

# **The History of Broadcasting in the United States**

*By* H. P. DAVIS, Vice-President

**Westinghouse Electric & Manufacturing Co.**



An address delivered before the Graduate School of  
Business Administration, Harvard University,

April 21, 1928



**Harry Phillips Davis**  
**Enshrined in Broadcasters Hall of Fame**  
**Akron, Ohio on October 3, 1990**

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The advances made by civilization have been very largely in proportion to the development of communication. Starting with mouth to mouth and eye to eye contact, progressively through the ages there has been a gradual evolution of mass communication, until, in our present day, it is exemplified and developed in many ways.

## Mass Communication

It is hard even for one who has seen in his lifetime the awakening of this mighty colossus—asleep since the beginning of time—to realize the amazing achievements and developments of the twentieth century in mass communication. To you, of the present generation, the perspective is less clear, therefore not so intimate, and is looked upon more in a matter of fact way. Yet no longer than 61 years ago a prominent Boston newspaper published the following article:

"A man about 46 years of age, giving the name of Joshua Coppersmith, has been arrested in New York for attempting to extort funds from ignorant and superstitious people by exhibiting a device which he says will convey the human voice any distance over metallic wires so that it will be heard by the listener at the other end. He calls the instrument a 'telephone' which is obviously intended to imitate the word 'telegraph' and win the confidence of those who know of the success of the latter instrument without understanding the principles on which it is based.

"Well-informed people know that it is impossible to transmit the human voice over wires as may be done with dots and dashes and signals of the Morse Code, and that, were it possible to do so, the thing would be of no practical value. The authorities who apprehended this criminal are to be congratulated and it is hoped that his punishment will be prompt and fitting, that it may serve as an example to other conscienceless schemers who enrich themselves at the expense of their fellow creatures."

The youngest but the most promising addition to these facilities for mass communication is radio broadcasting.

## Experiments Prior to World War

Attempts had been made, and some successful results had been accomplished, prior to the World War, in adapting telephonic principles to radio communications. Reginald Fessenden, probably the first to attempt this, transmitted a program Christmas Eve 1906. Later, Mr. Lee DeForrest did the same in the development of his apparatus. No real service, however, was attempted or introduced of a character similar to that now known as radio broadcasting. The war bringing an end to independent development work, attention was concentrated on such applications of radio as would be helpful in military operations, and the various Governments engaged in the conflict enlisted the aid of all the large electrical companies that had facilities available.

The Westinghouse Electric & Manufacturing Company, having extensive research, engineering and manufacturing facilities of a nature suitable for this branch of electric science, was requested by the British Government, shortly after the outbreak of the war, to undertake certain special work in radio. Considerable study on the part of Westinghouse engineers was devoted to this, but no special progress was made of a permanent character, as our own Government began an attempt to develop such facilities, foreseeing the possibility of needing them later.

This activity took form in several fields. One, however, was the development of radio transmitting and receiving apparatus, both telegraphic and telephonic. In order to carry out this work it was necessary to have transmitting and receiving stations, and by special license from our Government, the Westinghouse Electric & Manufacturing Company was permitted to build and operate such facilities for experimental purposes.

Two stations were designed, equipped and operated during the war. One was located near its plant at East Pittsburgh, Pennsylvania, and the other at the home of Dr. Frank Conrad in the Pittsburgh residential district, a distance of four or five miles separating the two stations. The calls of these stations were-- 2WM and 2WE.

Your speaker was in charge of the Westinghouse Company's war activities. Dr. Conrad was then serving as one of his assistants and among other things was especially assigned to radio work. Dr. Conrad's work was very closely coordinated with that of the United States Signal Corps.

Dr. Conrad became very much engrossed in this work, and in characteristic manner began to do research, developing new ideas and making important advances in the art. As a result, a considerable amount of money was invested in this equipment and a large staff of experts organized.

With the end of the war, the Company found itself with this investment and organization on its hands, and the re-establishment of patent restrictions, most of which were adversely held, placed the Company in a position of considerable difficulty in continuing this work. The progress that had been made during the war period, however, encouraged it to continue. Seeking a way to establish itself in the industry, negotiations were undertaken, and finally successfully concluded, whereby a controlling interest was purchased in the International Radio Telegraph Company which owned many important fundamental radio patents.

The International Radio Telegraph Company owned and operated several ship-to-shore radio stations, and was a pioneer in this field. The operation and development of this service immediately became a part of Westinghouse activities.

## Seek to Develop Radio Service

A large sum of money having been expended for the control of the International Radio Telegraph Company emphasized in our minds the necessity for developing our new acquisition into a service which would broaden, popularize and commercialize radio to a greater extent than existed at that time, in order to earn some return on this investment as well as to keep the radio organization together.

In seeking a revenue-returning service, the thought occurred to broadcast a news service regularly from our ship-to-shore stations to the ships. This thought was followed up but nothing was accomplished because of the negative reaction obtained from those organizations whom we desired to furnish this news material service. However, the thought of accomplishing something which would realize the service referred to, still persisted in our minds.

During this period Dr. Conrad had continued his experiments with the station at his home and had greatly improved his radio telephone transmitter. Following the date on which Government restrictions were removed from radio stations, Dr. Conrad quite regularly had operated this radio telephone transmitter to send out interesting programs of one kind or another, and to such an extent that people with receiving sets became sufficiently interested to listen to his station.

The program material available to him was largely phonograph records, although there were some talks, baseball and football scores. The station, whose call letters had been changed, was then designated as 8XX and was known as one of the best amateur stations in the country.

### **Effect of Newspaper Ad**

We were watching this activity very closely. In the early part of the following year the thought came which led to the initiation of a regular broadcast service. An advertisement of a local department store in a Pittsburgh newspaper, calling attention to a stock of radio receivers which could be used to receive the programs sent out by Dr. Conrad, caused the thought to come to me that the efforts that were then being made to develop radio telephony as a confidential means of communication were wrong, and that instead its field was really one of wide publicity; in fact the only means of instantaneous collective communication ever devised. Right in our grasp, therefore, we had that service which we had been thinking about and endeavoring to formulate.

Here was an idea of limitless opportunity if it could be "put across". A little study of this thought developed great possibilities. It was felt that here was something that would make a new public service of a kind certain to create epochal changes in the then accepted everyday affairs, quite as vital as had the introduction of the telephone and telegraph, or the application of electricity to lighting and to power.

We became convinced that we had in our hands, in this idea, the instrument that would prove to be the greatest and most direct mass communicational and mass educational means that had ever appeared. The natural fascination of its mystery, coupled with its ability to annihilate distance, would attract, interest and open many avenues to bring ease and happiness into human lives. It was obviously a form of service of universal application, that could be rendered without favor and without price.

### **Decided to Start Station**

Resulting from this idea was the decision to install a broadcasting station at East Pittsburgh and to initiate this service. This decision was made early in 1920, although it was not until fall that the equipment was ready for operation. In the interim, we held many interesting and now really historical conferences to plan our undertaking.

Dr. Frank Conrad, Assistant Chief Engineer; Mr. J. C. McQuiston, General Advertising Manager; Mr. S. M. Kintner, Manager of Research Department; Mr. O. S. Schairer,

Manager Patent Department; Mr. L. W. Chubb, Manager Radio Engineering Department, and Mr. M. C. Rypinski, Sales Department—all of the Westinghouse Electric & Manufacturing Company—participated in these conferences, and it was their experience, advice, constant faith and loyal efforts in the undertaking and the development that followed that carried the project to success.

## Cooperation of Press

One of the earliest decisions was the necessity of building up and obtaining necessary public interest in our efforts through the cooperation of the daily press. It happened that we were most fortunately situated to accomplish this. Mr. A. E. Braun, the directing head of the Pittsburgh Post, a morning paper, and the Pittsburgh Sun, an evening paper, was an officer in the International Radio Telegraph Company, and the cooperation of these papers and his hearty support were immediately forthcoming. This, with Mr. McQuiston's acquaintanceship and contacts with other press channels, and his work with Mr. Braun, added much to building up the public interest which led to the final great success of the venture.

## Main Objectives

The main objectives which we laid down as basic have guided our radio broadcasting ever since, and were—

1. To work, hand in hand, with the press, recognizing that only by published programs could the public fully appreciate a broadcasting service.
2. To provide a type of program that would be of interest and benefit to the greatest number, touching the lives of young and old, men and women, in various stages and conditions of life.
3. To avoid monotony by introducing variety in music, speeches, etc.
4. To have distinctive features so timed as to assure their coming on at regular periods every evening; in other words, as a railroad does by its time-table.
5. To be continuous. That is, operate every day of the year. KDKA has operated without a break in schedule since the opening of the station.

In our discussion the subject of the first program was a matter of very careful deliberation. We wanted to do something unusual—we wanted to make it spectacular; we wanted it to attract attention.

## First Program Spectacular

It happened that 1920 was the presidential election year, and the happy thought occurred to us to open our station on the night of the election returns and to broadcast this news. Through the cooperation of Mr. Braun our plans matured with the decision to open on November 2, 1920—which we did—and the result was the historical broadcast by KDKA of the Harding election. The election returns were gathered in the office of the Pittsburgh Post, in Pittsburgh, and from there telephoned to East Pittsburgh where they were relayed by another operator and broadcast by this new service.

A broadcasting station is a rather useless enterprise unless there is someone to listen to it. Here was an innovation, and even though advertised, few then, other than possibly some of the amateurs who had receiving sets, could listen to us. To meet this situation we had a number of simple receiving outfits manufactured. These we distributed among friends and to several of the officers of the Company. Thus was the first broadcast audience drafted.

## Broadcasting Begins

As a matter of historical record and sequence in the origin and progress of radio broadcasting as a public service, the following chronicle of events is important:

After a period of testing and experimental operation, the Westinghouse Electric & Manufacturing Company on November 2, 1920, at East Pittsburgh, Pa., put into operation the first broadcasting station in the world, now known as KDKA, and transmitted as its first program the returns of the Harding presidential election. Following this, a daily program from 8:30 to 9:30 P. M. was immediately instituted. The daily schedule of the station has been continued without interruption up to the present time.

After nine months of continuous operation of Station KDKA, the Westinghouse Company opened WBZ at Springfield, Mass., in September, 1921; followed on October 12, 1921 by WJZ at Newark, N. J., and on November 11, 1921, by KYW at Chicago, Illinois.

It was not until the summer of the next year that any other stations of prominence were placed into operation, and very few then, as it was a considerable time later that the great rush for wavelengths took place and the confusion introduced that now exists in the broadcasting wavebands.

Our first broadcasting was from a rough box affair upon the roof of one of the taller buildings at the plant, which still stands



there although no longer in use, and the development of the broadcasting studio is an interesting story.

### **Broadcast Westinghouse Band**

In the first few months of operation of KDKA, program material was drawn largely from phonograph records. It was recognized almost immediately by us, however, that no great interest or progress in broadcasting service would be possible if material differing from this type of entertainment were not available. The Westinghouse employes have always had a number of musical organizations, among them a very good band. We decided to broadcast this. Later, we organized the KDKA Little Symphony Orchestra.

Our phonograph was operated in the room in which the transmitter was located, and the announcer and others who had taken part in the program up to this time also had been using this room. With larger aggregations of talent, however, it was necessary to seek bigger quarters, so one of the auditoriums at East Pittsburgh was put into use. We immediately had difficulty in obtaining fidelity in the broadcast, due, apparently, to room resonance. To correct this, we thought of placing the band in the open air and to transmit from out-of-doors. When this was done the result was a marked improvement. As a result of this, we saw at once that if we wished to accomplish good sound reproduction, specially designed rooms would be required to broadcast from—but how, was not clearly apparent and in addition the expense incident to it was a serious problem.

As the warmer weather was approaching, we decided to broadcast our artists from this open air studio which, as before stated, was on the roof of one of the taller buildings at the plant. For protection we erected a tent. This proved good, and everything went along satisfactorily during the summer and early fall, until one night a high wind blew the tent away—and so our first studio passed out and into history.

### **Move Studio Indoors**

Necessity has always been the mother of invention, and having managed to keep our service going for nearly a year we could not think of discontinuing it because we had no studio—but we saw that we would have to go indoors. We, therefore, decided to try the tent inside. Part of the top floor of this high building was cleared and the tent "pitched" on this floor. We were pleased to find that it worked as effectively as it had out-of-doors. Thus was the first indoor broadcasting studio developed.

The subject of a specially constructed studio, however, was again revived and designs prepared for it. Taking the lesson of the tent to heart, we draped the whole interior of the new studio with the cheapest material we had available—burlap. We had now all the elements of the present studio.

The principles that were originated by our experience have governed the design of the present-day studios, but the lowly burlap has changed its name to the more dignified name of monk's cloth. Other materials, however, have been developed in this intervening period, and the walls, ceilings and floors of studios are now built of materials which are non-resonant in character so that the use of monk's cloth is required less than formerly.

One cannot but be impressed with what radio has accomplished in a few short years when one compares this first tent studio with the wonderful studios and equipment of the National Broadcasting Company.

### **The Amateurs Rebel**

KDKA had in the beginning a power of only 100 watts, but this was, of course, more powerful than the transmitting sets used by amateurs in those days. The amateurs, until our advent, had the field to themselves and had enjoyed the entire freedom of the air.

Our broadcasting transmitter coming into the picture was obviously not received with open arms by them as the continuous operation of the transmitter interfered to a large extent with their work. At that time most amateurs were using spark sets, and our broadcasting in turn was seriously marred by interference from that source. It came to a point of more or less open warfare, with the amateur operators, if anything, having the best of it.

It must be said, however, to the credit of the amateurs, that later when it was evident to them that the public was seriously interested in our efforts, their organization formulated rules of ethics, which, when observed, quite materially corrected this condition.

You can appreciate from this that the first year of our operations was beset with many difficulties and discouragements, and many discussions were had as to whether the game was worth the candle. But we persisted.

### **Westinghouse Executives Lend Support**

I am happy to pay tribute to the late General Guy E. Tripp, Chairman of the Board of Directors of the Westinghouse Electric & Manufacturing Company, and to Mr. E. M. Herr, President,

for their broad-minded support and patience. They had confidence in us and backed the undertaking in a personal way, as well as with contributions from the Company's funds to develop this new service. Finally, these efforts were rewarded by an aroused interest on the part of the public—an interest that grew almost to fever pitch in a stampede late in the year 1921, overwhelming an industry wholly unprepared for it.

## **Public Interest Awakened**

Radio broadcasting became a conversational topic as universal as the weather, and the spell of it became world wide. It is probably a fact that when the response came, no facility or service ever received such a reaction from the public or grew so fast in popularity, when the public was awakened to what it really was. When this happened, almost over night a scientific novelty and a hazardous experiment was transformed into a wide-spread and popular public service.

Thus was radio telephone broadcasting born—a new public service; a service for the benefit or entertainment of any one who might possess even the simplest receiving equipment. The secret of the success of the enterprise lay in the fact that there were then no interfering stations, and because of this only very simple receiving sets were required to “listen in”. This was fortunate, as there was nothing else and the available sets were cheap. Being telephonic, the communications could be understood by every one. They required no translation and were substantially unlimited as to the character of the subject matter that might be transmitted and received. In addition, there was the marvel and fascination of listening to messages received out of space with very simple and inexpensive apparatus.

## **Newspapers Assisted Growth**

We attribute much of this public response to the press work we had been doing. From the start we had sent our announcements and copies of programs to a list of representative newspapers. At first these schedules were typewritten and went to a limited list, but later they were printed, a larger list used, and an organized program of information was carried out in a magazine, which we started, called “Radio Broadcasting News” and sent to about 2000 newspapers. It was not long before KDKA's programs were printed in newspapers all over the United States and in every province of Canada.

In addition to this, a factor which probably contributed much to the success of broadcasting at this time was that broadcasting was done regularly, at well advertised times of the day or

night, and the programs consisted of matter that was of general interest—worth listening to.

Briefly, we endeavored to render a real public service, with regularity, presenting well planned, high grade, interesting and timely advertised programs. It was our conception that it could be made a valuable service different from anything then in existence and adapted to accomplish something entirely new, which was the distinguishing characteristic of our undertaking. This, and our sense of duty to the listening public, assisted in firmly establishing this effort as a definite and all-embracing service.

### **Church Service Begins**

The first real pick-up service ever attempted was that of the services of the Calvary Episcopal Church of Pittsburgh. Here, again, is an interesting story.

We had been sending out originally, as previously indicated, music and entertainment from phonograph records, and as we had determined to broadcast every day we naturally included Sunday. Our week-day form of program material did not seem quite suitable for Sunday evening purposes. Accordingly, we had a discussion about the matter and the happy suggestion was made—"Why not try to broadcast a church service". But how?

After consideration of the difficulties involved, especially in picking it up, a plan was worked out which we felt would make the technical part possible. As music was the principal make-up of our program, our thought naturally gravitated to the Episcopal service. It so happened that one of our engineers was a member of the choir of the Calvary Episcopal Church in the East Liberty section of Pittsburgh. He was called in, the matter explained to him, and he promised to see what could be done.

We were to learn later that fortune was with us in this thought to the extent that the Rector of that Church—Dr. E. J. van Etten, who is a broad-minded, far-sighted and progressive individual—immediately was interested in our proposal and a connection was formed then that has continued to the present day.

On January 2, 1921, the daring experiment was made of broadcasting the services of Calvary Episcopal Church. This was successful, and was so well received that it became a regular feature.

### **Dr. van Etten, First Radio Minister**

Dr. van Etten was the first minister whose church services were broadcast. His was the first voice to be heard in a broadcasting of divine services, and he has undoubtedly, through his enthusiasm in this work, done more to bring happiness and religious comfort to the masses of people than any other living man.

The broadcasting of church service alone, which was initiated by KDKA, was in itself sufficient to make radio broadcasting permanent and invaluable. The innovation was at once unique and compelling in its appeal to people of all ages, classes and denominations, and it has proved to be one of the greatest, most popular and beneficent features ever presented. Even today it is doing more to enlarge the church's sphere of influence than any medium heretofore employed.

It is my belief that the happy thought that led to the inclusion of a church in our broadcasting, and our success in selecting the church that we did, the idea of cooperating with the press and the public interest that we gained through it, coupled with our feeling of responsibility and with our unbounded confidence in the future of the service which we had initiated and were developing, and the soundness of the principles we had laid down for our guidance, formed the solid foundation upon which this whole broadcasting industry has been built.

Recognizing the need of expert advice in the development of programs, we sought the cooperation of Mr. Harvey Gaul, the musical director of Calvary Episcopal Church, to assist us in determining the best selection of artists and music. Mr. Gaul was thus the first radio impresario and during the period he was with us he made some valuable contributions to radio musical lore and broadcasting technique.

### Early Forecasting

There is a common saying that "hind sight is better than foresight", and in the light of today's accomplishments it is easy to ascribe many virtues to ourselves and to our undertaking.

But what do the records show? In an article which I wrote in February, 1921, only three months after regular broadcasting had been established, the following truly prophetic statements were made:

"The adaptability of the radiophone to broadcasting reports, news, entertainments, concerts, lectures, etc., creates a field particularly its own.

"It is quite possible that especially constructed transmitting rooms will be provided for such purposes, so that voices and music will be broadcast through unbounded areas and listened to by invisible and widely distributed audiences of vast numbers. The same opportunities would thus exist for the country dweller as for the city resident, and inmates of hospitals and sanitariums, and sick people and invalids in the home, would have opportunities for pleasures and diversions now denied them.

"The importance of reaching such tremendous numbers of people, with practically no effort, offers great possibilities for advertising and the distribution of news and important facts, and in reality introduces a 'universal speaking service'. It is not unreasonable to predict that the time will come when almost every home will include in its furnishings some sort of loudspeaking radio receiving instrument, which can be put into operation at will, permitting the householder to be in more or less constant touch with the outside world through these broadcasting agencies.

"The field of radio application is practically unlimited in the important

affairs of the world, and this development will mark one of the great steps in the progress and evolution of mankind."

Again, in another article which I prepared in January, 1922, the following appears:

"And where will it end? What are the limitations? Who dares to predict? Relays will permit one station to pass its message on to another, and we may easily expect to hear in an outlying farm in Maine some great artist singing into a microphone many thousand miles away. A receiving set in every home; in every hotel room; in every school room; in every hospital room. Why not? It is not so much a question of possibility—it is rather a question of 'how soon'."

*A dream then has become a reality now.*

## Pioneer Records

As part of the pioneer records of KDKA we have the honor to record that Honorable Herbert Hoover's first radio broadcast address was transmitted by KDKA. The address was presented during a dinner held at the Duquesne Club, Pittsburgh, Pa., January 15, 1921, to raise funds for European relief work. Mr. Hoover's pioneer address was followed by addresses of others of prominence. Our records reveal that on February 18, 1921, KDKA transmitted the address of Miss Alice M. Robertson, then Congresswoman-elect from Oklahoma, the first woman elected to Congress, and Colonel Theodore Roosevelt, Jr. Their addresses were delivered before the Pittsburgh Press Club.

One month later, on March 19, 1921, three members of the President's Cabinet addressed the audience of KDKA. These were Honorable Andrew W. Mellon, Secretary of the Treasury; Honorable James J. Davis, Secretary of Labor, and Honorable John W. Weeks, Secretary of War. At another time Honorable William Jennings Bryan made his first radio address over KDKA.

In the history of KDKA's broadcasting there have been a host of world-famous people who have addressed the station's radio audience. The pioneer speakers were of such high calibre that they surely set up a precedent for those who followed.

## Famous Radio Events

Then, in the following months, KDKA rapidly developed and presented a series of "firsts" in broadcasting history. Among these "firsts" were the re-transmission of Arlington Time Signals at 10:00 o'clock nightly. The time signal service introduced a few days after the start of KDKA became at once, and has so remained, one of the most popular and appreciated of radio features.

After the time signals, KDKA introduced the first sports events by broadcast, the occasion being a boxing contest between Johnny Ray and Johnny Dundee, held in Motor Square Garden, Pittsburgh, April 11, 1921. Both boxers, I might add, have long since retired.

Next, on May 9, 1921, KDKA broadcast from the stage of the Davis Theatre in Pittsburgh, the first theatrical program in history. On August 4, 5, 6, 1921, KDKA first broadcast tennis matches, the occasion being the Davis Cup matches held at the Allegheny Country Club, Sewickley, Pa., about 25 miles distant from the transmitting station. On August 5, 1921, KDKA transmitted the first play-by-play account of a baseball game held in the National League Park at Pittsburgh.

These pioneer athletic events were the forerunners of the tremendously interesting sports broadcasts with which the American public has been so well entertained in later years.

One of the first broadcasts made from WJZ was the World Series baseball games, with one of the New York teams as a contender.

KYW's first program was an auspicious one, it being the transmission of Grand Opera direct from the stage by artists of the Chicago Civic Opera Company. This program was the pioneer of the many delightful operatic programs which we have enjoyed in the past and which, I am happy to say, are still a tremendously interesting feature of chain hook-ups.

## Story of Farm Service

In the efforts to develop a diversified program, the agricultural population, of vast importance to any agency attempting to interest all of the people of the United States, was not overlooked. To the contrary, it is another striking instance of KDKA's pioneering that the station was the first to conduct a regular farm service, which included not only livestock, hay and grain reports, but also weather forecasts. On May 19, 1921, KDKA was authorized to broadcast government market reports and immediately began this service. Since that beginning, market reports which, from time to time, have been expanded in scope, have been a nightly feature of Westinghouse broadcasting stations.

Station KFKX, now located in Chicago, is one of the very few stations whose programs are almost exclusively devoted to farm subjects.

## Entire City Available for Programs

To reach the wide field of program material, an extensive system of pick-ups was worked out in Pittsburgh covering some thirty points of contact with events of public interest. Included in this arrangement are schools, churches, theatres, hotels, athletic fields, and halls, with special studios at one University and two hotels.

KYW, Chicago, and WBZ, Springfield, have similar but less extensive systems of pick-up. In the case of WBZ there is the striking feature of a line connection with Boston, 100 miles long, giving an additional pick-up system in that city and including also several studios.

This was all pioneering, and in the development of programs for our service was the endeavor constantly made to develop new and unusual features, as it is these that attract special attention, maintain public interest and win the greatest applause. It can be stated as a fact that there is hardly an element in program service today that was not covered in these early undertakings. In other words, the Westinghouse Electric & Manufacturing Company not only created broadcasting but has been one of the most active forces in developing it.

### **Announcers' School**

We soon found that training announcers in diction and pronunciation was necessary, since for every mispronounced word we were certain to receive many letters of criticism. This condition prompted us to start an announcers' school, under the capable direction of Mr. T. H. Bailey Whipple, our Literary Critic, who held daily rehearsals of the various announcements to be made.

Most opportunely for us, we were able to secure the services of Miss Marjorie Stewart who, although blind, wrote daily constructive criticisms of all programs, pointing out where improvements might be effected. She thus became the first radio critic and due to her exceptionally keen perception, false notes in our broadcasting, exceedingly difficult for the program manager to detect before delivery of the actual program, were eradicated.

### **Feel Public's Pulse by Letters**

We continually felt the pulse of the public through the thousands of letters sent to us, to determine their wishes in program arrangement. Some of these early letters were very interesting and instructive, and because of them we were from the very first led to maintain a high standard, not only in musical offerings but also in the lectures, addresses and other forms of program. It is believed that because the most important broadcasting stations have maintained their quality of program the radio listeners in the mass appreciate the quality offering more than one of ordinary grade. Broadcasting, without question, has had an uplifting effect upon the taste of the public in music—a fact well appreciated by the musical fraternity.



## Develop Modulation Meter

It was very soon discovered that the characteristics of the microphone were quite different from those of the human ear. The microphone responds to certain frequencies more readily than to others. Consequently, a grouping in a studio that would be satisfactory to the ear direct might not be at all pleasing when heard over the radio.

A little experience showed that it was necessary to determine accurate standards that can be applied in advance to assure that music as reproduced in the receiver, is properly balanced—that is, proper blending of high and low tones and also proper relation of volume of accompaniment and leading melodies.

Musical tones vary in pitch from the lowest tone on the piano, which produces 27 vibrations per second, to the highest tone of more than 4000 vibrations per second. These fundamental tones are superimposed by higher harmonics which determine the nature of the tone produced thus making it possible to distinguish between the violin, flute, clarinet, trumpet, etc., or the most complicated sound, which is the human voice.

To provide a means of control, a modulation meter calibrated from 1-100 was devised. This instrument is now standard equipment in every transmitter. It is used to study the effect of different kinds of music or frequencies upon the current in the modulating tubes—an important factor that determines the quality of broadcasting. Over-modulation causes distortion, and under-modulation gives too weak a signal, difficult to reproduce clearly on the receiving sets.

For a given volume of sound a high pitched tone produces a higher reading on the modulation meter than a lower tone—that is, the higher tones more easily produce distortion of music. This fact makes it evident that the arrangement of instruments in an orchestra, for example, when broadcasting, must be different from that of the usual set-up in an auditorium. It was found that the lower pitched instruments must be placed nearer the microphone than those of higher pitch. On the basis of data compiled on a large number of observations and careful checking of the music as actually produced in the studio, and the results obtained on a receiving set, a series of charts was worked out by Mr. A. G. Popcke one of the Westinghouse Electric & Manufacturing Company's engineers, showing the proper location of soloists and piano, also the proper grouping of instruments of various combinations as quartets, orchestra, band, etc.

## Chart Studio Acoustics

Of course, these charts were related to the acoustics of the studio and also to the type of microphone used. For this reason, as the art progressed, it was necessary to make changes in the placing of artists before the microphone.

Greater distance from the microphone is now possible on account of the improvements that have been made in the microphones, and the amplifiers used. The old-time carbon microphone had a strong frying undertone, or "ground tone", the volume of which was a considerable percentage of the volume of music to be broadcast. Up-to-date apparatus has reduced this ground tone to a very small percentage of the sound to be broadcast, and consequently greater amplification is used which results in greater possible distance between performer and microphone.

This increase in distance has simplified the problem of the proper placing of orchestra, for example. The musicians are not crowded about the microphone. The increase in distance has decreased the percentage of error due to slight departures from the proper placing of performers. In fact, the music in an auditorium can be picked up successfully with the regular seating of the orchestra by locating one or more microphones at the proper points.

The results accomplished by this kind of work, together with the work done on microphones and improvements in design of transmitters, have brought about much improvement in transmitting programs of the higher quality with greater fidelity, and if the radio audience use receiving equipment, particularly amplifiers and loud speakers, which will successfully reproduce all the frequencies that are transmitted, nearly perfect reception is possible.

## Short Wave Work

Meanwhile, KDKA was reaching out and pioneering in a branch of development of the radio art which now bids fair to be the most important in the science of communication. I refer to the work that the Westinghouse Company's engineers have done in short wave transmission, and from which much is expected by radio engineers.

Early in 1922 we were convinced that there were wonderful possibilities which were being overlooked in the then unused and rather despised short wave bands, considerably lower than those then in use for broadcasting and for communication. An experimental station known as KDPM was installed at the Westinghouse Company's plant at Cleveland, Ohio, and serious work was undertaken between KDKA at East Pittsburgh and this station in an

investigation of the subject of short wave transmission and re-broadcasting. Since that time, research and development work in this branch of the art have been carried on continuously and vigorously.

In the fall of 1923 the Westinghouse Company located a re-broadcasting station at Hastings, Nebraska, it becoming the well-known KFKX. At this point short wave transmissions from KDKA were nightly received and re-broadcast on the station's assigned wavelength.

## Great Britain Relays KDKA

On New Year's Eve, 1923, through previous arrangement, KDKA transmitted a short wave program to Great Britain. This program was re-broadcast to British listeners through a station operated by the Metropolitan Vickers Company at Manchester, England, and was the first internationally broadcast program, as well as the first to be rebroadcast.

This work in short wave transmission led us to continue striving for distance. On December 12, 1924, KDKA's short wave program was received and re-transmitted in Johannesburg, South Africa, by a newspaper there—The Johannesburg Star—and a few weeks later, January 25, 1925, we transmitted a program to Australia. This transmission marked the ultimate in distance transmission since it was half-way around the world. Two days later, our short wave programs were received and re-broadcast in Melbourne, Australia, completing the record of our achievement. In every event so listed, the event marked the first time in history that such an achievement had been accomplished. The records show that KDKA's short wave transmission have been heard in every part of the world.

## Far North Broadcasts

One important phase of the Westinghouse Company's broadcasting activities has been its so-called Far North Broadcasts, initiated through the foresight of Mr. George A. Wendt of the Canadian Westinghouse Company, Limited.

These programs now consist of a most fascinating list of letters, news reports and information from employes, relatives and friends of that band of adventurous folk whose lives are spent in small habitations, for the most part, above the Arctic Circle. The activities that resulted in the Far North Broadcasts began in the summer of 1923 when a number of receivers was distributed by the Canadian Westinghouse Company, to the Far North posts

of the Royal Canadian Mounted Police. Because of these receiving sets we were enabled to transmit messages to them, at first by KDKA, then later by the other Westinghouse stations. As season after season of transmitting has been conducted, more and more of the companies operating posts in the North of Canada, have supplied receiving sets to their representatives with the result that nearly all such places now have radio receiving installations.

Among the companies which have so equipped their posts are the Royal Canadian Mounted Police, the Hudson's Bay Company, the Revillon Freres, the Oblate Fathers, and others. To this host of listeners, the Westinghouse stations each winter send a series of messages, most of which are of unique importance to those living out of reach of all civilization save that which comes to them from the ether. We have sent messages that have saved lives, rearranged winter plans, have caused heartache, and happy reunion—all over that great area starting from Greenland in the east, thence over the coast of Labrador and all the way across Northern Canada. These Far North Broadcasts are among the most important things that broadcasting has ever accomplished.

The radio messages sent into the Far North were often the only communication those people had with the world for six months; it required often many months for the acknowledgments to reach us.

### **Pioneer in Synchronizing**

Again, in later years, another pioneering step was taken. I refer to synchronizing. We were operating Station WBZ at Springfield, and another station—WBZA—at Boston. WBZA was necessary because the Springfield Station WBZ could not be heard in certain sections of the Boston territory. WBZA, a small relay station, was installed in Boston to overcome this difficulty. At first it was operated on a different wavelength from WBZ, but it was realized that if these two stations could be synchronized and the program transmitted on a common wavelength from both stations, a much better distribution of the broadcast would be possible, and to the listener, of course, it would be as one station.

After some months of experimental work and development this was accomplished, and now for a considerable time these two stations have been run in synchronism with much more general satisfaction to the program listener.

### **Frequency Modulation**

Another pioneering step occurred—this time at East Pittsburgh where KDKA had been operating for some time with a

different type of modulation called "frequency modulation", by means of which we are able to eliminate three-quarters of the number of transmitting tubes that are required in the ordinary manner of transmitting. Further, the wave band is greatly sharpened and eliminates side band interference. Much is expected from this innovation later.

## **Radio Industry of Huge Size**

The business of the radio industry in 1920 did not amount to more than \$2,000,000 for the year. In 1927, this had grown to an annual business approximating \$500,000,000—all due to broadcasting.

Broadcasting, therefore, means everything to the industry since there would be nothing without it. Broadcasting itself would be nothing without the listeners, of which it is now estimated there are 40,000,000. The problem of the broadcasters, therefore, is to constantly strive to hold and increase the interest of the listening public. Nothing could be more useless than a broadcasting station without listeners, or a receiving set without a broadcasting station.

In the year prior to the appointment of the Federal Radio Commission, the entire industry was threatened with destruction due to the chaotic condition existing in broadcasting. Happily the Commission was appointed in time, and through its efforts very great improvements have been instituted.

Broadcasting, however, is still an infant. Much remains to be done in the way of research and development. This is quite evident from the facts herein recited of the step by step pioneering and epochal steps taken at KDKA.

Work of this nature requires the highest kind of engineering and research skill. It requires expensive and extensive facilities and the expenditures of large sums of money. There are, therefore, only a few organizations in the world that are in a position to undertake work of this kind.

## **Start of National Broadcasting Company**

Mr. Owen D. Young, Chairman of the Board of Directors of the Radio Corporation of America, through whose foresight and wonderful organizing ability is due much of the present development in the radio field, realizing this condition, proposed a plan of cooperation between the Radio Corporation of America, General Electric Company and the Westinghouse Electric & Manufacturing Company whereby this important field of broadcasting could be

organized and developed. This resulted in the formation of the National Broadcasting Company—an organization to devote its whole effort to the building up and developing of the broadcasting service through improved methods and programs, and to furnish a service throughout the country to properly located and selected stations in a manner similar to the service furnished to newspapers by the various Press associations.

Nothing could be more fortunate for radio's future than this. The participation of these important electrical organizations in the work of the National Broadcasting Company guarantees to it adequate financial strength and permits an organization and equipment to be provided that will be capable of coordinating and presenting program material of the highest order, backed by the vast technical resources of these large companies.

Certainly this guarantees to the listening public that broadcasting is now on a firm and lasting basis, and that it will become increasingly better as time goes on.

### **A National Service**

As the name implies, the National Broadcasting Company is a national service. It is not limited to east or west, north or south. It covers the entire nation through several networks and groups and individual stations. Its programs, therefore, have the widest possible appeal to all classes, localities and interests. This organization has, in fact, been charged with the stewardship of national entertainment and enlightenment—the greatest task ever assigned to any commercial enterprise.

Mr. Young further indicated the high purpose he had in mind in the organization of the National Broadcasting Company and guaranteed its good faith to the public by inviting eighteen recognized leaders in public life in this country to serve as an advisory council. This was done so that the National Broadcasting Company might have the guidance of men and women prominent in all phases of public life, and it is believed that from their advice will come the highest utilitarian development of this wonderful service.

Improvement and expansion in program offerings and in program technique, under the able leadership of Mr. Merlin Hall Aylesworth, and his staff, have been very marked since the formation of the National Broadcasting Company.

No history of broadcasting can be complete without reference to Mr. David Sarnoff, Vice President and General Manager of the Radio Corporation of America, an early pioneer, whose fine judgment, clear vision and high executive ability have made him the guiding genius of the entire radio industry. Many times in our

early days have we gone to him with our problems, and have never failed to be encouraged by his unbounded confidence and enthusiasm, and sound advice.

## Who Is to Pay?

From the very beginning the question of "who is to pay" has been constantly raised, and one plan after another has been proposed, and abandoned.

I can say that we have never felt concerned about this point, firm in our belief from the beginning that this service was so necessary in our daily lives that ways would develop to make it self-supporting.

Its advertising value has always been recognized, and it was evident from the beginning that sooner or later that this would be realized and would be the answer to the question.

It is a distinctive and encompassing medium. It is the greatest and most intimate contact that has ever appeared, and is wholly personal in its appeal. It has now become the key to millions of homes, and the individual or firm that can bring the subject of its activities in an adroit and satisfying way to the listening millions is employing a means for great commercial possibilities in the disposal of its product, and can justify the expenditure of large sums of money in its development.

## Other Forms of Amusement Safe

It is apparent, therefore, that insofar as this advertising appeal can be effectively developed, we need not worry about the source from which the money to pay will come. In the industrial development of this age, as one innovation succeeds another, there always arises the specter of obsolescence, but its baneful influence extends only to those industries or organizations that have become sterile and impotent. If they have the energy and ability to accept the new and to reconstruct the old, the combination means new life and development in general.

No danger is threatened to other sources of amusement and entertainment in the development of radio except to those that are decadent enough to deserve death, but radio certainly will be a stimulant for what is novel and new and better, and will educate people in that direction and stimulate their interest and desire for the better things of life. Insofar as amusement and entertainment cater to those desires and instincts, they have nothing to fear and everything to gain from radio.

## What of the Future?

But what of the future? Great innovations come infrequently, but often unexpectedly. No one ten years ago would have envisaged the actualities of today, yet we, who are closest to it, may presume to predict that in spite of the great developments to date the ground has scarcely been scratched, and that even more wonderful advances and possibilities are near at hand. Radio vision, whereby we shall see as well as hear by radio, is an accomplished fact; talking movies in the home, nearly here. No more visionary than some of the actualities of today were a dozen years ago, is the possibility of the transmission of power by radio.

We who are now active may have to leave much of these future developments to others; still we can feel content, ourselves, to have been a pioneer whose dreams and struggles have borne the cherished fruits of successful accomplishment—usually a sufficient reward, but in this instance many times amplified when we contemplate the greatness of the service and industry that has developed from the modest beginning I have recited to you today.

You have all heard of the famous statue of Memnon—out upon the shifting sands it sits, a calm on its face, its voice forever hushed. But of old it spoke, and once each day, as each new sun arose, there came forth from its lips a sound. And worshippers came long pilgrimages and knelt in the sand to catch that sound, which was in their ears as a voice from Heaven.

So the voice of Radio comes to its devotees almost as a voice from another world. In fact, radio broadcasting has brought to humanity a new and heavenly vision, if not a new world.