a straight line curve between the frequencies 300 and 4000. This covers the principal portion of a pianoforte range, most instruments, and a reasonable margin for harmonic range. The construction of a good transformer, which will be expected to give reasonable performance should be somewhat along the following lines:

CORE.

A. Ample core section with practically no air gap should be provided.

INDUCTANCE.

B. The inductance of the primary should be high at the average voltages used in wireless sets, say, about 80 henries.

RATIO.

C. The ratio should not be too high, but as high as possible consistent with low losses at high frequencies.

WINDINGS.

D. The windings should be sectioned or subdivided with a view to the reduction of self-capacity current and eddy current losses.

The points mentioned in A, B, and C are made to ensure faithful amplification at low frequencies, and that mentioned in D ensures good amplification at high frequencies.

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HERO WELCOMED

NATION-WIDE BROADCAST.

It has been stated that Lindbergh's epoch-making non-stop New York to Paris flight and the various receptions to the flyer which have followed it have sold more newspapers than any other event in history. And it seems highly probable that the broadcast descriptions of the Washington and New York ceremonies stimulated this enormous demand. For both radio and regular reporting have their place in the general scheme of news dissemination.

One is instantaneous and has no limits, but it is evanescent. It is gone when it is finished, while the other, although a trifle slower in obtaining its distribution, is distinctly tangible. It is concrete and lasting. Broadcasting appeals to the ear alone, while newspaper appeals only to the eye. These two mediums of spreading information can never compete, for no competition is possible. Rather, they supplement each other in a perfectly balanced plan of carrying news to people everywhere.

New Records Listed.

A few of the new records established in the linking together of 50 broadcast stations by land-lines by the National Broadcasting Company in the nationwide Lindbergh broadcast are listed as follows:—

Miles of Wire Line Used—14,000.
Number of Engineers Involved—350.
Pick-up Points—Washington 8, New York 7.
Number of Stations—50.
Estimated Audience—35,000,000.
Number of "Radio Reporters"—Washington 4, New York 6.
Longest Continuous Programme Devoted to One Subject—11½ hours.
Besides the big chains, there were many stations in New York and Washington that added many more thousands of fans to the audience that listened in on the Lindbergh reception.

NEUTRODYNES CAN HOWL

IMPROPER NEUTRALISATION.

Many New Zealanders are under the misconception that neutrodyne receiving sets cannot howl and interfere with reception by other listeners.

A neutralised receiver, unless it is carefully adjusted, can be less efficient than one in which neutralisation is not employed. There are three chief ills of improper neutralisation, according to an article in the July American Radio Broadcast magazine.

"The first and most obvious manifestation of incorrect adjustment of the neutralising device is oscillation in some or all of the radio-frequency circuits," reads this article. "These oscillations as a general rule become more severe as the frequency is increased, and a loud squeal or whistle will be heard as the tuning controls are adjusted to receive some station that is transmitting."

Receiver Will Radiate.

"Such an effect will make it difficult for the user of the receiver to obtain satisfactory reception and the oscillations will be radiated from the aerial attached to the receiver and cause interference on other receivers located in the neighbourhood. Such oscillations can be prevented by correct adjustment, and it is essential that the proper setting be determined in order to make it possible to obtain best results from the receiver."

"A second detrimental effect of maladjustment of the neutralisers is poor quality, which is generally due to the existence of too much regeneration. The quality, under these conditions, will generally sound drummy, indicating that the various frequencies in the carrier are being unequally amplified by the radio-frequency amplifiers. To preserve good quality, the radio-frequency amplifiers must amplify without distortion a band of frequencies extending about 5000 cycles above and 5000 cycles below the carrier frequency, and this condition does not exist unless proper neutralisation is obtained."

Prevent DX Reception.

"Another effect of improper neutralisation is to cause one or more of the tuned circuits in a single-control receiver to be thrown out of synchronism, so that the set loses a great deal of its sensitivity, and as a result it is not possible to tune in distant stations with satisfactory volume. These three major effects of improper neutralisation indicate how essential it is that neutralisation be always carefully and completely accomplished."

WET BATTERIES

TAKE CARE OF THEM.

The storage battery has been developed to a remarkable degree of perfection so that it will function over a long period of time with only a small amount of attention. Such attention consists more than anything else in keeping the battery properly filled with pure distilled water and correctly charged at all times. The efficiency and the life of the battery will decrease considerably if these two points are not carefully watched. The charging rate should be as close as possible to that recommended by the manufacturer, this information generally being given on the name plate of the battery. Although the state of charge of a battery can be measured with some accuracy by means of a voltmeter if the proper precautions are taken, the readings made in this way are not generally to be relied upon. A better method for use in testing a storage battery is to determine the state of charge by means of a hydrometer. The specific gravity, which is what the hydrometer measures, will be found to increase the reading of the hydrometer as the battery is charged, up to a certain point. The specific gravity reading for full charge is not the same for all batteries. For this reason, an endeavour should be made to obtain from the manufacturer of the battery information regarding the hydrometer reading, which should be obtained using his battery when it is fully charged and when it is fully discharged. Frequently, but not always, these same data will be found on the name plate. In the event that this information cannot be obtained, it is a safe rule to charge the battery until the hydrometer reading does not change during a period of one hour. When this condition holds true, the battery has absorbed all the charge possible. It will generally be found also that, when this condition of constant specific gravity reading throughout an hour is reached, the electrolyte will also begin to gas or bubble.

Care should be taken in charging the battery to make certain that its positive terminal is connected to the positive terminal of the source being used for charging purposes. If the battery is charged in the opposite direction the plates will be reversed in chemical character, and if the charging is continued for any great length of time, the battery will be destroyed. If a battery has only been charged in the wrong direction for a short length of time it can generally be brought back to normal by charging in the right direction for a very long time at a low charging rate.

EFFECT OF LIGHT ON CRYSTALS

The effect of light on crystal detectors is very curious, though not more so than the characteristic detecting action of the crystal itself, which has never been satisfactorily explained. Most crystals will work better if strong light, such as sunlight focused by means of a lens, be allowed to fall upon them. The light from a tungsten lamp may similarly be used. Galena behaves in this way, and so do most samples of pyrites. Carborundum and tellurium mixtures, on the other hand, do not seem to be affected by light. There is here a very interesting field for experiment by the enthusiastic amateur.

AMERICAN RADIO EXPORTS

United States March export of radio receiving sets totalled \$331, valued at nearly \$40,000, of which the largest quantity went to Argentina, with New Zealand taking the second largest amount according to the Department of Commerce. During the same month also transmitting sets and parts exported were valued at \$14,000. Also during March 85,770 radio valves were exported, valued at \$21,000, and receiving set components exported were valued at \$26,000. Receiving set accessories exported during the month of March were valued at nearly \$30,000.

If you play a copyrighted song in a public amusement place for profit you are committing an act of infringement and the owner of the song may sue you for damage and an injunction. To S. A. Lewis, manager of the Up-to-Date Dancing School in Minneapolis, the Minnesota District Court handed down a decision awarding Irving Berlin, Incorporated, an injunction and \$50 dollars and costs. All Lewis did was have his orchestra play "All Alone."

BROADCASTING NEWS

An Australian writer says: "Every now and again I hear murmurs of perturbation among newspaper men about the possible rivalry of the big stations with established news services. Lord Burnham was the first, I believe, to bring up the subject in Australia during the big Press conference. It is a question of some anxiety to some newspapers as to whether the broadcast descriptions and results of races, the descriptions of football matches, and other great items of interest, do not interfere with the sale of the actual paper. With regard to the particular journals in Melbourne which might be expected to feel any adverse effect, I have had cause to note a steadily-increasing circulation, as would normally be looked for. I find it hard to believe there is any appreciable number of newspaper readers who, after hearing racing results, would fall into the habit of doing without their customary newspaper."

Sporting Reports.

"Non-racing men would certainly wish to see the rest of the news, while racing men are so vitally interested in form, running, prices, and a score of matters outside the meagre details given over the wireless that they could hardly get to the race edition quickly enough. The danger is that managers of newspapers, filled with illusory fears, may withdraw their experts from broadcasting, and, as in the matter of news, throw on the companies, whose subscribers must have the information, the task of giving it to them by means of a service of experts who may prove, in real truth, rivals of the Press writers. To my mind, friendly co-operation on just such basis as at present exists is the only security against a war between broadcasting and printed news."

A Melbourne writer says: "The wireless world is agog for the report of the commission which has listened for many weary months to the luminous, indeed voluminous, evidence of scores of witnesses, and now has been treated to the lucubrations of counsel for the various conflicting interests. It is not possible for me to comment on the possible findings of the commission. My own chief interest has lain in the attitude of witnesses to the radio programmes of the major stations. After profound study of programmes abroad and perusing some scores of pamphlets and articles all dealing with the question of entertainment via the air, I have come to a fixed conclusion. That is this: A man's judgment of a radio programme is conditioned by his prejudices."

The Highbrow.

"The real, highbrow musician does and must necessarily loathe any programme that subordinates his loved musical gods to a noisy, shouting, blaring imitation of negroid foolishness. He cannot but believe that placing the preparation of programmes under a Government Department, limited by Act of Parliament or Congress, with a penalty against jazz as disorderly and against public policy, must make for improvement. A clergyman of a committee of inquiry must necessarily be compelled by his habit of thought to see that nothing but what in his opinion is decent and orderly appears on the programme. So many men, so many opinions. Far better leave the matter in the hands of those who are un-fanciful and who recognise that this great boon of wireless is not for one class or opinion, but must be used in the service of all. That habit of thought must necessarily produce periods of dullness and displeasures for some, but on balance it will please the majority."

Resin-cored solder, supplying its own flux, should be used for all joints in wireless work owing to the liability of acid-fluxed joints to corrode. "Killed acid" is handy for cleaning-up and tinning the iron. It is made by dissolving scrap zinc in commercial hydrochloric acid (spirits of salts) until no more will dissolve.

DON'T MEDDLE

THE CURSE OF THE NOVICE

Complaints of poor reception of the New Zealand stations have been definitely traced to novices partially disabling their receiving sets by meddling with them. They change their valves around, tinker with the condenser nuts, change the battery connections, applying a different plate voltage to their detector valves, "short" their batteries, and so on. They communicate with the broadcasting company and say reception is "rotten." Then a close-by neighbour lets a little light in by telling the novice that he had obtained good reception, and cannot understand what the novice had to grumble about.

Receiving Set Disabled.

The fact then dawns upon the novice that possibly there is something amiss with his apparatus. He summons the dealer or his assistant to inspect his set, and then discovers that he, himself, has put something out of gear through meddling with his equipment. He then coolly objects to paying for the servicing.

Service Should Be Charged.

An American dealer puts the matter fairly as follows:—

Does anyone get free service on his shoes, clothing, plumbing, or anything else? Why should radio have free service? Of course, I am presuming he wishes a radio expert to do his servicing; one who has usually paid out good money, spent long weary hours in study, to become efficient as a radiotician.

Sets Should Be Sealed.

I meet these "wise birds" every day when on service calls, and have come to the conclusion that the manufacturers should lock and seal all sets from some people who begin to learn radio backward, and by snooping and meddling with their sets, not yet paid for (twenty more payments and only thirty free service calls already!) All service calls should be paid for; it would stop meddlers.

THE AUSTRALIAN COMMISSION

THE RESULT AWAITED.

The report of the Australian Commonwealth Royal Commission which recently investigated wireless problems will not be made public for some weeks, according to a statement made by the Postmaster-General (Mr. Gibson) recently.

Mr. Gibson said that he had received a copy of the report, but had not yet had time to study it. It would be considered by the Federal Cabinet before it was made public, and, as the Cabinet would not meet again until about August 15, some weeks would elapse before the findings of the commission would be announced.

Those who reach home in and around San Francisco from theatres and parties early on Sunday mornings frequently round off the evening's entertainment by tuning in KGO for Gunzendorfer and his Hotel Whitcomb Band. Gunzendorfer and his entertainers go on the air at 10 o'clock on Saturday night, playing through until 1 o'clock the next morning. (This is equivalent to 7.30 p.m., Sunday, in New Zealand.) There are seven men in the orchestra, most of them working two or three instruments. Several are also adept at "putting over" recitations and comic songs. These versatile entertainers have been doing their stuff before KGO microphones for the past year.

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