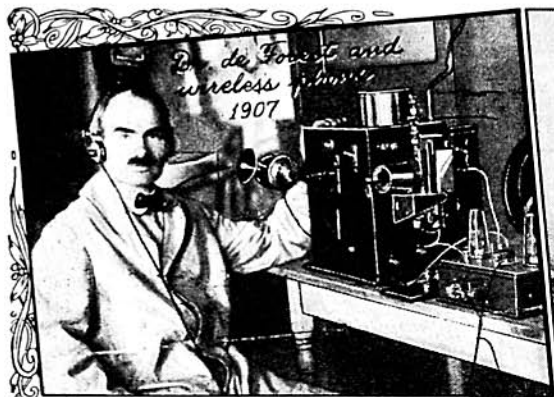


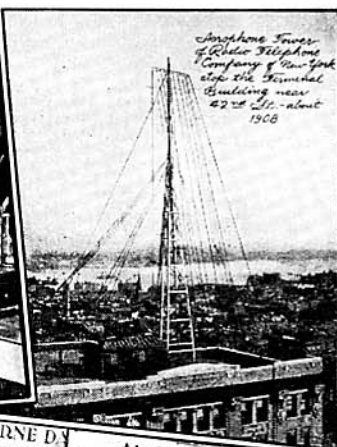
# THE GROWTH OF

HOW modern broadcasting grew from the experiments of a Pennsylvania amateur, conducted shortly after the World War, to a mammoth industry is told in the following article.

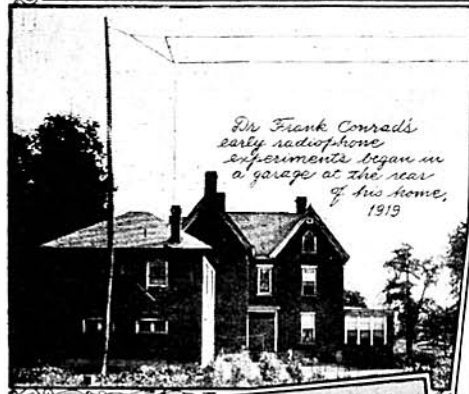
N. H. LESSEM



Dr. de Forest and wireless phone, 1907



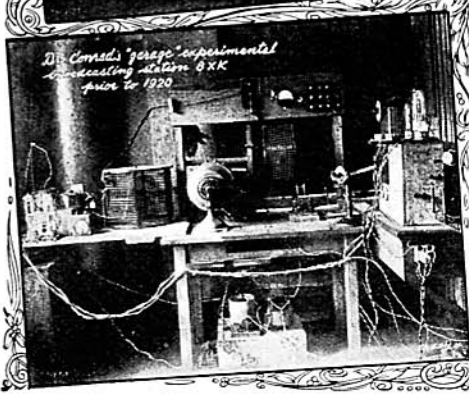
Telephone Tower of Radio Telephone Company of New York atop the Terminal Building near 42nd St., about 1908



Dr. Frank Conrad's early radiophone experiments began in a garage at the rear of his home, 1913



Radio Station of RCA, showing first broadcast of Harding's inauguration, 1920



Dr. Conrad's garage experimental broadcasting station, 8XK, prior to 1920



A Broadcast over WJZ, Newark, about 1921-22

IN ORDER TO TRACE broadcasting's growth, one must first arrive at a definition of the term. Do we include the experiments of Hertz and Loomis? Did broadcasting commence with Marconi, de Forest or with Conrad's transmissions?

For the purposes of this article, a rather definite distinction must be drawn between bona-fide broadcasting and the mere transmission of signals (be they voice, music or Morse) by wireless means.

## A DEFINITION

In its exact sense, the term "broadcasting" includes only such signals as are sent out by means of radio waves for general reception. A signal directed from one point to another in code so that it is unintelligible except to a certain or restricted few, is certainly not "broadcast" as the average individual or listener-in would define it.

His conception of "broadcasting" would refer more specifically to speech or music sent out for the information, entertainment or education of the general public,—consequently, broadcasting as America knows it today may be said to have had its true birth early in 1907—when de Forest constructed the first means of modulating an arc transmitter with voice impulses and began sound broadcasting from atop the 12-story Terminal Building at 42nd St. and Park Ave., in New York City.

So successful were the results that de Forest's company soon received an order for an installation on a private de luxe yacht, which was quickly followed by the sale of 24 complete radiophone stations to the U. S. Navy for installation on battleships. It is interesting to note that the latter units were sold with a positive guarantee of 5 miles reliable range, although actual operating tests showed them to be consistently good over a distance of 26 miles.

In 1908, de Forest went to France and installed his radiophone transmitter atop the Eiffel Tower, from where he broadcast phonograph music. Reports of this test showed that he was heard as far as 500 miles,—a feat which a few more modern stations could not duplicate today.

In January 1910, the De Forest Radio Telephone Company began a series of broadcasts, employing actual singers and grand opera stars to provide the programs. The first grand opera broadcast was a "double-feature", *Pagliacci* and *Cavalleria Rusticana*, and Caruso

# BROADCASTING

*The major steps in the transformation of "wireless" to "radio", ethereal chaos to orderly regulation—with side excursions into studio technique are here chronicled.*

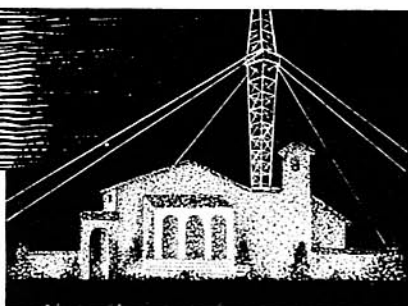
sang in the latter. These efforts and the talent were wasted, however, for it was too soon for broadcasting. Only amateur wireless operators had receiving sets and they were very few in number at that time.

And so for a while broadcasting lay dormant, until the day when it would catch the public's imagination like wild-fire and create an insatiable demand for receivers and parts. In the interim, during the early part of the World War to be exact, the A. T. & T. Company was conducting a series of tests and making developments in wireless telephone transmissions, for the purpose of providing facilities for long-distance telephone communication without wires. They had purchased the sole rights to de Forest's audion tube, perfected modulation systems (the vacuum tube as an oscillator was already discovered by both de Forest and Armstrong), and were finally successful in broadcasting telephone speech clearly and reliably over long distances. By the latter part of 1915, telephone conversations were broadcast across the Atlantic,—to illustrate how far their progress had gone. These early researches were destined to be the basis for future broadcast station design,—without them, broadcasting would have certainly been later in coming to the fore.

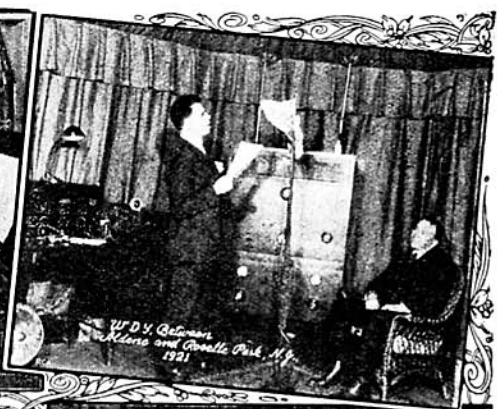
## AN INTRODUCTION—KDKA

In 1919, Dr. Frank Conrad—amateur and Westinghouse engineer—began to broadcast programs from his station which was located in the garage at the rear of his house in Pittsburgh. The programs consisted mainly of phonograph records, but by this time so many amateurs were in existence and so many were their friends who would come over to listen to the music, that Conrad began to receive avalanches of mail. Even newspapers began to publicize Conrad's stunt, listing at times the hours of broadcast. So great became the enthusiasm of nearby radio amateurs that the advertising department of a leading Pittsburgh department store got a bright idea for selling some Army surplus apparatus which it had on hand. "Buy one of these World War sets," the ads proclaimed, "and you will be able to hear Dr. Frank Conrad."

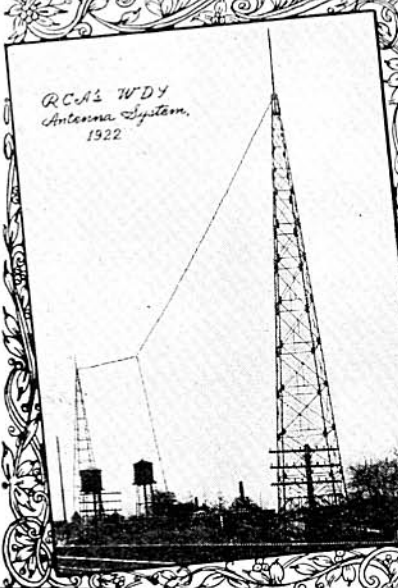
Ideas breed more ideas, and when Westinghouse officials saw the advertisement, a startling idea struck them:—"Why not build a transmitter right at the factory?", they thought, and proceeded to do so. By the middle of 1920,



*W.B.Z.'s Combination Station and Studio, Sept. 10th 1921*



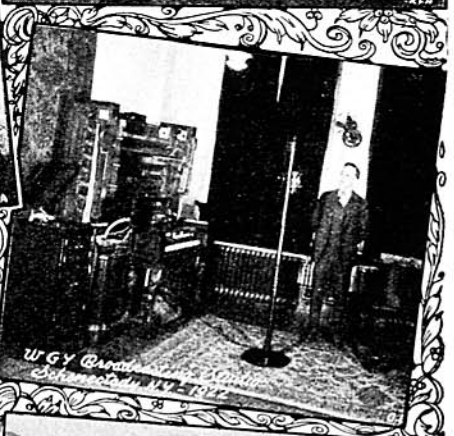
*W.D.Y. Belmont, Belmont and Gould Park, N.Y. 1921*



*R.C.A.'s W.D.Y. Antenna System, 1922*



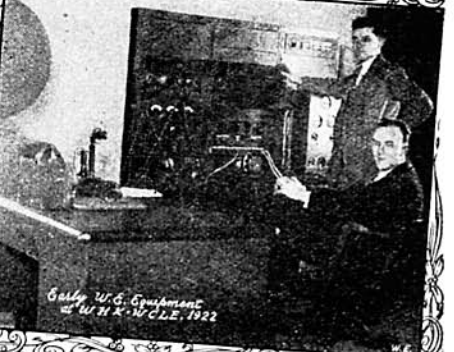
*Radio Dept. Office in N.Y. Dept. of Commerce, listening from W.B.Z. to home and away, on estimated 700,000 W.B.Z. sets in ordinary households—1922*



*W.G.Y. Broadcasting Station, N.Y. 1922*



*William Jennings Bryan's Point Breeze, Presbyterian Church, Broadcast of KDKA, March 12, 1922*



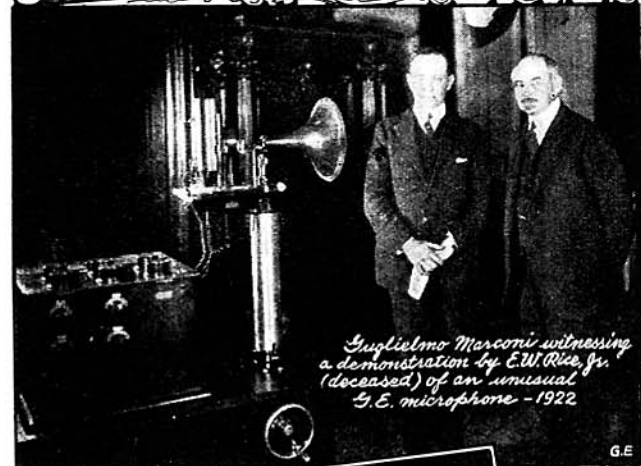
*Sally W.G. Equipment at W.H.K. W.C.L.E. 1922*



# THE GROWTH OF



KDKA's first formal studio inside one of the Westinghouse factory buildings, was soundproofed with burlap - 1922. Note counterbalanced mike stand. W.E.



Guglielmo Marconi witnessing a demonstration by E.W. Rice, Jr. (deceased) of an unusual G.E. microphone - 1922. G.E.



Warren Cox, WFKB's founder, at microphone. Note megaphone for directing sound waves to telephone-stand microphone - 1922. MCH



Full-fledged broadcasting over W.F.Z. - 1923. W.E.

it had been assigned call letters, and the little shack perched atop the 9-story factory was known as KDKA.

Then station officials got in touch with the executives of the Pittsburgh Post, and Sun, making arrangements for the returns of the Presidential election to be broadcast. On November 2, 1920, the station broadcast the bulletins and finally the news that Warren G. Harding was the country's newly-chosen chief executive.

Not recognizing a competitor which was later to cause them untold worry, various newspapers hailed this achievement. Some 2,000 of them, in fact, were so impressed by the performance that they commenced printing KDKA's programs, as a matter of reader interest. In doing so, they gave broadcasting its first foothold, which it has consistently enlarged.

Once started, broadcasting continued to spread like living flame, but before turning to contributions made to the art by other stations, let us tip our hats a few more times to KDKA. This station broadcast the first radio church service—and think of that when you get an airful next Sunday.

When you tune-in the speeches at a banquet, recall that KDKA was the first station to handle a broadcast of that sort. The same also holds true for the first remote pick-up, the first presidential inauguration, sporting event, baseball scores, time signals, market reports, etc.

## THE "A" AND "B" RANGES OF 360 AND 400 METERS, RESPECTIVELY

In broadcasting's early days, stations were licensed indiscriminately, without regard for the kilocycles and the interference that many stations would create when crowded together in a narrow channel. The operating frequency was at first 360 meters or (A) range, but soon broadcasting mushroomed from one station in 1920 to 600 stations in 1922, and the Department of Commerce was forced to include a 400-meter channel, or (B) range for the higher-power (and quality) stations.

At that there was considerable interference (even though



W.F.Z.'s short-wave remote pick-up portable transmitter - 1923. G.E.



KDKA's Pioneer pick-up short wave transmitter - 1922. W.E.



Typical outdoor listening broadcast from KDKA. Note Transmitter on microphone - 1923-24. W.E.

# BROADCASTING



this number of stations was spread out over the country),—so that at that time we find the broadcasters themselves drifting slightly away from their assigned frequencies to minimize or prevent the interference which they were creating. By 1923, the broadcasting range had changed to 200 to 550 meters, and none too soon, for by 1924 a total of 1,400 broadcasting stations were in existence.

## IMPORTANT CONTRIBUTIONS TO BROADCASTING

From the standpoint of reception, a contribution of WLW's is of almost equal importance, and though other developments antedate it, it merits consideration here. It was the first remote control transmitter.

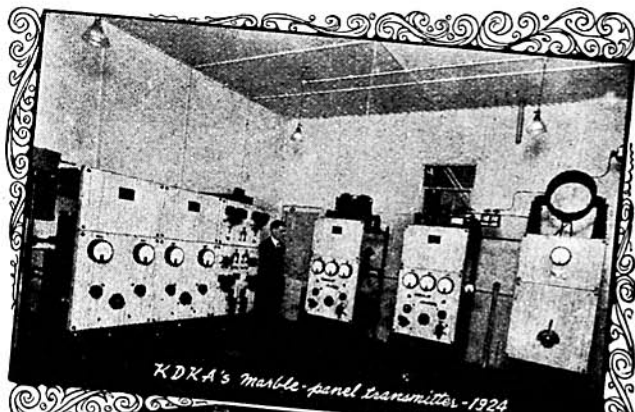
One early broadcasting peculiarity was that the transmitter and studios of any station were housed in the same building—the closer together the better. While convenient, it was not sound practice from the viewpoint of either the engineering or the program departments, for if the station were located in the heart of a city, the large neighboring buildings absorbed much of the radiated energy; if it were located anywhere else, it was hard to persuade top-notch artists to journey to it.

Performers were unpaid in the early '20's, and there was scarcely a more diverting sight than a taxi-load of hilarious and high-salaried opera stars bound for a station, elated over the free ride. The microphone into which they sang upon their arrival looked like an antique phonograph horn.

Returning from this digression, one must bow to the telephone company rather than to the broadcasting stations themselves for a step which may be considered to rank at least third in importance: the development of radio program transmission lines and, subsequently, high-frequency lines.

Standard telephone lines were at first the sole means of carrying programs from or to remote points. As such lines were designed to transmit only the human voice, they carried only a comparatively narrow band of audio frequencies,

(Continued on page 606)



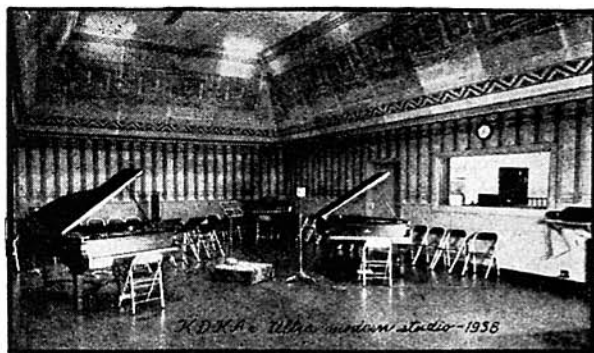
KDKA's marble-panel transmitter—1924



At Syria Mosque, one of KDKA's more than 40 pick-up points in Pittsburgh, in 1926



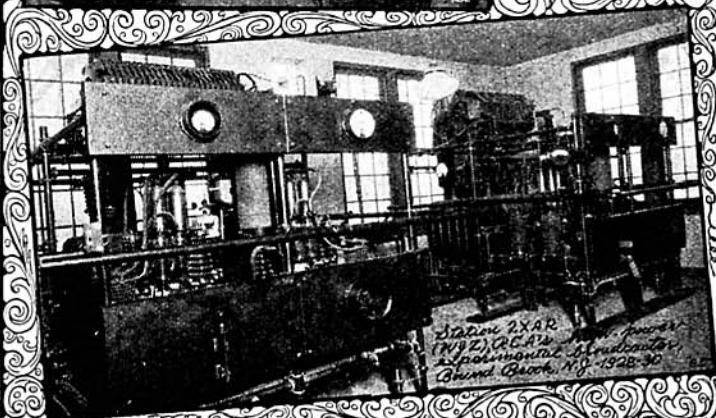
Carson Cookridge, KDKA's first address, W.C.A. and W.C.B. Radio station, with pickup—1924



KDKA's ultra-modern studio—1936



Section of power room, NBC's Radio City head quarters. Power control disk at right background—1938



Station 2XAR, NBC's experimental broadcaster, Grand Brook, N.Y.—1928-30





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APEX ELECTRIC MFG. COMPANY, CHICAGO, ILL.  
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KING ELECTRIC MFG. COMPANY, BUFFALO, N. Y.  
KOKOMO ELECTRIC COMPANY, KOKOMO, IND.  
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PREST-O-LITE, INDIANAPOLIS, IND.  
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STANDARD RADIO CORP. OF WORCESTER, WORCESTER, MASS.  
STANDARD RADIO MFG. CORP.  
THE STERLING MFG. CO., CLEVELAND, OHIO  
STEWART BATTERY CO., CHICAGO, ILL.  
THORDARSON ELECTRIC MFG. CO., CHICAGO, ILL.  
U-S-L RADIO, INC., NIAGARA FALLS, N. Y.  
UNIVERSAL BATTERY CO., CHICAGO, ILL.  
VALLEY ELECTRIC CO., ST. LOUIS, MO.  
THE WEBSTER COMPANY, RACINE, WIS.  
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## THE GROWTH OF BROADCASTING

(Continued from page 545)

scarcely going below 200 or over 2,500 cycles. This resulted in loss of "highs" and "lows" in the transmission of music and lack of natural quality in speech; the only reason it was acceptable is that early receivers were incapable of reproducing much more. As receiver design improved, the telephone companies kept step, offering radio lines of ever-increasing fidelity. Today almost every line for program transmission covers at least 100 to 5,000 cycles.

### CAME SUPER-POWER—AND HIGH FIDELITY

Of approximately equal importance was the development of super-power for radio broadcasting. Early stations had radiated low power, in most instances 100 to 500 watts. Considering the larger figure, one is immediately struck by the fact that this power, being dissipated in all directions, is slightly less than that consumed in the average 1-slice electric toaster.

With so little energy being radiated, the ratio of static to signal was extremely high; therefore static disturbances drowned out received signals very often during reception. But station engineers battled against interference, both natural and man-made, the fight culminating on May 2, 1934, when Powell Crosley, Jr. (who had begun broadcasting in 1921) increased WLW's power to half a million watts (in the antenna system), the first station of that power in the United States (or, for that matter, in the world).

High fidelity, about the same time, was receiving attention and it was found that carrier waves could be modulated to carry audio frequencies from 30 to 14,000 cycles, representing the upper and lower limits of average hearing. It was found also that stations could transmit such programs without incommensurate expenditures, and experimental high-fidelity transmission was begun. Only a few of the better receivers were able to take advantage of this improvement, however, until the manufacturing branch of the industry took cognizance of the better transmissions and began producing receivers capable of reproducing the extreme highs and lows. WOR claims to be the first regular commercial station to have adopted high-fidelity transmission as standard practice.

### IMPORTANCE OF SHORT WAVES IN BROADCASTING

Many consider the short-wave link as being next in importance. It has made possible not only the "stunt" broadcasts from airplanes, submarines, golf links, and similar points impossible to "hook-up" otherwise, but also the more important foreign programs. It antedates the previously mentioned steps by more than a decade, N.B.C. having used it in the mid-twenties for the presentation

of European programs in America, at not infrequent intervals.

Other advances are, for the most part, somewhat less revolutionary. For example, WENR-WMAQ claims a "first" on the broadcast of football and baseball games, and on the presentation of school and college classes by radio.

Other stations have originated other programs of similarly great importance, but immeasurably as such attention to programming has benefited radio, there is insufficient space to pay to each advance the tribute it merits.

## MILE POSTS IN TELEVISION

(Continued from page 579)

The images, reproduced by cathode-ray tubes are clear, with good detail and adequate brilliance. Size is still unsatisfactory for general use, although the newer tubes, which produce 8 x 10 inch images, are more nearly adequate, though there is some loss of definition, which is more apparent than real.

It must be stressed that the comparison of number of lines per television image with number of dots per inch in a printer's halftone cut is unfair to television. While the imperfections of the human eye are such that it corrects for a certain amount of lack of detail in either still or moving images, it does so in a much greater degree when image motion is present.


Intermediate-film and projection-type television have been aided by new high-intensity illuminants; and, as recently pointed out in *Radio-Craft*, high-definition video transmissions may soon utilize up to 1,000 lines/frame.

Already in acceptable form for public presentation, the release of television may now be expected almost from month to month. There are a number of stations throughout the United States broadcasting television programs on an experimental basis; television is well established in England (where it is subsidized by the government) and upon the European continent. The major networks are ready for television—they have studios and mobile (truck) pickups constructed—and are in truth straining at the leash.

With sufficient business upturn, to make mass purchasers of television receivers in the \$200 class probable, broadcasting will commence. As to who will bear the cost of programs—sponsors will, despite the comparatively few sets which will comprise the early audience, for there will be publicity and prestige for the first advertisers in the new art.

The contention that the Federal Communications Commission does not permit televised advertising will no longer exist, for it is safe to say that this important government bureau will do nothing to hamper a budding industry, but will cooperate and try to aid it in every way.

Thus, with television, an old catchword will gain new meaning. It is:—"I'll be seeing you!"



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