

RADIO-CRAFT

'' RADIO'S GREATEST MAGAZINE ''

RADIO "Radio" BROADCASTING

By the Editor — HUGO GERNSBACK

THE standard method of network broadcasting ever since its inception has been to link the various radio stations by telephone wires thus forming a *wire-linked* radio station network embracing the entire country.

When broadcasting first started, the thought uppermost in radio engineers' minds was to link the stations together not by wire but by radio. This logical thought, however, met with insuperable obstacles, most of which can be boiled down into one word—"static."

There was entirely too much noise that crept into the radio transmission if the linking-up between stations was made; and there were other technical difficulties not necessary to relate here. The fact was that a *radio-linked* network remained an impossibility.

Broadcast stations which wished to be linked together had only one other choice and that was to be linked together by wire, and this is exactly what they did. Up to very recently, therefore, all stations linked into a network used special telephone wires which connected all stations together. It is interesting, particularly to the layman, to note that these are not just ordinary telephone wires but they have to be specially balanced and noise-free lines for high-quality reproduction. When the key network station in New York sends out a program, this program, through suitable amplifiers and filters, is then piped through the American Telegraph and Telephone Co.'s wires from coast to coast as the need may be. At various points along the route there are other amplifiers (boosters), and other means whereby the quality of the wired program is kept at a high level. By telephone feeder wires it reaches the other radio stations comprising the network. The system as we now have it is technically excellent, the only drawback being the huge cost of the telephone lines to the broadcasters. The magnitude of this objection can be readily understood if we know that American broadcast stations paid-out for lease of telephone wires for broadcasting purposes, in one year, the tremendous sum of \$5,710,222.*

Small wonder then that for over 25 years engineers have battled with the problem of doing away with wire lines linking stations together and using radio links instead. Not much progress was made during the years except here and there where the broadcasters availed themselves of rebroadcasting shortwave programs originating at a distance. Even this has its drawbacks because the quality frequently suffers.

Take, for instance, the splendid effort now being made by the National Broadcasting Company, the Mutual Broadcasting System, and the Columbia Broadcasting System. These 3 organizations bring us from day to day foreign programs from the European capitals. These programs originate in Europe and are of course transmitted by radio, picked up on the Eastern seaboard, amplified and then put on the air again on the regular broadcast channels. While most of the time the talk is intelligible it suffers from static and other atmospheric conditions. This difficulty up to now has not been overcome.

The advent of Major Edwin H. Armstrong's *Wide-Band*

Frequency Modulation System has changed all this and it appears now that during the next 10 years not only will radio itself be revolutionized, as reported in my last month's editorial entitled "Static-Less Radio" but it seems certain that radio broadcasting also will be revolutionized, completely. The key which solves the problem of linking stations together is found in the Frequency Modulation System. During the early part of last December Major Armstrong amazed guests at a Meriden, Connecticut, demonstration by a *triplly*-relayed radio program without wires! This memorable experiment took place at station WDRC at Meriden, Conn., on December 4th. It was termed "amazing" by sceptical radio technicians who witnessed the new System. The following is the method used at that time.

From Major Armstrong's Frequency-Modulated Station W2XCR, at Yonkers, N. Y., a program was broadcast, which in turn was picked up by another, similar frequency-modulated station, W2XMN, at Alpine, N. J. This station then put the program on the air; in turn, this program was picked up by W1XPW—also a frequency-modulated transmitter (for station WDRC in Meriden, Conn.). Then station W1XPW in turn rebroadcast the Yonkers program which was received at the Meriden WDRC studios.

It would be thought that by triply relaying a radio broadcast program in this manner the quality would suffer, as each station rebroadcast the program that was fed to it from another station. The engineers dazedly confessed that this had not been the case, and that to the contrary, the quality received from the last station was equal to that broadcast from the first station!

Usually when you make a reproduction and then on top of this another reproduction of the previous one, the quality begins to suffer. It is as if you took a phonograph record and from this reproduced another phonograph record and from the result of the last one, made a new reproduction. In this manner it is well known that the defects of each reproduction are passed on to the next reproduction and if there are sufficient reproductions, the end result is poor.

With frequency modulation, however, the reason that we can pile one rebroadcast on top of another rebroadcast is, that in the normal broadcast of this type we have sound fidelity of an unusually high quality and no disturbances to start with. We have no extraneous noises of any kind and, therefore, the 2nd rebroadcast will not have any less fidelity nor any more static than the 1st, etc.

For this reason, unbelievable as it may seem, the end result is so good that you can not tell it from the original broadcast.

You will say that in linked rebroadcasts of this type, tube noises and other noises will no doubt creep in. This, however, is not the case because the tube noises do not reach the program at all and, therefore, are not rebroadcast.

It would seem that Radio is in for a complete revolution, from broadcasting itself, down to the receiver, during the next few years. There seems to be good reason, too, to believe that the radio chains will soon be free from the wire links to which they have been tied for some 20 years.

*A Federal Communications Commission survey for all stations, in 1937 (later figures are unavailable; figure includes all wire lines (network links, remote pick-ups, etc.).