from
Westinghouse
MSS 424

Box 62
Folder 10

Pertinent KDKA materials
from collection of
varied topic press releases

Release on 1921 religious broadcast
Release on two carpets KDKA jubilee (50th?)

KDKA 1020 Radio

WESTINGHOUSE BROADCASTING CO., INC.

Left: Broadcasting begins with KDKA's coverage of Harding-Cox election returns November 2, 1920.

ONE GATEWAY CENTER * PITTSBURGH 22, PENNSYLVANIA * EXPRESS 1-3000

KDKA BROADCAST FIRST RELIGIOUS SERVICE IN EARLY DAYS OF RADIO

The four hours of free religious programming aired over KDKA Radio each Sunday evening as well as all radio presentations of a religious nature had their origin early in 1921.

KDKA was the first to broadcast a regular church service. Pittsburgh's Calvary Episcopal Church was the setting, and January 2, 1921, was the date.

The program was broadcasting's first remote pickup and took place exactly two months after KDKA went on the air with its history-making coverage of the Harding-Cox election returns (November 2, 1920).

The minister was the late Dr. Edwin J. van Etten, then rector of that Pittsburgh congregation.

Recalling that broadcast, he once noted:

"All was going well, but on glancing at the choir I discovered strange faces and noted unusual antics. It was not until later that I learned these were Westinghouse engineers - one a Jewish lad, the other an Irish Catholic - garbed in surplices to make them inconspicuous in the midst of my Protestant Episcopal choir. Even now as I think of their presence there, it seems to me that they symbolize the real universality of radio religion."

(END)

PRESS INFORMATION
ONE GATEWAY CENTER PITTSBURGH PENNSYLVANIA 15222 TELEPHONE 391-3000

KDKA RADIO 1020 GROUP W
WESTINGHOUSE BROADCASTING COMPANY INC

TIME CAPSULE CEREMONY

FORMAT

4:00 P.M. Opening - Ed Schaughency and Bill Burns

Band - Number

Bill Burns introduces Mayor Flaherty

Mayor Flaherty - Remarks

Ed Schaughency introduces Mr. McGannon

Mr. McGannon - Remarks

Burns and Schaughency describe capsule lowering

Capsule lowering - Mayor Flaherty & Mr. McGannon

Schaughency introduces Mr. Wallis

Mr. Wallis - Presentation of the Trust Envelope

Burns and Schaughency - Wrap-up

Band - Closing number

KDKA Radio is the Group W (Westinghouse Broadcasting Company) station in Pittsburgh.

# # # #

Contact: Pat Pantonini

110270

PRESS INFORMATION
ONE GATEWAY CENTER PITTSBURGH PENNSYLVANIA 15222 TELEPHONE 391-3000

KDKA RADIO 1020 GROUP W
WESTINGHOUSE BROADCASTING COMPANY INC

THE CAPSULE

Length: 24 inches

Shape: Cylindrical

Diameter: 10 inches

Weight: (empty) 10 pounds

Thickness: One-quarter inch

Designed and custom made for KDKA by the PPG Fiber Glass Division Research Center here.

Made of PPG's fiber glass reinforced plastic, plastic compounds or resins reinforced with glass fibers to produce thousands of design shapes and forms. The glass fibers add strength to the plastic or resin in the same way that steel rods made reinforced concrete many times stronger than concrete alone.

THE BAND

The Kiski Area High School Band

155 pieces which includes the Color Guards

Alex Costanza, Supervisor Barry Lauravich, Conductor

This excellent band won first prize in this year's Columbus Day Parade and will play tonight at Three Rivers Stadium for the ABC Game of the Week during half time.

THE SITE

The space was made available through the courtesy of the Equitable Life Assurance Society of the United States.

A bronze plaque (to be added later) will mark the site.

# # # #

Contact: Pat Pantonini

110270

PRESS INFORMATION
ONE GATEWAY CENTER PITTSBURGH PENNSYLVANIA 15222 TELEPHONE 391-3000

KDKA RADIO 1020 GROUP W
WESTINGHOUSE BROADCASTING COMPANY INC

PARTIAL LIST OF CONTENTS OF THE TIME CAPSULE

The Mayor's Proclamation - KDKA Golden Jubilee Day in Pittsburgh.

Copy of the Congressional Record honoring KDKA Radio.

Resolution of the House of Representatives of Pennsylvania which congratulates KDKA on its fifty years of service to the Commonwealth.

Congratulations from the Governor of Pennsylvania.

Resolution by the Board of County Commissioners of Allegheny County honoring KDKA.

Six hours of tapes which trace the history of radio from the pioneer days.

Today's programs of KDKA's Golden Jubilee Broadcasts.

Microfilm copies - The Pittsburgh Press and the Post-Gazette.

A check which depicts Pittsburgh's skyline now from the Pittsburgh National Bank.

Predictions from the Nuclear Energy Systems Division of the Westinghouse Electric Corporation.

Predictions from listeners for the year 2000.

A copy of the History of KDKA Radio.

Typical KDKA program scripts from the past 50 years.

Magazines of the day.

(MORE)

Contents of the Time Capsule Continued

PLUS

Copies of material and microfilms which were placed in the cornerstone of the New Transmitter dedicated in 1939, which included:

- Log of Station Operations
- Newspaper and Magazines - 1939
- "Magic Dials" by Lowell Thomas
- Original script of the RKO motion picture "Allegheny Uprising"
- Blue prints of the 1939 KDKA transmitter
- Blue prints of the 1939 television equipment
- Specifications for Westinghouse 20th Anniversary Radio receiver.

And many other memorabilia of KDKA and Pittsburgh.

Plus a cassette tape machine so they can playback the tapes.

KDKA Radio is the Group W (Westinghouse Broadcasting Company) station in Pittsburgh.

# # # #

Contact: Pat Pantonini 110270

PRESS INFORMATION
ONE GATEWAY CENTER PITTSBURGH PENNSYLVANIA 15222 TELEPHONE 391-3000

KDKA RADIO 1020 GROUP W
WESTINGHOUSE BROADCASTING COMPANY INC

PEOPLE WHO ARE TAKING PART IN THE TIME CAPSULE CEREMONY

On-Air Co-Hosts: Ed Schaughency and Bill Burns

Officiating: The Honorable Pete Flaherty, Mayor of Pittsburgh

Mr. Donald H. McGannon, Chairman of the Board and President of Westinghouse Broadcasting Co.

Mr. Edward Wallis, Group W Area Vice President for Pittsburgh

Honored Guests: Mr. Marvin L. Shapiro, Executive Vice President, Westinghouse Broadcasting Co. and President of Group W Stations.

Mr. Leo H. Rosenberg, The Announcer of the First KDKA Broadcast, the Harding-Cox Election

Mr. Harold W. Arlin, The World's First Full-time Announcer.

Mr. Bill Hartman, General Manager of KDKA Radio.

KDKA Radio is the Group W (Westinghouse Broadcasting Company) station in Pittsburgh.

# # # #

Contact: Pat Pantonini

110270

Westinghouse
MSS 424
Box 124
Folder 6

Excerpt from collection of magazines Engineering Achievements
1920-1931

Excerpts dealing with
radio & broadcasting

(Gregory PR)

Engineering Achievements of the Westinghouse Elec. & Mfg. Co. for 1926

LIGHTING OF AIRPLANE LANDING FIELDS

The requirements encountered in the lighting of airplane landing fields differ greatly from standard practice. For this reason it was decided to create an **entirely new unit,** which would give a **beam of 3° vertical spread** and of **45° horizontal spread** and which would control the upwardly directed rays so as to obviate glare. Mounting a number of such units (3 to 5) on the side line with 300 to 350-foot spacings, would give sufficient penetration even for large fields.

Fig. 62—Airport Landing Floodlight (Open).

Fig. 63—Airport Landing Floodlight (Closed).

The mounting is at a height of 6 to 10 feet above ground and the units are tilted slightly downward, so that the top rays are slightly below horizontal. By individual adjustment such units take care of uneveness of the field, and if greater light intensity is desired at any future time, additional units can be interposed at less spacing, so that the beams overlap.

The unit consists of a steel drum 25 inches in diameter and 19 inches deep mounted on a 2½ inch pipe standard.

Mounted within the steel drum are a lamp socket with vertical, lateral and in-and-out focusing means, a 23-inch parabolic metal reflector of such focal length that all reflected rays come within 3° divergence, and a system of louvers to absorb all those rays of direct light, the upward tilt of which exceeds 1½°. The downwardly directed rays of direct light are not intercepted with and serve to illuminate the ground in front of the unit. A spread lens is mounted in front of the shell to fan out the beam to a horizontal spread of 45°.

When using a 1500-watt projection lamp and spread lens it gives a maximum intensity of 250,000 candle power.

The estimated intensity with plain lens is 3,000,000 candle power.

PRACTICAL SELENIUM CELL

A rare metal, selenium, which for many years has been a toy of experimenters, because of its sensitivity to light but had been regarded as too delicate and uncertain for extended use, has now been given practical adaptation. There is **now available a low cost, long lived, reliable selenium cell and relay** which may be depended on to operate a street light, an electric sign, a show window, a signal light or a contactor.

The difficulties overcome may be realized when it is considered that this metal has **six allotropic disguises,** that its sensitivity is a surface effect with a time lag which must be eliminated, that the largest cells built hitherto carried but a few thousandths of an ampere, that the cell must include a film fifty feet long and 5 mils wide, but should be no bigger than a cigarette case and that atmospheric moisture must be excluded.

RADIO

Two of our 30-watt aircraft transmitters and receivers have established a **navy record of 225 miles break-in communication** between two airplanes in flight.

Great progress has been made in the **high power short wave field. One 20 kw. 35 meter set** is in regular operation at **Buenos Aires communicating with Paris and New York.** A 20 kw. 20 to 100 meter telephone broadcast and telegraph equipment complete with studio and outside pick-up apparatus has been shipped to Russia. This is the **most powerful 20 meter broadcast** set built to date. A 40 kw. 30 meter set has been installed at Manila, P. I. for radio telegraph service. This set gives **three times the power ever before generated at 30 meters wavelength.** The latter two sets have the quartz crystal frequency control. In wavelength contrast to the above, there is also building a **40 kw. 7500-10,000 meter transmitter** for the Navy.

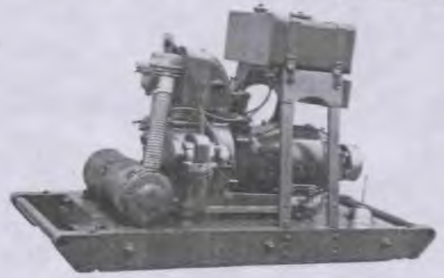

Fig. 64—Portable Radio Generator Driven by Motorcycle Engine.

In the broadcasting field, **quartz crystal frequency control** equipment has been added to stations KYW at Chicago, WBZ at Springfield, and WJZ Radio Corporation station near New York. Stations WBZ Springfield and WBZA at Boston are operating on the **same frequency, synchronized by carrier current over the same telephone line** that carries the programs between Boston and Springfield studios.

Much interesting special rotating machinery has been developed for use in connection with various kinds of transmitters on land, on sea, and in the air. One of the outfits consists of **two motors self-contained in a single housing driving two generators self-contained in a single housing.** One motor is rated 1¾ hp., 110 volts, d-c., and the other motor is rated 1¾ hp., 110 or 220 volt, split phase. The generators are 10 volts and 15 amperes for the plate and 800 volts, 8 amperes for the filament. The speed is 3450 rpm. The generator fields are so designed that when they are driven by the a-c. motor, the idle d-c. motor functions as an exciter for the generator fields.

A **single unit motor generator** has been built for supplying power to the 200 watt and 500 watt **ship transmitters.** It consists of a 115 volt d-c. motor driving a 1¼ kw. 1200 volt generator mounted on the same shaft and in the same frame with the motor. The motor is equipped with slip rings for obtaining a-c. current for the filaments. If only a-c. power is available the motor generator unit is driven by an a-c. motor, the d-c. motor of the motor generator unit becoming an exciter.

An **Indian Motorcycle engine driven double commutator d-c. generator** for Type P.E.-41 power unit has been built for the Signal Corps of the U.S. Army. The Indian Motorcycle engine and the generator are mounted on a common sub base and coupled together. The engine speed is controlled by means of a centrifugal governor, linked to the carburetor.

A **3-unit motor generator set for power supply** for type TV, TW, TX transmitter was built consisting of a 1½ hp. motor coupled on one side to a 7A SK generator, .18 kw., 11 volt for filament supply and on the other side to a double commutator 8B SK special, .6 kw., 1000 volt generator for plate supply.

A **wind driven generator** was developed for the U.S. Navy for use on Airplanes in connection with the Type M.B. spotting Sets. The generator is driven by a self-regulating single blade air fan. The speed is 4500 rpm. The generator armature has two windings, one 4 amperes at 7.5 volts for filament supply and the other .25 amperes, 400 volts for plate supply.

Fig. 65—Wind-Driven Radio Generator for Airplanes.

Radio tied to power circuit wires is a development of the last few years that is of great importance to large power transmission companies. Both communication and supervisory control can be worked over these "wired wireless" circuits. Both carrier current, and resonant frequency control for supervisory control systems have expanded materially this year. Successful carrier communication in large interconnected systems has resulted in its adoption for large utilities which contemplate interconnection later.

An example of **combined communication and control** is that of theAlabama Power Company, consisting of power line communication on the Magella-Selma-Hattiesburg 110 kv. line, consisting of 250 watt stations at Magella sub-station (Birmingham), Mitchell Dam, Martin Dam, Selma, Demopolis, Meridian and Hattiesburg. These stations provide through communication between the extremities of the line and any point in between. Twenty watt stations are located at Montgomery, Greenville, Union Springs, Cuba, Laurel and Eufala. These stations communicate only with their dispatching points.

Another **interesting dispatching system** is the installation connecting the Arkansas Light and Power Company, Louisiana Power and Light Company and Mississippi Power and Light Company. This system extends from Pine Bluff, Ark. to Jackson, Miss. It provides communication to all important points on 250 miles of 110 kv. line. Remmel Dam and El Dorado, Ark. are also equipped to communicate with Pine Bluff over their 66 kv. system.

Century Year annual publication Engineering Achievements of Westinghouse Elec. & Mfg. Co. for 1925
by H.W. Cope

where little electrical service is available, as well as in larger and more elaborate installations.

By means of regenerative braking in super calender drives using the Company's new dual frequency calender drive system, quick stops are made,—of great value in the saving of paper and in the efficiency of operation. By means of throwing the motor from a 60 cycle bus to a 6 cycle bus for threading-in processes, regenerative braking effort of a very high value is obtained so that stops can be accomplished within one second from calender speeds of more than 600 feet per minute.

Westinghouse sectional paper machine drive utilizes direct current motors for speed control of such precision that they function like synchronous motors. There is no change in revolutions per minute, with respect to the master, the motor armature only changing slightly in phase position or angular displacement similar to the rotor of a synchronous motor when load is thrown on or off. Differing, however, from synchronous motor drive the speed of the direct current motors can be adjusted to any predetermined value, and when once determined will operate synchronously with the master. This type of drive and control is now standard equipment in Westinghouse electrical sectional paper machine drive.

A performance worthy of note in this connection is that in a paper mill plant at Vancouver, Washington, in which this drive completed one year's operation of 24 hours per day, 6 days per week, or a total of more than 7200 hours total operation with a total loss of time on account of electrical troubles of all kinds of one hour and forty-five minutes; a total maintenance expense including spare contact points of $21.00. The equipment mentioned was used in the drive and control of a 136 inch Fourdrinier paper machine with a speed range of 150 to 700 feet of paper per minute.

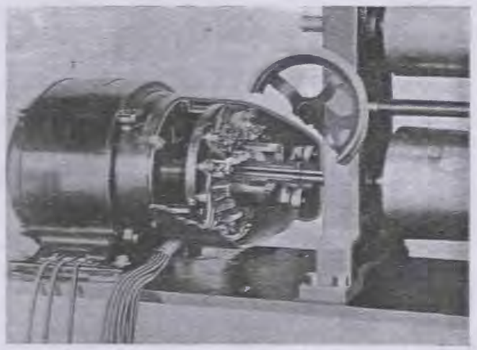

Fig. 57—Rotary Contactor Element for Westinghouse Sectional Paper Machine Drive.

ELEVATORS

The first full automatic floor-landing elevator equipment for high speed passenger service produced by the Company is now in operation. This equipment automatically brings the car to the floor after the operator has initiated the stop by moving the car switch to the "off" position. This constitutes a tremendous improvement over previous elevator operation in that the car stops at the floor, but does not stop before reaching the floor and then creeps to it, nor does it overrun the floor and then creep back.

GEARLESS TRACTION ELEVATOR BRAKES

A new brake has been developed for gearless traction elevator motors which is simpler in construction than our older type of brake, and which will make for far better operation. The new brake has all electrical parts totally enclosed.

ELECTROLYTIC INDUSTRY

The largest electrolytic power unit of its kind is being placed in operation, consisting of a 2800 kw., 136½ volt, geared, turbine driven, direct-current generator. This is representative of the most efficient type of power unit obtainable where the power plant and electrolytic cell room are adjacent.

VENTILATION

The Company is furnishing ninety motors totalling 6,000 hp. to drive the fans which will ventilate the Holland Vehicular Tunnel under the Hudson River, connecting New York and Jersey City. This tunnel, which has a capacity of 2,000 vehicles per hour in each direction, is approximately 8500 feet long and is the largest tunnel of its type in the world. All motors used are the Company's standard CW type.

PETROLEUM INDUSTRY

Fig. 58—Controller Equipment for Oil Well Operation with all Arcing Contactors Immersed in Oil.

The gradual decline of existing fields, the entrance of salt in old fields, drilling and pumping in localities where large quantities of gas prevail, and special operating conditions in foreign fields, have led to developments in apparatus to meet the new requirements.

The standard 15/35 hp. pumping motors have been supplemented by larger two speed motors of 20/50 hp. and 25/65 hp. with a corresponding increase in control equipment. Similarly, for shallow light pumping wells in foreign fields, a 10/25 hp. two speed motor with controller has been developed.

For gaseous oil fields, these motors are being equipped with the slip rings or other parts which might spark, entirely enclosed. The controllers for these protected pumping motors have been made with all arcing contacts oil-immersed. The protected type equipment also includes the 75 and 100 hp. ratings used for rotary or cable tool drilling.

RADIO

Fig. 59—Transmitting Apparatus at KDKA.

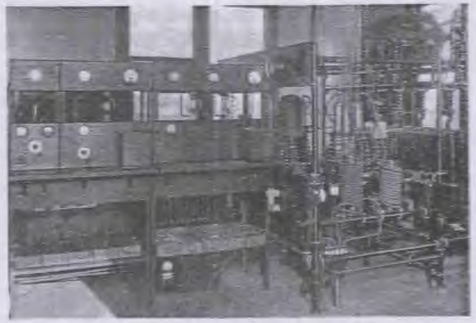

Fig. 60—Long Wave Crystal Control Set at KDKA.

WIRED wireless communication has been expanded materially during the past year, especially for communication over the lines of power systems. One of the public utilities has increased the number of Westinghouse sets in operation to a total of fourteen. The Westinghouse Company's policy of using high power for communication purposes has been fully vindicated.

Fig. 61—High Power Transmitter for Power Line Telephone Communication.

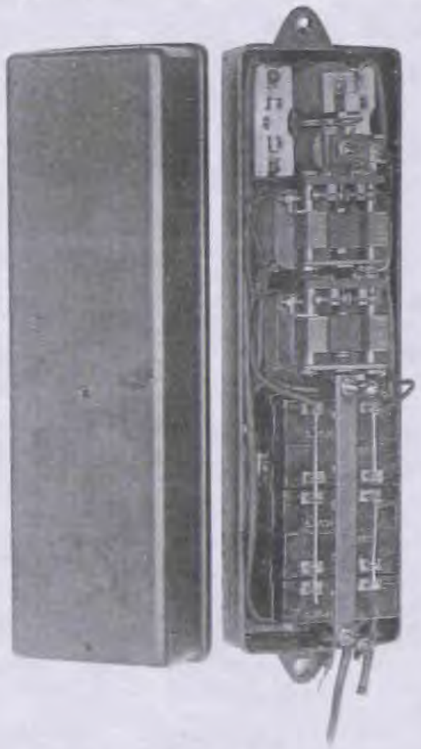

Fig. 62—Complete Street Light Control Unit.

annual Westinghouse publication

Engineering Achievements of the Westinghouse Elec. & Mfg. Co. for 1924
by H. W. Cope

RADIO

THE developments in this new field have gone forward with increasing speed. Broadcasting has been improved and the range extended, so that today almost every corner of the globe can be reached. The use of carrier current telephone systems has proved their reliability in dispatching service for large power systems. Vacuum tubes have been built in sizes hitherto unheard of.

TRANSMITTING AND RECEIVING APPARATUS

There has been designed and placed in successful service a 500 watt vacuum tube transmitting set, especially designed for ships. This set employs the master oscillator and power amplifier principle and is the first practical set of the type ever put in service.

Until recently it has been imposible to produce large size vacuum tubes that could be made to oscillate at frequencies above 2000 kilocycles. As a result of the careful study given this problem by the Company's engineers, it has been possible to develop a design of water cooled metal anode tube that will successfully operate on frequencies up to 6000 kilocycles.

RELAYS

Fig 84—10 kw. vacuum tube with water cooled anode.

Several types of tuned relays have been brought out that can be operated on frequencies in the neighborhood of 500 cycles. These are operated by superimposing a few volts of 500-cycle current on ordinary 60-cycle light and power lines. The original development of this type of relay was primarily intended for turning on and off street lights supplied from the same mains as the customer's circuits without in any way interfering with the customer's service. They can, of course, be used for the operation of switches for other purposes or for the throwing of signals located at remote points. As far as is known, this is the first time any one has been able to successfully develop a relay of this type.

CARRIER CURRENT COMMUNICATION

About 30 sets of equipment have been placed in service on the line of six different power companies. By means of this equipment, different parts of an interconnected system can be separated remotely by the main dispatcher's office. The performance of these sets has demonstrated beyond a doubt that the Company's Duplex Automatic Carrier Current equipment is superior and more reliable, through all kinds of weather conditions, to any other method of dispatching and has shown its extreme usefulness in the operation of a large interconnected power system. The use of plenty of power, duplex communication and selective calling will be extensively applied to load dispatching in the future and will be an important supplement to super-power operation.

DOMESTIC RECEIVING SETS

The Company's engineering design, development and research have been responsible for a line of radio receiving sets that met the more exacting requirements of the "listener in" of 1924. This enabled high quality reception of distant and nearby broadcast programs with good selectivity and better sensitivity. In order to help the receiving condition for the general public, the Company's engineers have been instrumental in producing simple radio receivers which can be operated without disturbance and at a price which removes the incentive to make disturbing receivers out of mismated parts or to operate poorly designed radiating receivers.

BROADCASTING

On January 1, 1924, radio relaying on short wave lengths was further developed and during the year important programs have been relayed by short wave so as to be broadcast locally on longer waves. On some occasions KDKA has supplied seven British stations, Hastings, Nebraska, and the San Francisco station with simultaneous programs.

Fig. 85—New short wave length Station KDKA. Exterior view.

A new short wave station using the latest developments has been built and put in operation near East Pittsburgh. This station is able to radiate short wave power over long distances in all directions both in daylight and dark.

On March 7, 1924, the banquet of the Massachusetts of Technology was broadcasted to the English speaking people of the world. Wire connection was used between the banquet hall and station WGY, whose signals were picked up by station KDKA and relayed to station KFKX and to station KGO, California, and was also relayed to the British Broadcasting Company, who in turn broadcasted it to the British Isles. This was the first time extensive radio interconnection had ever been attempted in connection with radio broadcasting.

On March 14, 1924, station KDKA gave its first concert entirely in Spanish for the benefit of the Spanish speaking people of the West Indies, Mexico, Central and South America. The program was relayed by station KFKX and also by a station in Buenos Aires, Argentina. This was so successful that several other Spanish programs have been broadcasted during the year.

Fig. 86—New short wave length Station KDKA. Interior view.

May 2, 1924, General John A. Delafield's address on "National Preparedness" was transmitted by wire to WGY, picked up by KDKA, and relayed to KFKX.

In June, 1924, station KDKA broadcasted both the Republican and the Democratic National Conventions.

July 4th to September 22nd, the Company carried on short wave communication with Captain McMillan's relief expedition on the Canadian Government ship "Arctic." During the same period, constant communication was also maintained on short wave length with the Hudson Bay ships "Nascopic" and "Bayeskimo."

At the time of the Wills-Firpo fight at "Boyle's 30 Acres," Hoboken, N. J., the Buenos Aires daily paper, *La Nacion*, had an announcer at the ringside who broadcasted the entire fight, blow by blow, to his paper by the use of station KDKA.

MISCELLANEOUS

Seven radio receiving sets with high power amplifiers and telephone and battery switchboards are being installed in some of the Veterans' Bureau Hospitals

There has been built for purposes of research a high frequency, high power oscillator. This is to be used in connection with work requiring the heating of small pieces of metal to high temperature by means of eddy current.

Submitted by C.W.Horn, Supt. Radio Operations. April 17,1926.

WHAT RADIO BROADCASTING NEEDS.

I have viewed the last five years of radio broadcasting very much in the light of a big experiment and have endeavored to gainfrom it sufficient information upon which to base its future possibilities and to obtain an idea of the lines along which this development would proceed. I did this for a rather personal reason in that my future activities in radio are to a great extent dependent upon the direction of growth. I have, therefore, been giving this matter considerable attention and have formed a few opinions which I will give below. I believe this is what you wanted when you requested me to write down for you the practical possibilities of radio and the probable direction of development. I am dividing this into two headings:

(a) Technical
(b) Program

TECHNICAL

The average person's conception of radio today is not a true one. Mention radio and he mentally pictures a receiving set, loud speaker and a few other pieces of apparatus, with perhaps the names of a few artists or programs. In reality I feel that radio is a distinct line of development, a branch of alternating current itself, a distinct field and one which will fill a long felt want on the part of the human race to overcome the barriers of distance and space. This radio has already done to a small extent in that it enables programs to be transmitted to distant points.

Radio is a service only a part of which is now being rendered. Just as wires are not telephone service, just so is present day radio not "Radio Service." We have much to accomplish and many features to add before it becomes a necessary service. However, we have before us radio vision - radio control of clocks and other devices, etc.

So much for my dream as to the future possibilities of radio. At present we are concerned with a very congested atmosphere, there being 534 stations licensed, with something like 526 additional applications pending. Obviously, such a condition cannot continue to exist, as there are but 86 wavelengths available at the present time. Unless these stations are reduced in number through elimination and the only businesslike method by which this number can be brought to a reasonable figure is through economic pressure. This latter will mean stiff competition, which will be somewhat expensive but will undoubtedly benefit in the end, and which will show the average station owner who has no ultimate reason outside of advertising for broadcasting that it does not pay him to be in that business. I feel that some day in the

near future this condition will arise and there will be a wholesale deletion of licenses. In order to be prepared to bring about this competition, or condition, those who have an ultimate reason for being in this field and who intend to remain therein must prepare by entrenching themselves firmly. That means a combination of stations into a powerful group controlling its sources and avenues of program. The Westinghouse Company and its associates are in an excellent position for this purpose in that they are owners of the most powerful and best known stations and are all associated, so that it is but a step to form a real combination in the broadcast field.

At the present stage of development it is obviously impractical for a few stations to cover the entire country. Interconnection seems the logical answer and we have two means of doing this:

(a) The proven one, which is by wires, and
(b) The experimental one, or short waves.

The individual stations should have sufficient power to thoroughly cover a reasonable radius about their station and should pay particular attention to quality of transmission. The stations should be so located that they will not overlap very much and care should be taken that the signal strength from the nearest station is sufficient in all parts of the territory to override the average static and interference.

Any combination which intends to engage in interconnection at the present time should depend to a great extent upon wire line interconnection. In the near future there is a possibility of forming a combination of short wave and wire line interconnection with the distant future possibily permitting interstation connection by radio alone.

As we have to deal with the present, we must consider the present wire situation. The A.T. & T. Co.has the most efficient system at present. Its trunk lines connecting the principal cities are already prepared for radio program transmission, or can be prepared. In addition, that company has its repeater stations with trained attendants, which will permit the installation of proper repeating and correcting devices for maintaining high quality. In addition they have a sufficiently large plant to permit spare wires and routes in case of emergency. The only other servicesavailable at present are Western Union wires, which are either already transposed or can be prepared, along definite routes connecting the principal cities. In view of the patent situation the Western Union cannot operate repeaters but can merely rent the lines. In other words, the Telephone Company can furnish complete service from point of pickup to the station terminals, while the Western Union Company will only furnish the wires suitably prepared, but all pickup equipment, line amplifiers, correction devices, etc. must be furnished and manned by the broadcasting interests.

The rates for wire line interconnection in the case of the Western Union are definitely fixed by the Interstate Commerce Commission, as the rental charge for wires is filed with that commission. In the case of the Telephone Company, broadcasting not yet being recognized as a definite public service, is not listed on the tariff files of the Commission and the rates at present are whatever the Telephone Company feels like charging.

In summarizing the technical phase of this discussion, I wish to state that the future looks bright for radio, having so many fields and avenues along which to develop. I feel that radio broadcasting will become a more stable proposition when the number of stations is reduced and that it will be along economical lines rather than through legislation that this will be brought about. I feel that the field is waiting for the radio group to set the pace and bring about this competitive condition. I have pointed out the wire situation and the necessity for wire connection ~~and~~ at the present time and probable future conditions of short wave interconnection. I have also shown that the most reliable service can be furnished by the Telephone Company and that the matter of cost will have to be determined by "bargaining." The picture, therefore, of the future system is a network of stations throughout the country, each individually capable of covering its territory with excellent transmission, sufficient signal to override interference, and with a program that cannot be matched by individual or small groups.

PROGRAM

At the present time broadcasting reminds me very much of ordinary vaudeville performances. The microphone is switched on, the announcement is made, giving the name of the singer, the selection and the author, and the artist does his part. This then is repeated very much as the acts appearing on a stage in a vaudeville house. This could really be termed "vaudeville broadcasting," or, as we used to say "variety shows." This has not been satisfactory in that it is a monotonous repetition of selections. The Telephone Company, I notice, has realized the necessity of breaking away from this type of program and is offering what we might term "Hours." KDKA did this simultaneously with the Telephone Company. We now occasionally obtain a program which has a continuous story, or thread, to keep the listeners' interest until the conclusion. This is an improvement but is yet far from being what we feel radio broadcasting should be.

When the average person visits a show he expects to be entertained and to leave with a satisfied feeling. For this purpose the stage director endeavors to draw the attention and mind of the audience and make them feel, or live, with the actors through the show. He has at his command and does use many devices, such as scenery, music and accessories to produce certain effects. He appeals to the brain and heart of the audience through two senses, the eye and the ear, and, in some few instances, the sense of smell, by perfumes, incense, etc. The motion picture director had a more difficult task in that he had but one sense, that is the eye, through which he

could appeal to the mind of his audience. You will note that the early motion pictures were "one-reelers" and in many ways similar to the radio performances of today. Then came the two-reelers, which might be classed as paralleled by our radio "Hours." Do you remember when between each reel some slides were shown? The pauses now between our selections are in the same class and are becoming as offensive to the ear as those slides were to our eyes in the early days of motion pictures.

Therefore, in order to look for a possible solution to the question "What will be the program of the future?" let us take a page out of the history of themotion pictures. In attending a performance at the Capitol Theatre, New York, you first of all are ushered to a comfortable seat. The show starts generally with an overture played by an excellent orchestra, generally followed by additional music featuring perhaps a ballet and usually a rendition by some talented artist. Without any pauses the program shifts from one piece to the next, and, while the orchestra is still playing the screen is brought into sight, and the machine having already been adjusted, the picture starts without any flickering and we see, perhaps, a news reel, at the conclusion of which, without the slightest hestitation or sudden change, it may fade into a comedy or perhaps the screen disappear and a stage seene may be brought before us. Without the slightest break the next act takes place with perhaps finally the feature picture being brought on and run through to its end without a single break, shifting from one reel to another so that the eye cannot notice it. At the conclusion of such a performance, if all parts of the program are of average worth, one feels satisfied and pleased. All of this has been carefully worked out by stage directors who have vision and who visualize what they want to do and how they want to do it.

Now, let us parallel this with radio. First, we need one person who has the artistic sense and necessary experience to know what can be done and how to do it. In other words, we need a stage director, or "Producer." There must be but one man in authority in a case like this and he must be given a sufficiently free hand in order to be able to put over his thoughts and ideals. Such a man would createa show, appealing to the ear in his case, just as the movie director appeals to theeye. He would run the continuous thread of thought and createplays with the climax at the proper point in order to hold the attention of the listener. We all have experienced the reluctance to break away from a movie in the middle of its performance. The artistic development of presentation for aural reception will have to be worked out very much along the same lines that the presentations for visual reception were worked out. I feel that men can be developed who will be able to take an orchestra, with some additional talent, and work it into a play with an appeal which will satisfy the listener.

You will remember that WGY started rather intensively to have plays written suitable for radio presentation. This was a step in the right direction but they stopped short of their objective. I feel, however, that they had the right conception but not sufficiently far advanced to realize that spoken plays alone do not satisfy.

It will, of course, be rather an expensive proposition for individual stations to have such a high class directorship and productions, but that is all the more reason why we should encourage this, as through a combination of stations we could finance such productions, thus setting the pace, which, as I explained above, will, in my opinion, economically solve the broadcasting problem. It is through some big effort, some breaking away from what we are accustomed to know that we will regain the leadership in broadcasting and set the pace, which will be too fast for the individual station owner who is interested only in advertising.

I have spoken to theatre people and many program directors, etc., in an effort to gain their ideas and thoughts and I believe that the usual calibre of broadcast program personnel is too low to conceive of anything better than what they are now doing. This is another reason why we should act on this opportunity of doing this more elaborate and finer thing and why I feel that we should get together with our associates and form an organization capable of handling such a proposition.

I believe that when such an organization does exist it will obtain the support and cooperation of music publishers, dramatic leagues, etc., for the reason that the director of a chain of stations covering the country will be more likely to keep from offending the ears of the listeners by repetitions of "By the Waters of Minnetonka," or some other composition that is being played to death. That is one of the big objections that the music people now have, in fact the only real complaint that they can make. In my opinion, an organization handling such a proposition must look for the one man who will undoubtedly become world famous if successful - one who can mould his program to such a point that he can command the attention of the majority of his listeners.

With this, of course, I consider that the advertising value of the stations will rise and the rates must, of course, be such that they will support such an organization. But, because of this high standard, there is no doubt that this will create additional returns for the purchasers of time, so as to make it worth while paying these additional rates. For, after all, it must be remembered that the amount of available time is limited to a few hours a week.

In summing up I feel that all efforts should be directed toward forming an organization capable of handling such a proposition as outlined above. The selling of time is a logical way of financing such a plan but in order to coordinate the work, in order to be able to follow definite policies, the matter of program should be entirely under the control of the Broadcasting Company. I believe that only national broadcasting of the best grade will be the final result during certain hours, with local programs at other times to satisfy any desire the public may have for such local affairs.

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Pgh Sun
9/29/1920

Air Concert "Picked Up" By Radio Here

Victrola music, played into the air over a wireless telephone, was "picked up" by listeners on the wireless receiving station which was recently installed here for patrons interested in wireless experiments. The concert was heard Thursday night about 10 o'clock, and continued 20 minutes. Two orchestra numbers, a soprano solo—which rang particularly high and clear through the air—and a juvenile "talking piece" constituted the program.

The music was from a Victrola pulled up close to the transmitter of a wireless telephone in the home of Frank Conrad, Penn and Peebles avenues, Wilkinsburg. Mr. Conrad is a wireless enthusiast and "puts on" the wireless concerts periodically for the entertainment of the many people in this district who have wireless sets.

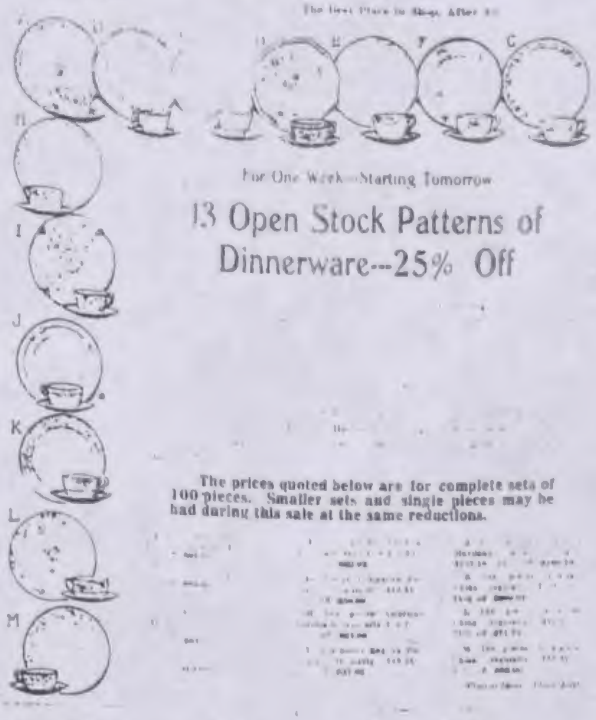
Amateur Wireless Sets, made by the maker of the Set which is in operation in our store, are on sale here $10.00 up.

—*West Basement.*

Evening
tory
Romance

The HORNE DAILY NEWS

The Best Place to Shop After All



For One Week—Starting Tomorrow

13 Open Stock Patterns of Dinnerware--25% Off

The prices quoted below are for complete sets of 100 pieces. Smaller sets and single pieces may be had during this sale at the same reductions.

"You did a big thing, when you gave women 'TRUWOOL' Suits"

Large, Direct Importations of Swiss Curtains for Fall

The Kiddie-Koop

$23.00 and $25.00
(Mattresses included)

Football Managers

Ginghams for Winter Wear

Silk Sale Special

Kimonos

Women's New Raincoats, Comfortable for Motoring

New Satin Raincapes

Madeira Embroidered Pillow Slips

Folding Chairs —40c Each

Art Concert "Picked Up" By Radio Here

The Boys' Haberdashery

Women's New Satin Dresses

Exceptional Offerings at $59.50

New Duveyn Dresses at $65.00

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THE ELECTRIC JOURNAL

VOL. XIX JUNE, 1922 NO. 6

The Field of Radio Broadcasting

Today a new public service has arisen and is exerting a potent influence in our every-day affairs, which is remarkable in two ways;—first, for what it has already accomplished, and second, for the seemingly unlimited possibilities of the future. This is made possible by the radio telephone or radiophone. It is probably a fact that no facility or service has ever received such instant response from the public or has grown so fast in popularity as radio broadcasting. In its simplest terms "radio broadcasting" consists of sending out by radiophone, from a powerful transmitting station, speeches, news, music, church services, results of sporting events—in short, anything with a universal appeal. This information can be received by anyone having a receiving set anywhere within a suitable radius of the transmitting station, as anyone is permitted to operate a receiving set. The apparatus needed for receiving ranges from the simplest crystal detector set for short distance reception to the highly sensitive vacuum tube sets, capable of great amplification, for long distance reception.

The mysterious fascination of broadcasting is undoubtedly one of the greatest attractions in its first appeal to the imagination. It is, however, destined to become something more than a fascinating novelty for, as the possibilities of radio unfold we see before us a wonderful and permanent public service comparable with other modern facilities and conveniences in its ability to make life better and easier. Radio annihilates distance, reducing it to nothing. The element of time scarcely enters into the speed of the transmission and can be entirely disregarded in practice since it is possible for a radio wave to encircle the globe in a small fraction of a second.

It is interesting to trace the progress of radio broadcasting from its inception. In November, 1920, the Westinghouse Electric & Mfg. Company, which is taking an active part in the development of radio communication, broadcasted the election returns from KDKA, its experimental station at East Pittsburgh, Pa. The returns were received by many amateur radio enthusiasts and the demand for further broadcasting was immediate and pronounced. A regular service from 8:30 to 9:30 P.M. was at once instituted, and has since been continued without interruption. This was the first regular public service of this kind inaugurated. Programs consisting of music, news, announcements, etc., are made up in advance and are published in practically all the newspapers within a radius of 200 miles of the station. Frequently the service is received by radio listeners as far distant as Texas, Kansas, the Dakotas, Canada, Florida and on board ships many hundred miles out on the Atlantic Ocean. Now and then reports come in from such distances as points in the northern part of South America, Cuba, and the State of Washington, and quite recently, even with the static which is prevalent at this season of the year, strains of a concert from KDKA were heard in Iquique, Chile, which is about 1400 miles below the equator and 4200 miles from East Pittsburgh.

After nine months of operation a second broadcasting station was opened under the same auspices at Newark, N. J., followed shortly by one in Springfield, Mass., and later by one in Chicago, Illinois. The last named made the broadcasting of grand opera by the Chicago Grand Opera Company a special feature, with great success. This extension of service was a direct response to the call for such service by the public at large. The number of those listening is difficult to estimate, but it certainly reaches many thousands. Probably at the present time nearly one million people are listening daily to the broadcasting from these four stations, and this number is being added to each day. That this service has a real appeal is evidenced by the thousands of letters received by the Westinghouse Company and by the participants in the programs, and by the further fact that at least three out of four persons are interested in the subject.

As radio broadcasting is developed today it has one feature not possessed by any other service in existence as, except for the comparatively small cost of the initial installation, it is without favor and without price. Everyone can occupy a "free reserved seat" at any and every radio broadcasting performance. This is an important fact not generally recognized. Several companies are now maintaining broadcasting stations. The only financial support they receive for this costly service is the possible profit from the sale of receiving apparatus of their manufacture; but there are hundreds of other manufacturers and dealers who are manufacturing and selling receiving apparatus also who do not support this service in any way whatever and who, because of the service rendered by others, reap large benefits without exertion or expense on their part.

Radio broadcasting has added the human touch with the public, and should obliterate the feeling that large organizations are heartless. It has been of immeasurable benefit to invalids, many of whom attribute their rapid recovery to this added interest to take their

minds off their misfortune. The broadcasting of church services is invaluable to people in inaccessible districts who are not able to take part in other forms of religious services. It is proving to be one of the greatest publicity and beneficent features ever utilized, and is doing more to enlarge the church's sphere of influence than any medium heretofore used. The children also look forward to their bedtime story the same as father looks forward now to his baseball scores.

Where will it end? What are its limitations? Who dares predict? Scientists and inventors are working on relays which 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 radiophone many thousand miles away. A receiving set in every home, in every hotel room, in every hospital room, in very school room—why not? It is not so much a question of possibility—it is rather a question of "how soon".

In broadcasting, radio has found its greatest usefulness and its most important field of application. It is destined to become a basic public service. The road is a rough one, however, as many of those who have been intimately connected with its development are realizing.

H. P. Davis

The Quantitative Study of Fundamental Principles*

It has been my experience that the vast majority of graduates from our technical schools have no real grasp of fundamental principles. These principles may have been taught to them, but have gone over their heads, or they have not realized that these were fundamental. The chief reason for this lack of realization, I think, lies in the fact that the students are not trained in the use of such principles. Possibly many of them would not have the grasp even if they were trained in the use of fundamentals, but the general indications that I have found are that they have never been drilled in the use of the fundamental principles.

When I first studied mechanical engineering, the professor at the head of the department, S. W. Robinson, had a tremendous reputation, as a man who knew practically everything. Naturally, I at first held the same opinion. However, as I got to know him better, to my surprise I found that there were a vast number of subjects about which he apparently knew little, but nevertheless, on such subjects he could reach conclusions quickly and reliably. In endeavoring to find the source of this ability, and also how he got at things, I presented to him on suitable occasions a number of special problems on which I had done considerable work and had encountered some difficulty. I found that in nearly all cases, when I first presented such a problem, he knew practically no more about the subject than I did, but that almost invariably, after a little study, he could solve the difficulty and explain it to me clearly. In analyzing how he did it, I came to the realization that he simply relied upon a few fundamental principles and that he brought these to bear directly on the solution of the problems I put up to him. In many cases I also had gone over these same fundamental principles, but failed to realize to what extent they could serve as tools for handling difficult work. Gradually, in watching Professor Robinson's work, I came to understand that his real strength did not come from a broad general fund of information, but rather from the fact that he had an apparently limited amount of information of a sort from which he could construct almost anything he wanted. This gave me an entirely new idea of the meaning of education. With him it was a case of having a few general-purpose tools, which he could use in all manner of ways to construct a desired result; whereas, compared with him, many so-called educated men had a vast collection of tools practically none of which they knew how to use.

A very large percentage of engineers do not realize that mathematics is simply a tool to be used in getting results. The study of mathematics with them is simply mathematics and not the means to an end. It is as if one would show the students some very fine instruments or tools and explain to them the construction of such tools, their fine workmanship, etc., but would never teach them how to use the tools. It is the use of mathematics that is important. Moreover, for the vast percentage of engineering work in general, it is not the difficult mathematics that is required. Algebra, geometry and trigonometry can probably take care of 90 percent of the high grade engineering work. Unfortunately, only a very few engineers can really handle algebra, and trigonometry in particular. The fault here apparently lies with their fundamental training. The knowledge of mathematics is cumulative. In other words, each part is built up on the preceding part. If the foundation is worthless, then the superstructure is of little value, no matter how much care has been taken in it. Algebra and trigonometry should be studied until the engineer has a handy working knowledge of them and can use them in all sorts of problems. In other words, these should become almost a form of technical language. With such a foundation he can tackle more advanced mathematics, advanced studies requiring mathematics, with great confidence and with a grasp of principles as he is going along, which continually prepares him for still more difficult work. But if the foundation is bad, the further he goes the worse he gets.

Unfortunately this foundation, in many cases, is merely worthless one. In fact, if you would question the students in any freshman class, I think you would find that an extremely small percentage of them have ever used algebra, geometry or trigonometry outside of class work or the book lessons. Among hundreds of selected college men, who come

*Revised by the author from a letter published in the *Journal A. I. E. E.*, Sept. 1921, p. 734

November 15, 1920

HOW WESTINGHOUSE ANNOUNCED HARDING'S ELECTION

Our Company succeeded in making many new friends by the efficient manner adopted for announcing the results of the national election.

Perhaps some of us have not noticed the radio aerial on top of the K-Building, but a glance in that direction will show the antenna of our wireless station.

The returns were received by telephone from a Pittsburgh newspaper, and were then sent out by wireless telephone. So rapid was the service obtained by this method that the receiving operators were able to get the returns exceedingly fast. In some cases they were heard even before they were received by special telegraph wires. During the intervals between returns phonograph music was played and those amateurs having loud sounding horns or two-stage amplifiers were able to throw the music over large rooms. Also two banjo artists were present and rendered very good banjo selections.

Not only in Pittsburgh were the returns heard, but in many towns in Ohio, Pennsylvania and West Virginia the messages were heard with equal clearness. Letters are still being received from operators from many miles around thanking us for giving the returns so promptly.

In Vandergrift, Pa., slide bulletins were shown in the street for the benefit of hundreds of people there, the news being shown from ten minutes to a half hour before they were received by means of an auxiliary telegraph wire between Vandergrift and Pittsburgh. In addition, the wireless set was connected by means of a cable with the local telephone exchange, and the wire chief sent the news directly to subscribers who had arranged beforehand for the service, and also gave the results to any one making inquiries.

At Latrobe the messages were utilized in a similar manner, thus enabling large crowds to get the messages early.

At Irwin a large hall was filled to its capacity to hear the results of the election, motion pictures being shown throughout the entire evening.

Not only in the immediate vicinity of Pittsburgh were the returns as sent from the Westinghouse Plant heard, but throughout Ohio and West Virginia they were heard with equal clearness.

Also in Pittsburgh the radio method of sending returns was utilized in two ways. Persons having simple sets did not need to leave their homes to receive the returns, and by means of sets installed in a number of clubs throughout the city, large assemblages were able to have social functions at the same time as receiving the returns. At the Edgewood Club in particular a loud sounding horn was in use, and people could hear all over the large ballroom the voice of the speaker at East Pittsburgh as transmitted through the radio apparatus.

At the same time the wireless telephone was giving this news to radio operators hundreds of men and women were receiving up-to-minute election returns in the auditorium of the cafeteria. As early as 8:30 in the evening announcements were made from several states as to how the election was going. The plan used to inform the people was very unique and thorough. As the returns were received they were thrown on the screen from the motion picture booth.

It was possible to receive the very latest returns through the cooperation of the wireless telephone service.

When returns were not being announced, a splendid entertainment program was in progress, consisting of music by Gill's Orchestra, motion pictures at intervals, vocal solo by Miss Ada France, vocal duet by Misses Ada and Agnes France and vocal solos by Miss Laura Atkin, Miss Anna Chilcote, George E. Kellogg and Fred Ward. Miss Julia Bartletti, pianist for the Community Chorus, accompanied the singers. The master of ceremonies for the occasion was A. S. Duncan.

Mar.8.26.

FREQUENCY CONTROL BY PIEZO CRYSTAL

By

C. W. Horn,
Supt. Radio Operations

Westinghouse Electric & Mfg. Company

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What an extreme pleasure it would be to the radio listener if he, while looking through the evening paper came across an item in the radio column indicating that such and such a station would broadcast a particular feature in which he was interested -- if he could note the station's call letters and frequency and then turn to his receiver and set it at the frequency desired and really hear that station without interference. This is all possible now that we have found a way of utilizing the Piezo crystal for controlling the frequency of a radio transmitter. I feel it to be only a question of time when we will be able to tune to any station within our range and know that it will be on the frequency assigned and also be sure that stations which should be on other frequencies are not off their assignment and interfering. This means that all broadcasting stations will have to have their transmitters controlled by some such device as the Piezo crystal.

This has been accomplished as far as the Westinghouse Station KDKA has been concerned and will be in the case of the other Westinghouse stations such as KYW, WBZ and KFKX as soon as

the equipment can be delivered which is now under construction. At KDKA there is in a small holder a piece of quartz ground to the exact dimensions necessary in order that it will oscillate at a frequency of 970 kcs., which is the wavelength assigned KDKA. This piece of quartz is mounted in a specially designed holder and connected into a circuit containing a 5 watt oscillating tube. The crystal has the property of keeping that circuit oscillating at that one frequency and no other. The small energy in this circuit is then amplified by means of power amplifying tubes until the energy is that desired for transmitting the program. The crystal, therefore, is actually the main principle of the entire transmitter, which serves merely to amplify the product or oscillations of the crystal.

How does the crystal perform its function? The crystal has a natural period of vibration. It is, however, inert until influenced by some external force. In order to do this the crystal is mounted between two plates which act somewhat in the manner of condenser plates. These two plates are connected into an oscillatory circuit, using a vacuum tube in the usual manner. The tube then is caused to oscillate at approximately the frequency of the crystal. As soon as the crystal becomes active or is influenced by the oscillations of the circuit it steps into its own frequency and pulls the circuit into that frequency. Therefore, to get the crystal started, the circuit is caused to oscillate by other means

very close to the crystal frequency. As soon as the crystal becomes active it becomes master of the circuits and keeps it at its own frequency.

It is only a question of time when all stations will be using some such system and the problem of crowding stations closely together will have been solved. It is due to the fact that the Department of Commerce assigned wavelengths 10 kcs. apart as much as anything else that stimulated this development. It is the old story of "Necessity is the mother of invention."

I believe that the future radio station will, upon completion of the installation work of its transmitter equipment, apply for its license to the Department of Commerce and incidentally forward its controlling crystal for measurement. The license will probably not be issued unless the crystal is exactly the frequency at which the station is to operate. This will do away with guess work and will reduce frequency measurements to an exact science rather than the approximate one it now is. At the present time there are very few wavemeters which do more than give approximate readings. With this fine control of frequency which we shall see within the next few years I believe that we shall have wavemeters, remarkably accurate as compared with the present day equipment.

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EDISON'S ESTIMATE OF RADIO 1921-22

(from Mr.Miller,Mgr., Newark Works, April 1929)

The Westinghouse Newark Works started one of the earliest broadcasting stations, and, being in need of programs for entertainment, Tommy Cowan was sent to Mr.Thomas A. Edison to ask the use of an Edison phonograph and records. He was received with a burst of profane denunciation of radio and radio broadcasting, which, the"Wizard" said, "was no damn good and would never amount to anything - he knew all about radio from his own experience". After a good deal more boiling over, Cowan finally persuaded Edison to lend him the records, though with a poor grace.

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Prof. of Rensselaer Tech. recalls (Apr. 29) that in the earliest days of AC. both the GE of and

Broadcasters Defy Strike Threat of Musicians

Eve Amer Dec 29, 1931

The Chicago Broadcasters' Association today presented a united and determined front to the demands of the musicians' union for more pay in lieu of a general strike among radio station musicians.

After a three-hour conference at the Merchandise Mart, the broadcasters announced that radio stations will continue their programs with phonograph records if the musicians walk out, as threatened, at midnight on New Year's Eve.

They countered the demands of James C. Petrillo, president of Chicago Federation of Musicians, with demands that Petrillo deal with the association as a unit and that union rules, deemed arbitrary, unreasonable and unfair, be revised.

Advised of the broadcasters' actions, Mr. Petrillo branded them as "silly." He maintained that he would "have nothing to do" with Mr. Fleming.

He also said arrangements had been made to broadcast, through radio station WCFL, all major orchestras by remote control, in the event the strike was necessary. Thus Chicagoans, he said, would not be deprived of their music.

RADIO MUSICAL STRIKE AVERTED; CONTRACT SIGNED

Compromise Plan Accepted by Both Sides.

The threatened strike of radio musicians in all studios affiliated with the Chicago Broadcasters' association, called for midnight last night, was averted late yesterday and a new contract was signed to run to Feb. 1, 1933. James C. Petrillo, president of the Chicago Federation of Musicians, and William S. Hedges, chairman of the broadcasters' executive committee, announced the settlement of all disputed questions. Both said they were pleased with the terms of the new contract.

The major provisions of the new contract are that the minimum studio band will be increased from 10 members to 15 members, that the musicians will work six days a week instead of seven, but will continue to work 35 hours a week, and that no change will be made in the wage scale, the minimum wage remaining at $90 a week. The contract was the first written agreement ever signed by the union and broadcasters' representatives.

Ratified by the Union.

The negotiations leading up to the settlement of the strike covered a period from 10 o'clock yesterday morning to 5 o'clock last evening. Before conferring with the union executive board the broadcasters' representative held a series of meetings Wednesday night and Thursday morning at which a compromise program was reached. The program was ratified last night by the union.

The joint statement issued by Hedges and Petrillo follows:

"The strike in the broadcasting stations is off. The settlement between the Chicago Broadcasters' association and the Chicago Federation of Musicians was made upon the basis of six days per week with the same number of hours per week being consumed in six days as were formerly used in seven days. No change is made in the wages. The minimum number of men in class A stations will be increased from ten to fifteen. Everybody is happy that a strike has been averted."

Original Demands Modified.

The original demands made by the union included the increase in orchestras to 15 members, a six day, thirty hour week with no reduction in pay, and union control of monitor boards. Early in the negotiations Petrillo ceded control of the monitors to the stations. Creation of an arbitration board, as demanded by the

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Daily Mirror

LAYING ATRONS

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RADIO STATIONS READY TO FIGHT MUSIC STRIKE

Wed Dec 28, 1931

Broadcasters Promise to Continue Programs Despite Move of Union.

Members of the Chicago Broadcasters' Association at a meeting today planned to make final preparations to combat the strike of all radio musicians, which has been ordered to take place at midnight New Year's eve by James C. Petrillo, president of the Chicago Federation of Musicians.

Joseph N. Weber, president of the National Federation of Musicians, was expected to arrive from New York today to confer with officials of the Chicago local. Since Weber has stood by Petrillo's action previously, however, only the slimmest of possibilities existed that the strike could be averted through his intervention.

"The broadcasting stations will continue to function," declared Attorney Joseph B. Fleming, counsel for the broadcasters, "and will give service to the public.

"We will present a unified front and fight it out. The strike has been forced on us and we will not permit it to impair our service."

A demand for a formal contract with the union, heretofore not in force, was to be among the counter-demands of the Broadcasters' Association, another of which is the establishment of an arbitration board. The union has demanded that the stations pay the musicians for seven days, while they work only six.

GIRL IS SERIOUSLY HURT, BROTHER KILLED, BY AU

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Petrillo Calls Music Strike in Radio Stations

James C. Petrillo, president of the Chicago Federation of Musicians, ordered a strike of radio bandsmen yesterday. The order, if carried out, would compel 450 musicians to walk out at midnight New Year's eve. It affects all except one station, WCFL, which is owned and operated by the Chicago Federation of Labor. Petrillo stated that Edward Nockels, labor leader and head of WCFL, had acceded to the musicians' demand for a 30 hour week with 35 hours' pay.

The order may also affect featured bands, which broadcast from hotel cafés, cabarets and night clubs. Petrillo said he had summoned leaders of these bands to his office and instructed them to cease playing at midnight Dec. 31 unless the microphones were shut off.

Indicates Strike May Spread.

Petrillo also made threats that the ban might be extended to include the Chicago studios of the CBS and NBC chains and that the strike may spread throughout the country. Regarding these phases of the threatened strike Petrillo said he had been in conference with Joseph Weber, president of the National Federation of Musicians, in New York.

"If the chains accept our demands in Chicago the musicians will stay on the job," Petrillo said. "If they try to feed programs to the local stations, either from the studios here or elsewhere, the strike will spread.

Stations Reject Demands.

"Responsibility for a strike, if one is called, rests solely with Mr. Petrillo," said Joseph B. Fleming, attorney for the Broadcasters' association, last night. "The musicians' union demands, among other things, a reduction from 35 to 30 hours a week with no reduction in pay. They also demand union regulation of the monitor control board. This operation belongs to the stations. The demands are unacceptable to the broadcasters.

"We have endeavored to conclude an agreement for 1932 under which musicians would receive the same scale of wages with the same rules and regulations as in 1931. We felt that in these times of business depression the fairness of such a proposal would appeal to members of the union.

"In calling a strike at this time of 450 men who receive an income in excess of $650,000 a year Mr. Petrillo is assuming a very grave responsibility. We would suggest that he give the matter a sober second thought before he carries his threat into execution."

Daily News Dec 30, 1931

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RADIO N

WOULD STRIKE OF MUSICIANS QUIET ETHER?

It Would Be Odd If It Did, but There Are Other Programs.

BY CHARLES J. GILCHREST.
(Radio Editor, The Daily News.)

Wouldn't it be funny if the musicians did go on strike at midnight tomorrow and the air suddenly became quiet? After all these years of radio broadcasting the good old ether would be lonesome without its customary load of harmony. . . . The fact that **Jim Petrillo** might call a musicians' strike does not mean the stations would have to sign off. . . . But if you'll tally the number of hours of broadcast for any one station and the number of those hours devoted to music you'll see just how heavy the proportion of music is to anything else on the air. . . . **Mr. Petrillo** might be able to keep all orchestras in Chicago off the air and might also be able to keep the networks from relaying us dances from other cities. . . . But we still would have the transcription libraries. . . . In the meantime all local stations and the networks are going right ahead with plans for plenty of music well into New Year's dawning.

* * *

their administration. It is to their interest to improve the whole banking system, and to inspire confidence in bank depositors. Further, it is the duty as enlightened citizens to co-operate with the legislature in accomplishing that important purpose.

12-29-31 Daily News

A POOR TIME TO STRIKE.

Any labor leader who orders a strike in such times as the present not only assumes a grave responsibility, but violates the first principles of sound economic policy. Even more reckless is the union official who calls a strike because his demand for a direct or indirect increase in wages is refused by the employers of workers he is supposed to represent.

The average American wage worker is morally certain to be moderate and sensible in a dispute over pay or conditions of employment. But too often union officials, through arrogance or bad temper, take positions which their followers would not support if they had freedom of choice.

The position of members of the radio orchestras and bands in Chicago, whom James C. Petrillo, president of the local federation of musicians, has ordered to walk out at midnight on New Year's eve, is distinctly a case in point. The strike was called because the radio stations would not comply with a demand for reduction of the musicians' hours from thirty-five to thirty a week—without a corresponding reduction in wages—and would not grant the demand for union regulation of the monitor control board. Neither of those demands was justifiable, and to strike as a means of enforcing them would be an act of sheer folly. The general public would resent the strike, as would the great majority of sober-minded union workers.

To carry out the strike threat would mean willful and inexcusable jeopardizing of the welfare of 450 men who, collectively, earn $650,000 a year.

Before executing his ill-timed and unwarranted threat, Mr. Petrillo should take steps to ascertain the wishes of the men he professes to serve. If he did, he would rescind the strike order.

THROUGH THE COURTESY OF THE

Chicago Federation of Musicians

The people of Chicago will continue to hear their favorite bands by tuning in after midnight Thursday on Station WCFL, the Voice of Labor.

These BANDS ARE AS FOLLOWS:

Frank Westphal and His Orchestra
Joe Gallicchio and His Orchestra
Gaston DuMoulin and His Orchestra
Rex Maupin and His Orchestra
Mark Fisher and His Orchestra
Ted DuMoulin and His Orchestra
Avis McDonald and His Orchestra

The foregoing are Studio Bands which will now be transferred to one station—

—WCFL—

. . . . . .

The following are bands which are now appearing in the various hotels, cafes, etc., in the Chicago district. They will appear in person on WCFL Station.

The exact time of each Band's appearance will be given later.

Don Pedro's Orchestra
Maurie Sherman's Orchestra
Paul Specht's Orchestra
Louis Panico's Orchestra
Verne Buck's Orchestra
Ted Cook's Orchestra
Irving Aaronson's Orchestra
Bernie Cummins' Orchestra
Corrie Lynch's Orchestra
Ben Bernie's Orchestra
Paul Whiteman's Orchestra
Herbie Kay's Orchestra
Art Kassel's Orchestra
Henri Gendron's Orchestra
Ted Weems' Orchestra
Irving Sewitt's Orchestra
Jimmie Garrigan's Orchestra
Clyde McCoy's Orchestra
Joe Rudolph's Orchestra
Herb Buteau's Orchestra
Tweet Hogan's Orchestra
Ralph Ginsburg's Orchestra
Jack Russell's Orchestra
Wayne King's Orchestra
(On his return to Chicago)

THE RADIO CORPORATION OF AMERICA

THREE HISTORICAL VIEWS

PART I The Years to 1938 BY JOHN C. WARNER

PART II The Years 1938-1958 BY ELMER W. ENGSTROM

PART III The Years 1958-1962 BY ELMER W. ENGSTROM

A collection of three articles about RCA.
Part I was written in 1938, Part II in 1958, and Part III in 1963.

INTRODUCTION

The Radio Corporation of America today is one of the largest and most broadly based enterprises devoted entirely to electronics. In achieving this position, it has pioneered in the development of an art and industry which has compressed within a brief span of years a degree of business growth and technical progress that seldom is achieved in less than a century.

The history of RCA, related in the articles that follow, is pre-eminently an account of dynamic industrial growth. Among the forces responsible for this achievement have been the leadership and vision of David Sarnoff, Chairman of the Board and Chief Executive Officer of RCA, and the outstanding array of research, engineering, production, and marketing talents which have thrived in the technical and business environment which he and his colleagues have done so much to foster and maintain through the years.

A succession of milestones in the advance of electronics has resulted from this combination of leadership and talent. Among them are the establishment of network broadcasting, the successful combination of the radio and the phonograph, the practical development of television in black-and-white and color, and fundamental concepts providing a foundation for today's electronic information-handling technology. The common denominator throughout this series of achievements has been a dynamic program of scientific research whose energetic support by RCA's management through the decades represents yet another example of industrial pioneering.

The first of these articles was written more than 25 years ago. It was prepared and delivered as one lecture of a series in an indoctrination course for RCA employees. So rapid has been the evolution of both RCA and the electronics industry that many of the events described read like ancient history. Even the trade names familiar to a large public in the 1920's have vanished almost beyond recollection today. Very few will recall, for example, the Graphanola, a popular phonograph produced by the Columbia Talking Machine Company around 1922. When this article was written in 1938, television was still a daring experiment, the ultra-high frequencies were in their infancy, and the vast area of solid-state electronics was yet to be opened for exploitation. Yet even then, the dynamic characters of both RCA and the industry were clearly visible, revealing great growth potential in any direction that might be chosen.

The author, John Chester Warner, was himself an intimate part of the scene which he describes. He was Vice President of the Radiotron Division, RCA Manufacturing Company—and in the same year in which the article was written he met a tragic and untimely death in an automobile accident at the age of 42. Through the 1920's, Warner had been associated closely with receiving tube research at the General Electric Company in Schenectady. In 1932, following the separation of RCA from the General Electric and Westinghouse companies, he was appointed Manager of research and development at the RCA Radiotron Company in Harrison, N.J. He was named Vice President of Radiotron in 1934, a year before the organization became the Radiotron Division of the new RCA Manufacturing Company.

The author of the subsequent articles is uniquely qualified to chronicle the further development of RCA. Elmer William Engstrom, now President of the Radio Corporation of America, has advanced through progressively more important executive assignments during his 33 years with the company and has directed most of RCA's principal research and engineering programs through the past three decades. A native of Minnesota, Dr. Engstrom was associated with the Radio Engineering Department of the General Electric Company through the 1920's. In 1930, when the radio engineering and manufacturing activities of G.E. were transferred to RCA, he continued as Division Engineer in charge of Photophone sound motion picture apparatus, development and design for the RCA Manufacturing Company at Camden, N.J.

During the 1930's, Dr. Engstrom directed the research and development program which transformed television from a series of experiments into a practical service, and was largely responsible for the pioneering application to this task of the concept that is now known as systems engineering. In 1942, he became Director of General Research and subsequently Director of Research at the newly organized RCA Laboratories in Princeton, N.J., where he led an outstanding program of RCA wartime research extending across the spectrum of military electronics. Elevated to a Vice Presidency in 1945, he entered upon a series of increasingly responsible executive assignments extending to all of the technical activities of the corporation. In October, 1955, he was appointed Senior Executive Vice President of RCA, and he was elected President of the corporation on December 1, 1961.

Dr. Engstrom is recognized today as one of the nation's outstanding business and technical executives, combining, in the words of Chairman David Sarnoff, "an unusual blend of business, administrative, and scientific abilities." His account of RCA's career since 1938, in the pages that follow, thus presents a story of growth and progress for which he, too, bears a large share of responsibility.

THE EDITORS

RADIO CORPORATION OF AMERICA

PART I—THE YEARS TO 1938

*By J. C. WARNER

Vice President (1934-1938), Radiotron Division,
RCA Manufacturing Company, Inc.

*Article written in 1938

J. C. Warner

IT WOULD BE misleading for me to imply that anything approaching a complete history of the Radio Corporation of America could be covered in the brief time which we can spend together. While the company is only a little over 18 years old several volumes would be required to do a really thorough job. However, I shall try to review some of the high points in the history of the company, and to cite the progressive changes in organization and their relation to the progress of the company in radio and allied fields.

It has often been said that "the story of the Radio Corporation of America outlines the larger story of the radio era," i.e. the era of radio broadcasting. Peculiarly enough the company was not organized with radio broadcasting in mind, although it is significant that the man whose name is so closely associated with the history of RCA and who has for many years been its active head, had clearly visualized the possibilities of radio broadcasting service and even "electric tuning" long before broadcasting made its first appearance. I refer, of course, to Mr. David Sarnoff.

RADIO—A NEW COMMUNICATIONS SERVICE

At the close of the war the only company in a position to handle commercial transatlantic radio communications was the Marconi Wireless Telegraph Company of America, although the stations which it had operated before the war were in the hands of the Government who had taken over all such stations for wartime purposes. This company was an offshoot of the British Marconi Co. and was largely owned by English interests.

At this time the best known means of long distance transmission was the Alexanderson high frequency alternator, the patents on which were owned by the General Electric Company. Negotiations between General Electric and the American Marconi Company, which had started several years previous, but had been interrupted by the war were resumed in 1919 for the purpose of transferring patent rights as well as alternators to the Marconi Company which was anxious to expand its transatlantic services.

Certain high officials of the Government learned of these negotiations and were unwilling to see a growing communications service under foreign control, particularly since the transatlantic cables were in the hands of foreign, though friendly, nations. Consequently they suggested to the General Electric Company that negotiations be suspended until after discussion with the Navy Department. This was in April 1919 and it is interesting to note that the letter to the General Electric Company was written by Mr. Franklin D. Roosevelt, then Acting Secretary of the Navy.

FORMATION OF RCA

As a result of conferences with the Navy a plan was developed for forming a new American company to take over the assets of the American Marconi Company. So, on October 17, 1919, the Radio Corporation of America was incorporated, and on November 20, 1919 the entire business of the Marconi Company was taken over.

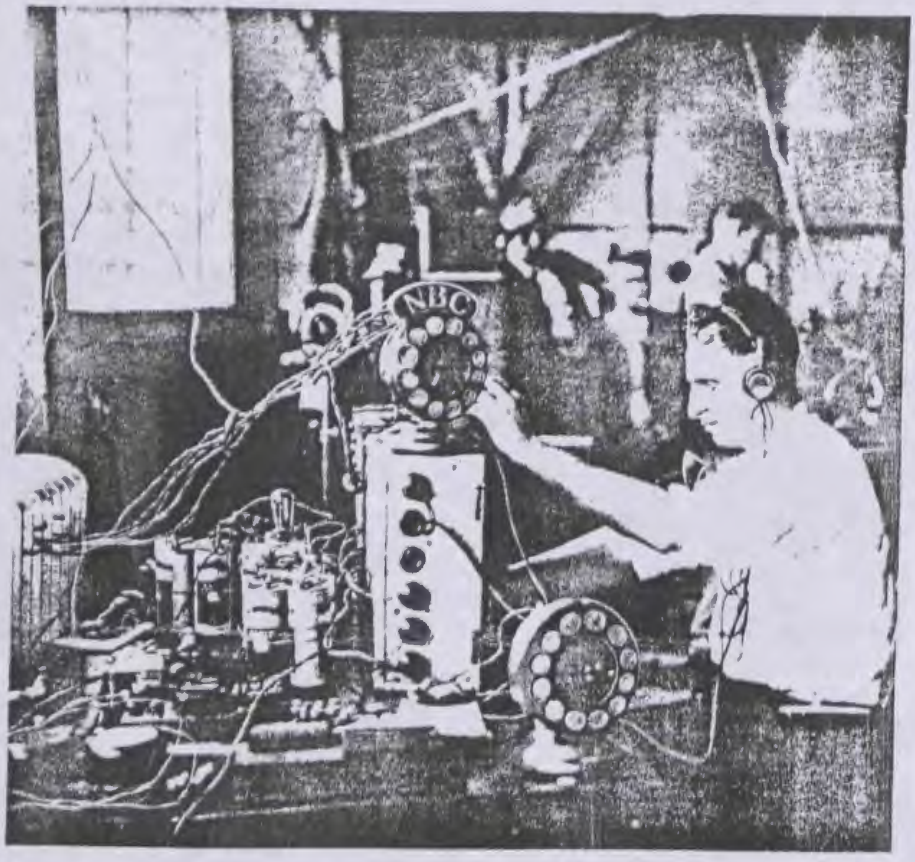
GE held a substantial interest in the new company, and immediate arrangements were made between RCA and GE to cross-license each other to use the radio patents of the GE Company and the patents RCA had just acquired from Marconi. Work was started at once on new high power alternator stations in California, Massachusetts and Hawaii.

But another patent deadlock soon appeared particularly with respect to vacuum tubes. The possibilities of long distance shortwave communications were unknown at this time. In fact, wavelengths under 200 meters were relegated to the supposedly unimportant use of amateurs. But, tube transmitters were needed for medium power services and, of course, tube receivers were essential.

Strong patents on vacuum tubes were held by both GE and the Western Electric Company, but neither could make effective use of its own patents without infringement of the other's. Again the Navy lent a hand and persuaded the GE Company and AT&T Company to come to an understanding "For the good of the public." This was in January 1920.

TRANSOCEANIC SERVICE BEGINS

In February 1920, the stations which had been taken over from the Marconi Company by the Government during the war were turned back to the new RCA, and a foreign communications service were inaugurated. One of the principal stations was in New Brunswick, N. J., and the long-wave antenna there has no doubt been seen by a great many of you. During that year,



Two scenes of early communications and broadcasting activities.

foreign service was established with England, Germany, France, Norway, Japan and Hawaii.

In July 1920 an agreement was reached between RCA, GE, and AT&T which permitted RCA to proceed with the use of all radio patents of these companies.

BEGINNING OF BROADCASTING

During the first year of the RCA attention was directed almost exclusively on communications, but in 1921 the first rumblings of what soon was to become a broadcasting boom began to be heard. A number of experimenters had been playing with the idea of transmitting phonograph music over somewhat crude telephone transmitters.

WESTINGHOUSE JOINS RADIO GROUP

Westinghouse had done a certain amount of radio experimentation in its laboratories, and shortly after the formation of RCA began to consider going into the radio field. A subsidiary company was set up known as The International Radio Telegraph Company which had acquired a large group of Fessenden patents from the old National Electric Signaling Company. Consideration was given to going into the communications business, but difficulties were encountered in that the important European stations were all tied in with the stations of the Marconi Co. now held by RCA.

To strengthen their position Westinghouse acquired a group of Armstrong and Pupin patents, among which was the Armstrong "feed-back" patent later to become quite famous. Finally, in 1921, a cross-license agreement was made between RCA, GE and Westinghouse, and Westinghouse now became a member of the radio group.

BROADCASTING BEGINS

Meanwhile, strenuous efforts were being made to get broadcasting started. The pioneer licensed station of the United States, and of the world, was KDKA, of the Westinghouse Company, in Pittsburgh, licensed by the Department of Commerce on October 27, 1920. This station broadcast election returns in November of that year. RCA first entered this field on July 2, 1921, when a one-day broadcast was made from a temporary station at Hoboken, N. J., on the occasion of the Dempsey-Carpentier fight. Soon after, RCA opened station WDY at Roselle Park, N. J., which continued for some months, when it was shut down on account of interference with station WJZ of the Westinghouse Company in nearby Newark. RCA then went in as halfpartner with Westinghouse in the management of WJZ. Broadcasting was really on its way.

WIRELESS SPECIALTY COMPANY

Another corporate element entered the picture in 1921, the Wireless Specialty Apparatus Company. This was a Massachusetts concern largely occupied in making apparatus for the Tropical Radio Company, which in turn was a subsidiary of the United Fruit Company, and which operated coast and ship service for the large United Fruit fleet. GE bought into Wireless Specialty, and again made license arrangements which cleared up a few more of the patent obstacles to RCA's progress.

A FORMATIVE PERIOD

These first two years cover what might be called the formative period of RCA. It was a period during which all of the important American companies which could play a part in the development of the radio field of that time were brought into a workable relationship.

It was a fortunate coincidence that the end of this two year period came just at the threshold of the development of the new broadcasting industry. In fact it is a fair statement that without the removal of the many previous obstacles, broadcasting itself would never have developed on a national scale in such a short time.

RCA ENTERS MERCHANDISING FIELD

Just prior to the start of broadcasting RCA had given thought to furnishing apparatus to radio amateurs both for reception and transmission. As broadcasting appeared, the line of amateur apparatus was expanded as quickly as possible to include home broadcast receiving equipment, and RCA now entered the merchandising field with GE and Westinghouse as manufacturers (Wireless Specialty also furnished a small amount of apparatus for a time). As later developed, this arrangement had many disadvantages but remember that at the time it was probably the only way in which the RCA could get started. It was, so to speak, a condition of RCA's birth.

In 1922, RCA got out a catalogue of radio equipment which well illustrates the conditions of that day in comparison with the present. For that reason I shall digress for a few moments to describe some of the things which where offered for sale. The catalogue was entitled "Radio Enters the Home," and since in this period every man had to be his own serviceman all the accessories imaginable were included as well as many parts for the experimenter to make his own set.

The cheapest receiver listed was a steel box containing a single-circuit tuner and crystal. This sold for $25.50 with headphones, antenna equipment and "full instructions." More elaborate crystal sets were available at $32.50 and $47.50. The cheapest tube set was the one-tube "Aeriola Senior" made by Westinghouse—it used a WD-11 tube in a regenerative circuit and sold for $75.90 with batteries and antenna, and for $65.00 without the accessories. This was a very popular set in its day and it is quite likely that a few of them are still in use.

GE supplied a set made in steel boxes. The two units comprised a tuning system in one box and a three-tube detector-amplifier in the other box, and sold complete for $250.00. Westinghouse supplied a somewhat similar receiver in a wooden box at $261.75. This also comprised two elements, one of which was a single circuit tuner, the other a detector-amplifier.

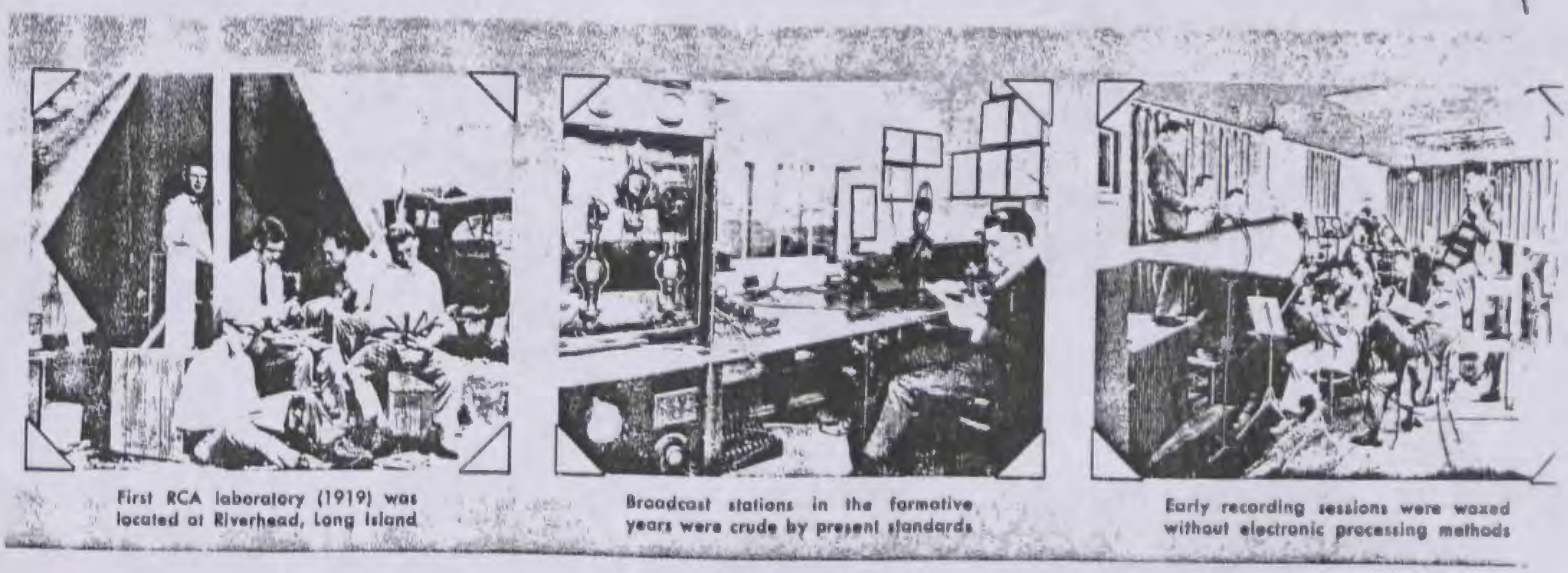
The most elaborate set was the "Aeriola Grand" made by Westinghouse. This had four tubes, a regenerative detector and, in addition, there were four ballast tubes to avoid use of a filament rheostat. No emphasis was placed on the number of tubes since the practice of stressing this had not yet appeared. This set sold for $401 with all accessories.

The only load-speaker shown was similar to a brass automobile horn with a telephone receiver on the end—which sold for $30.00. It is interesting to note that a phonograph attachment was available at $18.00 which consisted of a telephone receiver element to be attached to the tone arm of the phonograph so as to get the equivalent of a loadapeaker. There were two models—one for Victrolas and the other for Graphanolas.

FIRST RADIO TUBES

At this time RCA sold four types of receiving tubes. Two were made by Westinghouse and two by GE. The Westinghouse tubes were designed and manufactured in East Pittsburgh and the GE tubes were designed in their Research Laboratory at Schenectady and manufactured in two of the GE lamp factories, one at Nela Park, Cleveland, and the other in the Edison Lamp Works at Harrison, the same plant which is now the Radiotron Works of our own company.

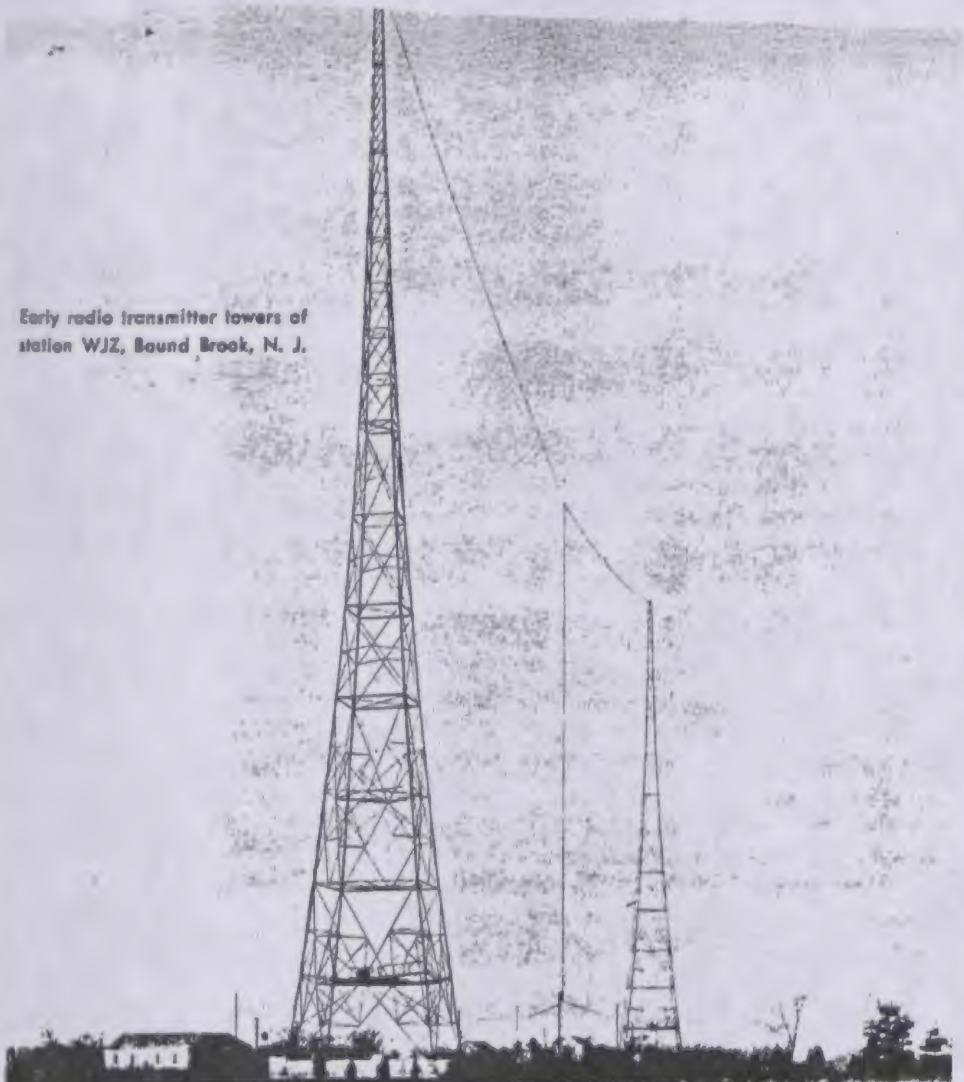
Tubes were also sold by E. T. Cunningham, Inc., first on the West Coast, and later throughout the country. Mr. Cunningham for some years had been making tubes for amateurs on the West Coast, and seeing the possibilities of merchandising tubes on a large



First RCA laboratory (1919) was located at Riverhead, Long Island

Broadcast stations in the formative years were crude by present standards

Early recording sessions were waxed without electronic processing methods

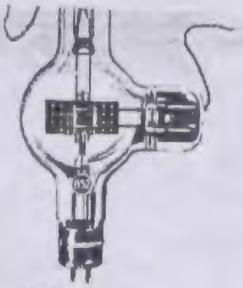


Early radio transmitter towers of station WJZ, Bound Brook, N. J.

Lester J. Wolf, currently in DEP Radar Projects at the Moorestown plant, is shown with a developmental quartz crystal frequency standard at Westinghouse, 1928-29.

Original studio and operating room, station WBZ, Springfield, Mass., in 1921. Horace R. Dyson, Staff Engineer in DEP Technical Administration, is the operator in the background.

WD-11 Detector Amplifier—1920



852 Transmitting triode—1927

scale he entered into an arrangement with RCA in 1920 which gave him the right to sell tubes under his own name. They were the same as RCA tubes but had different type numbers.

RCA PROGRESSES IN ALL FIELDS

The years 1923, 1924 and 1925 brought numerous advances in the RCA fields. To mention only a few—in 1923 two broadcasting stations were opened by RCA in New York and one in Washington. In 1925 the first WJZ transmitter was installed at Bound Brook, N. J. Short-waves came into use for long distance communications, first to supplement the high power long-wave transmitters, and later to take over practically all of the long distance service. Trans-oceanic communications were extended to additional European and South American countries. The first superheterodyne receiver was brought out in 1924. In 1925 a receiver was sold with accessories permitting it to be operated from alternating current. In the same year the electrodynamic loud speaker was brought out. Apparatus was developed for recording and reproducing records electrically. Improvements were made in tubes greatly reducing the power consumption.

In 1925, RCA furnished certain components to the Victor Talking Machine Company which were built into a radio-phonograph combination employing a single speaker. This is significant as the first step in very important later developments.

RCA ONLY A SELLING AGENCY

Remember, that during this period and for several years after, in the merchandising field RCA itself was only a selling agency. The manufacturing was done entirely by the electric companies. Receivers were made at Schenectady by GE and at East Pittsburgh by Westinghouse. Receiving tubes were engineered at East Pittsburgh and Schenectady, and were made in GE lamp factories at Cleve-

UX-222 Sharp-Cutoff Tetrode—1927

247 Power Pentode 1931

land, Harrison, and later at Newark—also in Westinghouse factories, at East Pittsburgh, Bloomfield, N. J., and later at Indianapolis (in what is now our Indianapolis Plant).

It must already be evident that the problems of coordination began to be tremendous. RCA first utilized the electrical laboratory of the City College of New York, which was in charge of Dr. Alfred N. Goldsmith, to test new models of apparatus. This was quickly outgrown and the Technical and Test Department of RCA was established in its own building at the edge of Van Cortlandt Park in New York. Here samples of apparatus were submitted independently by GE and Westinghouse, tested and reported back to the manufacturing companies, with approval or suggested changes.

It soon became necessary for RCA to have the same apparatus regardless of which company made it. In the case of tubes it was particularly essential to have uniform designs from all factories so they could be interchangeable in any receiver. Of course, this was long before the time tubes were shipped in sets.

EFFORTS ON COORDINATION

In an attempt to accomplish this necessary coordination, "design" or "standardization" committees were set up separately for receivers and tubes, comprising representatives of GE and Westinghouse. The tube committee which started in 1924 perhaps best serves to illustrate the unwieldiness of such an arrangement, which I will describe in some detail.

This committee was known as the Radiotron Standardization Committee. It was made up of representatives from East Pittsburgh, Cleveland, Schenectady, Bloomfield, and Harrison—two and sometimes three from each. It met once a month around the circle and attempted to arrive at agreements on tube designs, ratings, characteristics, and even some production problems. It had no direct representation from the receiver divisions so the coordination with them was supposedly handled by the East Pittsburgh and Schenectady tube representatives, and the ideas and needs of the receiver engineers carried to the tube meetings. The main committee carried with it a train of sub-committees and coordination groups intended to handle specific technical items. Needless to say this kind of an arrangement was in many ways unsatisfactory, yet it is difficult to visualize any better method under the then existing company relationships.

The "Design" committee on receivers operated in much the same way as the tube committee, but with some advantage in having only two groups involved. It finally became necessary to set up an additional receiver coordination committee which included RCA representation. One of their first subjects of discussion in 1927 was the "Radiola 16," and another model which became the "Radiola 17," which was the first real a-c receiver using a-c tubes.

The loss of time inherent in the inter-company committee method of coordination was a major handicap to progress in engineering, manufacturing, and sales, but it remained until new major changes in organization came to pass, as we shall see later.

FORMATION OF NATIONAL BROADCASTING COMPANY

Going back to 1924, the AT&T was actively developing the use of wire lines for furnishing programs to broadcast stations and they set up WEAF as the source of these programs. In 1926 RCA and its associates took steps to integrate a complete broadcasting service and formed the National Broadcasting Company. This was a recognition by RCA officials that this new service had the possibilities of an important industry and that a specialized organization was necessary to develop programs, to install new stations and to maintain a satisfactory continuous service to their own as well as other stations.

The new company acquired station WEAF from the AT&T, and also took over the stations owned by RCA and thereby created the real beginning of the network broadcasting industry.

RCA LICENSES OTHER RADIO COMPANIES

In 1927, a major step was taken in a new direction, the licensing of other manufacturers under RCA patents. It was inevitable that the demand for broadcast receivers would lead other companies into the business, and a large number had by this time become established. The granting of licenses to these companies strengthened their position, but at the same time gave RCA a rightful return for its huge investment in patents obtained through the research and engineering of the radio group and also by purchases from other inventors.

At first the superheterodyne patents were not included in the licenses. Also it was not until two years later that tube licenses were granted, although a number of lamp and other manufacturers were actively making tubes.

RADIOMARINE COMPANY FORMED

Late in 1927, the ship-to-shore telegraph business of the RCA, which had been growing steadily, was segregated into a new subsidiary company—the Radiomarine Corporation of America.

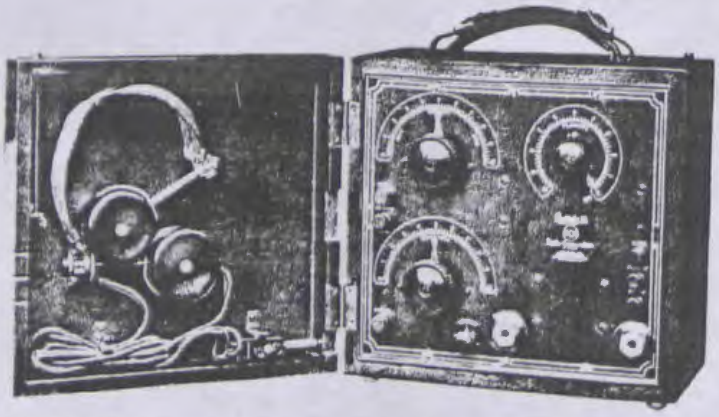
RCA PHOTOPHONE ORGANIZED

In 1928 a new offshoot of the radio business appeared. For several years work had been going on in the GE laboratories to perfect a system of recording sound on film. This was now ready for commercial exploitation in the motion picture industry and RCA Photophone Company was organized to handle this business.

RCA PURCHASES VICTOR COMPANY

1929 was a year of far-reaching changes in the organization of the RCA group which constituted the first major step towards integration of the company into a self-contained, self-controlled radio business.

I have mentioned already some of the handicaps inherent in the arrangements whereby RCA did the selling while the other companies manufactured. This method was wholly inadequate to meet the quick moves of the independent competitor. Furthermore, the electric companies naturally wanted to make a profit and so did RCA. This seriously handicapped the coordination of sales and production which is so essential to the success of an entire operation. RCA needed its own manufacturing facilities.



The "Radiola II", an early radio marketed by RCA at the start of the '20's. The word "Radiola" was coined by Dr. Alfred N. Goldsmith in a note to General Sarnoff supporting his concept of a "Radio Music Box" for home entertainment.

The Victor Talking Machine Company at Camden had been seriously affected by the growth of radio and had not been particularly successful in its attempts to enter the radio field. In order to obtain manufacturing facilities RCA purchased the Victor Company including the manufacturing plant, what was left of the phonograph business, and the Victor dog trademark. Arrangements were also made whereby RCA took over tube manufacturing from GE and Westinghouse. RCA acquired the entire Edison Lamp Works property of the GE at Harrison, and also the Westinghouse factory at Indianapolis, and at the end of the year the RCA Victor Company and the RCA Radiotron Company were organized.

RCA COMMUNICATIONS FORMED

In this same year the RCA Communications Company was formed to take over all of the business in transoceanic communications.

CONSOLIDATED RESEARCH, ENGINEERING, MANUFACTURING AND SALES

In 1930 RCA completed the consolidation in the RCA Victor and Radiotron companies of all facilities of research, engineering, manufacturing, and sales of RCA products which now for the first time included phonographs and records. Somewhat later, in 1932, the Photophone business also was taken over by the RCA Victor Company.

Licenses were now being granted to tube manufacturers and the superheterodyne patents were included in the set licenses. Agreements had also been made with a number of foreign radio manufacturers giving RCA rights under their patents and in some cases access to their laboratories.

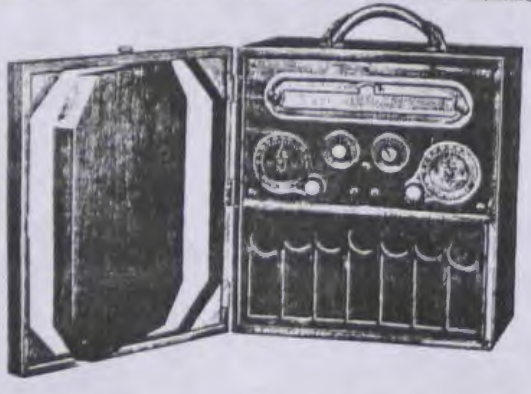
CUNNINGHAM COMPANY BOUGHT

In 1931 the E. T. Cunningham Company was taken over by RCA and consolidated with the RCA Radiotron Company, giving RCA rights to the use of the Cunningham brand and bringing Mr. Cunningham into the RCA organization.

ELECTRIC COMPANIES WITHDRAW

The second and final step toward an independent RCA took place in 1932. In 1930 the Government had brought suit against RCA attacking certain exclusive features of the inter-company agreements, and as the result of a consent decree all the stock interest of GE and Westinghouse in RCA was disposed of by those companies. AT&T had disposed of its stock interest in RCA some years before. Modified cross-license patent agreements were entered into with the approval of the Attorney General and the sanction of the Court. RCA now became a completely self-contained organization with wholly owned subsidiary companies operating a broadcasting business, a communications business, a marine radio business, a radio school, and a manufacturing and merchandising business.

The "Radiola 26", an early superheterodyne portable receiver. The lid contained a rotatable loop antenna which was also dial-tuned for maximum sensitivity.



DE FOREST COMPANY PURCHASED

In 1934 the tube business was augmented by the purchase of certain patents from the defunct De Forest Radio Company. This brought about the beginning of transmitting tube manufacturing by RCA Radiotron.

RCA VICTOR AND RCA RADIOTRON MERGE

In 1935, the manufacturing and merchandising business was further consolidated by the merger of the RCA Radiotron and RCA Victor Companies which now became the RCA Mfg. Co.

IMPORTANCE OF DIVERSIFICATION

Before concluding I want to emphasize one phase of the history of RCA which so far I have mentioned only indirectly, yet which stands out with clearness and significance in the whole course of the 18 years of RCA's life. I refer to product diversification. A study of the history of RCA is well worth while if it does no more than demonstrate the value of diversification, and its paramount importance to us in looking toward the future.

The corporate history is a sort of family tree in which certain elements contributed at the start, but which were later separated from the new growth. I shall use another horticultural analogy to illustrate product diversification.

Certain varieties of trees are responsive to wide differences of training. Two plants may sprout from the ground exactly alike, side by side. One of them may be trained to grow perfectly straight with a central trunk and beautiful symmetry. The other may be trained into a large bush-like growth with many branches.

Two companies may also start in

John B. Coleman inspecting a transmitter in Camden, ca. 1936. Mr. Coleman is presently Manager of BMEWS project.

Dr. Elmer W. Engstrom working on a radio receiver in a Camden research laboratory in 1934

Clarence A. Gunther is shown making receiver tests in a Camden laboratory, ca. 1935. Mr. Gunther is now Chief Defense Engineer, DEP

the same way from small beginnings. One may be concerned with a single product or a narrow field while the other grows many branches, large and small. We may have a great admiration for the tall straight tree, but if a storm comes along and breaks off the top it may be years before it recovers its original form. The same storm has little effect on the other tree. It may pass over without harm or even if a few branches are broken they may be trimmed off without showing.

The one-product company may do admirably in times of prosperity and we may envy its simple operation. But if it meets with changing conditions or times of depression the "one product" may no longer be in demand and the company has nowhere to turn.

Suppose that back in 1921 RCA had said "No, we aren't interested in radio entertainment, we are in the commercial communications business." Again suppose RCA had looked at talking pictures and said "No, we aren't interested, we are in the radio business." Again, after acquiring the Victor Company suppose RCA Victor had said "We will let the phonograph business die. It doesn't amount to much and we want to sell radio receivers." There are several obvious answers to these suppositions, but the uppermost in our minds probably is that if these things had happened most of us wouldn't have our jobs.

PUBLIC SERVICE IS PARAMOUNT

The strength of a company is in a large measure proportional to its service to the public. The RCA has grown as it has extended its fields of public service. It will continue to grow just so long as it utilizes its variety of resources to give the public new or better services, or new or better products.

It should never be forgotten that a by-product often becomes a main product. Again, the limitations of a product or service today may turn into advantages of tomorrow. The often alleged lack of secrecy in radio communication was once talked of as a handicap, but broadcasting, as its name implies, made good use of this so called handicap.

RESEARCH INSURES PROGRESS

Research has played a major part in the evolution of the RCA and must continue to do so. I use the term not alone in a technical sense but broadly —research in sales methods, in advertising, in relations with the public, in better understanding and organization of our personnel, as well as in engineering and manufacturing of our products.

Research provides the new food which the tree needs when the old is exhausted or no longer suitable. The tree must grow or it will die and a company must go ahead or back. It never stands still. RCA has made good use of its resources to expand its fields of activity. But it is a safe prediction that if we live up to our opportunities we will some day look back at 1938 and see that we have now only started to scratch the surface. Facsimile is barely started. Television is still ahead of us. Commercial Sound applications are getting under way. A multitude of ultra-high frequency applications are certain. And outside the radio or entertainment fields the field of electronic devices is in its early infancy.

I hope that this brief story of the RCA has served to show something of how far we have come but more important, how much farther we can go in the future.

The "Radiola 17"—the first a-c radio. The receiver contained six tubes plus rectifier and operated on a tuned radio-frequency principle

Fortune, Feb. 1938

...school children who rush to the radio every Wednesday night to tune in on the Gang Buster program do not know that Westinghouse's baggy-trousered, self-effacing Frank Conrad is the man who is generally credited with making radio broadcasting a commercial possibility in the U. S.

The ubiquitous Mr. Conrad

Invention is seldom a single man's show, but in Westinghouse is one man who has to his credit some 200 patents. He is Frank Conrad, who can never quite remember the year in which he invented anything. This gray, physically unimpressive person never finished the seventh grade. Yet he has been known to predict the performance of a proposed electrical device even before he has worked out the underlying problem mathematically. He picked up his physics and mathematics for himself; capable of anything that is susceptible of scientific information, he is at the moment amusing himself by studying the more abtruse aspects of horticulture.

The round, clocklike watt-hour meter that ticks off the kilowatts in most houses today was one of Conrad's earliest developments, patented when he was twenty-six. This displaced the old square meter which worked poorly and was expensive to make. At 31, Conrad worked out the idea of the pantograph trolley, which is used on electric railroads. The pantograph, which consists of a jointed, self-adjusting steel framework supporting a current-collecting crossbar set at right angles to the so-called catenary overhead wire, is superior to the old fashioned trolley pole in two ways: it won't jump the wire under high speeds and it can collect far more current than the trolley-pole wheel. Moreover, it allows the overhead wire to sway from side to side. Conrad invented the pantograph long before there were electric trains; he did it to please George Westinghouse, who wanted a substitute for the old trolley-pole used on street-cars. Once it was invented it could not be sold, so it hung around uselessly in Westinghouse's attic. But when the railroads began

electrifying in areas where the traffic peaks were congested, the pantograph was hauled out, dusted off, and put into a business that seemed to be specially made for it.

The most recent Conrad invention is an automobile dashboard electric clock. (The patent stands in his own name because Westinghouse did not wish to make this particular type of clock.) But Conrad's most extraordinary feat goes back to a $5 bet he made that his $10 watch--his "biscuit"--would keep better time than a friend's expensive importation. That was more than 20 years ago. Just for a gag he secretly substituted $65 worth of new jewel-movement machinery for the old works. But even this costly Machiavellianism didn't satisfy him. To get the most accurate time reports he set up a wireless in the laboratory over his garage to receive the Arlington time signals from Washington. This started his mind to working on radio, which amused him. He talked across space with sick radio amateurs in hospitals, and played phonograph music to cheer them up. When he ran out of records he invited the boys and girls of his neighborhood to come to his garage and supply vocal programs. A Pittsburgh store started to sell receiving sets to pick up these programs, and this gave Conrad an idea. At that time the best minds in radio were trying to devise a secret, personal method of wireless conversation to compete with the telephone. Avid amateurs, however, were busy picking up all wave lengths. Working on the theory that secrecy was impossible, Conrad proposed that Westinghouse manufacture radio receiving sets and also provide a regular amusement program to go along with them. Westinghouse's Vice President in charge of engineering, H. P. Davis, was impressed with the notion, and the result was KDKA--the first licensed commercial broadcasting station, which put Westinghouse on radio's ground floor.

Later on, Conrad proved to skeptical scientists, including marconi, that short-wave transmission, which was generally considered useless, could be made the basis of long-distance radio broadcasting. In the early twenties Westinghouse pooled its radio patents, including some of Conrads with G.E. and R.C.A. But when the government brought suit, both Westinghouse and G.E. withdrew from the arrangement with

R.C.A., ultimately disposing of their R.C.A. stock, principally by paying it out in the form of dividends to their stockholders.

WESTINGHOUSE
ELECTRIC & MANUFACTURING COMPANY

C

FROM Miscellaneous Eng. Dept.

DATE October 16, 1935

SUBJECT WESTINGHOUSE ACHIEVEMENTS

Mr. H. W. Cope,
Assistant to Vice President

As one of the Westinghouse achievements, the following notes on our early broadcasting may be of service to you in compiling your list of achievements.

The status of radio before the World War was that of a medium of communication restricted all most exclusively to ship service with a few high power land stations for long distance communication. All this communication was carried out by means of telegraph code, telephone apparatus not being available in spite of the fact that as early as 1907 Professor Fessenden had demonstrated the possibilities of radio-telephone communication. However the lack of satisfactory equipment prevented any commercial utilization of Professor Fessenden's developments. The urgent need for communication during the World War greatly stimulated the development of radio devices, the principal item of which was the vacuum tube. This vacuum tube made possible a commercial form of radio-telephone equipment. During the War, the Westinghouse Company undertook to develop and produce certain radio devices for the Army and Navy and the close of the activity left the Company with a considerable amount of manufacturing facilities for which they attempted to develop some commercial outlet. As a possibility in this direction, an attempt was made to produce apparatus suited to point-to-point communication - that is between a given transmitter and receiver, and the first step in this direction was to equip several of our own Works with transmitting and receiving apparatus which would permit interchange of company business.

The writer who was very much interested in this work had, previous to this, constructed at his home a transmitting set which was operated under a license from the Department of Commerce, permitting him to carry on experimental work. To operate a transmitting station it has always been necessary to obtain a government license and such license specifies the particular purpose for which the transmitter is to be used. The possible purposes were divided up into several headings, namely amateur stations which were stations to be used for non-commercial purposes and which were restricted in wave length and power. Experimental stations which were assumed to be used in the development of radio art. Commercial stations which were to be used for transmitting of commercial messages. At that time there was no provision for licensing of stations to be used for broadcasting, that is transmitting messages which were to be picked up by many listeners. In applying for a license for a particular class of service it is, of course, necessary for the applicant to show that he can efficiently perform the service corresponding to the class of license he is applying for. In the case of an experimental station, it was necessary to demonstrate to the Department of Commerce that the applicant was possessed of the necessary facilities to carry on development work, and in the case of my own license, it was indicated that this work was to be carried out in the interests of the Westinghouse Company and that their resources were

available. A license of this type permitted the writer to operate his station as a broadcast station, that is to transmit material which would be of interest to many listeners as it was in the nature of a development of this kind of service. As you know, there was a ban placed on the operation of any radio equipment during the War period. This ban, as far as receiving was concerned, was lifted in November 1919. The general ban on transmitters was not lifted until some time later, although in view of the fact that the writer possessed a permit to operate during the War period, he was able to transmit as soon as the receiving ban was lifted and to meet the requests of many outside listeners a regular schedule was established for transmitting every Saturday night, and later on this was extended to include a Wednesday night program as well. This schedule was carried out with a certain amount of regularity during the whole of 1920, and the general interest which it aroused was instrumental in convincing our executives, particularly Mr. H. P. Davis that there was a big field in broadcasting, although the possibilities of this field were very much depreciated by both the General Electric Company and Radio Corporation whose interests were largely in the development of a commercial point-to-point message service.

When the Company decided to seriously enter the broadcasting field it was apparent that a good time to make a start would be at the time of some event which was of national interest and as the Presidential election occurred that year this was selected as a very suitable beginning date. Accordingly provisions were made for broadcasting the results of the election of November 1920. At the time of this first broadcast from the Company's plant there of course was no provision in the licensing requirements of the Department of Commerce to license regular broadcasting stations; accordingly, it was necessary to carry these first broadcasts on under an experimental permit. This experimental permit was extended for several months, at the end of which time a formal broadcasting license was issued, and up until the time when broadcasting as a radio activity was included in the Department of Commerce licensing condition there, of course, were no formal broadcast stations, and it is the writer's recollection that K.D.K.A. did not receive the first broadcasting license, but that it was assigned to one of the other Company stations. However, as a date of beginning a broadcasting service, the writer's station 8XK can establish November 1919, as such a date. This was carried on experimentally during the most of 1920 by 8XK and during the end of 1920 and part of 1921 by K.D.K.A. in an experimental way until a formal broadcasting license was issued.

I assume you will not make any comparisons with other stations but for your own information the following is as near as the writer can remember the history of the station now operated by the Detroit News.

This station is the outgrowth of an amateur station operated in Detroit by two amateur operators and first licensed as an amateur station in August 1920. Like the writer's station 8XK it was operated with more or less regularity during the balance of 1920 and for some period of 1921. A formal broadcast license under the call W.W.J. was finally issued to the Detroit News some time in 1921, but at a latter period than that of several of the Westinghouse stations. The Detroit News' claim of priority is based on a comparison of the date for the issuing of the amateur license in Detroit to that of K.D.K.A.'s first broadcast in November 1920. However, this date should actually compare with the writer's first regular broadcast in November 1919.

It is, of course, a matter of record at the Radio Department in Washington as to just when the various licenses were issued, and in your final write-up of the Westinghouse achievements it would probably be well to add these dates which, although the writer has not available at this time, can be readily obtained.

Another achievement of the Westinghouse organization was the demonstration of the possibilities of the so called short radio waves as a medium for long distance transmission. In the early days of radio, the laws governing the propagation of radio waves were determined largely from experiments made on the then existing long wave government stations, and over the range of wave lengths investigated it was found that transmission conditioning improved steadily with an increase in wave length, and it was assumed that this law would hold good even over ranges of wave lengths not then investigated. Quite elaborate mathematical formulae were developed which allowed fairly accurate determinations of power required for given distance of transmission for the wave lengths then contemplated. These formulae indicated that for wave lengths below 200 or 300 meters the transmission would be comparatively unsatisfactory and for this reason there was assigned to the use of amateur stations wave lengths of 200 meters and under. That is, all amateur stations were restricted to use a wave length of not over 200 meters. During the early part of 1921 some experimental work carried out by the writer indicated to him that the previous accepted laws did not hold true on wave lengths below 100 meters and he accordingly setup some transmitting equipment here at Pittsburgh and to permit of tests being carried on at a distance he furnished equipment to some experimenters located in other cities, notably Boston. Tests carried on with the Boston station indicated a very great improvement in transmission when the wave lengths were reduced to that of the order of 60 meters or under. Accordingly a transmitter was setup here at East Pittsburgh which was operated at 60 meters and which was supplied the same program as that supplied to the regular transmitter of K.D.K.A. The operation of this transmitter resulted in the accumulation of data over a wide area and which demonstrated the uses of the short wave lengths as a medium of long distance transmission, and the result of these tests finally influenced the Radio Corporation to practically abandon their long wave stations and install short wave stations which, at the present time, carry practically all of their long distance message service. In addition to this, the Telephone Company have put in short wave transmitters which permit telephone communication with practically the whole world.

An interesting incident in this connection is the fact that the Telephone Company about 192_ in endeavoring to stage a demonstration of long distance telephony built up a transmitter consisting of several hundred of the receiving tubes then available and demonstrated the reception of telephone signals in Europe. The wave length selected was that of the Naval Station at Arlington, namely 2500 meters. In the light of our experimentation with the short waves it would have been possible for the Telephone Company to have carried out this demonstration on one of the short wave lengths with four or five of the receiving tubes as a transmitter, rather than the several hundred, and the Telephone Company actually referred to this experiment as proof that radio was not a feasible method of long distance telephone transmission.

I of course assume that in your writeup, the conditions leading up to some of these achievements would not be included but this is given for your information in order that you may make up a more effective story.

F. Conrad
Asst. Chief Engineer

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

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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 Rad Engineering Department, and Mr. M. C. Rypinski, Sales Depar ment—all of the Westinghouse Electric & Manufacturing Co pany—participated in these conferences, and it was their expe ience, advice, constant faith and loyal efforts in the undertaki and the development that followed that carried the project success.

Cooperation of Press

One of the earliest decisions was the necessity of building u and obtaining necessary public interest in our efforts through th cooperation of the daily press. It happened that we were mo fortunately situated to accomplish this. Mr. A. E. Braun, th directing head of the Pittsburgh Post, a morning paper, and th Pittsburgh Sun, an evening paper, was an officer in the Interna tional Radio Telegraph Company, and the cooperation of thes papers and his hearty support were immediately forthcomin This, with Mr. McQuiston's acquaintanceship and contacts wit other press channels, and his work with Mr. Braun, added much t building up the public interest which led to the final great succes of the venture.

Main Objectives

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

1. To work, hand in hand, with the press, recognizing tha only by published programs could the public fully appreciate broadcasting service.

2. To provide a type of program that would be of interes and benefit to the greatest number, touching the lives of young an 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 thei 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. Popeke 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 Boradcasts 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 al 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 commerical 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.

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BROADCASTERS CELEBRATE TENTH ANNIVERSARY TODAY

RADIO'S SECOND DECADE BEGINS

Fast Pace of Development Is Expected—Many Surprises Are Promised—Television for the Home Is Possible by 1940

DR. ALFRED N. GOLDSMITH, vice president and general engineer of the Radio Corporation of America, is a pioneer in wireless.

His vision to see ahead in radio, his ability to point in the right direction for research to follow on the quest of television and other developments, makes his opinion of what will happen in the second decade of broadcasting of interest to the industry, to research and to the listener who wonders what radio will have to offer in 1940.

Dr. Goldsmith conservatively "vaults across ten "years" to visualize the anticipated achievements of radio science.

By Dr. ALFRED N. GOLDSMITH.

RADIO broadcasting in 1920—an infant. Radio broadcasting in 1930—a world-wide and mature institution. Electrical entertainment in 1940—will be what? The radio pioneers blazed a splendid trail during the first half dozen years of the development of broadcasting. From an absolutely unknown method of reaching the people, in a brief span of years they established engineering and artistic precedents of basic importance which have enabled the building up of mass communication by radio telephony into a great industry. During the last few years they and their successors have refined the technique and widened the scope of broadcasting until, today, it stands as a highly developed and universally accepted form of major entertainment applied to the people of the world.

A Doubtful Theory.

It is but natural to ask whether the amazing rate of progress during the last ten years can be maintained, and whether 1940 will see radio as greatly improved compared to the present day conditions as is the broadcasting of today when compared to that of 1921. To the public, which is already well satisfied in the main with the excellent performance of the better modern receivers and transmitting stations, it would offhand appear as if progress from now on would be slower than themselves as they journey over the earth carrying with them suitable portable pick-up equipment for telephone and television broadcasts.

The transmitting stations themselves are connected in great synchronized networks which extend over the greater portion of the earth's surface. All stations transmitting a given program can use a relatively small number of wave lengths, thus increasing the number of possible simultaneous broadcasts. The stations of 1940 are chiefly of either the medium power of 500 kilowatts or of the low power of 50 kilowatts, and some stations of power running into the thousands of kilowatts have been erected to feed program material to the population of stretches of territory which justify really high-power broadcasting.

Needless to say, the networks of each nation of the world are capable of instantaneous connection to the networks of any other country. A simultaneous broadcast of an event in both Australia and in the United States, or in both South America and Europe, or in both Japan and the Argentine, involves no particular technical difficulties and is accepted as a normal part of our general broadcasting of 1940. If the regions near the North and South Poles have not been completely explored by that time and are still the object of investigation by enterprising polar expeditions, such expeditions will, of course, be in as immediate touch with the population of the nations of the world as if they were located in a great metropolis. Indeed, it is likely that they will be in closer touch because of the special interest which their activities arouse and the particular care which will be taken to maintain perfect contact with them. Television will carry the airplanes pictures of the polar ice cap to the sunny valleys of California.

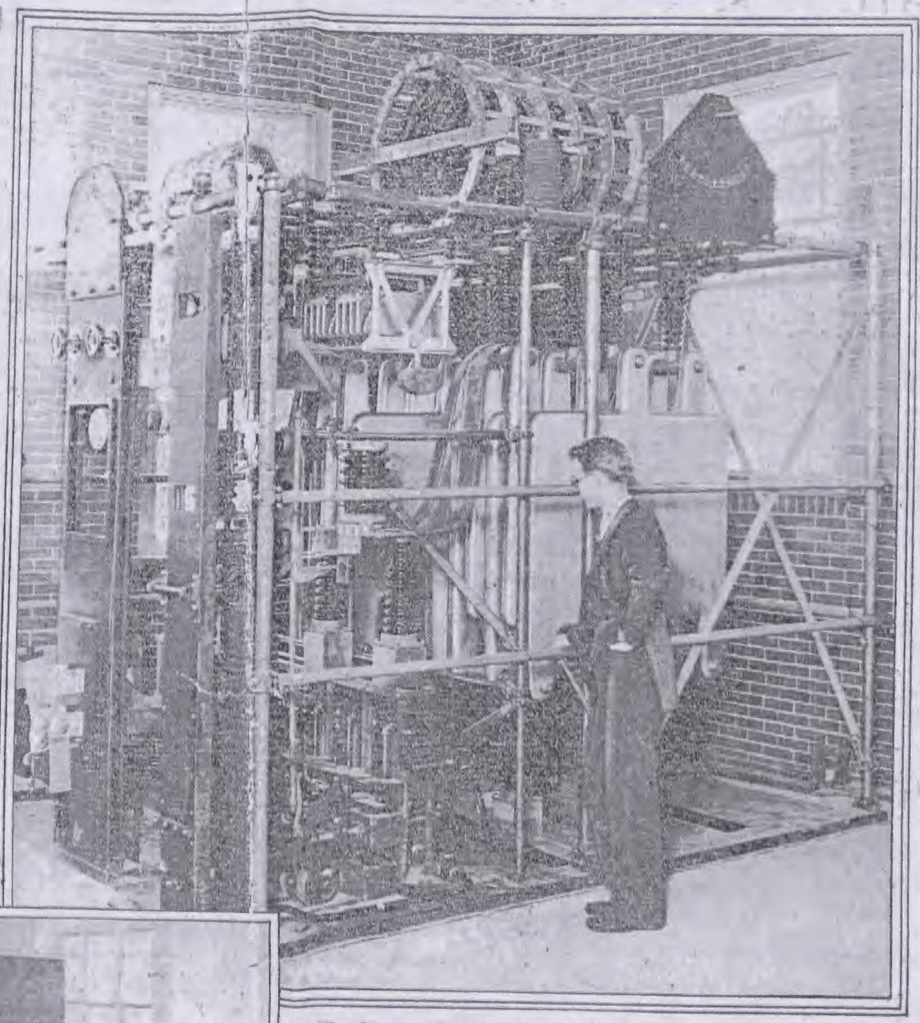
An Ally of Radio.

Closely allied to radio and completely coordinated with it in 1940 is the sound motion picture field. Whenever an excellent sound motion picture film is produced, it is available for broadcasting, and if an especially entertaining radio event or an important historical happening is broadcast, it is similarly made the subject of a sound motion picture film.

A number of supplementary electrical cases even in a single c[illegible]inet known as the "electrical entertainer." Essentially the electrical entertainer requires only two outlet portions, namely, a screen for showing a picture and a loud-speaker for producing a sound. Back of the screen is arranged either the television projector or the sound motion picture projector, or both. The educational and entertainment possibilities of such a device are limitless.

A New Servant for Man.

In 1940 we have the electrical entertainer at the disposal of the public. Its significance in the stimulation of musical taste, as an incentive to the creation of music at home, as an entertainment device and as a means of education has, it is believed, opened a new era. The electrical entertainer has already become a part of the life of the world. If we now look forward to 1950, some of its capabilities will have been further explored and mankind will have begun to derive a larger measure of the inestimable benefits which the applications of electricity can bring to it. And so, through the decades, the force which first frightened man when it flashed in the lightning and roared in the thunderbolt will not only become his servant but even his ally in improving his mind, broadening his cultural taste, and brightening his hours of leisure.



The Modern KDKA, a 400,000-Watt Transmitter Which Will Be Dedicated Today, Is a More Sturdy and Powerful Broadcaster Than That Used at the First Station, Shown in the Picture at the Left.

LISTENING-IN

LISTENERS of the world heard a remarkable broadcast during the past week.

A three-cornered international program featured addresses by President Hoover, Prime Minister Ramsay MacDonald of Great Britain and Premier Hamaguchi of Japan. The occasion was the depositing of the ratifications of the London Naval [illegible] the British Foreign Office parison note the transatlantic radio tones of Ramsay MacDonald, whose rounded sentences and even tones overlap atmospherics. Furthermore, those who talk across the ocean should take their time."

Nevertheless, Shaw's speech was clear enough for stenographers to take down the words after their flight across the Atlantic, and it was

BROADCASTING EVOLVED FROM THE CHAOS OF WAR

Davis Describes Events That Led to First Program—He Looks Ahead to Television—Future Is Untapped

By H. P. DAVIS,
Vice President, Westinghouse Electric and Manufacturing Company.

TEN years is not long, as time goes. It is an exceedingly brief period in which to develop an industry. Yet within that brief span the world has seen the beginning, the development, and, almost the maturity of radio broadcasting, an industry which has had the most amazing history of any in the world. Broadcasting is not really an industry. Instead, I like to call it a public service, one of the greatest, if not actually the greatest, of our modern civilization. The industry of radio is built around the service of broadcasting.

It was as a public service that broadcasting was begun and it is as a public service that it will continue its magnificent record of achievement. Like other manufacturers at the close of the World War, we had an investment in radio development in which we had been active during the period of the conflict. In equipment, in time, and in engineering development, this investment had been heavy and so something had to be done about the situation.

Birth of an Idea.

At that period it was the consensus of opinion that radio telephony, if it were ever developed, would be as a means of private communication. Therefore, developments had been directed along this line; ship-to-shore and point-to-point communication.

One of our transmitting stations with which we were actively engaged in developing radio telephony was located in the home of Dr. Frank Conrad, assistant chief engineer of the Westinghouse Company and then my principal assistant. During the course of his work with this transmitter he had built up an audience, mostly of amateurs in the vicinity. In this manner the radio telephone work of Dr. Conrad began to be well known within the circle of radio enthusiasts. I had no idea of the extent of this interest until one Sunday morning I read an advertisement in a Pittsburgh newspaper that some radio parts were for sale in a downtown department store. It was explained that these units a radio

years. Our first station KDKA was rated at 500 watts. Today we are formally opening a new KDKA, located near Saxonburg, Pa., which may be operated up to 400,000 watts. That is progress.

In the ten years just past the influence of broadcasting has covered the world. Kings and Premiers have spoken on world-wide networks. Short wave has developed possibilities for world-wide programs undreamed of in the beginning of broadcasting. Millions assemble to hear political leaders and captains of industry. Business depends upon its radio audience for much of its commercial effort.

In the Next Decade.

With all the possibilities developed today, there is still the future. If it were impossible to forecast the future of broadcasting ten years ago, then it is just as improbable that leaders of today can foresee with any degree of accurate vision what the next decade will bring.

I am satisfied from my contact with the electrical industry that the radio development is the biggest thing that has ever appeared in it. Today this amazing business which has been created by broadcasting gives employment to hundreds of thousands of people and the business done is figured in hundreds of millions. In the ten years of its existence the business done has amounted of $3,500,000,000. No other industry developed in the United States ever even approximated these astounding figures.

This is so because it represents one of the most remarkable, one of the most fascinating, one of the most tremendous innovations that man ever devised, and radio's future will eclipse its brilliant present because with the certainty of the population of the entire world for its audience, with every worth-while activity in human relations and endeavor anxious to use it, and with some of the best facilities and best brains in the world devoting their entire time and money to develop it, nothing can be surer than an accelerated rate in radio's progress.

A Believer in the Impossible.

[illegible] development in radio and

...in the past. Yet this theory is extremely doubtful, and the scientists and engineers have every reason to believe that not only electrical entertainment in general, but also radio broadcasting in particular, will improve in performance, convenience, and scope, and at a marked pace, as the years go on. New principles and methods, as yet only in the minds of the inventors, or at best in the laboratory, appear to beckon the radio art forward to new accomplishments and triumphs.

A Glimpse at 1940.

And so, vaulting over ten years, let us imagine ourselves in 1940. Looking about at the field of electrical entertainment, what do we find? The role of a prophet is at best a difficult one, and it may therefore be hoped that the following picture will not be too rigidly held against its delineator, and particularly not in its details. In such a discussion as this, an author always feels under a severe handicap and experiences some embarrassment when he remembers the existence of an imperishable rag-paper edition of THE NEW YORK TIMES, which can perhaps be later used against him.

We enter the radio broadcasting studio of 1940. The microphones are nowhere in evidence for the methods used so successfully in 1930 for sound motion picture production, with remote and concealed microphone, will have found their place in broadcasting. Devices oddly like cameras will point at the actors, picking up their images for television transmission, perhaps in color. Motion picture cameras are in evidence. The studio, with its special backgrounds and furnishings, will look much more like the stage of a theatre or a motion picture studio than like the orderly room which it resembled in 1930. Television pick-up men and camera men, sound recordists and control room experts are busily at work. Actors troop out of their dressing rooms in the costume suited to their performance. Their words and their appearance are carried instantaneously by wire line or radio connection to a multitude of outlet stations. In the control room, provision is made in the case of the more important broadcasts to record both the picture and the sound of the performance, either on photographic film or on some equivalent material. The cameras are taking pictures of the television performance which is being broadcast. Thus, the public can purchase sound motion picture records of any particularly attractive or historically important broadcast which has been presented. School children and their parents will have the advantage of seeing and hearing historial events which have been recorded for them at the same time as they were broadcast.

Outside the studio the telephone-television pick-up is carried out at any point of interest. Airplanes or balloons flying over a battlefield (if war is not outlawed) or even a football field (if this game is not super-

cal entertainment devices have become well known to the public by 1940. For example, facsimile broadcasting for certain special purposes has found its place in the radio régime of that day. The broadcasting of brief news reports, quotations, weather reports, various types of fiction, educational material, drawings, cartoons and photographs was an engineering possibility back in 1930 and now appeals to a large portion of the public which is provided with the necessary facsimile broadcasting receivers.

Another interesting field leading to gratification of the musical creative instinct involves the electrical musical instrument. In 1940 homes and public places are provided, if desired, with electrical musical instruments. These may be played in a manner corresponding to the natural aptitude of the player, either from a piano keyboard or from a string over a fret board, or in any other desired and convenient fashion. They produce a tone quality controllable at will, with any volume of sound that may be desired, and with any pitch of sound from the lowest to the highest notes. Amazing new and charming effects are possible. We find a splendid increase in musical taste and in the number of amateur musical performers as a result of these instruments. Some highly modern music is already being written specially for them.

The Electrical Entertainer.

Entering the home of 1940 one might judge from the preceding description that all the electrical entertaining devices to which reference has been made would prevent the owner of the home from entering the living room because of the congestion of pieces of furniture. Yet such is not the case. Instead of a multitude of cabinets each containing a single instrument, the electrical entertaining equipment is assembled in relatively few cabinets and in some

The Original KDKA. Note the Microphone With a Telephone Mouthpiece Protruding From a Box Which the Speaker Is Holding.

RADIO WILL MIX ELECTION RETURNS WITH MUSIC ON TUESDAY NIGHT

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8:00—Orchestral Concert; Jessica Dragonette, Soprano; Cavaliers Quartet—WEAF's Network.

...a peace.

Heretofore, international broadcasts have been limited among the United States, England, Germany and Holland. Now the engineers have succeeded in bringing the Far East into the world-wide radio circle.

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A radio listener who tuned in on George Bernard Shaw's radio début

as clear, possibly because it was in German, which made it difficult for American listeners to understand.

Cold Weather Helps.

The cooler weather is helping the radio business. A week ago yesterday afternoon carpenters and decorators were rushing to finish a new store in Flushing. Those who watched them doubted that order could be restored by 6 o'clock. But they worked fast and the doors were opened as scheduled. Thirty-two sets were sold within the next five hours.

WHITE DOES NOT EXPECT NEW RADIO LEGISLATION

NO radio legislation is likely to be passed by the next Congress, which convenes in December, according to Representative Wallace White Jr. of Lewiston, Me., chairman of the House Committee on Merchant Marine and Fisheries. The session, he believes, will be too short for its consideration.

Representative White may be in the Senate, instead of the House, at the next session, as he is the Republican candidate in the approaching election.

The Couzens bill for the creation of a Federal Communications Commission, to replace the Federal Radio Commission, is too controversial, Mr. White said on a recent visit to Washington, to be passed upon within the three-months' session.

...or dev... radio telephony, was wrong; that instead of private communication its field was one exactly opposite. In other words, here was something to which all the world could listen.

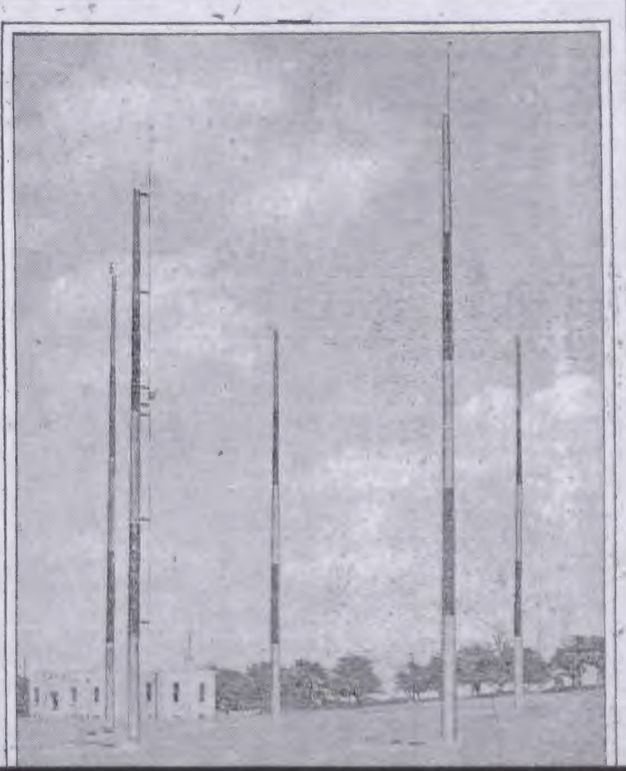
With that idea in mind we established a new station with the fundamental thought that a broadcasting station, once established, had a responsibility to its public and that responsibility was a daily prearranged schedule of programs arranged for the benefit of the public.

Our first program, indeed, was the announcing of the election returns that carried Warren G. Harding into the Presidential chair. That first broadcast, Nov. 2, 1920, was the start of KDKA and the beginning of broadcasting. No matter what claims are made now, KDKA was the first broadcasting station established to serve the public on a regular basis.

New Transmitter on the Air.

Once KDKA was established, we had a difficult time for several months convincing the public that here was something new. The newspapers again served an important function in developing broadcasting, for a local newspaper began publishing our programs and it was not long until broadcasting, in so far as public interest was concerned, was a success. Then the deluge. Stations sprang up by the hundreds and the industry of radio began.

Broadcasting has gone far in ten



...and which we now look upon as impossible.

I have seen so much of the development of this new product of electrical reseach that I am becoming more and more a believer in the impossible. There are few conceptions that do not demand constant revision with the increasing discoveries in physics and mathematics most of which result in almost magical changes in our daily environment.

Undoubtedly we will have television. Then sight will have been added to sound with all the vast possibilities that this field develops. It seems to me that much of our present methods of communication and entertainment will have been changed by then to conform to the benefits that may lie in broadcasting.

I can visualize a world linked by broadcasting methods, where countries may speak to one another where the ambitions of dynasties and dictators must bow to the welfare of their people; where understanding will have taken the place of diplomatic secrecy and twisted fact. All this is at our command, if we are unselfish enough to use the possibilities of broadcasting to their fullest.

Much lies before us. The possibilities of this great science have not yet been probed. The future is untapped. It is our duty and the duty of those who will follow us to make certain that broadcasting may follow the course that was laid down for it in the beginning. It is a public service, and on that basis its future development and expansion depends.

WOMEN'S COLLEGES TO BEGIN A SERIES OF BROADCASTS

ON Wednesday afternoon at 4 o'clock WJZ will begin a new series of broadcasts by faculty representatives of leading Eastern colleges for women, including Smith, Wellesley, Vassar, Mount Holyoke, Radcliffe, Bryn Mawr and Barnard.

Dr. W. Cabell Greet of Barnard College will inaugurate the series with a talk on American dialect, while Dean Marjorie Nicholson of Smith College will be the speaker on the following Wednesday. She will discuss the administrative side of a woman's college.

The third speaker in the series will be Alzada Comstock, Professor of Economics at Mount Holyoke, who on Nov. 19, will discuss women and money. On Nov. 26 Charles F. Farwick, Professor of Political Science at Bryn Mawr, will talk on international relations.

The Dec. 3 speaker is Harlow Shapley, Professor of Practical Astronomy at Radcliffe and director of the Harvard Observatory. He will talk about the stars.

"Women and Music" will be the title of the speech on Dec. 10 by E...

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1:15—Football: Illinois-Army—WABC (WOR at 1:30); 1:45—Harvard-Michigan, WJZ; 1:45—Pennsylvania-Notre Dame—WEAF.

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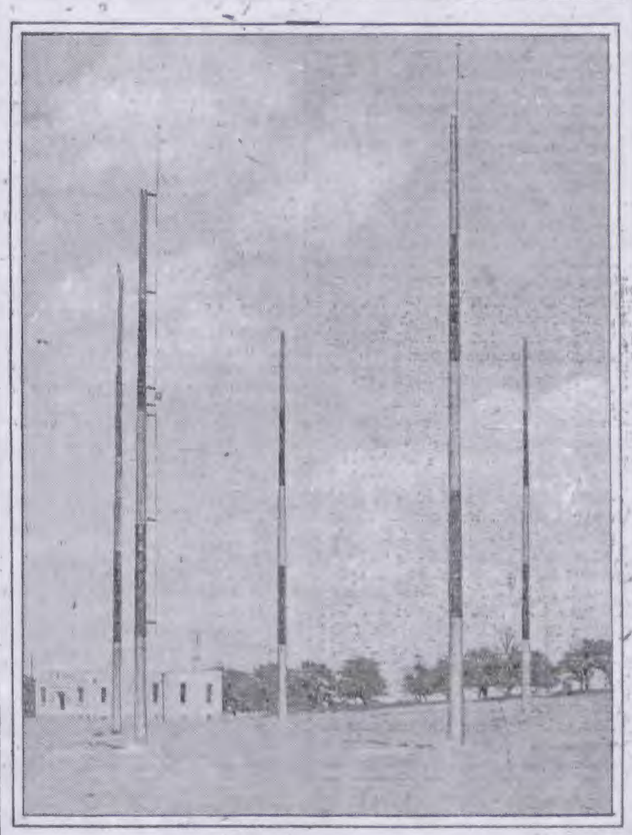

Short Wave Antenna System at Saxonburg, Pa., Which Is Associated With KDKA for World-Wide Broadcasts.

With that idea in mind we established a new station with the fundamental thought that a broadcasting station, once established, had a responsibility to its public and that responsibility was a daily prearranged schedule of programs arranged for the benefit of the public.

Our first program, indeed, was the announcing of the election returns that carried Warren G. Harding into the Presidential chair. That first broadcast, Nov. 2, 1920, was the start of KDKA and the beginning of broadcasting. No matter what claims are made now, KDKA was the first broadcasting station established to serve the public on a regular basis.

New Transmitter on the Air.

Once KDKA was established, we had a difficult time for several months convincing the public that here was something new. The newspapers again served an important function in developing broadcasting, for a local newspaper began publishing our programs and it was not long until broadcasting, in so far as public interest was concerned, was a success. Then the deluge. Stations sprang up by the hundreds and the industry of radio began.

Broadcasting has gone far in ten ing more and more a believer in the impossible. There are few conceptions that do not demand constant revision with the increasing discoveries in physics and mathematics, most of which result in almost magical changes in our daily environment.

Undoubtedly we will have television. Then sight will have been added to sound with all the vast possibilities that this field develops. It seems to me that much of our present methods of communication and entertainment will have been changed by then to conform to the benefits that may lie in broadcasting.

I can visualize a world linked by broadcasting methods, where countries may speak to one another; where the ambitions of dynasties and dictators must bow to the welfare of their people; where understanding will have taken the place of diplomatic secrecy and twisted fact. All this is at our command, if we are unselfish enough to use the possibilities of broadcasting to their fullest.

Much lies before us. The possibilities of this great science have not yet been probed. The future is untapped. It is our duty and the duty of those who will follow us to make certain that broadcasting may follow the course that was laid down for it in the beginning. It is a public service, and on that basis its future development and expansion depends.

WOMEN'S COLLEGES TO BEGIN A SERIES OF BROADCASTS

ON Wednesday afternoon at 5 o'clock WJZ will begin a n series of broadcasts by facul representatives of leading Easte colleges for women, including Smit Wellesley, Vassar, Mount Holyok Radcliffe, Bryn Mawr and Barnard

Dr. W. Cabell Greet of Barnar College will inaugurate the serie with a talk on American dialect while Dean Marjorie Nicholson o Smith College will be the speaker o the following Wednesday. She wi discuss the administrative side of th woman's college.

The third speaker in the series wi be Alzada Comstock, Professor o Economics at Mount Holyoke, who on Nov. 19, will discuss women and money. On Nov. 26 Charles F. Fenwick, Professor of Political Science at Bryn Mawr, will talk on international relations.

The Dec. 3 speaker is Harlow Shapley, Professor of Practical Astronomy at Radcliffe and director of the Harvard Observatory. He will talk about the stars.

"Women and Music" will be the title of the speech on Dec. 10 by Professor Marta Milinowski, head of the piano department at Vassar. The final speaker will be Elinor Gamble, Professor of Psychology at Wellesley. She will talk on psychology and common sense.

BASEBALL GOSSIP

SCORES AND STORIES DAILY AND IN THE SUNDAY GAZETTE TIMES.

THE GAZETTE

TUESDAY, APRIL 12, 1921 —PA

RAY AND DUNDEE DRAW

LIGHTWEIGHT STARS THRILL LARGE CROWD IN MOTOR CLUB ARENA

Contest Is Nip and Tuck Throughout, With Local Man Continually Trying for a Knock-out—Eddie Barr Hands Young Roscoe Lacing in Semi-Final.

By HARRY KECK, Sporting Editor.

JOHNNY RAY, the local lightweight, and Johnny Dundee, the veteran of New York, battled 10 brilliant and sensational rounds to a draw before a crowd of between 5,000 and 6,000 persons in Motor Square Garden last night.

It was a great fight, a thrilling one, one that electrified the spectators all the way. It was one of the best battles ever staged in any ring.

The first and sixth rounds were even. Dundee had the second, fifth, eighth and tenth and the third, fourth, sixth and ninth were won by Ray.

With both principals cool, clever and crafty, it was indeed a wonderful match. There was only a pound difference in their weights, Ray weighing 132 pounds to Dundee's 131, and there never was much to choose between them at any stage of the contest.

To give either the victory by a shade would be unfair to the other man. There are times when there must be a draw in the fight game, and this was one of those times. Any advantage that accrued to either man was only temporary and quickly snatched away or evened up.

Battle of Ring Generals.

The closest either man came to a knockdown was when Ray went to the floor just before the end of the seventh round. It was during a furious mixup and the local pride partly slipped and was partly knocked down from the force of a blow. He jumped to his feet instantly and was fighting like a tiger at the bell.

There was not a tame moment in the 30 minutes of fighting. The two great, foxy ring generals were continually leading, blocking, rushing, slugging, trading rights or trying to outguess each other. It was a better fight than the Ray-Dundee meeting in Duquesne Garden a few years ago, which also ended about even up. It was the greatest fight Ray ever put up before his home-town rooters. He tried everything in his repertoire and he had to, for Dundee was ever on top of him and drew out everything there was in reserve. Brilliance stood out all over the work of both men, and, if they were rematched, with both in the same fine condition, it probably would be the same sort of a great fight between them—with little to choose at the finish.

Throughout the battle Ray tried earnestly to score a knockout. He measured and cut loose many hard rights, straight to the jaw, and one of them palpably hurt Dundee, but none were good enough to put him down or out. He is a rugged proposition, is this flashy, jumping so-called Scotch-Wop. He can take great punishment and fight back so hard at the same time as to bull an opponent out of any punching advantage he may have, and eventually discourage the use of the wallop altogether.

But he didn't discourage Ray. Hutch kept seeking and making openings through which to shoot his right—his newly acquired knockout punch. This straight on down to the last half minute of the tenth round, when, following the landing of a scorcher, Ray pulled back as it shot, leaped several feet into the air and turned completely around with his face distorted with pain, evidence that he had injured the right fist in his last effort with it. However, he had presence enough of mind to tear in immediately and battle away at close quarters until the final bell. Just how badly he injured the hand was not known in his dressing room after the bout. It may be broken.

Dundee Hurt in Ninth.

Time and time again that hard right crashed home on Dundee's chin. In the ninth round one landed that did probably more damage than any other. Ray had just been short with a jab and a right cross, and Dundee was careless in the semi-clinch that followed. Quick as a flash Ray pulled back the right and let go, landing flush on the point of the chin. Dundee shook and turned half way round from the force of the blow, but gritted his teeth and tore in with both arms flailing away.

That was the fight from round to round, Ray shooting his left straight and looking for openings to drive his right across; Dundee forcing the fight and hooking and swinging with both hands to head and body. Never a let up; never the giving or asking of any quarter. Ray was plainly out to "take," or to knock out Dundee, if he could, and put himself in line for some big money matches. He tried hard enough, but the little iron man before him was too tough and gave back enough in volume to balance the scales against the local man's cleaner and harder hitting.

The semi-final provided a real upset of the dope bucket, Eddie Barr of the South Side boxing his way to a clean-cut victory over Young (Simon) Roscoe of Donora, who recently has built up a record as a sensational knockout puncher. Barr had his left hand in Roscoe's face almost all the time and his confidence and gameness in taking punishment in the first round, while Roscoe was strong, enabled him to tame down the wild swinger and come home well in front, although his left eye was cut and [illegible]

FIGHT BY ROUNDS

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They sparred and Ray let go a right as they went close. It was short. They clinched again and then Ray tapped with a left. Dundee missed two left hooks and then got one home as Ray stabbed with his left. Ray stabbed with his left and blocked a left hook. Dundee hooked left to the body and missed two left hooks, and then scored with two to the body with Ray on the ropes. Ray was short with a left and tied up Dundee in a clinch. Ray jabbed and then blocked left and right in midair. Ray straightened up and stabbed in two straight lefts. He followed up with left and right swings, but they failed to find their mark. Ray jabbed again at the bell. It was an even round, full of good clever boxing.

ROUND TWO.

Dundee went close and ripped up a left to the head, but then found himself tied up. He stayed on top of Ray and hooked two lefts to the head, then he bounded back against the ropes and Ray met him coming off with a solid left to the jaw. It was pretty work on Ray's part. They traded lefts a few times and then Ray sent a fast right to the jaw which apparently did not hurt Dundee. Dundee started to bound off the ropes and pull his jumping-jack stuff and outboxed Ray. Dundee put a short right to the jaw and then a left and backed on to the ropes again. Ray jabbed and Dundee mixed to the head. It was Dundee's round, his tricks and generalship gaining him the edge.

ROUND THREE.

Ray shot a hard right to the jaw and Dundee stopped in his tracks. Ray rushed Dundee across the ring with right and left to the head. Ray hooked a solid left to the head. Ray rushed in with another left and Dundee slugged to the head, but his punches landed on Ray's protecting arms. Ray stabbed a left and the [illegible] Ray was

[illegible] middle of the ring and they clinched. Ray jabbed and blocked a return. He jabbed again, Dundee got home a jab and then Ray blocked one. Dundee came in close and Ray covered, but the visitor mauled away to the body. Ray crossed his right to the chin, but the blow had no apparent effect and Dundee kept fighting. Ray tricked his opponent into a trap, making a move to push back his hair and letting a right hand punch go full tilt for his temple. It landed on the jaw and might have floored a less rugged opponent. Ray crashed home another right, but started it lower. Dundee was forcing at the bell, but he was not landing his punches. It was Ray's round.

ROUND SEVEN.

After sparring for a few moments Ray shot over a hard right to the chin and Dundee immediately went close and roughed it. They did a lot of feinting and then went into a clinch. Ray was using the ring more and made Dundee follow him. Each was trying to force the other to lead and present an opening. Ray jabbed lightly to the head. Ray let go another jab on the fly and then was short with a right. Dundee stood up and tried to slug, but Ray pulled away and landed right to chin as he got clear. Ray stabbed twice without a return. Ray was short with a right and ran into a hard left hook. Dundee piled in and swung with both fists and Ray was partly knocked and partly fell to the floor of the ring. He leaped to his feet at once and tore into his opponent, punching away with both hands. The bell rang while they were in this mixup. Dundee's effective work just before the bell earned him a draw on the round.

ROUND EIGHT

They did a lot of fancy boxing at the start and then Dundee rushed in with a sloppy right to the head. Dundee crowded Ray, walking in with [illegible]

Mutt and Jeff—As Bill Shakespeare Said,

(Copyright [illegible])


SOME CLASS TO 'BUGS' SECUUM, EH, MUTT? HE'S SENT HIS CAR TO TAKE US TO HIS CLUB. YOU'LL LIKE HIM WHEN YOU MEET HIM!
WHY DO YOU CALL HIM 'BUGS'? IS HE 'BUG-HOUSE'?
NO, HE'S A BRAINY GUY. BUT WHEN WE WERE BOYS IN SCHOOL WE GAVE EVERYBODY A 'NICKNAME'. HIS NAME WAS GUS, BUT BECAUSE HE HAD A TRAINED BUG WE CALLED HIM 'BUGS'
178

Trout Fishing Outlook Good, Buller Declares

[By Associated Press to The Gazette Times.]

HARRISBURG, April 11.—Conditions are favorable for good trout fishing in Pennsylvania counties where such angling has been customary. Trout probably will be found in more streams than a year ago because the systematic "planting," in the opinion of Commissioner of Fisheries Nathan R. Buller, who has received numerous reports of fish wardens and men looking after young fish.

"The winter has been favorable for trout, and we have sent out more fish than ever of a size able to take care of themselves," the Commissioner said. "The indications are good for fine fishing in many sections."

CARNEGIE TECH TACKLES DUKES NEXT THURSDAY

COACH WAGNER put his [illegible] through a stiff workout yesterday afternoon in preparation for Tech's first appearance on the [illegible] grounds. The Tartan aggregation crosses bats with the fast Duquesne ball team Thursday, and Wagner is picking out the flaws that showed up in the games last week. The [illegible] have a mighty strong nine this year and the Plaid realize they [illegible] against a stiff proposition. The Tartans ran into some slow-ball pitchers in their jaunt through Virginia, but the Duquesne squad has a strong [illegible] pitchers with all kinds of [illegible] just what the Tech [illegible] will be [illegible] to chalk up against this type of [illegible] remains to be seen.

In practice this afternoon Coach Wagner intends to try [illegible] the shortstop berth. [illegible] been unable to report earlier in the season due to recovering from the basketball season. [illegible] player with quite a reputation in his home town of Sharon [illegible] year was the mainstay of the [illegible] infield nine. Should [illegible] his reputation Hennis [illegible] fill one of his infield troubles. [illegible] is at present scheduled to open [illegible] game at shortstop with [illegible] third base. That combination [illegible] Joe [illegible] respectively in the [illegible] [illegible] in the games with [illegible] and Lee and V. M. I. [illegible] with good results.

The Tech Field bleachers have undergone repairs and now are in first class condition for the [illegible] Thursday. On Saturday the [illegible] at 3 p. m. [illegible] Tartan nine meets Delaware University on Tech Field. As yet nothing is known about the midget state nine though from reports now rumored they are bringing a team that [illegible] well to take over the Plaid scalp.

Finish Fight in Sight Between Jockey Clubs

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ADAMS PI[illegible] IN OPEN[illegible]

LOUISVI[illegible] When [illegible] Cincinnati [illegible] the season [illegible]

Schenley [illegible] Hoc[illegible]

FAV[illegible] INN[illegible] T[illegible]

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Irish Show Announced.

Tommy Stevenson of Hazelwood, 136 pounds, won comfortably over Young Ritchie of the Hill, 132, in the second bout and Ray Schaurrs of the North Side, 104 pounds, and Abe Modell of the Hill, 106, battled to a draw in the opener. Every bout was good, and it was one of the best cards, on the whole, staged in the city this busy season. Eddie Kennedy refereed and handled all bouts well.

Before the main event, Mrs. Murray Edlis was introduced from the ring and made a speech announcing the boxing show to be held in the same arena on May 4 for the Irish Relief.

FIGHT BY ROUNDS

ROUND ONE.

They sparred and Ray let go a right as they went close. It was short. They clinched again and then Ray tapped with a left. Dundee missed two left hooks and then got one home as Ray stabbed with his left. Ray stabbed with his left and blocked a left hook. Dundee hooked left to the body and missed two left hooks, and then scored with two to the body with Ray on the ropes. Ray was short with a left and tied up Dundee in a clinch. Ray jabbed and then blocked left and right in midair. Ray straightened up and stabbed in two straight lefts. He followed up with left and right swings, but they failed to find their mark. Ray jabbed again at the bell. It was an even round, full of good, clever boxing.

ROUND TWO.

Dundee went close and ripped up a left to the head, but then found himself tied up. He stayed on top of Ray and hooked two lefts to the head, then he bounded back against the ropes and Ray met him coming off with a solid left to the jaw. It was pretty work on Ray's part. They traded lefts a few times and then Ray sent a fast right to the jaw, which apparently did not hurt Dundee. Dundee started to bound off the ropes and pull his jumping-jack stuff and outboxed Ray. Dundee put a short right to the jaw and then a left and backed on to the ropes again. Ray jabbed and Dundee mixed to the head. It was Dundee's round, his tricks and generalship gaining him the edge.

ROUND THREE.

Ray shot a hard right to the jaw and Dundee stopped in his tracks. Ray rushed Dundee across the ring with right and left to the head. Ray hooked a solid left to the head. Ray rushed in with another left and Dundee slugged to the head, but his punches landed on Ray's protecting arms. Ray stabbed a left and the crowd roared in approval. Ray was short with a right and Dundee crashed home a right at the same time. Dundee started his hopping tactics, but Ray, boxing coolly, easily had the better of the mixing. Dundee was bringing out everything in Ray's repertoire and it was a good fight. Ray's round.

ROUND FOUR.

Dundee led with light left and right. Ray shot over a right to chin. Dundee reciprocated. Dundee slugged to the head and landed several times. Ray sent in his left to the head and then shifted to the body at close quarters. Dundee hooked left to head. Ray slugged, sending his right hard to the jaw and bringing up his left in close. Dundee crashed over a hard right and they were slugging toe to toe in the middle of the ring. Ray beat a tattoo with a back-hand right in a clinch. Ray crashed a terrific right swing to the point of the chin and Dundee shook to his toes. However, instead of covering, he came back with a hard right to the body. They were fighting hard at the bell. It was Ray's round, through cleaner hitting.

ROUND FIVE.

Dundee walked almost to Ray's corner and started left and right but missed and slipped to the floor. They sparred until Dundee swung an overhand right to the jaw. Dundee walked in with his hands over his head and swung left and rights solidly to the jaw. Ray brought up a short uppercut to the body. Dundee came close. Ray jabbed. He was waiting for a chance to get over his right, but Dundee was crowding him too much. Ray was short with a right and Dundee crowded in and let his right go to the jaw. Dundee bounded off the ropes and Ray jabbed as they met in the center of the ring. Ray let go another right which Dundee took on the chin. Then the New Yorker piled in and swung to the head. He outboxed Ray during the round.

ROUND SIX.

Ray missed a right-hander in the middle of the ring and they clinched. Ray jabbed and blocked a return. He jabbed again, Dundee got home a jab and then Ray blocked one. Dundee came in close and Ray covered, but the visitor mauled away to the body. Ray crossed his right to the chin, but the blow had no apparent effect and Dundee kept fighting. Ray tricked his opponent into a trap, making a move to push back his hair and letting a right hand punch go full tilt for his temple. It landed on the jaw and might have floored a less rugged opponent. Ray crashed home another right, but started it lower. Dundee was forcing at the bell, but he was not landing his punches. It was Ray's round.

ROUND SEVEN.

After sparring for a few moments Ray shot over a hard right to the chin and Dundee immediately went close and roughed it. They did a lot of feinting and then went into a clinch. Ray was using the ring more and made Dundee follow him. Each was trying to force the other to lead and present an opening. Ray jabbed lightly to the head. Ray let go another jab on the fly and then was short with a right. Dundee stood up and tried to slug, but Ray pulled away and landed right to chin as he got clear. Ray stabbed twice without a return. Ray was short with a right and ran into a hard left hook. Dundee piled in and swung with both fists and Ray was partly knocked and partly fell to the floor of the ring. He leaped to his feet at once and tore into his opponent, punching away with both hands. The bell rang while they were in this mixup. Dundee's effective work just before the bell earned him a draw on the round.

ROUND EIGHT.

They did a lot of fancy boxing at the start and then Dundee rushed in with a sloppy right to the head. Dundee crowded Ray, walking in with his hands before his face and hooking his left and then following with free use of both hands. They staged a terrific rally in which they moved all over the ring, with Dundee forcing all the time and Ray contenting himself with crossing and swinging his right several times. This style of battling was to Dundee's liking, and he slammed home a number of hard lefts to the body and lefts and rights to the head, winning the round.

ROUND NINE.

Ray walked in with a light left to head and then tied up Dundee, when the latter tried to slug. Dundee jabbed and Ray crossed a hard right to chin. Ray missed a right swing and they traded light lefts. Ray fenced for an opening and then missed his right. He jabbed, but Dundee came back with a good left to the body. Dundee crouched low and ducked and slipped Ray's leads. Ray was short with a right and they clinched. Ray was short with left and right, but tore loose with another right when Dundee carelessly left himself open after the two misses. The punch turned Dundee partly around. They were sparring at the bell and it was Ray's round by a shade. Going into the tenth round Ray had a hair-line advantage.

ROUND TEN.

Dundee rushed, but was short with left and brought up his right lightly. They stood toe to toe and slugged, with Dundee having a shade the better of the going. Both jabbed a lot, with many of their efforts being short. Ray sent home a good left jab and followed with a right cross. Dundee hooked left to the body and jaw. Dundee cut loose and fought like a wild man, battling Ray across the ring. Ray got in a good right hand. Dundee had the better of some boxing in the center of the ring. They finished up in a slugging bee. Ray came out of one of the exchanges on the jump; it looked as if he had hurt his right hand. It was Dundee's round and it evened up a great fight.

... Good, Buller Declares

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The Tech Field bleachers ... reports ... now are in first class condition for the game Thursday at 3 p. m. On Saturday the Tartan nine meets Delaware University on Tech Field. As yet nothing is known about the midget ... though from reports ... they are bringing a team that ... well to take over the Plaid scalp.

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BALTIMORE, April 11.—Precipitating what probably will prove a finish fight between the New York Jockey Club and the Maryland Racing Commission, the Maryland Jockey Club today turned down all spring stake entries for Pimlico of Commander J. K. L. Ross because the entry blanks were signed by H. G. Bedwell as Ross' agent.

Mr. Bedwell was granted recognition as an agent by the Maryland Commission just before the opening of the Bowie meeting April 1. The recognition was accepted by the Bowie authorities who registered Bedwell. The New York Jockey Club, however, previously had refused Bedwell recognition as an agent.

In its action today, therefore, the Maryland Jockey Club stands with the New York Jockey Club and refuses recognition of the power of the Maryland Racing Commission to authorize an agent. This power is granted specifically in the rules of the commission. In addition, the preamble of the rules states that their acceptance by the tracks is "a condition under which a license is granted" for a race meeting.

John Powler to Oppose Cleveland Welter at P. A. A.

John P. Powler of the Triangle Club of Lawrenceville, who is to be the 145-pound representative on the local team of amateur boxers to oppose Cleveland lads in the intercity show on Saturday night at the Pittsburgh Athletic Association clubhouse gymnasium, made a fine showing in the recent Allegheny Mountain Association A. A. U. senior championships, getting into the semifinals.

He is in good trim at present, and believes he can score over his Forest City rival, either Eddie Herman or Ted Glownecki. Powler is a hard puncher and knows how to box. There will be six other attractive bouts on the program.

Kumagae Tries Golf.

PINEHURST, N. C., April 11.—(Special.)—Ichiya Kumagae put his approach shot dead at the first hole of a golf match played with Howard Toshell and Fred Hawthorne here this afternoon, and then lost 14 of the remaining 17 holes, the other three being halved.

N. Y. Boxing Commissioner Quits.

NEW YORK, April 11.—(A. P.)—Joseph J. Johnson, chairman of the State Boxing Commission, today mailed his resignation to Gov. Miller. The letter, understood to contain the reasons for his action, was not made public.

GREB FINISHES SOLDIER JONES IN 4 ROUNDS

[By Associated Press to Gazette Times.]

TORONTO, ONTARIO, April 11.—Harry Greb of Pittsburg knocked out Soldier Jones of Toronto in the fourth round of a 10-round match here tonight.

Gibbons Matched With Wiggins.

ST. PAUL, MINN., April 11.—(A. P.)—Mike Gibbons of St. Paul has been matched with Chuck Wiggins of Indianapolis for a 10-round bout in Minneapolis either April 21 or 27 at catch weights, it was announced here today. Gibbons' last ring appearance was two years ago, when he met Mike O'Dowd. Gibbons has a tentative promise of a match with Johnny Wilson, the middleweight champion, this summer.

Duke Preps Play Today.

The game scheduled for yesterday between Pittsburgh Academy and the Dukes was postponed on account of the cold weather, but will be played today at 3 p. m.

L OUISVILLE ... When ... Reds ... Cincinnati ... the season ... will be ... team ... Advices ... that Moran ... ... Pirates ... his old ...

Schenley Hock...

FAV... INN... T...

P INEH...

PIRATE BOX SCORE

PITTSBURGH.

	AB.	R.	H.	P.	A.	E.
Bigbee, lf.	5	2	3	1	0	0
Carey, m.	4	1	1	2	0	0
Maranville, s.	4	1	1	0	1	1
Barnhart, 3.	3	0	0	1	1	0
Whitted, r.	4	0	0	1	0	0
Tierney, 2.	3	1	1	4	3	0
Grimm, 1.	4	1	2	11	0	0
Wilson, c.	4	0	0	3	1	0
Cooper, p.	3	1	1	0	5	0
*Rohwer	1	0	0	0	0	0
Totals	35	7	9	24	11	2

MEMPHIS.

	AB.	R.	H.	P.	A.	E.
High, 3.	3	2	2	0	1	0
McMillen, s.	4	1	1	1	2	1
Camp, m.	5	1	2	1	0	0
McLarry, 1.	4	1	1	14	1	0
Williams, lf.	4	0	1	2	0	0
Hendricks, r.	4	0	0	0	0	0
Yockey, 2.	4	0	0	1	6	0
Dowie, c.	4	2	3	3	0	0
Tuero, p.	0	0	0	1	4	0
†Hunzling	1	1	1	0	0	0
Niemetz, p.	0	0	0	0	1	0
Boyd, p.	0	0	0	0	0	0
Totals	35	8	12	27	15	1

*Batted for Tuero in the sixth.
†Batted for Cooper in the ninth.

Pittsburgh	1	0	0	0	0	0	0	6	0	—7
Memphis	3	1	0	0	0	4	0	0	*	—8

Two-base hits—Dowie, Camp, Tierney, McMillen. Three-base hits—Bigbee, High, Williams. Home run—Grimm. Stolen bases—Carey, Maranville. Bases on balls—Off Cooper 2, off Neimetz 1. Hits—Off Tuero 3 in 6 innings; off Neimetz 6 in 2-3 innings; off Boyd 0 in 1 1-3 innings. First base on errors—Pittsburgh 1, Memphis 1. Sacrifice bunts—Tuero 2. Sacrifice flies—Carey, Barnhart. Left on bases—Pittsburgh 4, Memphis 7. Struck out—By Tuero 2, by Niemetz 1, by Cooper 2. Time—1:40. Umpire—Campbell.

and they jumped on the kid quite forcibly in the eighth.

Lefty Grimm struck the blow that registered terror in the hearts of the Memphis fans. Lefty pulled a screaming liner over the right field wall as a climax to the eighth inning jamboree. Maranville and Tierney were on the bases and two were out with the Buccos four runs behind when Lefty's bat shot the sphere over the high barrier. The drive was just a foot or two inside the white marker and was an impressive smash. It brought about the passing of the Cleveland boy.

Bigbee opened the game with a triple and scored on Carey's sacrifice fly, but Tuero said "enuff" at this point and just naturally tightened. The Chicks scored three in the first and came back with another in the second. The sixth brought them four runs and made everybody happy.

DUNDEE TESTS RAY'S NEW WALLOP TONIGHT

By HARRY KECK, Sporting Editor.

WHETHER Johnny Ray's knockout punch works equally well against ordinary opponents and topnotchers will be demonstrated tonight, when the local lightweight hooks up with Johnny Dundee, the veteran scrapologist from New York, in the 10-round main bout in Motor Square Garden. Ray says he will try for a knockout. He stopped Tony Zill of Youngstown in impressive fashion in Exposition Hall recently and last week flopped a sparring partner while trying out his punch. He believes he is ready to hand a sleeper to Dundee.

However, knocking out Dundee is quite a feat. Lightweight Champion Benny Leonard has tried it a number of times and never has succeeded. Willie Jackson is the only man who ever turned the trick and when he did it he was virtually unknown and became famous over night by reason of his victory. In later bouts, Dundee licked Jackson as often as the latter won from him.

Dundee arrived in the city yesterday and inspected the Motor Square arena, expressing himself as being highly pleased with the arrangements.

The bout will be the third between Ray and Dundee. They met in Philadelphia for six rounds several years ago and then fought 10 rounds in Duquesne Garden with honors about even in a slugging bee.

Donora Knockerout on Card.

The fans will get another glimpse at Young Roscoe, the Donora Wild Man, in action in the semi-final. Eddie Barr of the South Side will be his opponent. Roscoe is a tearing-in, knockout puncher, while Barr is a smooth, clever boxer who may be able to stave off the new sensation and win on points.

The second bout will be between Tommy Stevenson of Hazelwood and Young Ritchie of the South Side, aggressive lightweights, and a pair of flyweights, Abe Modell of the Hill and Ray Schauers of the North Side, meet in the opener, which will get under way at 8:30.

Eddie Kennedy will referee all bouts. The advance sale of tickets indicates a packed house.

Mike Gibbons has signed for a 10-round bout in Minneapolis April 21 or 22. His opponent probably will be Chuck Wiggins, the light-heavyweight, of Indianapolis. The bout will be the first of a series to prepare Mike for a championship battle with Johnny Wilson.

THE complete card for Duke Barry's show in Connellsville next Friday night follows: Main bout, 10 rounds, Johnny Donnelly vs. Tommy Phillips; semi-final, six rounds, Buck Krouse vs. Joe Mullen; opener, six rounds, Jackie Fromme vs. Reed Brown. Eddie Kennedy will referee.

Elmer Simmons, who got as far as the semi-finals in the recent A. M. A. championship tournament, would like to meet any of the professional 128-133 pounders. His manager is A. Barks of 6343 Penn avenue.

THE following list of bouts has been arranged for New Orleans: Tonight, Pal Moran vs. Frankie Farren; April 19, Marty Burke vs. Bill Bailey; April 22, Marty Burke vs. Harry Foley, and April 27, Jock Malone vs. Battling Ortega. All will be for 15 rounds.

Danny Constabile of the East End and Ray Smith of Lawrenceville, bantamweights, will meet in one of the preliminaries to the Tommy Phillips-Young Carmen bout in McKeesport Wednesday night. Dick Conlan and Eddie Wimler are down for the semi-final.

JACK PERRY has started hard training for his 10-round main bout with Johnny Tillman before the Birmingham Club in Exposition Hall next Monday night. Reports from Minneapolis are that Tillman is working there for the scrap.

Johnny Dundee is booked for 12 rounds with Rocky Kansas in Boston next Saturday night.

WHITEY WENZEL, the North Side middleweight, is suffering from an attack of the grippe. He has been laid up in bed for two days, but expects to be able to resume training about Wednesday. He was offered a bout yesterday for Monday night of next week with Joe Chip in Wheeling. His manager, Jimmy McKeague, is withholding an answer until he can make sure whether or not Whitey will be able to get ready on such short notice after having to break in training.

Harry Greb fights Soldier Jones in Toronto tonight.

THE choice of "somewhere in New Jersey" for the Dempsey-Carpentier fight next July 2 looks like a wise one on the part of Tex Rickard. He will pull a big crowd from New York and the entire Eastern half of the country.

The meeting of the matchmaking committee of the Irish relief show to be staged in Motor Square Garden May 4, held yesterday, failed to bring any definite developments. A number of matches were talked up, but it was decided not to close any until later. Another meeting of the committee will be held next Sunday afternoon.

FAY KEISER sends word from Cumberland that his injured hand is again O. K. and that he will return to Pittsburgh shortly to resume training. His first bout probably will be with Whitey Wenzel. Fay defeated Buck Crouse his last time out.

The boxing show in Sewickley tomorrow night will not be for the Irish relief fund, but for the benefit of the service men in the hospital there. An error was made in the original announcement. Among the four-round bouts will be the following: Johnny Ray vs. Jack McAuliffe, Patsy Young vs. Danny Constabile, and Val Grunan vs. Willie Scott.

DUKE BARRY has matched his flyweight, Jackie Fromme, against Young Raeburn for the semi-final of eight rounds in Youngstown Thursday night.

Eddie O'Dowd, the Columbus flyweight, has moved to New York, along with his manager, Willard Stuart, and hopes to be able to land a bout for the American title at his poundage.

High School Boy Makes New Century Record, :09 4-5

BAKERSFIELD, CAL., April 10.—(A. P.)—Wickersham of Bakersfield High made what is believed to be a new interscholastic record for the 100-yard dash here yesterday, covering the distance in :09 4-5 in a meet with the Southern branch of the University of California.

TECH BALL TEAM OPENS SEASON SUCCESSFULLY

CARNEGIE TECH got away to a good start on its opening games of the season, by winning two out of three on its trip through West Virginia. Coach Wagner is highly pleased by the performance of his men, and looks forward to one of the most successful ball seasons the Plaid has ever had.

The Tartans met Virginia Polytech on Thursday in Blacksburg and went down to a hard defeat. McCaw started for Tech, and during the first two innings was nicked for six hits, V. P. I. scoring five tallies. Skinny settled down to the game and held the Virginians to three scattered hits for the rest of the game. Tech pushed two counters across the plate in the third and two more in the seventh. Coach Wagner used Durkin at short and Dvilisks at third.

With Washington and Lee the story was different. The Techites went in with the determination to win. Cappe and Irwin were the batteries for the Plaid. Cappe retired the W. & L. players in fine order. Tech came to the bat, and amid a wild raid on the opposing tosser, hung up five counters in the first inning.

The Virginia Military Institute was nearly a duplicate of the day before. With three men on in the first, Cappe nailed the pitcher for a home run. In the ninth, with the bags again filled, Capt. Ray Doherty poled out a two-bagger, scoring two runs. Durkin, next up, hit safely, scoring two more. Robertson added another hit to his count, and scored the fifth run for the ninth. McCaw started on the mound for Tech, but was replaced by Weiss in the second. Weiss pitched air-tight ball throughout the game and handled his eight innings in fine form.

EXHIBITION GAMES

By Associated Press

At Kansas City—

	R.	H.	E.
Chicago Nationals	10	18	1
Kansas City (Amer. Ass'n)	5	8	1

Batteries—Martin and O'Farrell; Williams, Bond and Brock, Lamo.

At Chattanooga—

	R.	H.	E.
Toledo (Amer. Ass'n)	3	9	2
Chattanooga (South'n Ass'n)	0	4	2

Batteries—Brady, McColl and Laabs; Vines, Noel, Miller and Neiderkorn, Graham.

At Louisville—

	R.	H.	E.
Boston Nationals	7	9	1
Louisville (A. A.)	5	12	3

Batteries—Townsend and Gibson; Wright; Koob, Miller and Kocher.

At Jersey City—

	R.	H.	E.
Philadelphia Nationals	4	11	0
Jersey City Internationals	2	7	3

Batteries—Smith and Peters; Tecorr, Wurm and Freitag.

At Brooklyn, 12 innings—

	R.	H.	E.
New York Americans	4	9	1
Brooklyn Nationals	5	12	2

Batteries—Shawkey, Quinn and Hoffmann; Smith, Ruether and Krueger.

At New York—

	R.	H.	E.
New York Nationals	7	11	2
Washington Americans	5	12	3

Batteries—Toney, Nehf and Smith, Gaston; Shaw, Mogridge, Acosta and Picinich.

At Milwaukee—

	R.	H.	E.
Milwaukee (A. A.)	[illegible]	[illegible]	1
Chicago Americans	[illegible]	[illegible]	0

Batteries—Gearin, Northrop and Quinn; McWeeney, Morris and Yaryan.

At Newark—

	R.	H.	E.
Newark Internationals	[illegible]	9	1
Boston Americans	[illegible]	10	1

Batteries—Harper, Tipple and Smith; Jones, Thormahlen, Karr and Ruel.

Browns Beat Cards in Series.

ST. LOUIS, April 10.—(A. P.)—The St. Louis Americans retained the city championship by defeating the St. Louis Nationals 5 to 1, today, in the seventh and deciding game of the

W. Va. U... For Se...

[Spec...

MORGANTOWN, W... —The West Vir... track schedule, ... today, follows: April ... Philadelphia; May ... outs, Morgantown; M... Tech dual meet, Pitts... University of Pittsburgh ... meet, Pittsburgh; May ... and Jefferson College ... meet, Washington ... versity of Pittsburgh ... burgh, June 18, N... A. meet at Chi...

While the schedule ... any home events, w... ception of the ... tractive and Mounta... Coach Cartmell's ... good showing in the ...

100 in Univers...

The Mountaineers ... a short time to get ... relays ... with ... Holy Cross, M... Northeastern College ... lege of Iowa, ... times ... daily and the ... better relay team ... presented the old ... season are very br...

No less than ... in the university ... innovation ... termine the ... in the univ... son to believe that ... material here that ... uncovered. Coach ... find some point earn...

The inter-collegiate ...

Gian... H...

Wash.-Jeff. Varsity Nine Undetermined

[Special Telegram to The Gazette Times.]

WASHINGTON, PA., April 11.—With his squad almost 30 per cent over the number which is desired to retain permanently, Coach Fuller is confronted with the problem of opening the season at the end of the week without having definitely determined the occupant of a single position on the varsity. He had hoped to get a rather definite line on the caliber of his candidates yesterday in a practice game between two teams, and in which he had expressed his intention of trying every available man; but the weather put a crimp in his plans. Fuller hopes to stage this game tomorrow afternoon, after which he will make another cut in his squad, holding about 15 men until after the first two or three games.

Wash.-Jeff has no varsity captain elected and will not select one for a time. Coach Fuller will name a captain for each of the first three contests and then a leader will be chosen by the varsity men, it being agreed that by that time the squad will have been pared to the proportions desired and that any man then retained will be of genuine first-string caliber. In addition to the varsity Fuller is preparing to organize a freshman team, as there are a number of undeveloped first-year players who show promise and who are expected to be...

O. Snyder was one of the star hurlers on the best team the famous Ohio school has turned out in years and he is counted upon to win a lot of games for the Presidents.

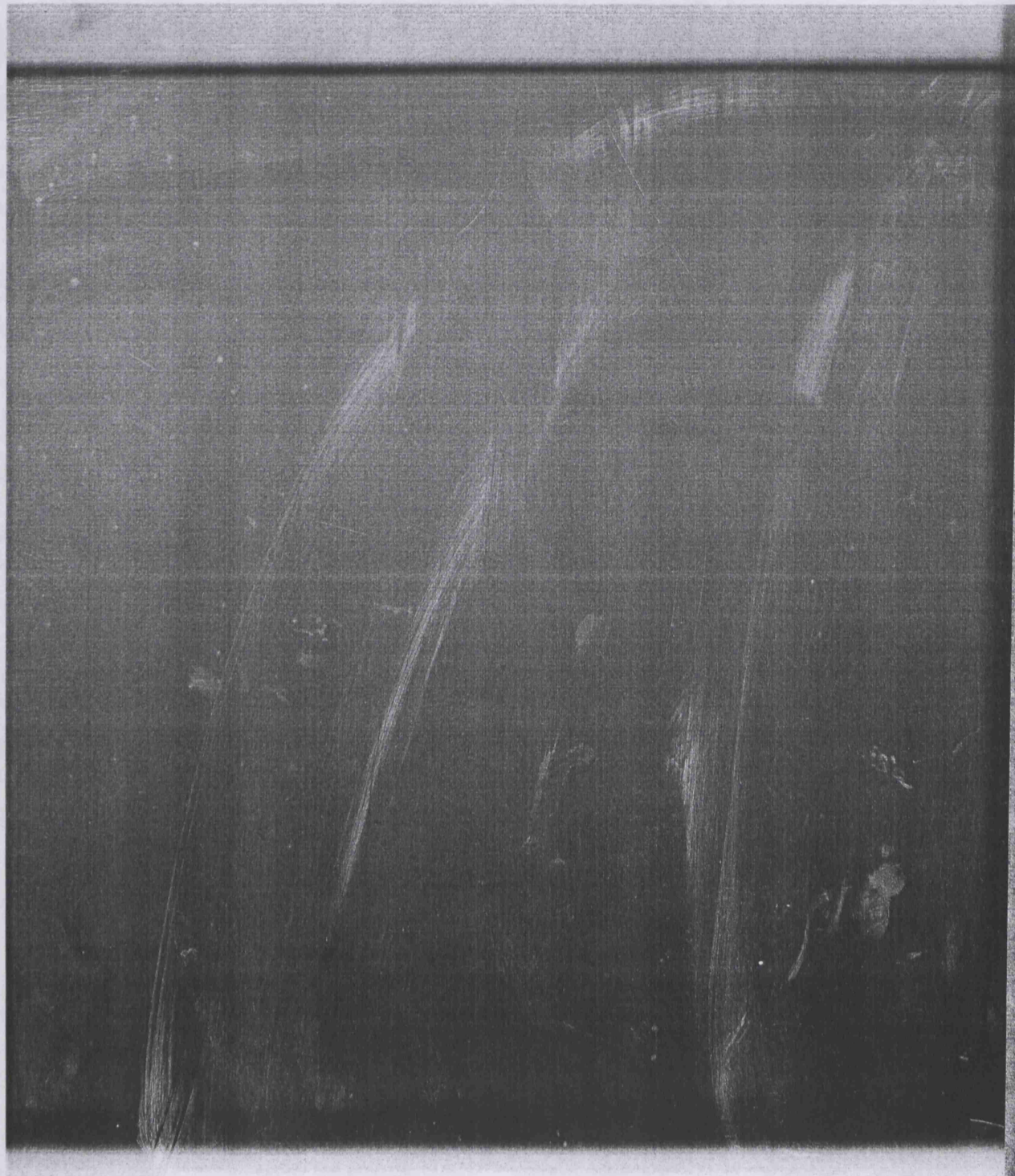
Washington & Jefferson has been asked to place the team representing the Allegheny vocational school for disabled soldiers in Pittsburgh for a game in Washington. Athletics at the soldiers school are in charge of Wilson S. McDermott, former assistant football manager at W. & J. Most of the men there are physically well, nearly all of them suffering from purely nervous ailments caused by their war experiences. McDermott states that he has a lot of high-class baseball players, and he is endeavoring to take his team to various points in the plan of recuperation. It is not likely, however, that the college authorities will permit another game. Manager Wylie Pate was limited to 14 games, and he has booked 15, the faculty having sanctioned a double header with Tyler Tube on Memorial Day. It is probable that the Tyler Tube team will give the vocational school nine a game under auspices of the local American Legion post.

Relay Prospects Good.

The victory of Kemp Conn in the first of the elimination trials for places on the Wash.-Jeff. relay team, which will go to Philadelphia on April 30, provides half the regulars, as Charles West is certain to make an-

PITT DIAMOND AND SWIMMING EVENTS FRIDAY

TWO important events are on the athletic schedule for next Friday at the University of Pittsburgh. In the afternoon Coach Dick Harley's varsity baseball team will open its season, meeting Delaware College at Trees Field. In the evening the ninth annual interscholastic swimming meet and the university championships will be decided in ... Trees Gymnasium pool.



How Westinghouse Announced Harding's Election

OUR Company succeeded in making many new friends by the efficient manner adopted for announcing the results of the national election.

Perhaps some of us have not noticed the radio aerial on top of the K-Building, but a glance in that direction will show the antenna of our wireless station.

The returns were received by telephone from a Pittsburgh newspaper, and were then sent out by wireless telephone. So rapid was the service obtained by this method that the receiving operators were able to get the returns exceedingly fast. In some cases they were heard even before they were received by special telegraph wires. During the intervals between returns phonograph music was played and those amateurs having loud sounding horns or two-stage amplifiers were able to throw the music over large rooms. Also two banjo artists were present and rendered very good banjo selections.

Not only in Pittsburgh were the returns heard, but in many towns in Ohio, Pennsylvania and West Virginia the messages were heard with equal clearness. Letters are still being received from operators from many miles around thanking us for giving the returns so promptly.

In Vandergrift, Pa., slide bulletins were shown in the street for the benefit of hundreds of people there, the news being shown from ten minutes to a half hour before they were received by means of an auxiliary telegraph wire between Vandergrift and Pittsburgh. In addition, the wireless set was connected by means of a cable with the local telephone exchange, and the wire chief sent the news directly to subscribers who had arranged beforehand for the service, and also gave the results to any one making inquiries.

At Latrobe the messages were utilized in a similar manner, thus enabling large crowds to get the messages early.

At Irwin a large hall was filled to its capacity to hear the results of the election, motion pictures being shown throughout the entire evening.

Not only in the immediate vicinity of Pittsburgh were the returns as sent from the Westinghouse Plant heard, but throughout Ohio and West Virginia they were heard with equal clearness.

Also in Pittsburgh the radio method of sending returns was utilized in two ways. Persons having simple sets did not need to leave their homes to receive the returns, and by means of sets installed in a number of clubs throughout the city, large assemblages were able to have social functions at the same time as receiving the returns. At the Edgewood Club in particular a loud sounding horn was in use, and people could hear all over the large ballroom the voice of the speaker at East Pittsburgh as transmitted through the radio apparatus.

At the same time the wireless telephone was giving this news to radio operators hundreds of men and women were receiving up-to-minute election returns in the auditorium of the cafeteria. As early as 8:30 in the evening announcements were made from several states as to how the election was going. The plan used to inform the people was very unique and thorough. As the returns were received they were thrown on the screen from the motion picture booth.

It was possible to receive the very latest returns through the cooperation of the wireless telephone service.

When returns were not being announced, a splendid entertainment program was in progress, consisting of music by Gill's Orchestra, motion pictures at intervals, vocal solo by Miss Ada France, vocal duet by Misses Ada and Agnes France and vocal solos by Miss Laura Atkin, Miss Anna Chilcote, George E. Kellogg and Fred Ward. Miss Julia Bartletti, pianist for the Community Chorus, accompanied the singers. The master of ceremonies for the occasion was A. S. Duncan.

You Can Make Others Happy if You Have a Record or Two to Give Away

Almost everyone has a Victor or Columbia record in his collection that he is tired of, and would give away if he knew that it could be used to good advantage. Here is your opportunity to dispose of some of your records, which will be used to make the sick room a little more cheerful at the State Tuberculosis Sanitariums.

There are about twenty-five employes of our Company and many other patients at the sanitariums whose stay you can make happier by furnishing them with music. Look over your stock of records and if you can donate one or two, leave them at the Relief Department for distribution to the various sanitariums.

It's easy enough to be pleasant
When your engine goes with a hum,
But the man worth while
Is the man who can smile
When the darn thing goes on the bum.

Radio Service

C. W. HORN, Supervisor of Radio Operations

THERE appears to exist, in certain quarters, an opinion that since the Westinghouse Company has turned over to the Radio Corporation of America the entire sales of radio apparatus, that this Company is entirely divorced from the handling of apparatus after it has been manufactured and shipped to the Radio Corporation. This opinion is not quite correct inasmuch as it is the duty of the manufacturing company, especially a concern with the reputation of the Westinghouse Company, to back up its product and insure efficient results to the users of its apparatus. This is best accomplished through the Service Department and, for that reason, all of the Service Stations are now organized to handle this work. The Service Stations will have complete data, together with a sufficient stock of parts to repair any of our radio apparatus, which may prove either defective or be damaged through mis-use. Radio experts will be available to install apparatus and to inspect apparatus already installed to assure the customer of maximum results.

Frequently, a good customer of the Company will purchase radio apparatus and being inexperienced with apparatus of this type, will desire to have same installed in which case he would favor the manufacturer. The Service Department will be able to take care of situations of this kind, thus assuring complete satisfaction to the customer. I believe it would be a very good policy for all salesmen to acquaint themselves with the local set-up which has been made to take care of radio service work, thus becoming acquainted with our facilities which will enable them to answer questions intelligently and know just what promises can be made in conversation with customers.

While it may seem that radio has progressed greatly in the last year, due to broadcasting stations, I believe that we have not yet really begun to appreciate the wonderful possibilities and the great future of radio. Many uses will be found for radio both in the industrial and entertainment line. The surface has just been scratched and we have uncovered a new form of energy. So little is known regarding high frequency electric currents, not only those used in radio communications, but those used in other lines as well, that it is very hard to propnesy what the future holds in store.

For this reason, I believe it should be the policy of the wise salesman to acquaint himself with some of the fundamentals and some of the possibilities of radio frequency energy. It undoubtedly will be one of the future forms of useful energy and will continue to increase in importance.

Occasionally, complaints are received regarding the manner in which our radio apparatus performs. Very often these complaints are due to ignorance as to the proper operation of this apparatus and a word or two of advice would clear the trouble entirely. The Service Department will be ready with this advice and any necessary instructions which may be required in individual cases. Therefore, any salesman or Westinghouse man who hears complaints in reference to Westinghouse radio apparatus should

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SEPTEMBER 30, 1922

refer these to the Service Department, where they will be taken care of. Each in its class, the various types of apparatus developed by this Company are undoubtedly the most sensitive and best designed apparatus it is possible to produce. Frequently, however, claims are made by dealers which sometimes are not quite correct, such as long range on a crystal set when we all know that the average range is about 25 miles when receiving from radio telephone stations. Dealers are, therefore, included in our service problem and such facts should be reported to the Service Department, in order that we may assist such dealers and thus prevent unnecessary complaints relative to our apparatus.

The Service Department is prepared to handle apparatus for employees who may desire to purchase same and a regular employee's discount for this type of material is allowed.

As a final word, I would like to impress upon the readers that the thing to remember is that radio in the very near future will make great strides and while there will be depressions at times, such depressions will be only temporary.

While a certain percentage of personal attractiveness, mental alertness, and a goodly dash of ginger are always demanded by a sales manager in selecting his force of representatives, his real desire is for the man who, to use the vernacular, is a good, steady, intelligent "plugger," and who is always willing to give more time to interesting a buyer in the goods he is selling, than in exploiting his personal attractions.—"Old Ben"

SALES LETTER

Published Monthly for the Westinghouse Sales Organization

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G. DARE FLECK.....*Managing Editor*

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No. 384 EAST PITTSBURGH, PA. January 15, 1924

Radio Is Universal Subject of Interest

WHAT subject to lead off with in the approach of a salesman to a customer must often tax the wits of a salesman? Probably the weather or the state of the health of the customer is most frequently the beginning of the conversation. There is nothing in this, however, that attaches particularly to our Company or to a mutual consideration.

As a possible variation, the subject of radio might often be touched upon as a "feeler", because, if the two minds might "tune" on this suggested theme, our Company will have a favorable position in the discussion that may place our Westinghouse representative in a position of advantage, because—

Westinghouse gave Radio Broadcasting to the world—Westinghouse was the Pioneer.

Westinghouse has kept the lead in Radio Broadcasting for three years, maintaining during most of the time four broadcasting stations: KDKA, The Pioneer of the World, East Pittsburgh; WBZ, Springfield, Mass.; KYW, Chicago, Ill.; WJZ, New York, later transferred to the Radio Corporation for supervision and operation.

Recently again Westinghouse became the pioneer, establishing its leadership in radio broadcasting, by the introduction of radio repeating by the use of one hundred meters, through a repeating station at Hastings, Nebr., this latest development making it possible for Westinghouse to reach all of America, Canada, Mexico and Alaska.

Westinghouse radio stations were the first to be heard in foreign lands. KDKA was early heard in South America and WJZ was received in England before any other station.

Again, through our associates, Metropolitan Vickers Electric Company in Great Britain, our KDKA programs sent out on 100 meter wave, are being picked up in Manchester, England, and repeated, thus being heard throughout all Europe.

Surely it is worth while for our salesmen to keep informed as to our position in radio and when opportunity presents, introduce this most interesting topic of today, in which Westinghouse is so clearly the leader.

No one has a better right to talk on the subject than a Westinghouse representative.

SALES LETTER

CONFIDENTIAL AND FOR PRIVATE CIRCULATION ONLY

PUBLISHED MONTHLY BY THE

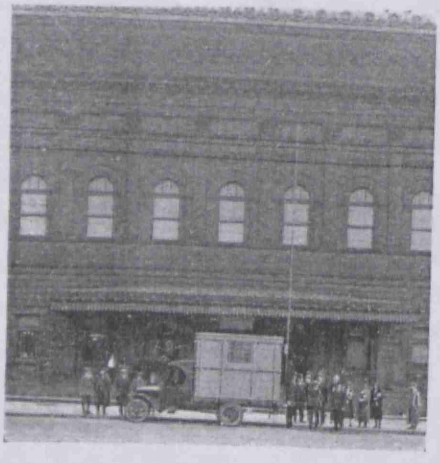
Westinghouse Electric & Manufacturing Company

No. 399 East Pittsburgh, Pa. April, 1925

Station 8-XP, a Westinghouse Portable Broadcasting Outfit, Broadcasting from the Grand Theatre, Pittsburgh

Portable Short-Wave Broadcasting Station Developed

MANY millions of people set their dials every evening for the program of their favorite station, yet few if any appreciate the real problems of the men who make their enjoyment possible. The



Broadcasting from Carnegie Lecture Hall, Pittsburgh

slight turning of a dial or perhaps two, takes them from the lecture hall of a great university through the rich notes of an opera singer to a jazz band, or from a ball game to a church service and so on—yet the men who are producing these separate programs are nightly facing difficulties in securing programs which the public may enjoy without interference.

Radio was an invention which to the average person a score of years ago was but a thing to read about. They never heard any programs or if they did it was through static which was stood for only because of the novelty of hearing some program come seemingly out of the air to them. Time has brought a great many changes and where in the early stages there was but one broadcasting station, there now are hundreds, while in the past where few listened there are millions who are greatly interested in the nightly work of the ethereal artists.

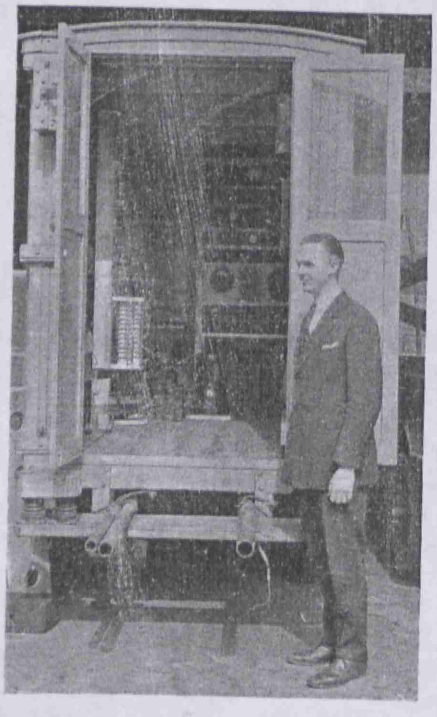
Of the many problems which confront the radio engineer daily, the overcoming of difficulties in picking up programs from out of the way places, where telephone lines are either inaccessible or so costly as to be prohibitive and the solving of the electrically unsuitable places where programs are being held. To meet this, our Company has developed a portable radio broadcasting station. Carroll J. Burnside, an engineer attached to Radio Operations, has been closely connected with the development of the set. Athletic fields, outdoor concert platforms and the like, are almost impossible to reach by telephone and again, many places where lines are obtainable the electrical characteristic of the circuits make them unfit for use as radio pick-up lines. The use of the latter lines often result in the distortion of music and speech, with the consequence loss of quality, which is so easily detected by the critical listener. It was mainly due to this latter fact coupled with the trouble in reaching out of the way places in the Pittsburgh district that the use of the portable short wave transmitter was presented.

The requirements of this transmitter were that it be dependable at all times, that it could work properly anywhere and that it make use of a wave length free from interference and take up as little room as possible. Also, the personnel necessary for operation must be small while the upkeep of the portable must be kept low enough to justify its use.

The portable short wave transmitter designed by Mr. Burnsides, is encased in an especially built truck body five feet wide, nine feet long and six feet high inside, solidly built to withstand the jar of the truck in motion. The truck itself is a one-ton Ford so that the equipment must be encased with thick cushions of felt so that the jar of traveling does not injure the transmitting tubes and metering equipment.

The transmitter is a quarter kilowatt set. Power is being obtained from a 110 volt lighting circuit at the place where the program is to be broadcast. A power transformer in the truck is used to get the necessary high voltage to operate the set, the power at this high voltage being passed through a vacuum tube rectifier, making use of two quarter kilowatt air-cooled rectifier tubes which gives single phase full wave rectification. The output of these tubes is passed through a brute force filter of choke coils and condensers, which delivers 2000 volts d-c. power to the transmitter. Means are provided for changing the voltage applied to the rectifier tube to take care of variations in the voltage of the lighting circuit, thus assuring unvarying supply to the transmitter.

The transmitter itself makes use of the standard Hartley oscillator circuit with Heising modulation, using a quarter kilowatt oscillator and two quarter kilowatt modula-



Carroll J. Burnsides and His Portable Station

tors. The tank circuit of the oscillator is a standard inductance of the usual solenoid type wound with a heavy copper strap, and an oil

(Continued on Page 8462)

Let KDKA Vouch for You

W. W. Rodgers,
Department of Publicity

ONE would rather meet an old friend than a new acquaintance. With the first, there are many things to chat about concerning this experience or that event which has been shared in common. With the second, conversation may lag because a common bond of experience is usually lacking, and often a subject of mutual interest is hard to find.

A salesman endeavors first of all to interest his prospect. In what better way can this be done than to start the conversation in channels in which each has some interest or knowledge?

An illustration of the benefits of this elementary psychology of salesmanship is furnished by a Westinghouse dealer engaged in selling our farm light equipment in a Rocky Mountain district of the Far West, who capitalizes the invention and the development which, to the public, are synonymous with Westinghouse, namely, the airbrake and radio broadcasting.

The dealer, whose policy we mention, calls on men far removed from the ordinary haunts of what is erroneously termed civilization. His prospects are inherently suspicious of strangers and are accustomed to deal plainly with facts. Although they live in the Rockies, these ranchers are "from Missouri" and require the salesman to "show them". These conditions require that a salesman must first win the confidence of his prospects and then sell them on the application of the equipment to their specific needs.

This dealer's success in gaining the friendship of his prospects largely depends upon his first statement, for after introducing himself as a Westinghouse representative, he immediately follows with the remark that "of course Westinghouse is well-known, as it is the Company that invented the airbrake and established KDKA, world's pioneer broadcasting station".

The rancher knows that airbrakes made the modern trains possible, he is usually familiar with their history and he hears our programs nearly every night.

It has been the experience of this Western dealer that the response to this form of approach has always been immediately favorable and that from then on he has never had difficulty in winning the confidence of the customer.

This dealer is capitalizing the public's interest and confidence in KDKA. He, by giving the information that he is connected with the broadcasting company, is immediately accepted in the same spirit with which the broadcasting station's programs are welcomed in the home.

All our salesmen should remember to capitalize the good-will of the public obtained through its constant contact with Westinghouse broadcasting stations, these being not only KDKA, operated from the East Pittsburgh Works, but also KYW at Chicago; WBZ at Springfield, Massachusetts, and KFKX at Hastings, Nebraska.

Many prospects for Westinghouse apparatus belong to that class termed "radio fans". Such "fans" are willing talkers on all subjects pertaining to radio. Mention radio to them and very likely the salesman, will spend the next hour listening to their experience concerning the operations of their radio sets and will be expected to give some information in return.

Nearly every owner of a radio receive belongs to the "fan" class, having the "disease" in a form which may vary from mildness to acuteness.

The radio stations operated by the Westinghouse Company are their most constant contacts with the public, and are today, according to public reckoning probably the outstanding achievement of the Company. These stations are unceasing in their efforts to build up of good-will in the public mind.

The salesman who is not capitalizing this good-will, who is not using it to advantage, is not utilizing all the tools at his command in promoting his work. He is not making the most effective contact.

Consider the record of Westinghouse broadcasting. KDKA was the first station established as a broadcaster in the world; it was the first to broadcast every modern program feature, except the transmitting of operatic programs, and these were first sent by its sister station, KYW in Chicago. Westinghouse pioneered in short wave development KDKA now holding the record for first transmitting the ultimate in distance because of its many transmissions with Australia halfway around the world. Westinghouse also pioneered in the repeating by radio of programs, having established such a system; first, at KFKX, and later, at KYW and WBZ; all these stations now being equipped with short wave apparatus to enable them to rebroadcast a program originating at East Pittsburgh.

KDKA'S programs have been heard on every continent in the world. It is a familiar and an old friend to radio listeners in the British Isles, in Europe, in South Africa, in South America and finally in Asia, notably Japan.

The records established by the stations of the Company, both in program origination and transmitting, have never been equalled by any organization. It is, therefore, inevitable that the public should recognize this merit and react favorably when Westinghouse Broadcasting is mentioned.

No other agency has yet been developed which has so permanently established itself in the homes of the public, as has broadcasting. No method of communication has been developed which so effectively becomes a part of the daily life of the listener.

The statements made in the preceding paragraph are platitudes which have been publicized for some years and which still are impressive.

Westinghouse leadership in broadcasting provides an opportunity for the salesmen to so identify himself as to be a welcome visitor to his customer's office. Make KDKA serve as an advance agent.

December 27, 1926.

Publicity Dept.,
Mr. P. A. Boyd, Press Repv.

Attached hereto is a rough copy in reference to broadcasting studios, their equipment, etc. You wanted an article on this subject and here it is. I hope you will correct the English in it and make it presentable before forwarding through.

RADIO OPERATIONS,
C.W.HORN, SUPT.

CWH:O

WHY A RADIO STUDIO?

A radio studio is not just a place where performances take place to be picked up and broadcast, or, in other words, it is not just a room where such performances take place, but is a specially designed, acoustically treated chamber in order that the quality transmitted will be at its best. In order to properly describe what takes place in a studio it is necessary that we have some inkling as to how sound waves act, so we must have a knowledge of wave energy with resultant reflections, absorption of energy, etc. The microphone which connects the studio with the transmitting equipment is a very accurate recorder of all sounds that actually exist in the studio even though the ear may disregard or not notice them.

How often have we been engrossed in some occupation or work and become totally indifferent to the sounds which are daily all about us but which we never seem to notice. Only when we are directly spoken to or some unusual sound manifests itself do we become aware of it. This is due entirely to the fact that we have a brain which can differentiate between sounds intended for our notice and other sounds.

The microphone which is installed in the studio has no brain to help it along and accurately responds to everything that transpires in that studio. It, however, picks up sound which the ear of the average person does not pay any attention to but when these sounds are put through the transmitter and listened to by the fadio fan, who by listening to his loud speaker immediately

becomes aware of them because he is paying particular attention to everything that is coming from the loud speaker. It is also necessary that we arrange a performance to be so enacted in order to enable the microphone to pick up what it is intended to give the listener. Extreme care must, therefore, be taken to prepare the walls and other surfaces in the studio in order to insure proper sound and the proper quality as well as proper intensity of all instruments.

This is accomplished usually by covering the walls, ceiling and floors with sound absorbing material such as heavy cloth, rugs and sometimes specially prepared material such as Celotex. This Celotex material is in use in a number of the Westinghouse Company studios and has the advantage of doing away with draperies, which have a great habit of accumulating dust and dirt, as well as sometimes being a fire hazard. Furthermore, decorative effects can be obtained by using this material that are otherwise not obtainable.

I have found from experience that too much absorption of sound energy makes the room sound very dead and makes it very difficult for the performers to do their very best. Therefore, a happy medium has been found and I have determined that the best percentage of absorption is in the neighborhood of 25% to 30%. The thing most necessary to watch out for is to prevent hard surfaces from reflecting energy back to the microphone. It will be seen that the wave from the instrument or singer moves in a straight line to the microphone and that any waves traveling a longer distance such as from the performer to the wall and then

and then reflectedback to the microphone must come in to the microphone at a somewhat later time than the original wave. This causés interference and results in very poor quality. If the path is sufficiently long so that the reflected sound comes in sufficiently far behind it might even interfere with the following sound.

In order to give the reader a good picture of what a studio consists I will describe the Pittsburgh Post Studio of Station KDKA of the Westinghouse Company. This is a large room approcimately 25 x 40 feet. Upon entering this room one is immediately impressed with the very quiet tone and the restful atmospheree encountered. Your feet sink into very heavy rugs or carpet under which is laid some felted material and you can walk about this room noiselessly. The walls and ceilings are lined with Celotex of various designs. That on the walls has squares which resemble blocks of stone with some of these blocks having a large number of holes drilled into them. On each of these sides are panels embedded in the wall containing water color pictures, depicting appropriate scenes to go with that studio.

If one is fortunate enough to enter this Studio when a performance is taking place you will remark on how clear and natural all tones from the musicians or from the instruments sound to you and you will notice that you are hearing the instruments themselves and not a general sound as in a large hall.

That is because of the sound absorbing qualities of the material used in lining this studio which prevents reverberation and thus prevents the echoes that you would expect to hear. This is accomplished by using some soft material through which the sound waves travel and which cannot very readily reflect because the surface is not hard. As energy is absorbed by their passage into this material the sound waves are also losing energy and as it passes back again into the room. If this last is sufficient the absorption will be such that the sound cannot reverberate or reflect back and forth between the sides of the room. Furthermore, this loss of energy in the sound wave prevents this from being sharply reflected back to the microphone to cause a disturbance or interference noted in the paragraph above.

As KHKA is the pioneer broadcasting station it naturally had the first problem of providing a suitable studio to solve. The first studio one might say was really just a bare room and the reverberation and hollowness of the sound wave could be noticed. A great improvement was made during the summer months when performances took place on the roof outside in the open air. There being no walls to reflect the sound perfect absorption was obtained and there was no distortion. With the coming of colder weather, however, it was found necessary that a real studio would have to be provided. We, therefore, looked about us and pounced on the first thing that struck us as being highly absorbent as far as sound wave energy was concerned, and that happened to be wool felt, or hair felt. We lined a room with this material and in order to hide the looks of the felt we covered it with cloth. This served

very well and proved to us the necessity of properly shielding the studio. However, we soon realized that we had overdone this job as performers kept informing the studio attendants that they could not do their best in such a "dead" atmosphere. We, therefore, began a study of this problem and decided that the best absorption, or rather the most absorption allowable, was about 25% to 30% at the best. Heretofore we had nearer 60%. As the studios were in the Pittsburgh territory and out at the plant of the Westinghouse Company it was subject to a rather heavy smoke-laden atmosphere, which quickly soiled and coated with grit everything upon which such a deposit could be made. We, therefore, kept our eyes open for some material which would have a flat surface and sufficiently hard so we could brush it and clean it. This was met by the Celotex material with which the new Pittsburgh studio is finished.

Another thing that must be kept in mind when designing a studio and in providing for just the right amount of absorption is the fact that the average loud speaker when in a room has in itself a certain amount of effect or reflection to contend with. The proper thing, of course, is to transplant the music without distortion directly to the home and permit the natural reflections of the room to make it sound natural. In other words, if the energy which the loud speaker receives has already many echoes and extraneous sounds those added by the room may be of such a nature as to cause an unnatural effect. For best results, the loud speaker in the home should be placed in a room that is rather heavily furnished in order to prevent the reflection or

reverberation which make the music sound somewhat shrill just as if in a bare room. Usually the living room is the best place to put the loud speaker as that contains the overstuffed furniture and other material which absorbs sound energy.

Since the advent of the radio studio a great deal of attention has been paid to the proper absorption of sound energy in homes and public buildings. In order to secure a nice quiet room it is necessary to place therein some materials which will absorb the energy and prevent its reflection or reverberation. It is not just chance that some homes or some rooms are quiet and restful while others are noisy and sounds appear to be shrill. It all depends and can be very closely figured upon the amount of reflection from the walls and ceiling as well as the floor, Heavy rugs, draperies, etc., all tend to quiet the room. Decorators and Home furnishers keep two things first in mind in order to produce the restful and quiet effect so much desired.

C.W.Horn

May 12, 1926.

For more than a year past Westinghouse radio engineers under the supervision of Mr. Frank Conrad, Assistant Chief Engineer, and C. W. Horn, Supt. of Radio Operations, have been at work on an experiment, which, if successful will have far-reaching effects on the future of radio. These experiments have been successfully concluded and tests have been made to determine the effect and the results of this long period of labor and great expenditure of money. Not only was the principal objective achieved but additional obstacles were overcome and new ideas developed. These will all have a great effect on the campaign of improvements which the Westinghouse Company is patiently engaged upon in order that radio may become the one fine bright thing that the men in charge believe that it will ultimately become.

Station WBZ at Springfield and WBZA at Boston are connected by wire lines approximately 100 miles in length. Both of these stations can now operate on exactly the same wavelength and with the same program without the slightest interference and the listener at some point distant from either of these stations will not know from which station his signals are being received. To accomplish this was no small task, as these two stations operating on 900,000 cycles per second must be in exact step, without the slightest change, otherwise distortion and beat notes would result. This is accomplished in a very unique way by means of the now

famous Piezo crystal control. Both WBZ and WBZA are crystal controlled stations, that is, Piezo crystal controlled stations. Both stations are kept on their absolutely exact frequency by means of a piece of quartz employed in the proper circuits for this purpose.

In order to make sure that the two stations are in exact synchronism one crystal controls both stations. Roughly, a description of the plan is as follows: A crystal ground so that its period of vibration is 50,000 cycles per second is caused to vibrate in a special electrical circuit at Springfield. This energy is amplified and then placed on a line as carrier current and transmitted to Boston. At both Boston and Springfield this frequency is then amplified by frequency multipliers and amplifiers until the 18th harmonic, or 900 kcs. is obtained. This 900 kcs. frequency is then amplified by means of high power apparatus and radiated into the air. Therefore, both of these stations, although separated by 100 miles are following the vibrations of that one small piece of quartz which feeds into the line connecting these two stations.

Thus for the first time has it been made possible for two stations to operate simultaneously without causing interference. More stations can be added to such a chain.

The great value of this work, however, is not alone the operation of more than one station on a wavelength, but, it is believed, that the objectionable "fading of signals" so noticeable, particularly in New England sections, has been overcome. Everyone who is a radio listener knows how stations fade in and out, sometimes very rapidly and sometimes more slowly, and Westinghouse engineers have made it their problem to solve this annoying phenomena. Thus, they have successfully accomplished by means of the system explained

above, which makes it possible to radiate energy from more than one point in order to permit the reception of radio signals from more than one direction. It has been known that this change of signal strength is not the same at different points. That is, fading does not occur simultaneously at all points. Thus, by making it possible to receive from different directions simultaneously the same signal, these engineers have made it possible to receive a fairly constant signal in place of what was generally the case.

One can pick out the greatest hindrances to radio at the present time and in any such list it will be noted that, outside of static, or even sometimes in some localities given greater importance than static, is this fading or rapid swing in signal intensity, which has been declared most bothersome. This has now been demonstrated as being possible to overcome and leaves just one less objectionable feature for the radio fan to contend with.

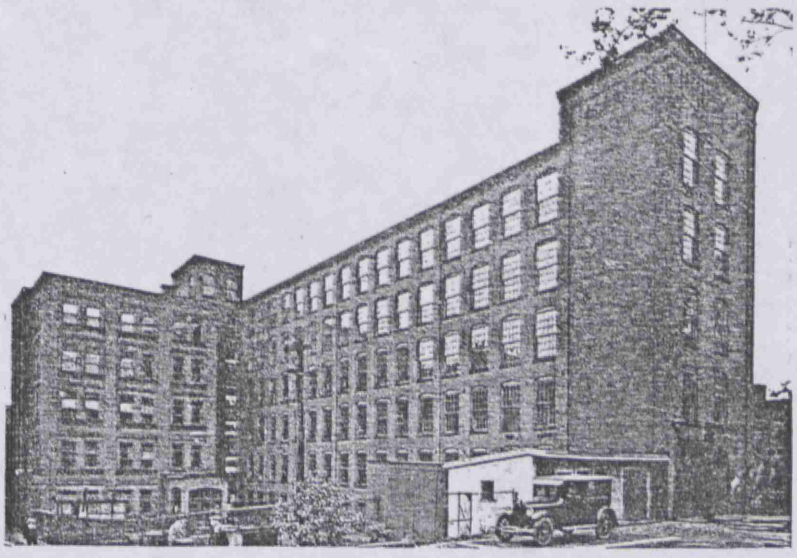
It is by such intensive engineering and reasearch work that it will be made possible for the listener of the future to thoroughly enjoy excellent programs unmarred by any of the disturbances now being encountered. Practically one year of work on the part of these engineers was required to demonstrate whether or not the theory underlying these experiments was sound or whether it was based on incorrect fundamentals and all of the work and expense must go for nothing.

Mr. Frank Falknor, the engineer directly in charge og the work, with Mr. D. A. Myer, Engineer in charge of WBZ and WBZA and assisting engineers must be given great credit for this accomplishment.

- C.W.Horn, Supt. Radio Operations

Westinghouse Comes Back to Chicopee Falls

What the Newest Westinghouse Plant Is Doing



The Chicopee Falls Plant which Westinghouse is again using, this time for the construction of radio transmitting apparatus

THE latest manufacturing unit to join the Westinghouse group can paradoxically be said to be the oldest—for a portion of the buildings which only recently has been demolished, was used during the Civil War for the manufacture of guns. What remains, plus some recently acquired property, forms the Chicopee Falls Works, located in a small village of Chicopee Falls, Mass. This town of about 12,000 inhabitants forms the eastern part of the town of Chicopee, which is located on the banks of the Connecticut River on the northern boundary of Springfield, Mass. Chicopee Falls has been known as an industrial city for many years, for here are located such manufacturing plants as the Fisk Rubber Company, the Chicopee Manufacturing Company (a subsidiary of Johnson & Johnson), the A. G. Spaulding Company, the Savage Arms Company and the Dwight Mills.

The Chicopee Falls property was acquired by the New England Westinghouse Company, in 1915, when that Company was formed to manufacture rifles for the Russian Government. It was purchased from the Stevens Duryea Automobile Company and with the East Springfield Works and several other allied properties was converted to the manufacture of guns. After the collapse of the Russian Government and about the time the United States entered the World War, it was re-arranged and equipped to manufacture Browning Machine Guns. These plants, under the direction of Mr. F. A. Merrick, now Vice President and General Manager of Westinghouse, successfully produced these guns until the close of the war. At this time the machinery and equipment were turned over to the United States Government and the buildings remained empty until September, 1927.

The rapid expansion of radio transmitter work made inadequate the space at the East Springfield Works, where the medium sized units were built and also at East Pittsburgh where the large units were constructed. It was then decided to use the Chicopee Falls plant for transmitter manufacture. The location of the plant was considered ideal from a shipping standpoint, being within one day's trucking distance from the ports of New York and Boston, where the transmitters can be easily installed on board ships or shipped to foreign countries.

The property adjoining the plant was purchased during May, 1927, making a combined property of 3½ acres. On this is located two six-story brick buildings, one four-story steel and brick building, one five-story office building, several one and two-story buildings, a boiler house, a transformer house, and store houses. These comprise 166,000 square feet of manufacturing floor space and 18,376 square feet of office space. Of this area, 60,000 square feet are being used at the present time for laboratories, and for the manufacture of radio transmitters and wired wireless. The entire office, with the exception of one floor, is being used to house the Sales, Engineering, Drafting and Factory Supervisory force.

Production is increasing so rapidly that it is anticipated all of the present equipped floor space will be required within the coming year and possibly a demand made on some of the vacant space.

Not only are radio transmitters of capacities varying from 500 watts upward for all kinds of service being built at this plant, but receiving sets such as used by the U. S. Army and Navy and also some foreign governments and in addition wired wireless as used by large power companies are also manufactured. Special radio sets including combined sending and receiving sets for airplanes and auditorium amplifiers form a part of the product.

In creating an organization for the operation of the plant, the idea for a complete independent unit was carried out to an unusual degree. While the Works Manager of the East Springfield plant is responsible for manufacturing operations, yet the Superintendent, Mr. J. A. Lavallee, is practically independent, and controls all of the operating departments.

The Engineering Division, under the supervision of Mr. D. G. Little, carries on development work in a well-equipped laboratory.

Mr. Q. A. Brackett is in general charge with Mr. J. J. Sweeney in direct charge of U. S. Government work and Mr. Chapman, in charge of wired wireless.

Ⓦ

Control Engineering Struts Its Stuff

(*Continued from page 13*)

then as the clock hands jerked into place at 7:50 they were finished.

In one hour Control Engineering had demonstrated to district managers the short cuts of design and a new photographic process of creating blueprints from drawings, which had enabled it to reduce the former work of weeks to a time of only a few hours. And to show district managers how that saving of time had been made, Control Engineering had "strut its stuff".

Reprint 420

Listening In—at the Top of the World

By

H. P. Davis
Vice President
Westinghouse Electric & Mfg. Co.

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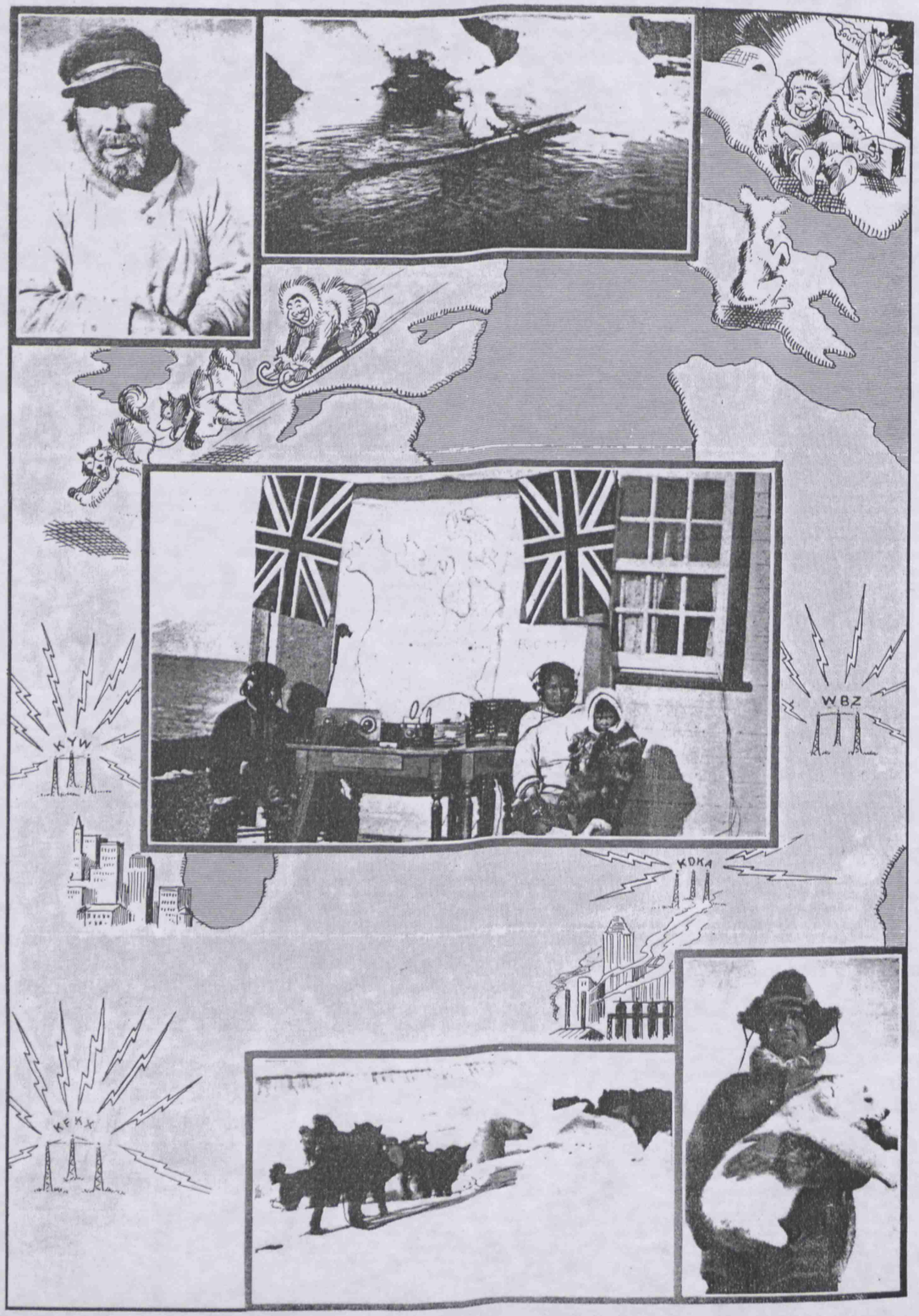
April 1930

Compliments of
Westinghouse Electric & Mfg. Co.
East Pittsburgh, Pa.



Listening In---At the Top of the World

H. P. Davis
Vice-President,
Westinghouse Electric & Mfg. Co.

In the summer of 1921 the Canadian Government Exploring Ship "C.G.S. Arctic", under the command of the veteran explorer Capt. J. E. Bernier, left the docks at Quebec carrying the annual Canadian Arctic Expedition which sails north each summer to reprovision the Royal Canadian Mounted Police posts. On the ship were mounted police in full uniform who were going into the Canadian Arctic to replace the men who had been "doing their bit" and presented quite a thrilling sight as they left their families and friends to be cut off from direct communication with any civilization for many months and sometimes years. Shortly afterwards, this same summer, the fur boats of the Hudson's Bay Company departed from Montreal on their way north to take in the annual supply of provisions and mail, and to bring out the year's accumulation of furs. On these boats were all sorts of men who spend their lives in the far north, as well as more red-coated mounted police and missionaries with their black cossocks and heavy gold crosses.

George A. Wendt
Originator of Broadcasting to the Arctic and Antarctic

Watching these ships depart was Mr. Geo. A. Wendt, of the Canadian Westinghouse Company, and the idea came to him of broadcasting to the frozen stretches of the far north the things of particular interest to the groups of people scattered throughout this region. Practically all explorers have written regarding the difficulty of keeping up the morale of their expedition during the long periods of inactivity in the dark period, and it occurred to Mr. Wendt that in the far north from coast to coast were scores of little isolated communities, particularly posts of the fur companies, where little groups of men yearly had to pass through the same periods of inactivity as did the occasional Arctic expedition. Furthermore, the Arctic is accessible only once a year. Only once each year does any mail go in, and only once each year does any mail come out, and it appeared that here was an opportunity for radio to perform a wonderful service.

In order to carry out this pioneering work with the far north the co-operation of the Hudson's Bay Company and Westinghouse Radio Station KDKA was secured, and in the summer of 1922 a number of sets were sent in and installed along the shore of Hudson Bay, James Bay, and on the coast of Labrador. No particular schedules were made at that time. It was simply a case of sending in the sets and getting a report the next year.

In the early part of the winter of 1922-23 a courier with dog team came out from Rupert's House with a message from the factor at that point inquiring about his wife. On taking the matter up with the Hudson's Bay Company, Mr. Wendt found that in the preceding summer they had taken this man's wife out on one of their boats, and she at that time was in a somewhat precarious condition, with the result that her husband was becoming very anxious to receive some news of her

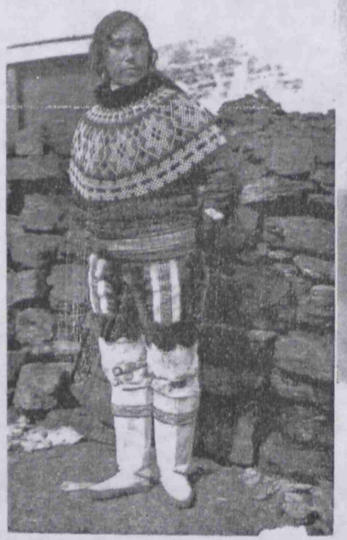
condition. It was ascertained that the man's wife was on the road to recovery and accordingly this message was sent on to Pittsburgh to be broadcast. This first broadcast was sent out from Shadyside Presbyterian Church at Pittsburgh by the Rev. Hugh Thomson Kerr during his afternoon's service. That evening the same message was repeated by the Rev. Percival Barker and later in the week it was again repeated from the National Stockman and Farmers' Studio of KDKA. Several months went by and another courier came out with the message that all these broadcasts had been received at Rupert's House and, furthermore, that the same message had been picked up by Revillon Frères at Moose Factory, where a courier with dog teams had been sent around the shores of Hudson's Bay to Rupert's House with the same message. Thus was launched the first Arctic broadcast.

The Hudson's Bay Company was incorporated May 2, 1670. The first Governor of the company was Prince Rupert, and it was eminently fitting that this first message into the far north should have been to the post named after the founder of the Hudson's Bay Company, who were then known as "The Company of Gentlemen Adventurers of England Trading into Hudson's Bay".

On account of the success of the first year's broadcasting, the Hudson's Bay Company decided to extend the scope of these radio operations, with the consequence that sets were sent into Baffinland and other points in the Arctic and Sub-Arctic, and at the same time the posts were informed that KDKA would endeavor to broadcast to them on certain pre-determined dates, and thus in a tentative way was started the first definite schedule.

Coincident with these events was carried on a series of short-wave experiments between KDKA and the Canadian Government Exploring Ship "C.G.S. Arctic". This was done through the co-operation and assistance of the Radiotelegraph branch of the Dominion of Canada. KDKA transmitted on short waves to the "Arctic" from the time the boat left Quebec until it returned, during which period the boat touched at Godhavn, Greenland, sailed North to Etah, and then across Smith Sound to Cape Sabine at which point there was established a new world's farthest north record; then down the Coast of Ellesmereland and Baffinland, and back to Quebec. Both the radio telegraph and the radio telephone were used on these short waves, the boat in turn being able to reply only in the dot and dash of the International code. During the entire trip KDKA never missed a single short-wave transmission to the boat.

As time went on, each year more and more radio sets were installed in the Arctic and Sub-Arctic until practically every post and isolated community in the far north was equipped with a radio set. The broadcasts from the Westinghouse radio stations became a regular service to the Royal Canadian Mounted Police, the Hudson's Bay Company, Revillon Frères and the missions, and included messages of many characters. Official messages were transmitted from the Dominion Government and from the Mounted Police as well as from the fur companies. Post permits were broadcast at the request of the government. Messages were sent in regarding the securing of specimens, and other messages were sent to the various naturalists and scientists of the Canadian Government. The Hudson's Bay Company also put radio telephone transmitters on their boats which enabled them to talk to the posts days before their arrival. Of course, these conversations were one way only as the posts could not talk back; nevertheless the Hudson's Bay manager aboard the boat was able to give instructions to his posts several days before the boat arrived.



The peculiar hair dressing of a married Greenland woman is shown above. On the left is a Greenland woman attired in native dress. Eskimo girls are seen at the right in native costume

The service was later extended to include Iceland. After one experience there it was found necessary to secure Iceland announcers, as the average Scandinavian cannot speak the Icelandic tongue, and fortunately Icelandic announcers were secured at both KDKA and KYW. French, Danish, and Eskimo languages have also been used in addition to Icelandic, and, of course, English. Westinghouse stations KDKA, WBZ, WBZA, KYW and KFKX have been used for these broadcasts and a great many interesting and romantic stories could be told of events in the little known parts of the world to which these messages are sent.

A walrus which only recently had been harpooned in the head is shown being dragged from the water to the ice by a group of typical Eskimo hunters

The Bayeskimo of the Hudson's Bay Company was caught in the ice and sunk off Hudson Straits on her way into Hudson Bay with the annual supply of provisions. KDKA immediately broadcast this news to all of the waiting posts in the far north, telling them that a relief ship would be sent from Montreal as soon as they were able to secure and provision such a ship. You can naturally appreciate what frame of mind the men would be in after waiting one whole year for the ship, and then not having the ship show up, and they would anxiously scan the horizon for it week after week, and so radio performed a function of relieving the minds of the men at the posts.

The relief ship sailed and managed to provision most of the posts, but, unfortunately, the season was too far advanced for it to reach Southampton Island, located in the northern part of Hudson Bay. At the request of the Hudson's Bay Company KDKA nightly broadcast messages to Chesterfield Inlet, Repulse Bay and Wager Inlet asking them to try and get across to Southampton Island with provisions. On account of the rapidly-running tide and floating ice they were not able to reach Southampton Island. Fortunately, however, the radio set on Southampton Island was working, and they heard the message and realized that the other posts had been provisioned. It was then practically winter and with very short periods of daylight. However, the men on Southampton Island managed to work themselves north and then during favorable periods they went from one small island to another finally reaching the mainland at about the Arctic Circle and then west to Repulse Bay where they were able to reprovision themselves. Thus again a thrilling chapter was written into history by means of the radio.

This radio work developed many interesting acquaintances with the men in the north. One of the outstanding characters is the Rev. Bishop Turquetil located at Chesterfield Inlet. He has spent over twenty years of his life among the Eskimos and speaks their language fluently. He had made a special typewriter with the Eskimo characters thereby enabling him to translate anything into the Eskimo tongue. A few years ago he went to Pittsburgh and broadcast from KDKA to the Eskimos in the Eskimo's language. Announcements had been broadcast to the north weeks ahead that he was to talk to his children, as he called them, with the result that the Eskimos came in from hundreds of miles away, and this was probably the first broadcast in the Eskimo tongue to a large gathering of natives who had come together for such an event.

Following the broadcast Bishop Turquetil made the following statement. "Radio broadcasting to the north from KDKA is a real Godsend to us, and if it were abandoned, our life over there would be a real misery, a true despair, after we enjoyed so much that only way of communicating with our country, our home and with the ones we love so dear. Besides mere affection to our home, the efficiency of our work among natives, the welfare of the same natives, both material and spiritual, depends largely on radio communication with the civilized world."

Also located at Chesterfield Inlet is Staff Sgt. Joyce of the Royal Canadian Mounted Police. Last year his son who was attending school in Ottawa was taken very ill, and efforts were made to send messages in by the radio telegraph to Port Churchill with an idea of having these messages carried by plane to Chesterfield Inlet. At the same time KDKA broadcast messages. The plane was not able to get through, but Staff Sgt. Joyce received his messages through KDKA. Unfortunately, the season was too late for him to get out by dog team, and too early for him to get out by boat, with the result that from week to week KDKA kept him informed of the improvement of his son.

Among the many humorous incidents is one regarding the Eskimos who are very adept at playing

The illustrations on the frontispiece and pages 192 and 193 are reproduced through the courtesy of the N. W. Territories, Canadian Government.

the concertina and have also become radio fans. Every year the Canadian Government sends in new phonograph records to the police posts. On playing these records the Mounted Police discovered music which was vaguely familiar to them and on investigation they found that the Eskimos had been hearing these tunes out of the air and playing them on their concertinas months before the records themselves arrived.

One night one of the Westinghouse stations thought they would add a little interest to the broadcast by having a police dog bark into the microphone, with the result that there was started the world's greatest dog-chorus, as this barking into the microphone apparently started the dogs barking from Alaska to Baffinland

The handling of messages is now down to a definite routine. In May or June a definite schedule of dates is arranged and several thousands of the programs are mimeographed and distributed to the Hudson's Bay Company, Mounted Police, Revillon Frères, and the missionaries, who send them into every post at every point in the north, and in addition to this, copies of the schedules are distributed throughout the world to the next of kin of those whose duties require their service in the far north.

Bishop Turquetil is shown above talking over the microphone at KDKA to his Eskimo people in their own tongue

Thousands of messages are broadcast annually. The programs consist of a most fascinating list of letters, news reports and information from relatives and friends of that band of adventurous folk whose lives are spent in small habitations, mostly near the Arctic circle. It is quite thrilling to listen to these messages, especially the first time they are heard, and to think that they are being also listened to, and much more eagerly, by people in these strange lands who have no other means of contact with the civilization far to the south.

In the words of Bishop Turquetil: "Besides mere affection to our homes, the efficiency of our work among the natives, and the welfare of the natives, depends largely on radio communication with the civilized world"

The acknowledgments of the receipt of these messages usually arrive once a year, sometimes in October after the fur boats have returned from the far north. In addition to this, these messages have been heard and acknowledged from nearly all over the world including Europe, South Africa, South America, Australia, Hawaii and ships at sea. These messages seem to have a peculiar fascination for those in tropical and semi-tropical climates. One day there arrived two messages, one from Johannesburg, South Africa, telling how they had listened to these messages going to the far north while sweltering in 90° in the shade; the other message was from Chesterfield Inlet regarding the same transmission, and telling how the thermometer there at that time was nearly 40° below zero.

In view of the pioneering work which had been done in the Arctic, arrangements were made with Commander Richard E. Byrd to carry on experimental work with him in the Antarctic and the results have already proven of considerable value and interest. It is expected that when the work of the expedition is completed and analyzed that considerable light will be shed on some of the phenomena which now puzzle the users of radio. Regular broadcasts were carried on with Dr. Herbert Spencer Dickey during his expedition to the Orinoco River in South America last year. Dr. Dickey has spent 27 years in the wilds of South America and is returning this spring to explore the unknown head-waters of the Orinoco, assisted by radio. Many interesting things could be told of the expeditions to the Antarctic and to the tropics, but these are other stories. There are stories enough regarding the broadcasts to the Arctic only, to fill several volumes. The benefits which these broadcasts have given to science, and the pleasure and interest which have been added to the lives of the people in the Arctic regions are of inestimable value.

In addition to the appreciable benefit to science which these broadcasts have proven to be, their psycological value is inestimable. The pleasure and interest which has been added to the lives of these people isolated from civilization would in itself justify such effort as has been put into this work during the past few years. In the wanderings of explorers over the barren lands they occasionally come upon some isolated trapper, or missionary, or post factor. Outside of the dwelling is invariably a radio aerial, and inside is the annual Westinghouse radio schedule.

Thus through Mr. Wendt's initiative and vision, an idea was born that lead to a pioneering activity and innovation of world-wide importance and one that in the case of the frozen wastes of the far north and south must have given to many comfort and help over the rough spots of the long winter night.

These N. B. C. stations broadcast a Westinghouse Salute every Tuesday Evening

Atlanta	WSB	New Orleans	WSMB
Baltimore	WBAL	New York	WJZ
Birmingham	WAPI	Oakland, Cal.	KGO
Boston	WBZA	Phoenix, Ariz.	KTAR
Chicago	KYW	Pittsburgh	KDKA
Clearwater, Fla.	WSUN	Portland, Ore.	KGW
Covington	WCKY	Richmond	WRVA
Denver	KOA	Rochester, N.Y.	WHAM
Detroit	WJR	St. Louis	KWK
Duluth	WEBC	Salt Lake	KSL
Houston	KPRC	San Antonio	WOAI
Jacksonville	WJAX	San Diego	KFSD
Kansas City	WREN	San Francisco	KGO
Los Angeles	KECA	Seattle	KOMO
Louisville	WHAS	Spokane	KHQ
Memphis	WMC	Springfield, Mass.	WBZ
Miami, Fla.	WIOD	St. Paul	KSTP
Milwaukee	WTMJ	St. Petersburg	WSUN
Minneapolis	KSTP	Superior	WEBC
Nashville	WSM		

Westinghouse Electric & Mfg. Co.

East Pittsburgh, Pa.

F. 8169

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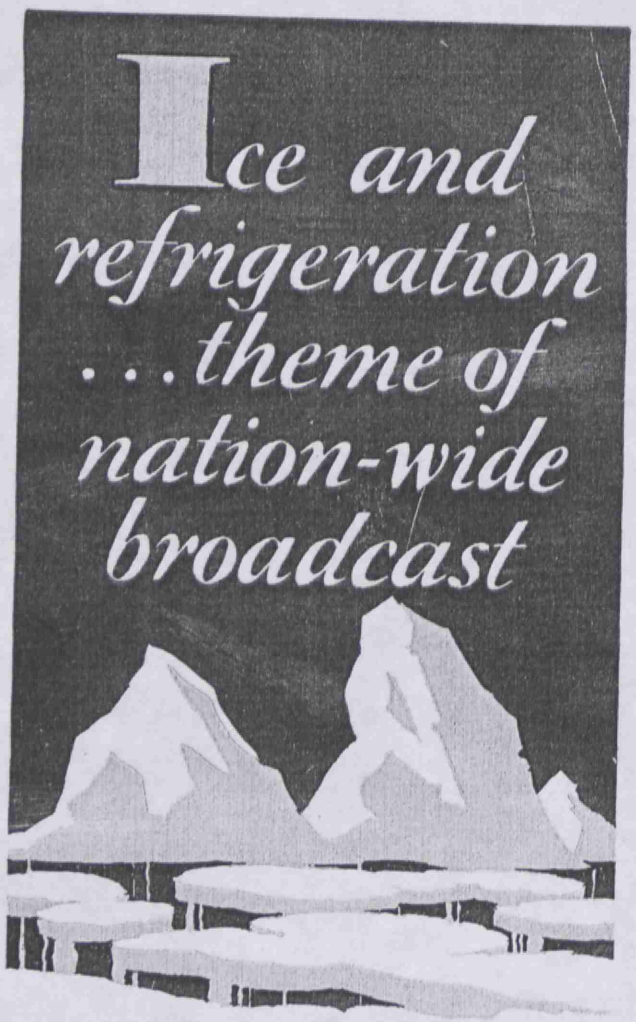


Westinghouse Salutes the Ice and Refrigeration Industry

TUESDAY evening, November 25, 1930 this radio program was broadcast over a nation wide network of radio stations associated with the National Broadcasting Company. Gardner Poole, President of the American Institute of Refrigeration addressed the radio audience in response to the Salute to the industry with which he is so prominently connected.

Announcer:

The production which is now beginning is the Westinghouse Salute—one of a series sponsored by Westinghouse Electric. To-night Westinghouse Salutes the Ice and Refrigeration industries of America and of all the world. Ladies and Gentlemen: The Westinghouse Salute.

1. Westinghouse Overture - - - - Sodero

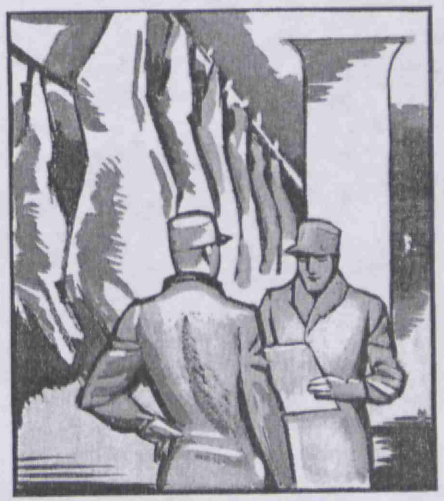
Voice:

For hundreds of years man sought to cool himself and his food. He learned that evaporating water would reduce temperature: he took advantage of the coolness of caves, of mountain brooks and of cold spring water. In winter he harvested the ice from rivers and ponds, storing it against the warm days of summer. But mechanical refrigeration as we know it today has developed in less than a century. True the first experimental ice making machine was invented in 1755 by Dr. William Cullen of England, but refrigeration remained a labratory experiment until about eighty years ago when several inventors perfected apparatus for manufacturing ice in commercial quantities. Thus the development of the industry really dates from the middle of the last century and the days of Stephen Collins Foster some of whose melodies we hear now played by the Westinghouse Ensemble.

2. Selections from Stephen Collins Foster (opening with "Oh, Susanna" and closing with "Camptown Races.")

Voice:

Refrigeration was discovered in a research for a better way to preserve foods till man was ready to consume them. So it is natural that our greatest use of refrigeration still lies in preserving food. Every year it serves more and more of us as is shown by the constant increase in the production of ice and the adoption of home refrigerating plants. The use of



ice in the home is now considered a necessity. Thus refrigeration contributes to our health and happiness by giving us at all times the temperatures which formerly were only known for a few days in winter.

Reminiscent of winter days is "*The Skaters Waltz*" which we'll hear the Westinghouse Ensemble play next.

3. The Skaters Waltz - - - - - Waldtefel

Voice:

Today the refrigeration industry enables us to keep a room as cool as we wish—whatever the temperature outside may be. Many theatres, office buildings, and factories already are equipped with refrigerating systems as a part of their ventilating equipment.

To-day even our homes may know this comfort through the hot summer days, and thus we may be able to spend most of our time in the invigorating coolness of the perfect climate. Races from cool climates of the earth have always been vigorous—conquerors like the Vikings. Now we hear the chorus of the Westinghouse Ensemble in Eaton 'Flanning's stirring "*Song of the Vikings*".

4. Song of the Vikings - - - Eaton Fanning
(Mixed Chorus)

Voice:

Mechanical refrigeration enables us to save the surplus of summer that we may eat abundantly and well in winter. The United States leads the world both in the size of factories making refrigerating machinery and in their total output. This refrigerating machinery makes possible modern quick freezing of fish and meats bringing them to our tables in perfect condition. It makes possible cold storage in refrigerator cars, which carry fresh foods across the continent—cold storage in ships which carry food around the world. All this we owe to refrigeration which produces the cold of snowclad mountains for our use the year round. Such cold mountain breezes are suggested by the Westinghouse Ensemble as it plays "*On the Mountains*" by Greig.

5. On the Mountains - - - - - - Greig

Announcer:

You are listening to the Westinghouse Salute to the Ice and Refrigeration Industry, coming to you from the studios of Westinghouse Electric Radio Station KDKA, Pittsburgh, through stations associated with the National Broadcasting Company.

CHIMES - - - - - Station Announcements

Voice:

Though we usually think of refrigeration in our homes, in stores, or in keeping ice cream ready to eat, it also is playing an ever increasing part in manufacturing processes. The celephane wrapper of your cigar or candy, the delicate rayon of transparent velvet, the oil and gasoline for your car—there are but a few of the products refrigeration may have helped to make. So, too, it plays an important part in the manufacture of munitions, and thus has its place in such martial scenes as the Westinghouse Ensemble suggests in John Philip Sousa's "*Bullets and Bayonets March*".

6. Bullets and Bayonets - - - - - Sousa

Voice:

Refrigeration is constantly finding new ways to serve mankind. It is making possible the shipment of meat from Australia or the Argentine; and is revolutionizing our methods of food distribution. Westinghouse Electric is privileged to present Mr. Gardner Poole, President of the American Institute of Refrigeration, who during the next four minutes will tell us more about this fascinating industry. He speaks from New York.

Mr. Poole, Westinghouse Salutes you, sir, and the industry you represent.

7. Fanfare

GARDNER POOLE, *President*
American Institute of Refrigeration

The Contributions of Ice and Refrigeration to the Modern Standard of Living

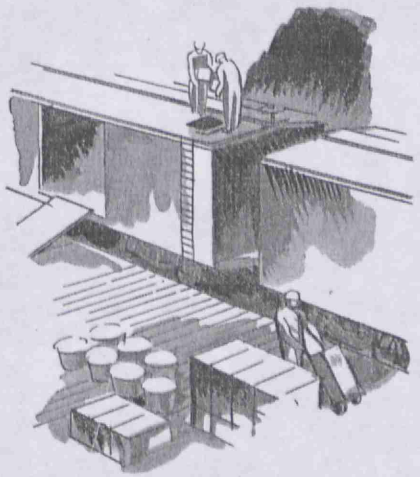
WITHIN the time of the present generation, practically the entire industry of ice and refrigeration has grown from a crude or experimental stage to its present magnitude, serving as an outlet for the best efforts and endeavors of hundreds of thousands of people, contributing to the advancement of the industrial arts, conserving millions of dollars worth of food products annually, equalizing extreme prices for seasonable products, increasing the supply of perishable foodstuffs by extending the markets, thus stimulating production, and furnishing our tables with fruit and other delicacies that the previous generation considered luxuries, or were unable to secure. It has been a leading factor in making possible the fullness of present day life.

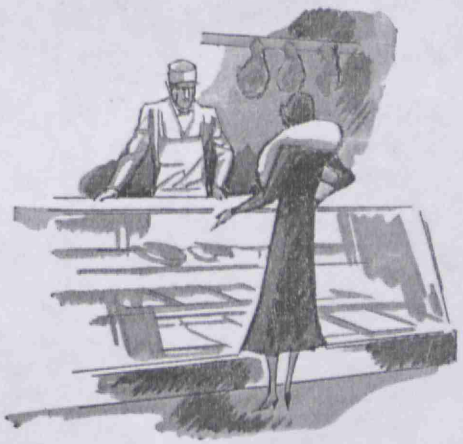
The development of industrial refrigeration in the United States has expanded to a point far beyond the conception of the early pioneers, and the refrigerating machine may well rank with the steam engine, the internal-combustion engine, and with electricity as one of the principal agencies in the development of human progress and prosperity.

I wish that time permitted a review of its progress and application, but some idea of its magnitude and

The Westinghouse Ensemble

AN appropriate musical background is of great importance in each Westinghouse Salute. The Westinghouse Ensemble is of a size and quality such that every phase of tonal interpretation is possible so the repertory of world music is available for the arrangement of a fitting program for each Salute.





diversity is indicated by recent statistics listing 220 industries and businesses in this country using refrigeration. I can only refer to a few high spots. The ice industry with an annual production of sixty million tons, and the cold storage industry where refrigeration is a prime factor in connection with the preservation of our perishable food supplies, are the largest users. In the packing house industry, in the textile industry, in the processing of oils, manufacture of candy, manufacture of films in the moving picture industry, in the manufacture of ice cream and in the dairy industries, refrigeration is now almost indispensable. A very important and more recent development is in connection with mechanical refrigeration for the home, which dates back only to 1914, expanding to a total sales volume of more than 630,000 units in the year 1929. Also the establishment and development of air conditioning is a science capable of almost unlimited contribution to industrial development and to the health and comfort of human beings.

The most recent development in refrigeration is known as "quick freezing". It is a method of freezing fish, meats and many other perishable products by efficient application of low temperatures in producing only microscopic crystals, thus preventing structural breakdown and preserving all of the flavor and wholesomeness of these products without appreciable loss of weight or change in appearance, thus permitting packaging and sealing in convenient form for distribution to the consumer.

While I have been talking mostly about the development of the industry in this country, the broader phases of its world-wide development must not be overlooked. This may be emphasized by the fact that a World Congress of Refrigeration is held every fourth year with more than fifty nations of the world participating, represented by official delegates appointed by their respective Governments. The American Institute of Refrigeration has represented the refrigerating industries of this country in these meetings by nomination of the State Department

in Washington. The last Congress was held at Rome, Italy, in 1928; the next will meet in Buenos Aires, Argentine Republic, in 1932.

In closing, may I in turn salute Westinghouse for its conspicuous contributions in the development of this refrigeration industry, and express our grateful appreciation for the honor of participating in this series of instructive programs. May I also pay a tribute to those men of science and industry whose genius and ability have made the words "ice and refrigeration" in relation to their application synonymous with words "health" and "comfort".

Voice:

You have just been listening to Mr. Gardner Poole, President of the American Institute of Refrigeration speaking in this Westinghouse Salute to the Ice and Refrigeration Industries. His address has been printed in booklet form and can be secured by writing Westinghouse Electric, East Pittsburgh, or the station which brings you this program.

Now the Westinghouse Ensemble and the Westinghouse Chorus brings us selections from Victor Herbert's Light Opera, "*It Happened In Nordland*".

8. Selections From "It Happened in Nordland" - - - - - - Herbert

Voice:

Electricity plays an important part in the ice and refrigeration industries and Westinghouse engineers have been privileged to work closely with the industry's engineers in adapting electric power to their needs. Westinghouse motors drive the compressors in ice plants, cold storage plants or homes. Westinghouse lighting contributes to the safety and efficiency of workers, wherever refrigerating equipment is used. And so to the Ice and Refrigeration Industries, Westinghouse dedicates this production as a tribute and a salute—to their achievements of the past, present and the future.

9. Westinghouse Signature - - - - Sodero

Announcer:

This production is one of a series in which Westinghouse each week salutes one of the cities or industries that make America great.

Next week at this time Westinghouse Electric has a program of particular interest to everyone with a Christmas Gift problem.

The Westinghouse Ensemble to which you have been listening is directed by Zoel Parenteau with T. J. Vastine, Associate Conductor. The narrator is Frederick G. Rodgers, and the announcer is Louis L. Kaufman. The clear mellow tone of the new Westinghouse Radio brings you the full beauty of any program. Hear it at your Westinghouse Radio dealer's. Compare its tone—its selectivity—its beautiful cabinet. You'll surely want to own one, because the Westinghouse Radio challenges comparison.

Station Announcer:

The Westinghouse Salute has come to you from the studios of Westinghouse Station KDKA through stations associated with the National Broadcasting Company.

The **Westinghouse Salutes to America's Industries**

WESTINGHOUSE sponsors a series of radio programs dedicated to great modern industries. Each program is a "Salute" to an industry, and is in recognition of its accomplishments, of its value and place in our civilization, and of its influence in providing a more satisfactory life and standard of living for all of us.

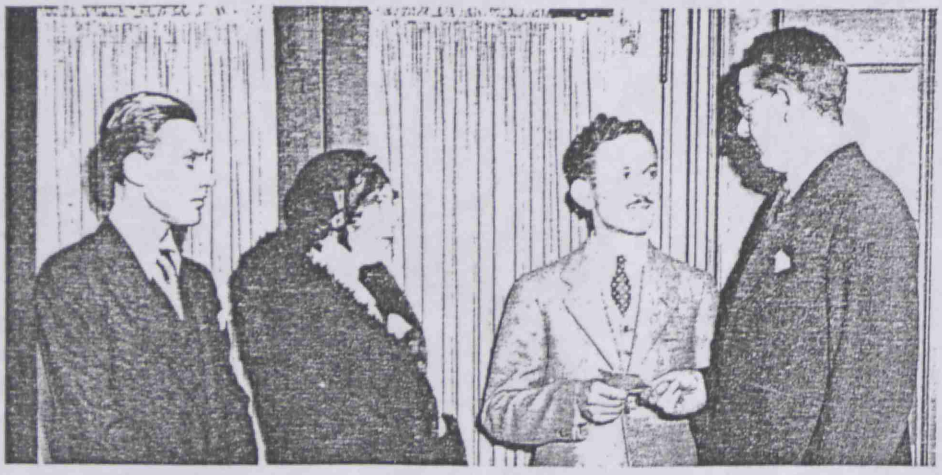
The structure of our present day civilization, is vast and complex. By the cooperation and coordination of our industries we have attained our great material wealth. And so efficient is this coordination, so apt is each individual industry in supplying its quota of human wants, that we are prone to forget the vital relationship it has with almost every phase of our daily life and well being. Too often we see only the grime and smoke, hear only the clash of metal, and lose the greater vision of a vast organization constructed for service and working to our benefit. These radio programs are presented as acknowledgment of the importance and accomplishment of our industries, and to inculcate a greater appreciation of how we are dependent upon each industry and upon the cooperation of all the industries that constitute our great industrial organization.

In each production the romantic story of an industry is briefly and vividly told. And at intervals there is music—stirring, brilliant music carefully selected so that the theme and feeling of the story is faithfully portrayed.

A feature of each Salute is a message from some outstanding figure in the industry to which the program is dedicated. There is, therefore, to be heard on the Westinghouse programs, from week to week, speakers of national reputation, and each having for a subject that which he knows best, and which is nearest to his heart.

Westinghouse is particularly fitted to present a series of programs of this nature. It is through the application of electricity that many of our great industries have reached their high state of efficiency and development. As engineers, and manufacturers of electrical equipment Westinghouse has cooperated with these industries, has assisted in research and development, and has pride in their accomplishments.

More Than 150,000 Ideas



(Left to right) Charles P. Bassett, Lucy K. Wilkes, and Peter Copeland being presented with the Radio Contest awards by A. W. Robertson, Chairman of the Board.

PETER COPELAND, young architect of Newark, New Jersey, at present unemployed, captured the first prize of $5000 in the Westinghouse Radio $10,000 Idea Contest for the improvement of radio cabinets, while Mrs. Lucy K. Wilkes, a young housewife of New York, was awarded the second prize of $2000 and Charles Preston Bassett, a young interior decorator of Pittsburgh, Pa., also unemployed, received the third prize of $1000. There were 45 other cash prizes awarded, ranging from $200 down to $25.00.

This contest opened on September 25, 1930 and closed at midnight, December 24, 1930.

A. W. Robertson, Chairman of the Board, presented the winners of the three capital prizes with their checks for $5000, $2000 and $1000 respectively in the board room of the Company in New York, Tuesday, January 27.

The names of all of the prize winners and the names of the towns in which they are located were announced during the Westinghouse Salute the same evening from the studios of KDKA in Pittsburgh. As the Westinghouse Salute is one of the National Broadcasting Company's regular features, it was heard throughout the country on the network of that organization.

More than 150,000 ideas for the improvement of radio cabinets were submitted by the general public, all of the prize winning ideas becoming the property of Westinghouse.

Of the entries received about one-third were submitted by women.

Mr. Copeland, 27 years of age, who lives at 101 Vassar Avenue, Newark, New Jersey, recently returned from abroad has decided to take the cash in place of the European trip offered in order to complete his studies.

Mrs. Wilkes, the young housewife, lives with her husband and three children, at 6151 Tyndall Avenue, Riverdale-on-the-Hudson, New York. She has also decided to take the money instead of the automobile.

Charles Preston Bassett, a 27-year old artist and designer from Pittsburgh, Pa., received cash.

Other prize winners are: $200 Awards: L. Chappelle Barr, 20 Beech Tree Lane, Pelham Manor, New York; Arthur H. Sidebotham, 12 Rose Street, S. W., Grand Rapids, Michigan; L. B. Goldinger, Lennox Place, Wheeling, West Virginia; Tell Jacot, Serre 36, LaChaux-de-Fonds, France; Syd. F. Abrahms, 45 Riverside Drive, New York, N. Y.

$100 Awards: Robert W. Dickerson, 71 Division Street, Hudson, Ohio; Montrose Pallen McArdle, 910 Century Building, St. Louis, Missouri; Joseph Tiritter, 37-30—81st Street, Jackson Heights, L. I., New York; Robert E. Johnston, 246 Christie Heights, Leonia, New Jersey; Mary Atkin, 321 Northern Avenue, Cincinnati, Ohio.

$50 Awards: Robert W. Harris, New Albany, Indiana; George M. Goodell, Los Angeles, California; Roscoe D. McClure, Eugene, Oregon; Roland Wentzel, North Salem, New York; Glen Swinger, Grand Rapids, Michigan; Raymond Muckenthaler, South Bend, Indiana; Lampert Bemelmans Sculptor, Miami, Florida; John E. Nitchie, Westfield, New Jersey; Miss Hazel A. Tucker, Everett, Massachusetts; Albert C. Agnew, Bank Building, San Francisco, California.

$25 Awards: James Henry Cooke, P. O. Carmel-by-the-Sea, California; Carl H. Eggebrecht, Grand Rapids, Michigan; William A. Bein, New Haven, Connecticut; Wm. J. Jones, Seattle, Washington; George Gordon, Lakewood, Ohio; Arthur Johnson, Bay Ridge, Brooklyn, New York; Alfred F. Miller, Cleveland, Ohio; Paul Thomas Stockdale, Detroit, Michigan; Lester Beach Scheide, Inc., Hartford, Connecticut; Tom Appleyard, Grand Rapids, Michigan; Karl F. Conner, Ft. Wayne, Indiana; Andrea Louis Ricci, New York City; Samuel L. Meulendyke, New York City; Mrs. Margaret Swinger, Grand Rapids, Michigan; Richard H. Spessard, Schoolfield, Virginia; M. J. Oches, Cleveland, Ohio; Clara Fargo, (Mrs. Joseph R. Thomas), New York, New York; George Fraser, Providence, R. I.; John Norris Olsen, Burlingame, California; Warren T. Bartlett, North Brookfield, Massachusetts; Charles Bachmann, Philadelphia, Pa.; Adelaide M. Budington, Detroit, Michigan; J. F. Branagan, Buffalo, New York; Harold J. Thompson, New Bedford, Massachusetts; Carl Jensen, Cincinnati, Ohio.

) Harris & Ewing

RADIO BROADCAST

Vol. 4 No. 5 March, 1924

Broadcasting Complete American Programs to All England

How KDKA Programs on Only 94 Meters Were Heard in England Even Over Lowly Crystal Sets. What Broadcast Repeating May Mean

BY W. W. RODGERS

INTERNATIONAL broadcasting, three months ago only an imaginative theory, is now an actual fact, due to the great progress made in relaying or repeating broadcasts, by means of high frequency waves.

Short waves or high frequency broadcasts—both terms have the same meaning—have opened up a new field in broadcasting. The first test completed at the very start of the New Year open up possibilities that promise extremely rapid developments in 1924.

The first complete international repeating of concerts was accomplished by the Westinghouse Electric and Manufacturing Company coöperating with the Metropolitan-Vickers Electric Company at Manchester, England. There is a kind of unusual justice that KDKA, one of the pioneer broadcasting stations should be the first radio station to transmit concerts to England on a thoroughly accurate basis.

Radio moves so swiftly these days that events tread upon the very heels of one another. The transatlantic tests, sponsored by RADIO BROADCAST, the *Wireless World and Radio Review* (London) and the British Broadcasting Company used the old method of transmitting programs. These had hardly been completed to the satisfaction of the world, when this new scientific feat was accomplished and the latter was so much more satisfactory that there was hardly a comparison between the old method and this new method started by the Westinghouse Company. The old method of transatlantic reception, as all readers of RADIO BROADCAST know, is the same as receiving the concerts in the United States. The station trying to reach England sends out advance notices and then on a prearranged night sends its concert. Those on the other side, know the hour the concert will be broadcasted and listen patiently for the signals. Sometimes on favorable nights, the operator equipped with an extremely sensitive receiver will hear fragments of the concert, but he is never certain to get the signals. The drawback to this method is, of course, the fact that only a small minority of the people living in a country can hear these transatlantic signals because it is only the small minority who own high-priced, very sensitive receiving apparatus. The great mass of the people depend upon the one—or two—tube sets—the English call them "valves"—for the reception of the concerts.

No reception is certain by this method. The listener must be ruled by the god of static, and the good or bad genii of "conditions." It is at best a haphazard arrangement.

But now comes the perfection of the short wave, or high frequency broadcasts. The first announcement of the use of high frequency or very short wavelengths came late last year when Station KFKX, the first radio repeating station in the world, was opened at Hastings, Nebraska. This station is near the exact geographical center of the United States for the purpose of repeating the broadcasts of KDKA, at East Pittsburgh, Pa. It was built to bring the concerts of KDKA to the people of the entire country. The normal range of KDKA was greatly increased because of the repeating station, and the people on the West Coast, who heretofore, had not heard that station, except on very sensitive multi-tube sets, began to pick up Pittsburgh with average receivers.

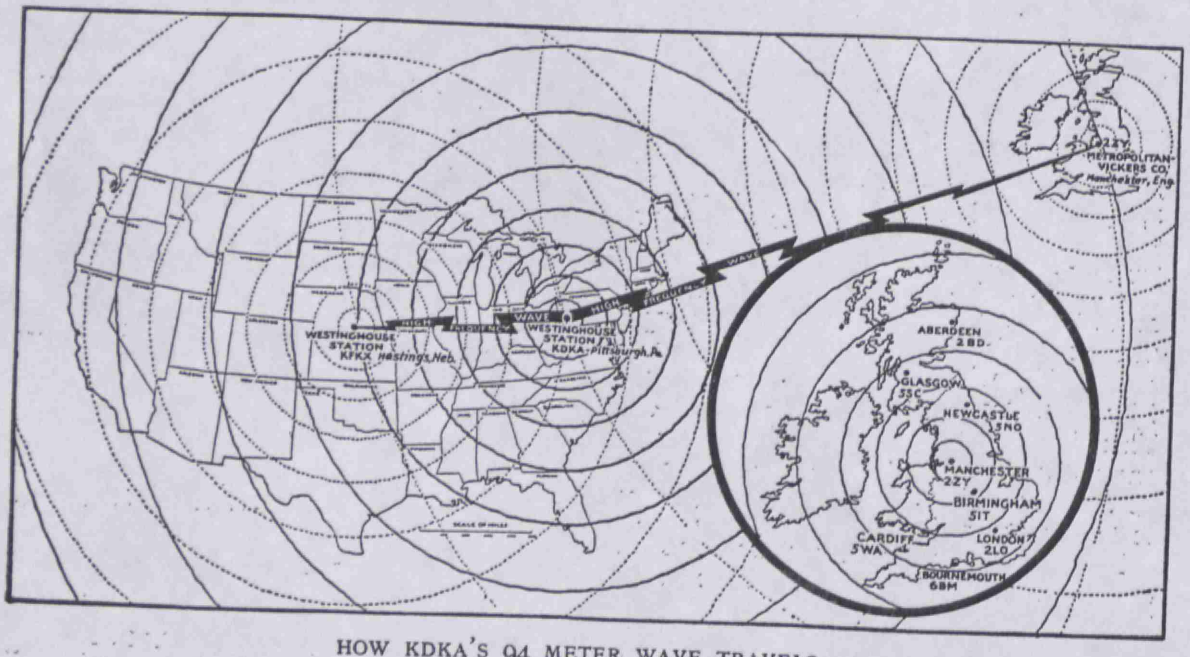
The same principle as used in rebroadcasting from KFKX at Hastings was used in the repeating of concerts in England. The same waves were used as were sent to KFKX, in fact the same transmitter broadcasting its very short waves to the Hastings, Nebraska station simultaneously carried the concert to England for repeating.

All this development in short wave application was accomplished in the last two years' experimenting with these short waves by Frank Conrad, assistant chief engineer of the Westinghouse Company. He had found in his experimenting that the short waves go farther with the same power than do the longer waves and had also made the revolutionary discovery that the short wavelengths were not affected by daylight in nearly the same degree as are the ordinary waves now used in broadcasting. Interference from other stations, of course, at that frequency, did not exist.

Thus, since a medium by means of which broadcasting could be carried on at great distances without interference was at the engineer's command, no barrier opposed international broadcasting. But the proper cooperation from the other side of the Atlantic involved many problems, which though not apparent to the public, took nearly a year to perfect. International broadcasting, brought to a climax with the New Year, really started early in 1922, yet so quietly were the developments made that, at the time of the trans-Atlantic tests last November, few in the broadcast world had even hinted at the possibilities of the repeating station.

HOW THE PLANS WERE QUIETLY MADE

IN THE summer of 1922, Mr. A. P. M. Fleming, manager of the research department of the Metropolitan-Vickers Electrical



HOW KDKA'S 94 METER WAVE TRAVELS

KFKX at Hastings, Nebraska, and the stations of the British Broadcasting Company rebroadcast the short waves with the regular transmitter so that any one with a simple receiver can pick the signals up

Company, visited the engineering department of the Westinghouse Company. During this visit, he talked with Mr. Conrad, Mr. Davis, and others of the officials interested in broadcasting and was told of the short wave tests and how this new medium promised great developments in the radio field. It was in a talk with Mr. Davis that the idea for this international broadcasting was started.

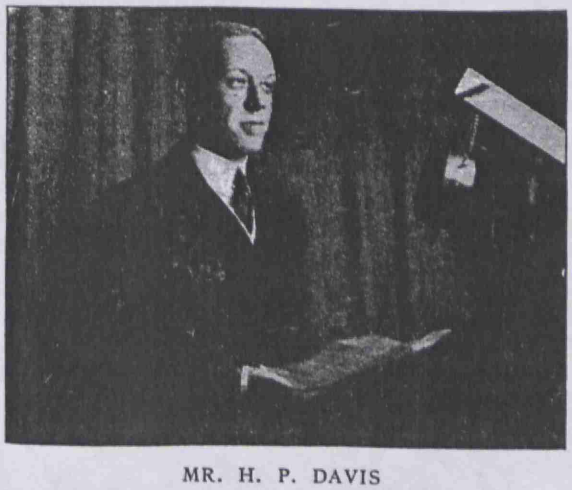
Mr. Fleming told Mr. Davis of the broadcast situation in England at the time and though the possibilities were there, the thought seemed literally and metaphorically a very ethereal subject because while the United States had been very thoroughly "sold" to radio broadcasting, in England the furore was just starting. The public had not caught the enthusiasm. Many of the English newspapers were even severely critical of the future of broadcasting.

Despite the uncertain broadcasting situation in England, the research department of the Metropolitan-Vickers research laboratories were at the time working on the radio problem and had high hopes for radio broadcasting in England. As a matter of fact, scarcely had Mr. Fleming returned when the radio storm broke and swept over England in the same manner it had swept the United States.

During the later months of organization, the British Broadcasting Company was formed, an organization which has a monopoly on broadcasting in England. The company is an association of manufacturers operating broadcasting stations. Those comprising the association of broadcast stations include the following—2LO, London, 363 meters; 6BM, Bournemouth, 385 meters; 5WA, Cardiff, 353 meters; 5SC, Glasgow, 415 meters; 5IT, Birmingham, 423 meters; 5 NO, Newcastle, 400 meters; 2AC, Manchester, 370 meters; and 2BD, Aberdeen, 495 meters. These stations besides operating independently of each other are also linked by land wire so that in the event of an important happening in one section of the country, the stations can be linked together. Simultaneous broadcasting from all eight stations occurred in RADIO BROADCAST's test of last November.

MR. FRANK CONRAD

Assistant chief engineer of the Westinghouse Company, who was largely responsible for the success of the short wave broadcasting



MR. H. P. DAVIS

Vice-President of the Westinghouse Company, before the microphone at KDKA where he sent New Year greetings to England at 7 P.M. on December 31, 1923. It was just midnight in England

This was the situation when the "Metro-Vick" Company began testing with East Pittsburgh on short wavelengths. After leaving America, Mr. Fleming had not been forgotten by the Pittsburgh broadcast officials and they were constantly in correspondence with him regarding the progress of developments with the high frequencies. After the success of the short wave tests in the United States, the English Company installed a private high frequency receiver in its plant at Manchester, England to test with the broadcasts of KDKA and particularly with the broadcasts sent to KFKX.

After many weeks' testing and frequent changes in the design of various units in the high frequency receiver, the results showed a stable reception and one that could easily be

"THIS IS 2LO, LONDON".
And Captain E. P. Eckersley, chief engineer of the British Broadcasting Company with a wavemeter and long wavelength pipe testing their radiated wave. 2 LO was one of the stations to rebroadcast KDKA's short wave program

placed on the air in England whenever desirable. So the Metropolitan-Vickers Company sent the program out through "Merrie" England and the European continent for the first time, December 29, 1923. The other seven British broadcasting stations were linked in by land phone with the result that all of them were broadcasting KDKA's concerts, a feat never before accomplished.

Of course, this wasn't the first time KDKA had been heard in England. As a matter of fact, KDKA has been receiving hundreds of letters from all parts of the world, telling of the reception of its concerts on its regular wavelength, but the receivers of these broadcast signals did it with multi-tube sets and then the reception at most was greatly dependent upon weather conditions and was quite haphazard. However, here was an actuality that gave every one in the ordinary broadcast range of the English stations, (which, by the way, are limited by law to an output of three kilowatts and which usually operate much below that figure), an opportunity to listen-in.

Knowing from the cables that passed back and forth between England and the American company that the proper time had come to exchange international greetings, arrangements were made to repeat KDKA's concerts throughout England through the Metropolitan-Vickers pick-up with Mr. H. P. Davis of the Westinghouse Company sending the greetings. Mr. Davis gave his New Year's greeting from the East Pittsburgh Studio of KDKA at seven o'clock, Eastern Standard Time Monday evening, December 31, 1923. Because of the difference in time—five hours—this was exactly midnight in Great Britain and Mr. Davis's speech was the first greeting received in the Old World from the New, for the coming year. Mr. Davis said:

"To the people of Great Britain in this New Year's Eve, I send greetings from America and express to you the wish of every American—that Great Britain and her European neighbors may enjoy a prosperous, peaceful, and progressive New Year.

"That the means of communication have been greatly advanced during the past year is fitly shown by the fact that I am able to speak directly to you, across an intervening ocean. This achievement will ultimately result in making known to you America's daily events and your every day happenings known to us.

"A year ago such an achievement seemed beyond belief. With such advancement in the radio art an established fact, no man dares predict what developments will take place before another New Year.

"It is a wonderful thing for the world—this achievement which enables the peoples of one continent to "listen in" on the activities of the peoples of another continent—for the friendship of nations is founded on closer understanding among the various peoples and in no way can different nations better understand each other and become more closely in touch with each other than by improved means of rapid and accurate communication.

"It is also fitting that Westinghouse Station KDKA, the pioneer broadcasting station of the world, should be the first station to develop a means for the repeating of its programs to you, the peoples of other continents, for it was here, and by this station, from which I am now

sending this message, that radio broadcasting was first undertaken. This feat is only another progressive step in the development of this great utility.

"On behalf of the people of America, it is my great privilege, therefore, for the first time in history, by means of the spoken word, to speak directly to you the wish for a happy and prosperous New Year."

The announcer at the time Mr. Davis spoke was an Englishman, chosen because of the fact that his decided English accent would be an added touch to the broadcasting. This announcer was Mr. Sidney Nightingale, who prefaced the speaker's remarks.

An aftermath of Mr. Nightingale's announcing came the next day in a message from his mother, Mrs. J. R. Nightingale of Manchester, England. This lady listened to her son's announcing 3,900 miles away. It is safe to say that a mother, any mother for that matter, after hearing her son's voice coming so far would feel quite proud, but she was particularly proud that her son's voice should be the first that came over from America to be repeated by these British stations.

So, just a year after a speculative talk in the offices of Mr. Davis at East Pittsburgh, the theory of the future had become the established fact and international broadcasting had become a scientific accomplishment.

For this rebroadcasting, KDKA transmits to England on 94 meters (3,200 kilocycles), the same frequency or wavelength at which it transmits to Hastings, Nebraska. The wavelengths of the English stations have been listed earlier in this article and are not important except as being a definite link between the 94 meters of KDKA and the broadcast listener of the Old World.

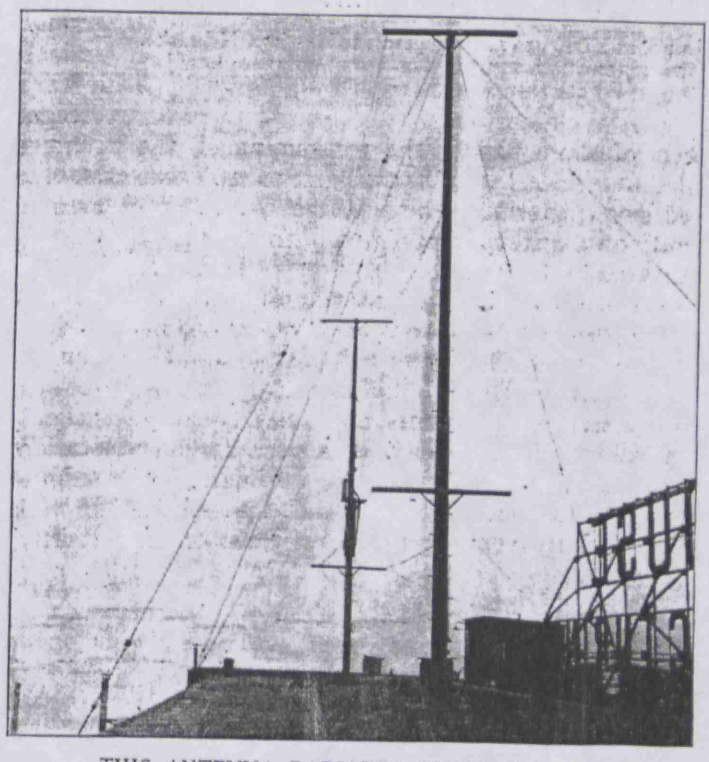
The antenna at East Pittsburgh used for this repeating radio transmission is not more than thirty-five feet long. This is much smaller than the antenna required for ordinary broadcasting. There are only thirty-five feet between flat top and counterpoise. The antenna and counterpoise consist of two small cages.

One of the difficulties of short wave broadcasting is that every precaution must be taken to prevent any outside influences, such as vibration, that would change the frequency. The vibration of the ground or the swinging of the antenna would serve to throw the set off its frequency. To guard against the possibility of swinging, the East Pittsburgh short wave antenna, including the flat top and counterpoise, are stretched between cross arms rigidly attached to the tower instead of the more common swinging spreaders.

The lead-in from the antenna to the counterpoise consists of copper tubing rigidly mounted on long high voltage porcelain insulators on the poles. The various inductances on the set are wound on rigid forms. Copper tubing is used to make all the connections.

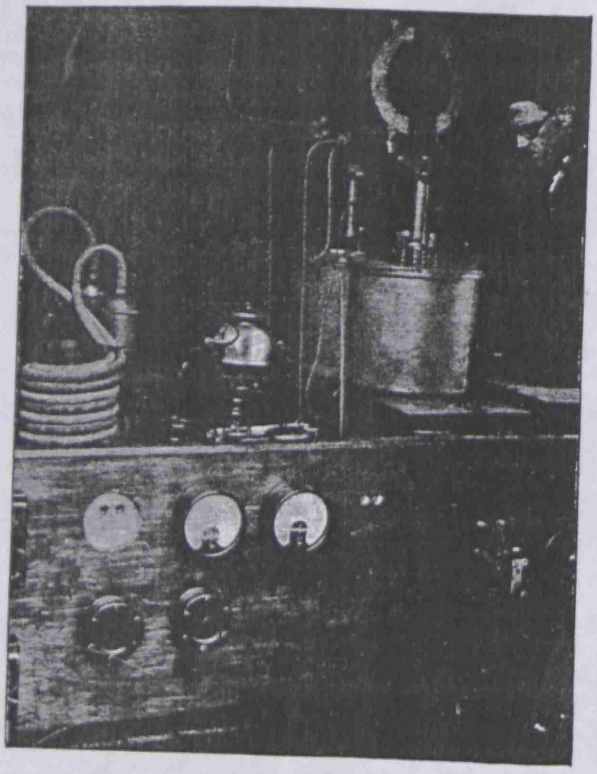
The short wave set at East Pittsburgh is located on the top of a nine-story building and is subjected to the usual jars. But the set is therefore suspended on a system of springs, and vibrations of the building cannot affect the operation of the set.

The transmitting set at East Pittsburgh con-



THIS ANTENNA RADIATES ON 94 METERS

And is only 35 feet long. Note that the spreaders are tightly fixed to the masts, in order to prevent any swinging of the wires and consequent slight variation in the radiated wave. This is the antenna used in sending to England and to KFKX, the "repeater" broadcasting station at Hastings, Nebraska



THE 94 METER TRANSMITTER
In use at KDKA to send programs to Hastings, Nebraska. The transmitter is supported on heavy springs so local jars will not change the wavelength adjustment

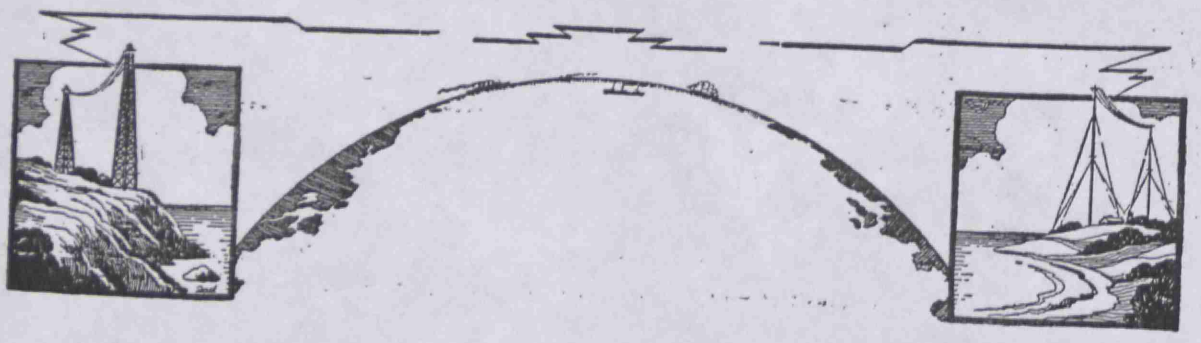
sists of three panels: the rectifier panel, the modulator panel, and the oscillator panel. The rectifier converts the high voltage A. C. current, obtained by stepping up the ordinary plant current supply to high voltage D. C. for the plate circuit. The modulator with its accessories impresses the voice frequency on his high voltage D.C. current before it goes to the oscillator. Finally the oscillator converts the high voltage D.C. currents into radio frequency, in which form it is delivered to the antenna.

Although this article tells primarily of repeating of concerts in England, that all the while that the very short waves of 3,200 kc. are going across the ocean to be received in Great Britain, similar waves are going out to Hastings, Nebraska, where they are being repeated through Station KFKX. Therefore, when KDKA goes into operation, with the repeating equipment in England and at Hastings, Nebraska, the station is covering nearly half of the world.

Not only is this an enormous scientific and engineering achievement but it is also a great step forward toward better international relations. By means of this amazing means of communication, the human touch is possible over thousands of leagues of ocean and it must prove a thing of inestimable good, bringing as it does whole continents into personal communication, which is bound to result in that better understanding so vitally necessary for any lasting peace.

C. W. Horn, superintendent of radio operations of the Westinghouse Company, a man who is very close to the broadcast situation, sees something significant in the English repeating. According to Mr. Horn it sounds the death knell of those stations who either can't or won't put on the air the best of programs. The pace that is being set is very swift and, Mr. Horn thinks, those who can't maintain it will fall by the wayside.

Significantly, the repeating of these English concerts brings to mind the remarks of Mr. Davis, one year and a half ago, relative to the broadcast situation. At that time he said that the only way to obtain the greatest possible good out of radio was to have a few modern powerful and efficient transmitting sets located in such manner as to serve various districts. Within these districts there would be located repeating stations which would repeat efficiently the concerts broadcasted by the central station. Developments of the last few months seem to indicate that this may be the ultimate in broadcasting and with events moving so swiftly, the new year may give the answer.



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Broadcasting Problems and Possible Solution Given by Radio Exper

cond of Two Articles Takes Up Restrictions.

LLS OF NEW IMPROVEMENTS

By C. W. HORN.
rintendent of Radio Operations, West ouse Electric and Manufacturing Co.

ere are, as mentioned previously, many radio broadcasting stations is country at the present time to it operation without considerable ference. The British, seeing the dle we have gotten ourselves into, taken precautions and have gone e opposite extreme. From informa- which I obtained I find that they license about eight stations for the ish Isles.

th the air having definite limita- , that is there are only a certain ber of wave lengths which can be , thus limiting the number of sta- which can operate simultaneously. solution must naturally then take form of restrictions. With restric- in force there must be a certain unt of discrimination by the au- ities in order that the public inter- may be protected.

e stations mose capable of furnish- good programs and those situated nters where talent is available must avored. Cities such as New York, ago, San Francisco, Philadelphia, burgh, etc., may be classed as ical centers and are also on the ing lists of all of the more promi- musical and artist's agencies. efore, the stations having consider- power and situated in these cen- are better able to supply the public of entertainment than a station ating a very poor wave and situ- in some rural place, or second city and which depends for its ic on the volunteer first depart- t band.

ould Compare Programs.

evidence, I would like to have the er compare the program being rad- l from New York and Chicago re one occasionally hears opera or inent artists as well as the speak- and entertainers at banquets of onal organizations, with the talent is broadcast from stations situated mall cities or towns. As there are a limited number of large cities in this country, surely not exceeding 25, special attention should be given stations located in these cities in order that they may make use of the available talent.

The apparatus in use to broadcast music or speech is rapidly undergoing changes and it is safe to state that any apparatus in use at the present day and considered very modern will be almost obsolete in six months. I will describe briefly some of the energy transformations which take place from the time sound energy is first picked up until it is reproduced at the receiving station in the head phones or loud speaker. The sound energy, as we all know, consists of vibrations in the air or a series of compressions and rarifications. These waves strike the diaphragm in the microphone causing it to vibrate, which, in turn, varies the resistance of the phone and thus changes the flow of current according to the sound waves. This is like our ordinary telephone. However, this energy is greatly amplified by means of vacuum tube amplifiers and then fed into the modulators or high powered vacuum tubes which are so designed that they will change their resistance according to the electric current which comes from the microphone.

Produces Change.

These modulators are connected to the oscillators or the tubes which generate the high frequency carrier energy which makes possible, radio telephony. The modulators are so connected to these oscillators that any change which occurs in the modulator will produce a corresponding change in the oscillator and also in the carrier wave. The carrier wave is then said to be modulated and this wave radiated in all directions from the transmitting antennas and is picked up by the antenna attached to the receiver. A current is thus caused to flow in the receiving antenna, particularly when it is in resonance or, as we say, has the same electrical length or is tuned to the tarnsmitted wave. This energy is detected, in the more modern sets, by vacuum tubes and then usually amplified in order that it may operate a loud speaker.

Through each stage this energy has been taken it is constantly undergoing some change or other. At one instant the energy is all electric and at another it is all magnetic. It is stepped up and stepped down and transformed in order to overcome some local difficulty in order to overcome some local difficulty. The general result is as we hear it and it must be admitted that it is pretyty good for we have been taught that nothing is perfect and there is a little loss whenever energy is transformed from one kind to oanother.

Most Inefficient.

Each individual piece of apparatus used in radio has distinct characteristics. Take for instance a microphone used to pick up sound energy. There are microphones on the market which will pick up certain notes better than others and I might state that the microphone is one of the most inefficient pieces of apparatus used in the entire broadcasting station. Likewise, loud speaking telephones are by no means perfect. On both of these pieces of apparatus much development work is required and is being undertaken. Gradually defect after defect is being removed from each individual piece and in the end all of these will be standardized very much in the same manner that the automobile or other mechanical or electrical equipment has become standardized.

I have mentioned before that we are at the present time in a very unhappy state in radio broadcasting due to overcrowding and the desire of so many stations to use the aid of publicity or some other selfish purpose. I have a suggestion to make at this time and it may appear somewhat drastic, but I believe that the time is ripe for drastic action. If the White Bill, which passed the House and which was anchored in the Senate ever should become a law the department of commerce would have authority to more closely regulate this activity and some relife can be hoped for. However, unless very unwisely administered and a very fixed and definite plan is adopted, this added authority will help very little.

Has Broadcast Plan.

My suggestions for a plan of action is as follows: Determine by means of an engineering commission the number of stations that can operate simultaneously on different wave lengths without undue interference. Then very carefily allocate these stations throughout the country, paying particular attention to the large cities. The cities of obtaining talent, such as New York and Shicago, should be permitted to have at least four stations, each operating on a separate wave length. These stations snould all be allowed to make use of considerable power and in fact should be required to use fairly high power in order that listeners at distant points can pick them up. These stations, which no doubt will number about 25 or 30, should be called national stations and their programs accordingly should be well balanced and not too muc local interest.

All the other broadcasting stat should be put on a number of f wave lenghts and permitted to go something like that which is going now on 330 and 400 meters. In o words, a few special waves stay some particular wave or group of wi which could be assigned them.

The reason for the above plan i try to approach the ideal as nearl it is possible to do this. In my esti tion, the ideal condition would be under which it would be possible the average person to turn his dia a fixed point and know that he w be able to pick up a certain sta without interference. Should he find that the broadcasted materia such as to be uninteresting to him could then turn to some other sta and pick that one up, again without terference. If he is interested in l affairs or in a local program he c tune down to that particular stat but he is in no wise bound to liste one station to the exclusion of all oth It is realized that this is a somew idealistic state of affairs and a cer amount of improvement in receiving paratus will no doubt have to brought up before this can be acc plished.

Must Be Flexible.

With the situation in the hands of proper authorities with plenty of po to enforce regulations and with a c mission of recognized experts and gineers to advise on what is desir it is believe that the chaotic condi now existing can be greatly impro Whatever law is enacted must be fl ble enough to be changed within a y as the progress of radio developmen very rapid. For this reason also gi care should be exercised in order to those who are helping to develop science as great leeway as possible

Radio telephony has been develo entirely by engineers and there is n ing of accidental discovery about As an example I might mention tha Station KDKA of the Westinghc Company diffefrent grounds of en eers are engaged on different proble Dr. Thomas has been investigating crophones and has developed a mi phone which is aradical departure f all others in that it makes use of diaphragm. Another group is in sively engaged upon vacuum tube de opment and almost every week or parts of the broadcasting transmi are replaced with improved appara This is only possible because of large laboratory facilities and the staff maintained by this company.

Westinghouse Furnishes Feature for Electrical Show

NO doubt many of us attended the Pittsburgh Electrical Show held in Motor Square Garden November 4 to 11.

One of the features of this show was its connection with the Westinghouse Radio Station KDKA, by means of which features were broadcasted to all points of the country. A glass booth was erected in which prominent speakers addressed the crowds, but although they were in plain view of those attending the show, not a word spoken by them was heard until it had first travelled to Station KDKA, East Pittsburgh, and from there was broadcasted, being received by those in Motor Square Garden by means of radio receivers and loud speakers distributed about the building.

On the evening of Election Day a complete radio wedding was broadcasted in this manner, and it is reported that from five to six thousand persons were turned away from the Show because the building was packed early in the evening by those who wished to see this unique ceremony.

The contracting parties were George Albert Carver, Swissvale, Pa., and Bertha McMunn, of Pitcairn, Pa., and the ceremony was performed by the Rev. J. Hankey Colcaugh.

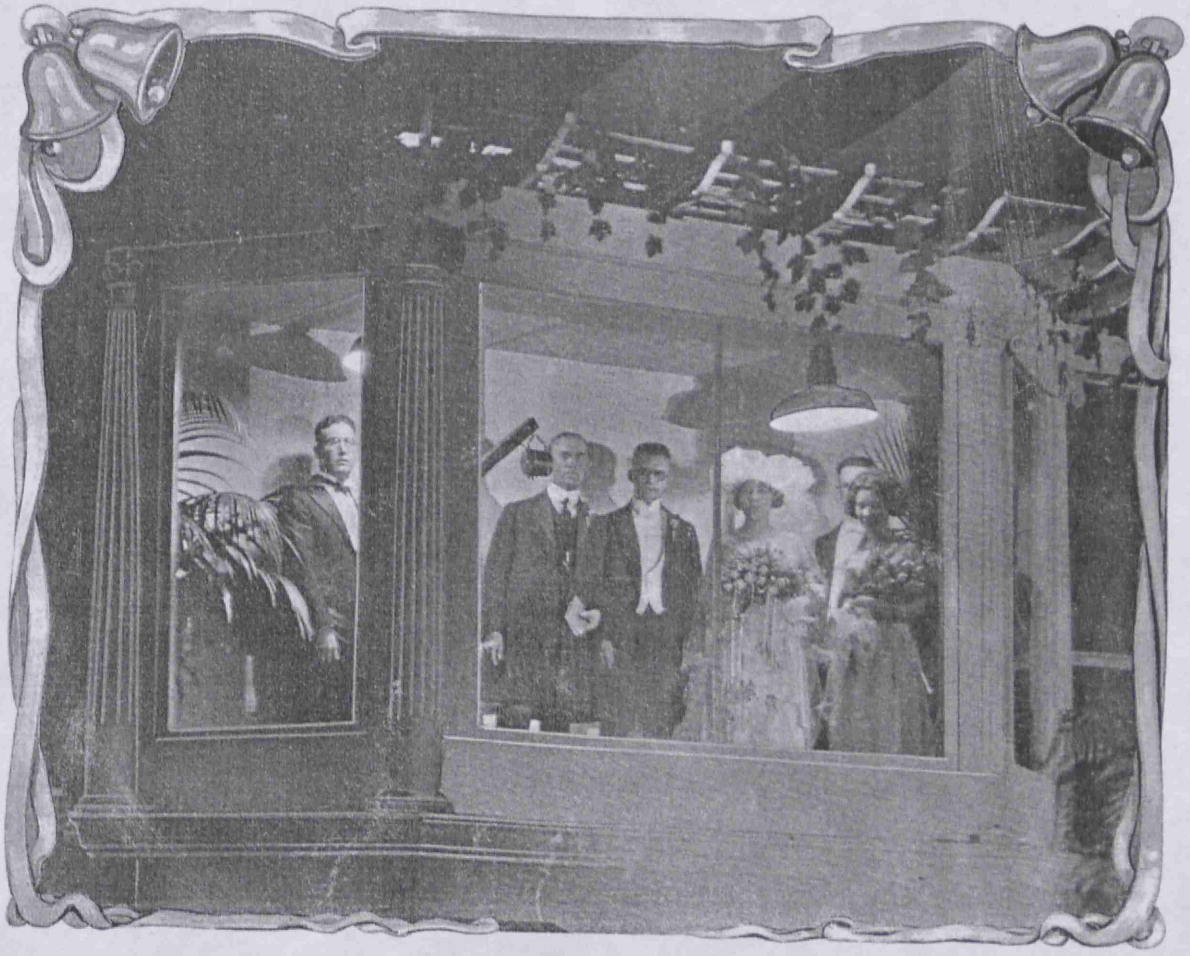
Another attractive feature of the show was the Electrical Home, which showed in such a convincing way the many services which can be performed by means of electricity.

As giving a glimpse of the history of the Electrical Industry, and touching upon the part our Company has taken in its development we are repeating, on page 4, the address of A. W. Thompson, President of the Philadelphia Company, which was delivered from the glass booth mentioned above.

Appreciation

Many letters are received showing appreciation for acts of kindness during sickness and death in the families of our employes. Obviously we cannot publish all of them, so this column has been established for listing names of persons who wish through the News to express such appreciation.

Mr. P. Green, Sec. W-11 and family; Mr. H. T. Swan, Sec. W-10; and Charles Nicol, Sec. W-11.



Radio Wedding at Pittsburgh Electrical Show. Officiating Minister, Rev. J. Hankey Colcaugh; Groom, George Albert Carver, Swissvale, Pa., Bride, Bertha Annie McMunn, Pitcairn, Pa. At Left of Bridal Party, L. H. Rosenberg, KDKA Representative

Address by Arthur W. Thompson at Pittsburgh Electrical Show

Ladies and Gentlemen in the Motor Square Garden and Radio Fans Listening In:

THE ever-unfolding wonders which are being accomplished in the world of electricity fascinate me, yes, thrill me. I count it not a mere honor that I should have been chosen to deliver the opening address at this greatest ELECTRICAL EXPOSITION, but an opportunity which is seldom presented to one.

To those thousands of people who are listening to my voice as it is broadcasted through the air to all parts of the country, I extend greetings on behalf of these Pittsburgh business men who have spent so much time and energy to make this exposition a success and to whom belongs great credit. The fact that you are listening indicates your interest, not in my talk, but in this Giant which has been harnessed to give not only comfort and luxuries, but necessities of life: LIGHT —HEAT—POWER.

The most important developments in human progress since the middle ages have been the discovery and application of the power of steam and electricity. Each of these discoveries applied latent forces of nature to transportation and industry. The many applications of steam to productive effort pointed the way for our twentieth century application of electricity.

Thirty years ago was the beginning of the application of electrical energy to industry and transportation. Not until 1895 was the first electric power transmitted commercially from Niagara Falls.

Since 1900 we have seen this giant energy, ELECTRICITY, become of greater service to human activities than any other manufactured product. This power, obtained from natural sources, has lightened the tasks of millions of men and has made life as we know it, not only more comfortable but possible. Along the thin wire speeds energy capable of producing greater power, greater light, or greater heat than any other known earthly force.

The purpose of this Electric Exposition is to exhibit, under one roof, not all but many of the uses to which this greatest servant, Electricity, is being put today Some of the things which are shown here tonight as rarities will perhaps be necessities within a short space of time. Such is the progress that has been made and is being made in the industry.

When we consider that only forty years have passed since Thomas A. Edison started the first central station in the world for the generation of electrical energy, it is not difficult for us to imagine miracles in the future. It was on the fourth of September 1882 that this first start of what has since become a mighty industry, was begun. Mr. Edison's little plant was on Pearl Street, in New York City, and furnished illumination to a comparatively small number of customers, having only a few hundred lamps within a district comprising less than one square mile. The central station electrical company of Pittsburgh supplies more than 1,000 square miles. That was the beginning and the world will always be grateful to the youthful inventor and builder for his genius, ability and persistence in overcoming difficulties which must have seemed unsurpassable. This was the foundation of the General Electric Company.

Five years ater, our own late fellow townsman, George Westinghouse, started his little power plant in Garrison Alley, near where I am now speaking, and lighted four hundred lamps in a building in Lawrenceville four miles distant. That was the first successful transmission of electrical energy for any considerable distance through the medium of alternating current, and was the beginning of the Westinghouse Electric and Manufacturing Company.

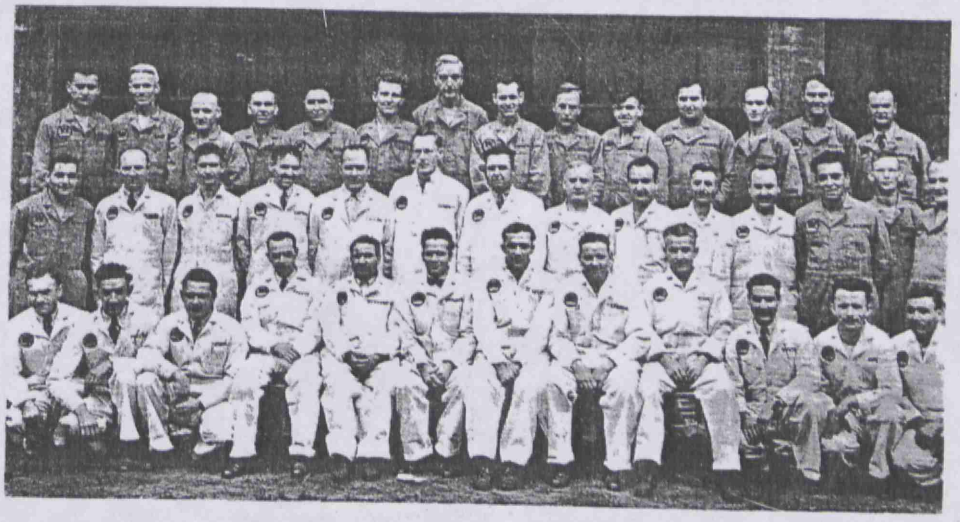
This early but modest beginning of Mr. Westinghouse in electric lighting in Pittsburgh revolutionized the applications of electricity and helped make possible this tremendous electrical development and transmission of this energy for domestic and industrial uses. What a wonderful step from those four hundred electric lamps to the tremendous electric furnace, of which there are such a large number in this district today. It is interesting to note that one electric furnace uses enough electrical energy to light the streets and homes of a city of twenty thousand people.

The immense central power plants developed at the mouth of coal mines, so near the heart of this great metropolitan center, together with the growth of turbines and generators by the electrical industry, as well as the development of electrical appliances for making lighter the burden of the house wife, all gain the admiration of our countrymen.

Before going further I wish to call your attention to how appropriate it seems that the words I am now uttering marking the opening of this exposition in the ELECTRICAL AND STEEL CITY should be sent by wireless, from the broadcasting station of the Westinghouse Electric and Manufacturing Company. That great company, managed by men of genius, foresight and courage, has contributed largely to the perfection of the apparatus for the production of electrical current

You have all seen, or read about, the great searchlight of the General Electric Company which, from its place on the roof of this building, is lighting the heavens

NATTY ENOUGH FOR THE MOST DISCRIMINATING



These lads aren't internes at some hospital; they're employes in Sections ZX-1 and Z, and they wear these natty coveralls while they work. Jess Reed, at the extreme right in the middle row, is almost out of the picture.

Station KYW Now Located at Philadelphia

Pioneer Station of Middle West Moved after Thirteen Years at Chicago . . . New Station Dedicated by Five-Hour Program

"Westinghouse Station KYW, Chicago," signed off for the last time on December 2, and "Westinghouse Station KYW, Philadelphia," opened on December 3.

Located just outside Philadelphia, the new KYW was dedicated by means of a five-hour program. The Honorable J. Hampton Moore, Mayor of Philadelphia, with a welcoming address, preceded the principal speakers. They were: A. W. Robertson, Chairman of the Board of the Company; Richard Patterson, Executive Vice President of the National Broadcasting Company; and Thaddeus Brown, of the Federal Communications Commission.

John S. Royal, Vice President of the National Broadcasting Company, was there, as were Dr. Leon Levy and Isaac Levy, of the Philadelphia Broadcasting Company.

Some of the Westinghouse officials present at the dedication were: Dr. S. M. Kintner, Vice President; Walter C. Evans, Manager of Radio; S. D. Gregory, Assistant to Manager, Radio Division; E. W. Loomis, Manager of the Middle Atlantic District; George Maertz, Sales Promotion Manager, Middle Atlantic District; and E. F. Sells, Manager, Washington Office.

Exemplifying the technical perfection of modern radio engineering, the new facilities of Station KYW reveal the fullness of Westinghouse engineering experience in the field of broadcasting. The architecture of the transmitter building is Pennsylvania Colonial. This is the first time in broadcasting history that a transmitter of fifty kilowatt maximum rating has been so designed that its size is suitable for a building of this style. Two innovations that resulted in saving much space were the use of extremely compact nitrogen-filled radio condensers for the power amplifier, and a new design of high voltage rectifier capable of delivering 12,000 volts, seventeen amperes d-c.

In order to attain the highly directional control of the broadcast necessary to assure best reception in Philadelphia and vicinity, and to minimize interference with other radio stations, a distinctive type of antenna construction has been developed. Four vertical antennae, each consisting of a two-hundred-foot tubular steel mast mounted on a forty-five foot wooden structure and connected separately to the transmitter, permit exceptionally accurate control of the area covered by the broadcast. No antenna wires are strung between the masts and no guy wires are required.

When entering the station building, one is impressed with the quietness of operation, as the usual roar of motor-generator sets found in broadcasting stations has been eliminated. A feature of this new station is the fact that the filaments of all transmitting tubes operate directly from alternating current; thus dispensing with the need for rotating equipment. This advance has been made possible through the development of the Westinghouse "magnetron suppressor," eliminating entirely the noises which heretofore have prevented the use of alternating current for filament operation.

Like other broadcasting stations, KYW is required to maintain its assigned frequency (which is 1,020 kilocycles) within arange of plus or minus fifty cycles. To accomplish this, a quartz crystal plate about one inch square is used to generate the radio frequency oscillations, the feeble oscillations of which are amplified in the transmitter. The oscillator unit in which the quartz plate is held is a new Westinghouse development containing many refinements that limit the variation from the assigned frequency to less than five cycles. The quartz plate is maintained at a constant temperature through the use of mercury thermostats, and the complete oven is contained in an aluminum casting, making the unit free of all interference from external circuits.

In controlling the purity of broadcasting waves, it has been customary to rely on decibel-meter readings, but Station KYW has incorporated, in addition, a more accurate means to insure the truest tone control possible. On the monitor board is an eight-inch opaque glass dial on which, through the use of an oscilloscope, is reproduced the exact shape of the waves broadcast.

This indicator enables the operator to visualize immediately any variation from predetermined limits. A similar dial on the graphic-meter panel indicates visually the phase and amplitude relationship of the current going to each of the four antenna masts, giving the operator at all times a true picture of the area being covered by the broadcast.

E. H. Gager has been appointed plant manager of Station KYW, Philadelphia. For the past several months, Mr. Gager has been in charge of the construction of the new station. He will have complete technical supervision of the studio and station, and

(Continued on next page)

How Westinghouse Announced Harding's Election

OUR Company succeeded in making many new friends by the efficient manner adopted for announcing the results of the national election.

Perhaps some of us have not noticed the radio aerial on top of the K-Building, but a glance in that direction will show the antenna of our wireless station.

The returns were received by telephone from a Pittsburgh newspaper, and were then sent out by wireless telephone. So rapid was the service obtained by this method that the receiving operators were able to get the returns exceedingly fast. In some cases they were heard even before they were received by special telegraph wires. During the intervals between returns phonograph music was played and those amateurs having loud sounding horns or two-stage amplifiers were able to throw the music over large rooms. Also two banjo artists were present and rendered very good banjo selections.

Not only in Pittsburgh were the returns heard, but in many towns in Ohio, Pennsylvania and West Virginia the messages were heard with equal clearness. Letters are still being received from operators from many miles around thanking us for giving the returns so promptly.

In Vandergrift, Pa., slide bulletins were shown in the street for the benefit of hundreds of people there, the news being shown from ten minutes to a half hour before they were received by means of an auxiliary telegraph wire between Vandergrift and Pittsburgh. In addition, the wireless set was connected by means of a cable with the local telephone exchange, and the wire chief sent the news directly to subscribers who had arranged beforehand for the service, and also gave the results to any one making inquiries.

At Latrobe the messages were utilized in a similar manner, thus enabling large crowds to get the messages early.

At Irwin a large hall was filled to its capacity to hear the results of the election, motion pictures being shown throughout the entire evening.

Not only in the immediate vicinity of Pittsburgh were the returns as sent from the Westinghouse Plant heard, but throughout Ohio and West Virginia they were heard with equal clearness.

Also in Pittsburgh the radio method of sending returns was utilized in two ways. Persons having simple sets did not need to leave their homes to receive the returns, and by means of sets installed in a number of clubs throughout the city, large assemblages were able to have social functions at the same time as receiving the returns. At the Edgewood Club in particular a loud sounding horn was in use, and people could hear all over the large ballroom the voice of the speaker at East Pittsburgh as transmitted through the radio apparatus.

At the same time the wireless telephone was giving this news to radio operators hundreds of men and women were receiving up-to-minute election returns in the auditorium of the cafeteria. As early as 8:30 in the evening announcements were made from several states as to how the election was going. The plan used to inform the people was very unique and thorough. As the returns were received they were thrown on the screen from the motion picture booth.

It was possible to receive the very latest returns through the cooperation of the wireless telephone service.

When returns were not being announced, a splendid entertainment program was in progress, consisting of music by Gill's Orchestra, motion pictures at intervals, vocal solo by Miss Ada France, vocal duet by Misses Ada and Agnes France and vocal solos by Miss Laura Atkin, Miss Anna Chilcote, George E. Kellogg and Fred Ward. Miss Julia Bartletti, pianist for the Community Chorus, accompanied the singers. The master of ceremonies for the occasion was A. S. Duncan.

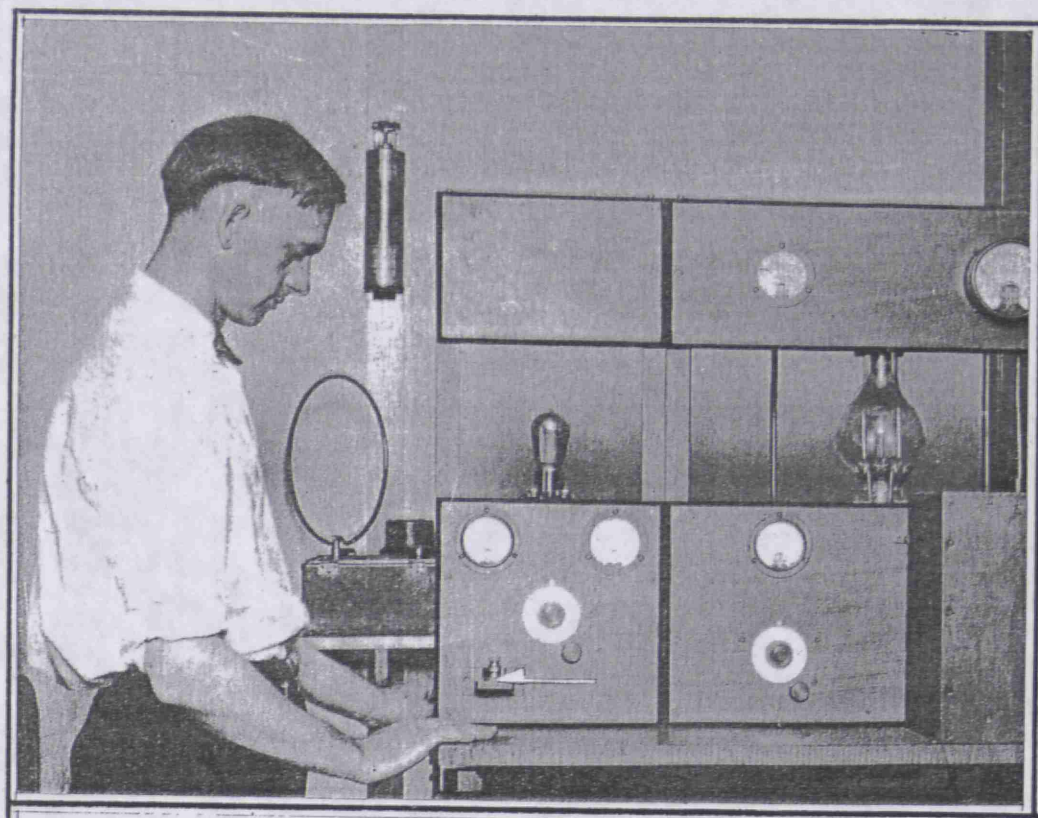
You Can Make Others Happy if You Have a Record or Two to Give Away

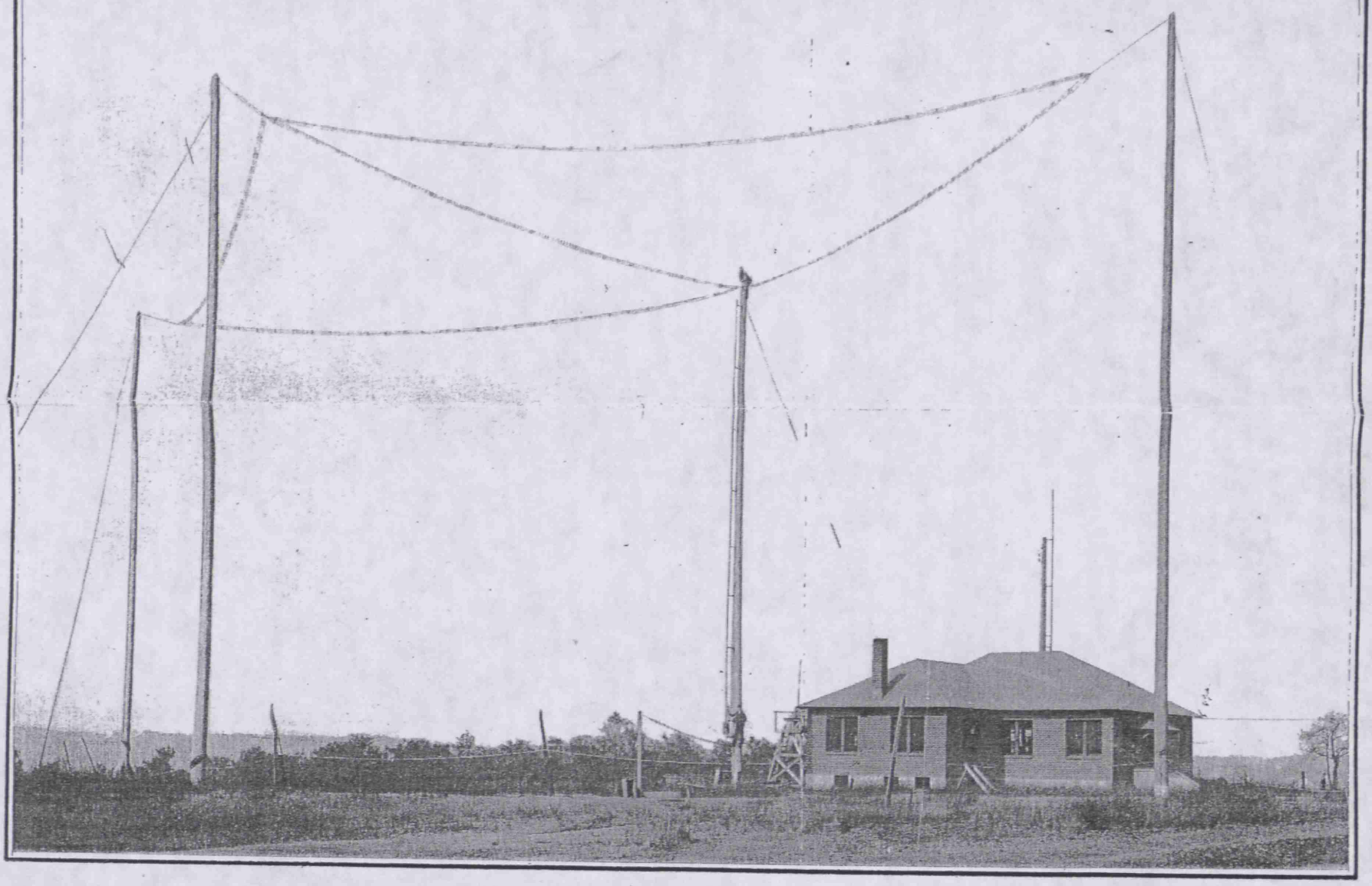
Almost everyone has a Victor or Columbia record in his collection that he is tired of, and would give away if he knew that it could be used to good advantage. Here is your opportunity to dispose of some of your records, which will be used to make the sick room a little more cheerful at the State Tuberculosis Sanitariums.

There are about twenty-five employes of our Company and many other patients at the sanitariums whose stay you can make happier by furnishing them with music. Look over your stock of records and if you can donate one or two, leave them at the Relief Department for distribution to the various sanitariums.

It's easy enough to be pleasant
When your engine goes with a hum,
But the man worth while
Is the man who can smile
When the darn thing goes on the bum.

Piezo Crystal Sets K D K A's Wavelength





Top, Left: The arrow marks the point at which the piezo crystal is installed in KDKA'S transmitting equipment.

Top, Right: The crystal is dwarfed in size by the 10 kilowatt transmitting tube, held by H. W. Arlin, pioneer Announcer of KDKA.

Bottom: General view of antennae at KDKA and the radio experimental building wherein is contained the long and short wave broadcasting equipment of the station.

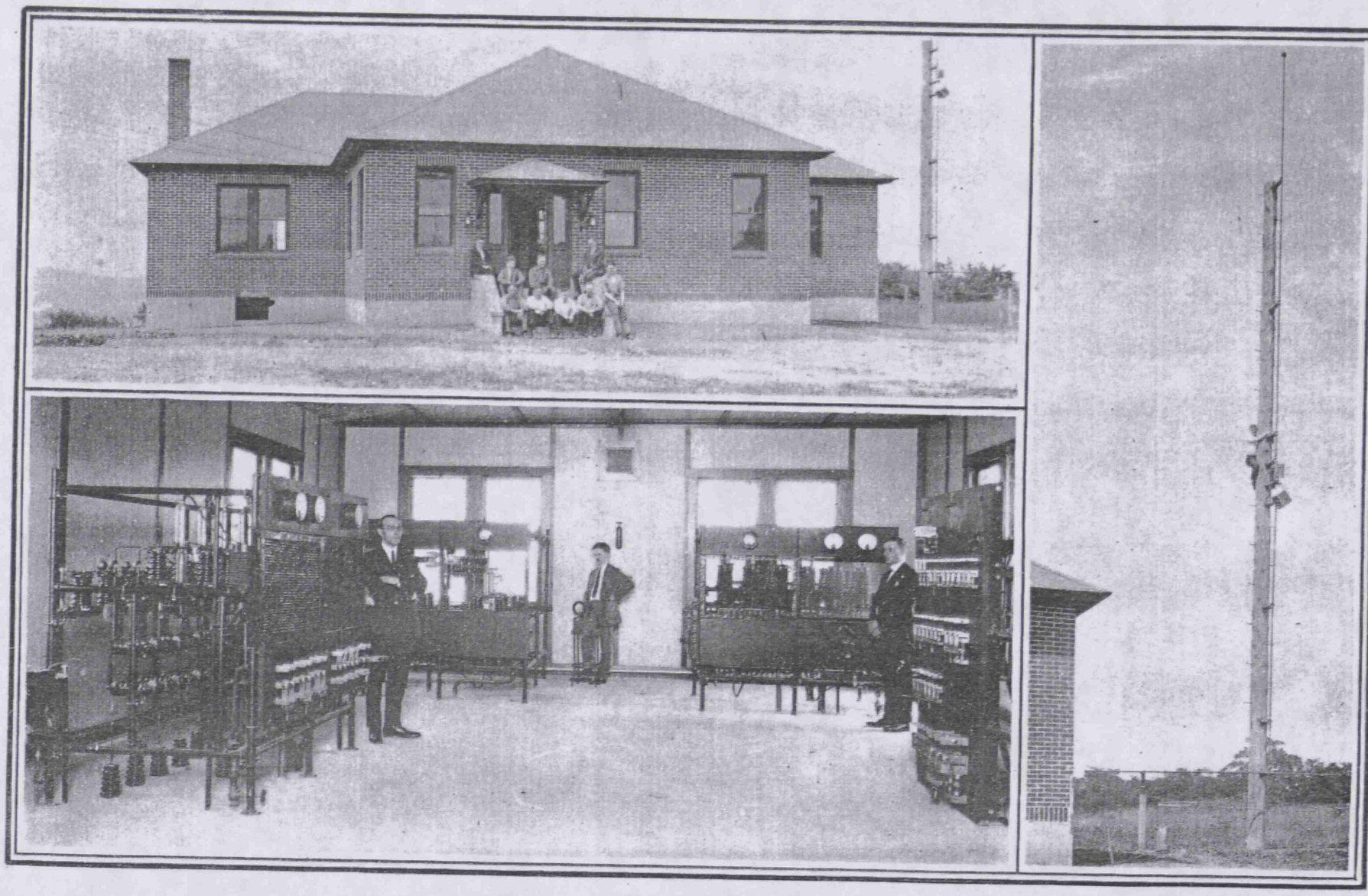
A Piezo crystal, ground to a certain size and form and placed in a specially designed transmitting circuit automatically holds KDKA unvaryingly on its assigned wavelength.

Such crystals have been in use experimentally for months on the KDKA short wave set, a type of transmitter on which constant frequencies must be maintained. After preliminary tests on the short wave transmitter, the crystals were installed in the long wave set. The other Westinghouse broadcasting stations, KYW at Chicago; WBZ at Springfield, Mass., and KFKX at Hastings, Neb. will be similarly equipped.

The size and shape of the crystal governs the wavelength or frequency of the transmitter and holds it constant. It is expected that one of the most frequent causes of program signal distortion, caused by stations deviating from their assigned wavelength and so interfering with each other, will be eliminated by a general use of piezo crystals to fix the wavelength of broadcasting stations.

Westinghouse Picture News Service.
Electric & Manufacturing Co. East Pittsburgh, Pa. Number 2533

Westinghouse Short Wave Station Housed In New Radio Experimental Building



Top:- An exterior view of the radio experimental building in which is located the short wave transmitting equipment of station KDKA.

Bottom:- Interior views of transmitting equipment, including rectifier, modulator and oscillator panels.

Right:- New Vertical type antenna perfected by Frank Conrad, assistant chief engineer, Westinghouse Electric & Manufacturing Company, which has proven to be the most perfect type antenna for short wave transmission.

Throughly aware that short-wave or high-frequency wave broadcasting will bring forth the greatest future developments in radio broadcasting, the Westinghouse Electric & Manufacturing Company has completed and has been operating some months now a new specially-designed radio experimental station , erected at a cost of several hundred thousand dollars.

The new building is a one-story concrete and brick structure located on the Greensburgh Pike, about a mile east of the Westinghouse Company's East Pittsburgh Works. The site chosen is within a few feet of being the highest spot in Allegheny county.

The control and transmitting apparatus is located on the main floor of the building. All bulky apparatus such as transformers, motor generator equipment, filters, chokes and other equipment is located in the basement. Power is brought into the basement through underground ducts from two separate sources both of which are 4,000 volt, three-phase, 60 cycle. Available power supply is in the neighborhood of 250 killowatts.

All transmitting equipment is of the most modern design, including water-cooled tubes, panel-mounted equipment with every part easily available, remote control, paralleled transmitting tubes, indicating and modulation meters, etc.

One of the striking features of the station is the new type antenna, consisting of 60 feet of vertical copper tubing. Daylight transmission heard in Argentina is an eloquent tribute to the effectiveness of this type of antenna.

Westinghouse Picture News Service.
Electric & Manufacturing Co. East Pittsburgh, Pa. Number 2427

BROADCASTING Stations

(Left) The transmitting staff at WBZ entertained that station's NBC staff at a corn roast. Cy Young, Office Manager, is shown doing the culinary honors, while the fair sex laugh—with him, we hope! Fred Cole gives the "chief" some moral support.

(Above) When we told Maury Cross that his picture was going to appear in the *Magazine*, WOWO's young maestro did his best to look proud! Maury is kept busy, either practicing with his orchestra or doing a little transposing.

(Below) A view of the master control room of WOWO doesn't always include Glen Thayer, one of our "operating geniuses," but it does this time. Here he is!

(Left) A. E. Nelson, new General Manager for NBC at KDKA, was one of the founders of WIBO, in Chicago, in 1923. Many famous entertainers got their start at WIBO, when Mr. Nelson was Manager. The list includes: Fibber McGee and Molly, Eddie and Frank Cavanaugh, Ted Fiorito, Art Kassell, and Mark Fisher.

(Right) "The Westinghouse Smiles Revue" is heard every Thursday evening at 7:30, over KDKA. The program advertises Westinghouse refrigerators. Left to right: George Heid, Miss Mildred Lawson, Pat Haley, and Miss Lottie Lawson. From the beginning until it closes the program is "all smiles."

(Below) Bill Hauser, Chief Operator at WBZA, visited his "old home town," Marshalltown, Iowa, in September. Bill drove to Buffalo, took a boat to Detroit, and drove from there home.

(Left) A. H. Morton, Manager of NBC-managed and -operated stations, wielded the trowel at the cornerstone laying of KYW's new building. Left to right: Leslie Joy, General Manager of KYW; Mr. Morton; and E. H. Gager, Plant Manager, KYW. Executives from Westinghouse, NBC, and RCA attended the ceremony. The building, on Walnut Street in Philadelphia, will be completed this year.

PANEL LAYOUTS FOR "MAKING WAVES - PITTSBURGH'S PIONE

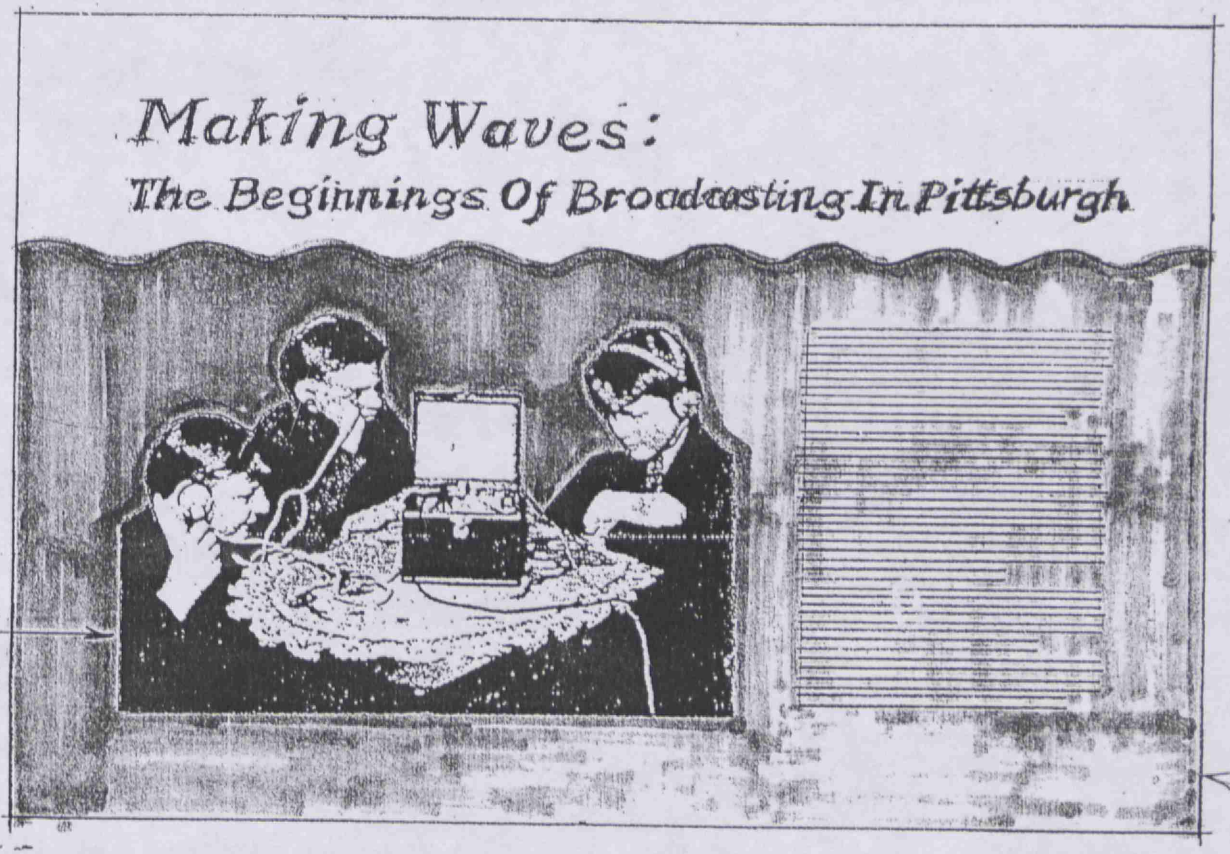
ALL HEADLINE TYPE: SOUVENIR DEMI ITALIC

~~2½" CAP HT.~~

1¾" CAP HT. U/L CASE

BODY COPY TYPE: SOUVENIR LT.

30" X 36" PHOTO BLACK & WHITE ENLARGEMENT TO COME FROM WESTINGHOUSE)



(I) - INTRO PANEL 4' X 6'

Match Phts 1384 OR 1434

(II) FESS

Photo #13 Ask Charlie Ruch!
Not same photo - C. Ruch will keep looking!

Westinghouse Station at Hastings, Nebraska, Opens New Era in Radio Broadcasting

First of Its Kind in the World

HASTINGS, NEBRASKA, is the place selected by our Company for the location of its first radio repeating station to serve as the connecting link of the pioneer station—KDKA—with the people living on the Pacific Coast and also the citizens of the western states.

The installation of the Hastings station KFKX, as its license reads, means that broadcasts from station KDKA, will be picked up as easily and with the same apparatus in the furthest western states, as KDKA's broadcasts are now received by people living a few hundred miles from East Pittsburgh.

The repeating station marks a great forward step in radio, almost as great a stride in radio progress as was made when our Company first started radio broadcasting with the establishment of its world's pioneer broadcasting Station KDKA, in November, 1920.

Always a pioneer in radio, our Company, because of its engineering genius, has now removed the limitations of distance in the broadcasting of programs. The transmitting station at KDKA is as fine and as modern as radio engineers can make it. It is possible to receive KDKA all over the country, but, naturally, the greater the distance away from the station, the more sensitive must be the apparatus. To pick up KDKA in California, for instance, requires very sensitive, high-priced apparatus. Recent developments perfected by our engineers have made it possible to rebroadcast or repeat KDKA's concerts from Hastings, which will serve as a booster station to points on the Pacific Coast. Thus the same simple apparatus which can be used on the Pacific Coast to pick up local broadcasts can also pick up the repeated program from KDKA.

The station at Hastings is one of the marvels of the radio engineering world.

KFKX can receive broadcasts sent from KDKA on 3200 kilocycle frequency (94 meters) and transmit direct to its territory on 1050 kilocycles frequency (286 meters) which is its assigned broadcasting wave-length. It can transmit also its own broadcasts from a local studio on 1050 kilocycles, for the benefit of the people living in its territory, or westward to the Pacific Ocean.

KFKX can also receive broadcasts from KDKA on, say 3200 kilocycle frequency (94 meters) and repeat the same broadcasts to other transmitting stations located on the Pacific Coast or elsewhere on 2800 kilocycle frequency (107 meters). Both these frequencies are much higher than are used in radio broadcasting and will not interfere either with radio broadcast traffic or amateur traffic. Thus it seems quite possible to repeat the programs of a single station so that they can be heard all over the country.

For this repeating, two special transmitters are required, with special receivers to receive the high frequencies.

A feature of the high frequency broadcasters is the short antenna used. The antenna at Hastings and at East Pittsburgh are not over 35 feet long. This is much smaller than the antenna required for ordinary broadcasting. There are only 35 feet between flat top and counterpoise. The antenna and counterpoise consist of two small cages.

One of the difficulties attendant upon high frequency broadcasting is that every precaution must be taken to prevent any outside influences, such as vibration, that would change the frequency. The vibration of the ground or the swinging of the antenna would serve to throw the set off its frequency. To guard against the possibility of swinging, both the East Pittsburgh and Hastings high frequency stations antennae, including the flat top and counterpoise, are stretched between cross arms rigidly attached to the tower instead of the more common swinging spreaders.

The down lead from the antenna to the counterpoise consists of copper tubing rigidly mounted on long high voltage porcelain insulators on the poles. The various inductances on the set are wound on rigid forms. Copper tubing is used to make all the connections.

The high frequency set at East Pittsburgh is located on the top of the K building which is nine stories high and naturally would ordinarily be subjected to vibrations. This set is therefore suspended on a system of springs, so that vibrations of the building cannot effect the operation of the set.

At Hastings, Nebraska, the set is located in an isolated building and is not subjected to any vibrations, so the precaution of suspending this set on springs has not been necessary.

The transmitting set at Hastings consists of three panels; the rectifier panel, the modulator panel and the oscillator panel. The rectifier converts the high voltage a-c. current received on the antenna to high voltage d-c. for the plate circuit. The modulator with its accessories impresses the voice frequency on this high voltage d-c. current before it goes to the oscillator. Finally the oscillator converts the high voltage d-c. currents into radio frequency, in which form it is delivered to the antenna.

For local broadcasting a studio has been suggested in the main business section of Hastings, which will be connected with the station by means of telephone lines. The studio, if built, will compare favorably with any Eastern studio and a special type of condenser transmitter will be installed to insure good tonal quality.

Story of Radio Broadcasting

THE ROMANCE of radio broadcasting—from its beginning in the Wilkinsburg garage where the late Dr. Frank Conrad played phonograph records in front of a converted-telephone transmitter—is told in five-star fashion in the new motion picture, "On the Air," produced by Paramount Studios for Westinghouse Radio Stations, Inc.

The film will be shown throughout the Company, under a schedule arranged by the Westinghouse Motion Picture Bureau at Pittsburgh.

With a cast of more than 100 persons, and featuring Bob White, KDKA Program Director, in the narrator's role, the 30-minute movie records the swift rise of the radio industry from the days of wireless telephony to a billion-dollar enterprise reaching into virtually every home in the nation.

For good measure, "On the Air" goes behind the scenes in a modern broadcasting studio to tell how a radio show is whipped together, rehearsed and put on the air; how sound effects are created for broadcasting; how voices and music get from the broadcasting studio to the radio receiver in your home (see next page); how the nation's 900 stations can be on the air at the same time without interfering with one another, and how broadcasts from various stations are artfully beamed to cover only clearly defined areas.

Highlights of the historical portion of the film (see montage on opposite page) show Dr. Conrad working in his garage laboratory (which was faithfully recreated, even down to the soap boxes that formed the base for some of his equipment) . . .

The clerk in a Pittsburgh department store listening in and getting an idea that if more people knew about the Wilkinsburg scientist's putting music on the air it would boost the store's sales of crystal-set receivers . . .

H. P. Davis, then Vice President at Westinghouse, catching from the resulting store advertisement a vision that radio was an instrument of public rather than private communication, and convincing the Company heads that his hunch was worth a trial . . .

The resultant birth of Station KDKA, and radio's overnight growth from a hobby to a national institution.

"On the Air" has a number of pleasantly nostalgic scenes showing the first tube-type receivers which replaced the home-made crystal sets, and there's even one sequence showing how a set of earphones was placed in mother's mixing bowl to amplify for a roomful of guests the sounds that came from the air.

The wonders of modern radio broadcasting are shown in a behind-the-scenes trip through Station KDKA's Allison Park transmitting station, the KYW news room as an important news flash goes on the air, and through other studios where orchestras play and actors speak.

AT ITS CONCLUSION, "On the Air" looks to the future, a future in which new chapters will be written in radio's history—in radiophoto transmission, in frequency-modulation (FM) broadcasting, in television and in international short-wave broadcasting.

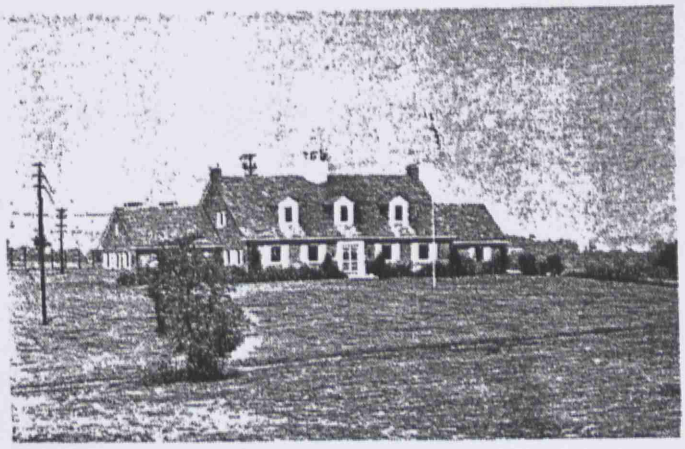
"As each radio day brings information, entertainment and education to your home," concludes the film's narrator, "scientists continue to reach into the future . . . planning and developing new services that will make your street, your home, the center of the universe . . . so that the whole wide world of pictures and colors and sounds will be as close to you as your radio."

NEW RADIO PROGRAM

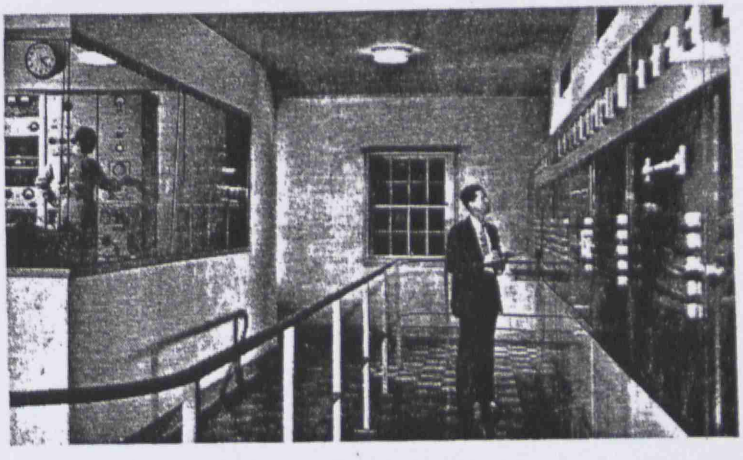
In addition to the Westinghouse Sunday afternoon program (2:30, Red Network), the Company will inaugurate on March 13 a brand new radio program.

The new show, basically a musical program, will be on the air from 10:15 to 10:30 every Monday, Wednesday and Friday evening, over the 159 stations of the Blue Network.

Make a date now with your easy chair and radio for the premiere March 13.



A far cry from the two-story garage where broadcasting began is KDKA's million-dollar transmitting station at Allison Park, a suburb of Pittsburgh. At the extreme



KDKA's Chief Engineer, T. C. Kenney, records data from dials at the transmitter station. Behind these metal walls are wires, vacuum tubes, electrical condensers, coils, switches, relays and

The first broadcast of WJZ took place on October 1, 1921. A room in the Westinghouse factory in Newark served as a studio for the program. Thomas H. Cowan, the station's first announcer and program supervisor, is seated at the piano in the same studio at a slightly later date. At the table is Joe Watts, Westinghouse engineer and announcer. Cowan, a radio veteran, is still to be heard on the New York municipal station, WNYC.

sets were bought just for this event. The announcer, J. Andrew White, gave the first blow-by-blow radio description of a boxing match. The Jess Willard-Luis Firpo fight in 1923 set a pattern for radio broadcasting that was to grow tremendously in popularity. Attendance at sports events increased greatly, too, their popularity stimulated by radio.

The number of stations listeners could tune in on grew rapidly. The Detroit *News* station, WWJ, which had been operating a radiophone, was granted a license for regular broadcasting in 1921. WJZ, then at Newark, New Jersey, broadcast its first program in 1921 from a small building erected on a factory roof. Its studio resembled a storage room, draped with odds and ends, old rugs, nondescript chairs and tables, and a rented piano and phonograph.

In 1921, KDKA, Pittsburgh, still located at the company's East Pittsburgh plant, did a series of "firsts" that included the first remote church broadcast, first broadcast by a national figure (Herbert Hoover), the first regular broadcast of baseball scores, the first market reports, and the first World Series broadcast. Westinghouse that year produced the first popular-priced home radio receiver (approximately $60, not including headsets or loud speakers) and established radio stations in cities where it had manufacturing plants. These were KBZ, East Springfield, Mass.; KYW, Chicago; and WJZ, Newark. Incidentally, one station —now WBZ—remains in the original studio site at the East Springfield Plant.

The sale of radio sets grew so quickly that the manufacturers could not meet the demand.

In this period radio stations were not selling time for advertising, but were broadcasting primarily to stimulate the sale of sets.

Although the program which announced the election of Harding on KDKA in 1920 is usually considered the historic beginning of broadcasting, there are numerous other claims to this honor. Station KQW in San Jose, California, produced its first broadcast in

Other organizations soon entered the broadcasting field; General Electric, AT&T, and of course, RCA, were soon in the broadcasting operation.

By the end of 1920, thirty broadcasting licenses had been issued by the Federal Government. Two years later, over 200 licenses had been issued, and in 1923 there were nearly 600 licenses. The main problem at the time was financial. No one had yet determined an adequate and regular method by which stations could support themselves.

During this entire period, the American Telephone and Telegraph Company had been watching broadcasting activities with a great deal of interest. The development of the radio and radiotelephony had been progressing steadily throughout the years. In 1922, AT&T financed and built station WEAF in New York, replacing another AT&T station, WBAY, which had proved unsuccessful because of its location. A great deal of money was put into the new WEAF, and many technical innovations were installed. It was at WEAF that many techniques of broadcasting and commercial sponsoring were developed. The company, anxious to test the potentialities of radio, inaugurated the policy of continuous broadcasting and sold time at the rate of ten minutes for $100.00. In one of the first sponsored programs ever to be broadcast, on August 28, 1922, at 5:15 to 5:30 P.M., H. M. Blackwell discussed the advantages of apartments in Jackson Heights, New York. In November of 1922, the New York Philharmonic Society broadcast its first complete concert, and President Calvin Coolidge gave his opening message to Congress, which was broadcast over six stations. On December 6, 1923, stations WEAF (New York), WCAP (Washington, D. C.), and WJAR (Providence, R. I.) were connected by wire, to become the nation's first network.

The era of expansion for radio had begun, creating one of the most extraordinary new product demands in the history of the United States. From all over the country, orders for radio receiving sets and for radio broadcasting equipment poured into the offices of manufacturers.

Said *Radio Broadcast* in its first issue, May, 1922:

> The rate of increase in the number of people who spend at least a part of their evening in listening in is almost incomprehensible. To those who have recently tried to purchase receiving equipment some idea of this increase has undoubtedly occurred as they stood perhaps in the fourth or fifth row at the radio counter waiting their turn only to be told when they finally reached the counter, that they might place an order and it would be filled when possible. The manufacture is probably not even yet at its height. It is still growing in some kind of geometrical progression. It seems quite likely that before the movement has reached its height, before the market for receiving apparatus becomes approximately saturated, there will be at least five million receiving sets in this country.

Church services were first broadcast in New York City from station WJZ in January of 1922. During the chapel service in the Christ Episcopal Church, Glenridge, New Jersey, Rev. George P. Dougherty delivered his Christmas Eve message to the radio public.

In his autobiography, Vincent Lopez gives a colorful account of his first experiences with broadcasting. The year was 1921, and Lopez had agreed to help out his friend Thomas Cowan, who was then program director of station WJZ, by substituting with his band for a program that had been cancelled at the last minute. They wouldn't be paid, of course, but Cowan said, "There'll come a day soon when we'll both get paid—plenty. Wait and see."

A big payoff hardly seemed around the corner when we saw the WJZ studio that next evening. It was located in an old clock room in an unused area of Westinghouse's Newark factory. There were no elevators. Just a rickety stairway barely large enough for us to thread our instruments upstairs.

The small room was decorated with some absorbent material dyed an ugly shade of red to give it some semblance of uniformity. There were also some secondhand lamps as well as some rugs to help deaden studio sounds. Somehow an old upright piano had been squeezed in. Even Casey's in Brooklyn had owned a better one. But we were there, and we made the best of it.

* * *

We had been so worried about everything else, we hadn't given a thought as to what the program would be. I'll never forget Tommy Cowan turning to me and saying, "Vincent, why don't you announce the program?"

"Me announce the program?" I was so frightened as it was, I didn't know what to do. Tommy and I argued the point for a few minutes. I told him it was my first time near a mike, but he finally talked me into saying hello to the radio audience. When the program began I stepped up on a little platform and said, "Hello, everybody. Lopez speaking." Cowan jumped up alongside me and said right into the microphone:

"Is that all you're going to say, Mr. Lopez?"

"That's enough for me," I answered.

Tommy took over as announcer and said, "The first selection will be 'Anitra's Dance' in a fox-trot tempo." I called out to the orchestra, "Number 42, boys," and we were on our way.

There's one other thing about that first radio show I'll never forget. Sometime during the program Cowan suggested that I play a piano solo. I motioned to the broken down upright and said, "On that?" But Tommy paid no attention to me and brought the mike near the piano. Well, there was no backing out then, so I played "Canadian

"Lopez speaking . . ." Vincent Lopez's radio career goes back to 1921, when he and his band played regularly over WJZ from the Pennsylvania Grill in New York.

Capers," the song which had been responsible for getting me the job at the Pennsylvania Hotel.

In those days there wasn't any specific time limit on programs. If something was good, it went on and on. Our show lasted an hour and a half.

° ° °

When the show was over the telephone started to ring. Many of the calls were from Westinghouse officials who were pleased with the show. I was still answering the congratulatory phone calls that lit up WJZ's undersized plug board long past midnight!

One call came all the way from Washington, D.C. It was from Joseph Tumulty, the secretary to President Wilson. Radio had no more ardent fan than Mr. Tumulty. He even came to New York a few weeks later to watch us broadcast.

There was some additional talent on the show that night —a young baritone doubling in radio to help advertise his appearance at a Newark theatre. His name? John Charles Thomas.

Tommy Cowan had quite an inspiration that evening. With the regular programs finished, he introduced Mr. Tumulty on the air and interviewed him about the world political situation. Cowan chalked up another first for WJZ: the radio commentator.

Most of my band regarded our trip to Newark that night as a lark—or an annoyance. Paul Whiteman had already turned down such appearances for his band with the quick comment that radio was for kids, who liked to build crystal sets and fool around with them. I had a hopeful idea that radio would somehow increase our popularity, but I didn't foresee the millions of fans it would create for us within a few short years.

° ° °

The mail response to our music had the Newark Post Office working overtime for several days and Cowan asked us to broadcast regularly. However, E. M. Statler had no enthusiasm for that idea. He wanted us at the Pennsylvania Grill, quite naturally, not out in Newark.

"Can't you put a microphone right on our bandstand and send it out over the wires to Newark?" I asked Tommy, trying to hold on to the broadcast time.

"The telephone company says it isn't feasible," Cowan explained. "I think they're wrong about it. Let me see if Western Union can rig something up."

The rigging took a month and involved special wires out to Newark, but everything straightened out and we went on the air one Thursday night, with the announcement we'd be broadcasting regularly right from the Grill —another first—and we all wondered if people would like to come in and watch the band do a program.

Within an hour, telephone calls had soaked up every table reservation for the following evening—and the calls kept coming in that night and the next day.

Early Friday evening, Seventh Avenue and the two side streets looked like Ebbett's Field back in the old days when the New York Giants were fighting the Brooklyn Dodgers for the pennant. What's more, the entire hotel was sold out by mid-afternoon.

"Vincent," said an amazed E. M. Statler, "I couldn't build business up like this in a thousand years of hard work. You did it in an hour. I think radio has some real possibilities." It was the understatement of the century.

The first stage show for broadcast emanated from station WJZ on February 19, 1922, and featured Ed Wynn in *The Perfect Fool*. The comedian's reaction to the microphone was the subject of an article in *Radio Broadcast*, which said:

Ed Wynn approached the microphone gingerly. He looked at it suspiciously. The time came for him to perform. As with all professionals, he was a trifle nervous. The nervousness, however, wore off, but Wynn was appalled by the silence. He had told some of his best stories and had not even heard a snicker. He asked the announcer to help him and the announcer quickly assembled all the people from around the studio including the electricians in shirt sleeves, scrub-women, with their skirts tucked up,

One of the earliest programs on WJZ in 1922 featured Ed Wynn in *The Perfect Fool*. Wynn, born in 1886, has been in show business virtually all his life, starting in vaudeville and graduating into musical comedies on the New York stage. He starred in the *Ziegfeld Follies of 1914* and in many other Broadway hits after that. Wynn's type of humor, which he brought virtually intact to radio, relied heavily on outrageous puns and a giggling delivery. His trade mark, a long, drawn out "so-o-o-o-o," was interpolated in the telling of his fantastic yarns. In his Texaco "Fire Chief" shows of the early 1930's long-suffering Graham McNamee was his announcer and straight man. After many years of semi-retirement Ed Wynn has recently made a very successful comeback as a character actor in television and motion pictures.

Some vintage Wynn humor:

"A married woman? My goodness, everyone knows what a married woman is! That's someone who has nothing to wear, and six closets to keep it in. The wife likes clothes so much that one day when the husband comes home, she says, 'How do you like this new skunk coat I bought? It's genuine skunk. I bought it for a song.' He says, 'What's the song—"I walk alone"?'

"Here the mood changes, and the finish of the story takes place ten years later. They have an eight-year-old boy. He is always fighting with other boys. If he isn't fighting on one side of the street, he is fighting on the other, and he always gets beaten up. His mother almost goes crazy because she never knows which side her brat is battered on."

telephone operators and artists who were billed later on the program. They were all invited into the studio to view the show. It was a strange audience, but their approbation turned the trick. With the giggles, guffaws and shouts of merriment to encourage him, Wynn proceeded with the entertainment. He needed only the responsive sight of his hearers doubled over with laughter. Had he been a more frequent radio performer, he would have been able to imagine the fans in their homes tuned in on his program and convulsed with mirth.

Paul Whiteman entered radio about 1922 and his first experience in the WJZ studio also was somewhat disconcerting. The importance of the audience in the

Paul Whiteman, called "The King of Jazz," entered radio about 1922, doing his first broadcast from WJZ. In the next quarter of a century there was hardly a year he couldn't be heard on the radio and he became one of the pioneers in the new medium of television. Here he is before a broadcast in the 1930's.

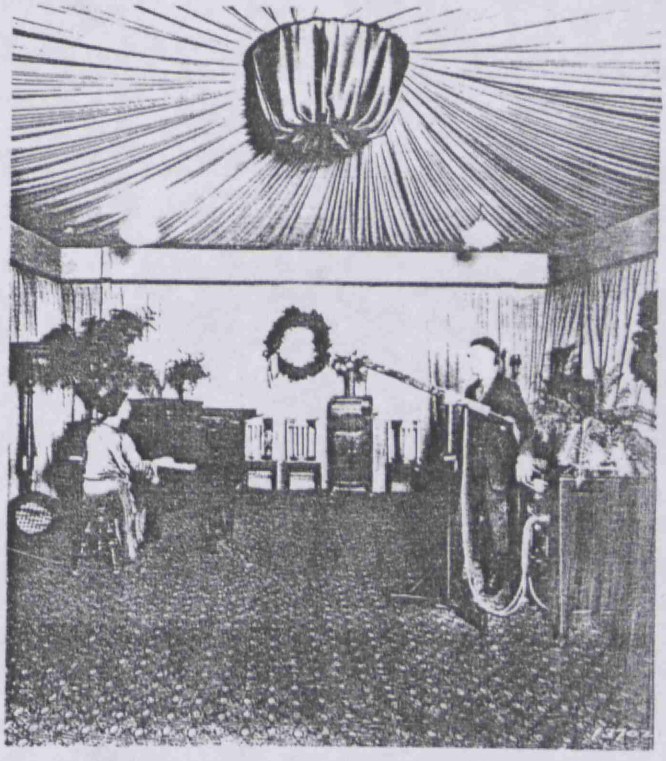
studio was recognized almost immediately and became a main factor in the creation of a successful broadcast.

Radio stations, by May, 1922, totalled 314, creating a great number of difficulties. The problem of so rapidly expanding an industry became serious enough for President Warren G. Harding, in mid-winter, 1922, to instruct Secretary of Commerce Herbert Hoover to call a conference of manufacturers and broadcasters —the First National Radio Conference—in Washington. Secretary Hoover declared that the country was on the threshold of a new means of widespread communication which would have profound importance from the point of view of public education and welfare.

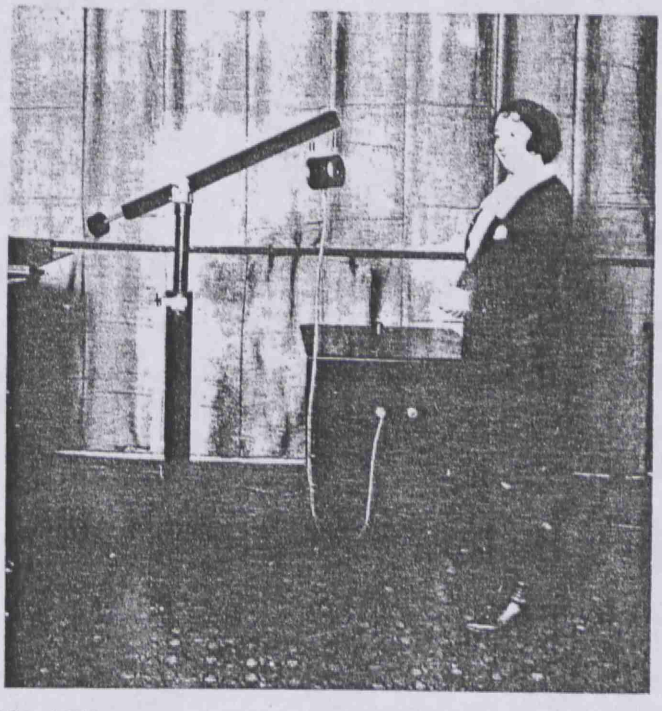
The conference accomplished a number of important results, which included the establishment of a Federal legal authority to control all transmitting stations except amateur and experimental stations. It also revealed that radio communication was to be considered a public utility and as such should be regulated by the Federal Government in the public interest.

Despite the fact that the first sponsored program had been made in August, 1922, few radio stations throughout the United States had hit upon a method by which money could be made, other than through the sale of radio equipment. Most American radio station operators found great difficulty in maintaining the cost of radio broadcasting. England solved the problem in 1922 by creating a government-controlled monopoly of broadcasting supported by taxes levied annually on each radio set. However, such a solution was considered impossible in the United States and serious difficulties were encountered by station broadcasters. Within the next few years, administrators in the broadcasting industry realized that only through sponsored programs could radio survive and flourish, giving birth to one of the greatest advertising media in the world.

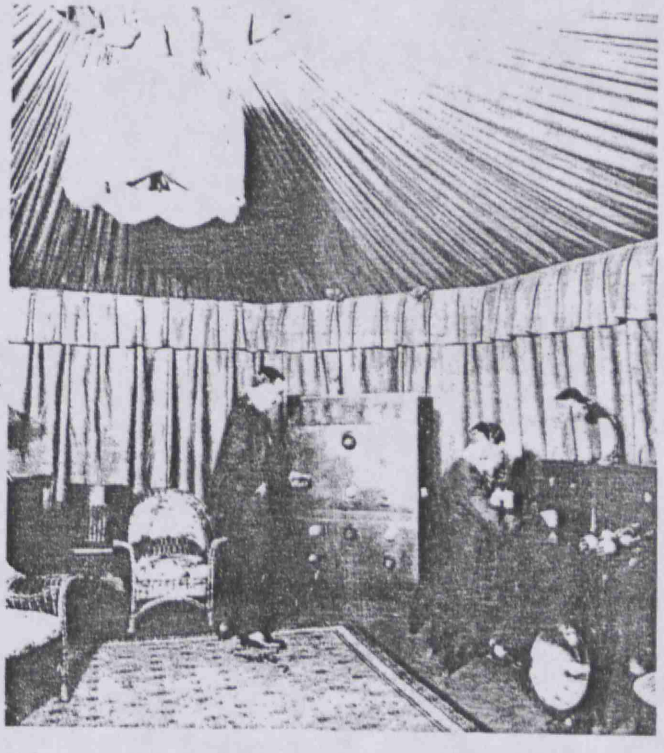
T. J. Vastine conducted radio's first band concert over KDKA in 1921.



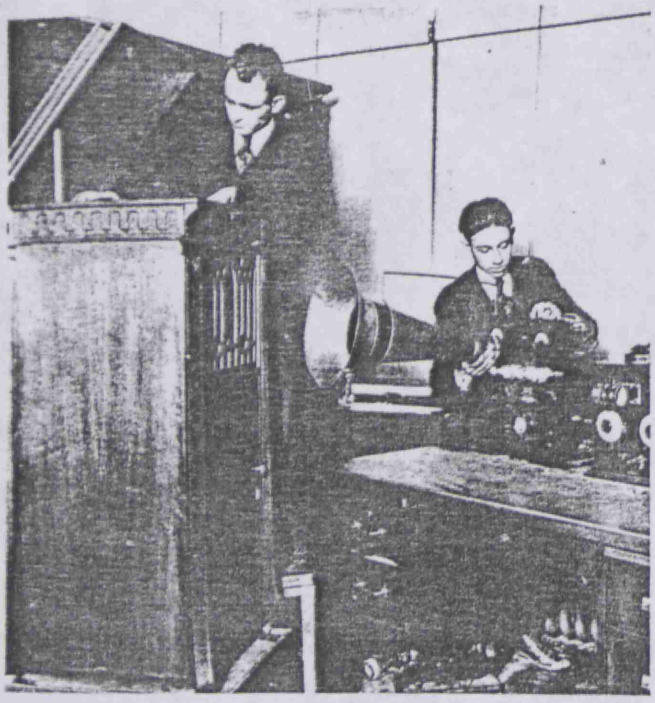
This sumptuous indoor tent studio was installed in a Pittsburgh Westinghouse plant in 1921. One of radio's first on-the-air mishaps occurred here, when a stray dog knocked over a microphone and added his loud barks to the ensuing pandemonium.



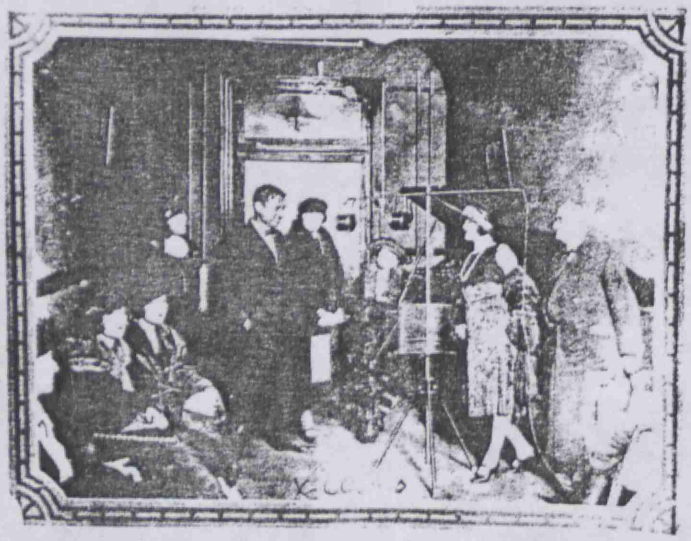
This 1921 picture shows an early microphone with a boom arrangement that permitted it to be raised or lowered according to the performer's height.



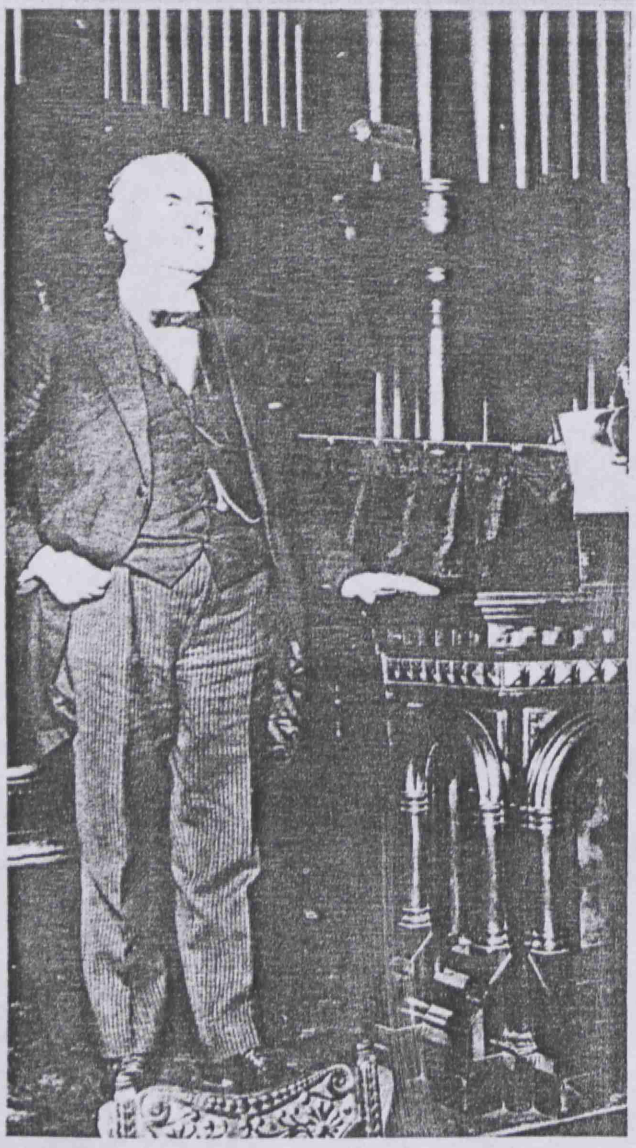
Other stations used the tent-studio idea to combat echo. Here is RCA's first broadcasting studio at Roselle Park, New Jersey, in 1921.



The original crew of WWJ is shown ready to go on the air in 1922, using the station's first transmitter. The horn type of microphone funneled the voice—or in this case the phonograph music—into the transmitter. Power was supplied by a 150-watt, 500-volt direct current generator driven by a quarter-horsepower motor placed under the table.



Will Rogers and a group of *Ziegfeld Follies* girls broadcast from the Pittsburgh *Post* studio of KDKA in 1922.



"The great commoner," William Jennings Bryan, broadcast a sermon from Point Breeze Presbyterian Church in Pittsburgh over KDKA in 1922.

Crystal sets were generally in use in 1922, requiring the listener to use earphones in order to hear the programs picked up. This contraption made it impossible for more than one person to listen in. Loudspeakers which could transmit the sound loud enough for groups of people had not yet been perfected. Considerable static in radio reception was also a tremendous problem at that time, and it was not until years later that solutions were discovered.

When Station WJZ was eleven months old in August, 1922, a young singer named Milton J. Cross was hired. His singing voice was ideal for broadcasting, but his speaking voice also won great acclaim and was destined to become one of the most familiar voices in radio. Another notable performer from the studios of WJZ in the spring of 1922 was Miss Bertha

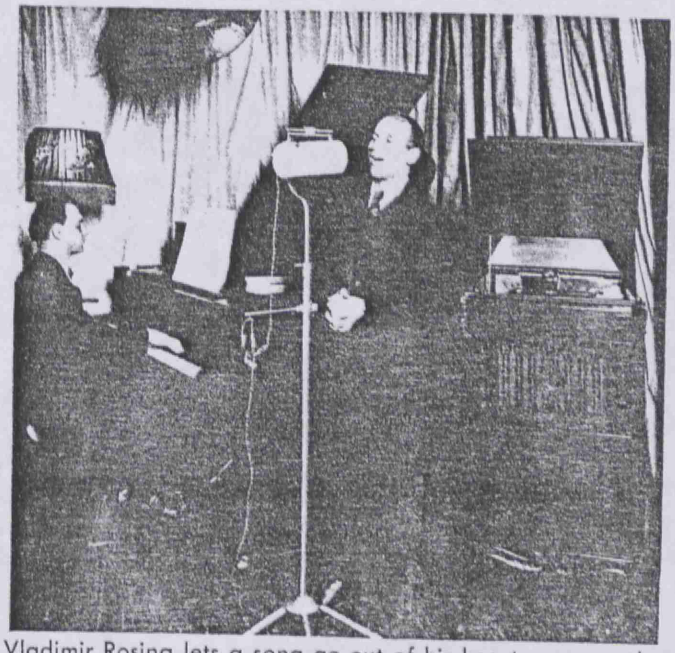
We two boys without a care
Entertain you folks out there—
That's our hap-hap-happiness!

Billy Jones and Ernie Hare, radio's legendary "Happiness Boys," were perhaps the first of the broadcasting comedians to gain a wide audience.

Brainard, who made regular appearances in a series called "Broadcasting Broadway" in which she reviewed plays and offered other information about the theater.

During the same year, Gimbel Brothers' department store broadcast an hour-long musical program. The American Tobacco Company came on the air and joined radio with its Lucky Strike Radio Show.

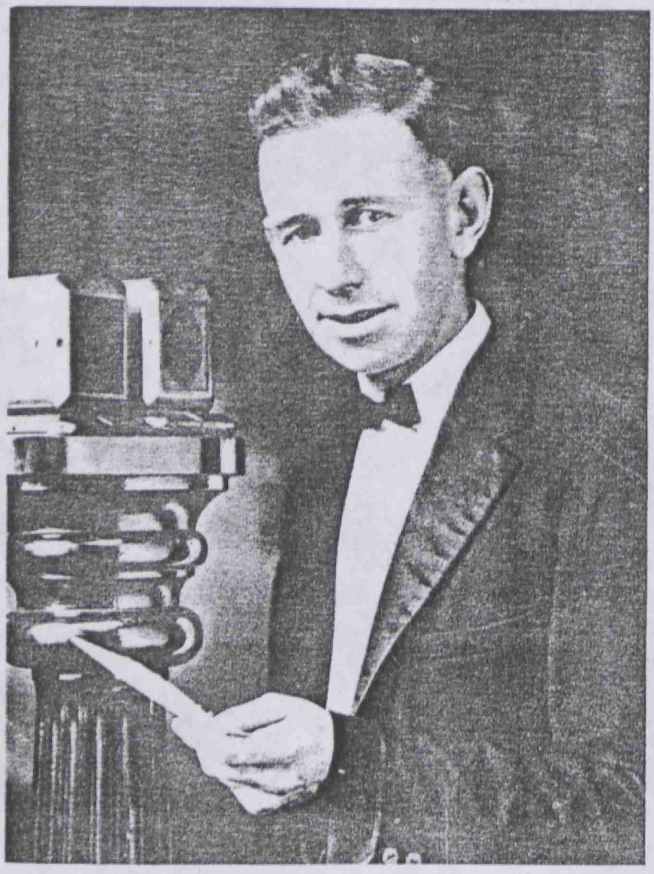
On August 22, 1923, the Happiness Candy Company went on the air with a new type of program. The show called "The Happiness Boys," featured Billy Jones and Ernie Hare, and provided a comparatively small audi-



Vladimir Rosing lets a song go out of his heart, apparently to a piano and phonograph accompaniment. The year is 1922.

Bertha Brainard, sometimes called the "First Lady of Radio," made regular appearances on WJZ in a program series called "Broadcasting Broadway," in which she reviewed plays and offered other information about the current theatre.

A young man named Milton Cross joined the staff of WJZ in 1922. Despite the fact that he made his debut as a tenor, he was hired as an assistant to Thomas H. Cowan, New York's first radio announcer. Cross, shown here in about 1928, was destined to become the nation's foremost commentator on musical programs, particularly the Metropolitan Opera broadcasts, with which his name is almost synonymous.



The nation's first full-time radio announcer was Harold W. Arlin of KDKA. Mr. Arlin spent five years behind the mike. During this period he introduced such public figures as William Jennings Bryan, Marshal Foch, and David Lloyd George. He also broadcast the first play-by-play account of a football game, between the University of West Virginia and the University of Pittsburgh.

ence with the first real comedy of radio. Utilizing a small studio so that the laughter would be heard on the air, "The Happiness Boys" helped to plunge the nation into a new era of radio programming.

Also in 1923 Roxy (S. L. Rothafel) and His Gang began their Sunday morning broadcasts from the Capitol Theater in New York, a series that was to continue, in only slightly altered form, into the late 1930's as The Capitol Theater Family with Roxy's successor, "Major" Edward Bowes.

One of radio's most beloved figures, Dr. Walter Damrosch, who would play an incalculable role in the popularization of serious music in America, made his first air appearance on October 29, 1923, with a lecture recital on Beethoven, over WEAF.

A young man named Graham McNamee made his debut that year, too. McNamee, who was more notable for his ability to project the atmosphere and excitement of a sports event into the nation's living rooms than for his reporting accuracy, became one of the most popular announcers in early radio. Together with Phillip Carlin, he covered most of the important sports events of a decade and more.

WEAF, WCAP, and WJAR provided the vehicle for a number of important personages: David Lloyd George, Prime Minister of Great Britain on a goodwill tour to the United States, made an important broadcast. Ex-President Woodrow Wilson broadcast a ten-minute message to the country on the significance of Armistice Day. The first broadcast of a football game was made by Graham McNamee at the annual Army-Navy event.

Republicans gathered in Cleveland on June 10, 1924 for a three-day national convention. It was the first convention to be broadcast to the American people. When Graham McNamee and Major John Andrew White reported in vivid language the exciting Coolidge "bandwagon" scene, millions of listeners were experiencing history in the making.

Later in 1924, when 1,444 delegates assembled in

Frank E. Mullen, a Sioux City Farm editor, broadcast a regular farm program on KDKA in 1921.

Helen Hahn, one of the first radio hostesses and woman announcers, was heard over WBAY in New York.

Madison Square Garden, New York City, the American radio audience was able to listen in on the Democratic National Convention.

A typical program of 1924 is reproduced below. This WEAF program log records an interesting mixture of sustaining and sponsored offerings.

PROGRAM—FRIDAY, SEPTEMBER 12, 1924
STATION WEAF—AMERICAN TELEPHONE AND TELEGRAPH COMPANY
(492 Meters 610 Kilocycles) (Daylight Saving Time)
195 Broadway, New York City

11:00 a.m. Helen Morris, Soprano.

11:10 a.m. Health Talk under the auspices of the Association for the Prevention and Relief of Heart Disease, by Dr. Wm. St. Lawrence.

11:25 a.m. "The Flower Garden's Big Opportunity" by Leonard Barron, Editor of *Garden Magazine and Home Builder.*

11:50 a.m. Consolidated Market and Weather Reports by the United States Department of Agriculture and the New York State Department of Farms and Markets, together with *American Agriculturist.*

4:00-5:00 p.m. "Women's Club Program."

4:00 p.m. John Burnham, Concert Pianist, Program: "The Harmonious Blacksmith" (Handel); First Movement "Sonata" (Beethoven); "By the Brook" (Boisdefre).

4:10 p.m. Talk by Mr. Arthur J. Westermayr.

4:25 p.m. John Burnham, Concert Pianist, Program: "Waltz" (Chopin).

4:35 p.m. "When Every Voter Votes," the second in a series of lectures on "Getting Out the Vote" by Mrs. Raymond Brown, Managing Director of Woman's Citizen, speaking under the auspices of the New York League of Women Voters.

4:50 p.m. John Burnham, Pianist. Program: "Impromptu" and "Gavotte Antique" (compositions by Mr. Burnham).

6:00 p.m. Dinner Music from the Rose Room of the Hotel Waldorf-Astoria, New York City, Joseph Knecht, directing. Program: "Marche Lorraine" (Ganne); Selection "Les Huguenots" (Meyerbeer); "Arlesienne" (Bizet); "Caprice Viennois" (Kreisler); Entr'acte and Valse from "Coppelia" (Delibes); "Habañera" (Chabrier); "Lob der Frauen" (Strauss); "Madame Sherry" (Hoshna).

7:30 p.m. "Sir Hobgoblin Broadcasts a Get-Up-Time-Story" by Blanche Elizabeth Wade, the G. R. Kinney and Company Story Teller.

7:45 p.m. Harry Jentes, Jazz Pianist.

7:55 p.m. Rosella Sheiner, 10-year-old Violinist.

8:05 p.m. Isabel Duff "Scotty" Wood, Soprano, Program of Scotch Songs.

8:20 p.m. Harry Jentes, Jazz Pianist.

8:35 p.m. Joseph White, Tenor, Accompanied by Winifred T. Barr.

8:50 p.m. Rosella Sheiner, 10-year-old Violinist.

9:00-10:00 p.m. B. Fischer and Company's "Astor Coffee" Dance Orchestra.

Joseph M. White, the "Silver Masked Tenor," was heard over WEAF in New York from 1923 to 1927 as soloist with the Goodrich Silvertown Orchestra. His identity was carefully guarded, and he wore a sterling silver mask when he appeared in public. He signed an exclusive contract with NBC in 1929 and was heard regularly until 1940, when he retired after sustaining serious injuries in an automobile accident. He died in 1959.

10:00 p.m. Joseph White, Tenor.
10:15-11:00 p.m. Special Radio Program on National Defense Test Day direct from the War Department Building, Washington, D.C. Speeches by General J. J. Carty, Hon. John W. Weeks, Secretary of War, and General John J. Pershing, General of the Armies of the United States and Chief of Staff, in order named.

An afternoon religious service broadcast by KDKA in 1923.

The summer of 1924 also saw a continuance of the controversy regarding the question of financial support of radio broadcasts. Secretary of Commerce Herbert Hoover expressed the opinion that broadcasting should be supported by industry. H. B. Thayer, president of the American Telephone and Telegraph Company, solved the company's problem by selling time on all its broadcasting stations. David Sarnoff, vice-president and general manager of the Radio Corporation of America, advocated outright endowment of radio broadcasting stations. He argued that because radio had reached the stage where it actually contributed a great deal to the happiness of mankind it deserved endowments similar to those enjoyed by libraries, museums and educational institutions. For the General Electric Company, Martin P. Rice stated that broadcasting should be supported by voluntary contributions or by licensing individual radio sets.

Since little money was available, few performers were paid for their services. The great newspaperman Heywood Broun, in protest, described the plight of the unpaid artist and predicted that this situation would be solved by some sort of financial support by advertisers.

The impact of radio in this country was so great that it had become one of the most influential forces in American life, stimulating every phase of activity.

Calvary Episcopal Church, Pittsburgh, was the scene of the first regularly scheduled church broadcasts, January, 1921.

The first portable radio? This perambulator-borne set may be it. Apparently people without babies could substitute dolls, as this young lady has done.

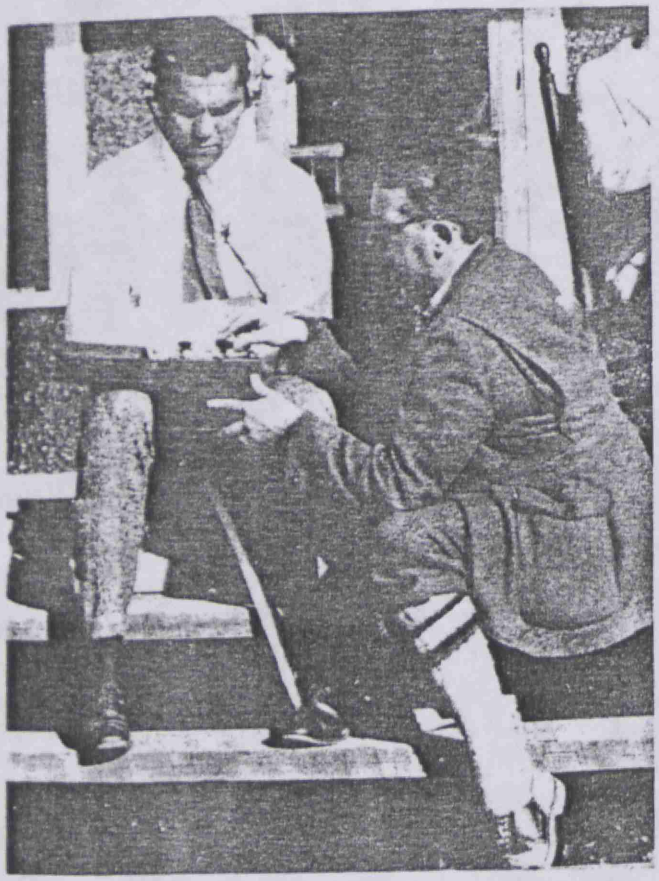
New stars were born, new expressions were popularized as new program formats were being offered. Radio was penetrating every third home in the country, and tenement house roofs were covered with forests of antennae.

Politically too, radio was making its mark. When after Harding, President Calvin Coolidge delivered his message to Congress, for the first time, people of the Nation had an opportunity to listen to this important event. Undoubtedly radio played a vital role in the career of Calvin Coolidge and helped to re-elect him in 1923.

His inauguration was covered by radio on March 4th, 1925, by 21 stations from Boston to San Francisco, under the banner of the AT&T network. It was estimated that fifteen million people listened to the voice of the President on this occasion.

This same year saw the appearance of John McCormack, the famous Irish tenor on WEAF, and of Lucrezia Bori of the Metropolitan Opera Company. This was the first in a series of broadcasts of great figures in the music world who had not previously been heard on radio because of the fear that broadcasting would adversely affect the sales of their recordings made for the Victor Talking Machine Company. A sustaining program of grand opera followed, with five stations participating in the broadcast. The program was so successful that a radio opera company was organized under the name of "The WEAF Grand Opera Company" and directed by Cesare Sodero.

1925 also saw the emergence of new radio personalities. The "A & P Gypsies" were delighting listening audiences on six stations, the "Gold Dust Twins"



Heavyweight champion Jack Dempsey listens to the radio music box, tuned in by Major J. Andrew White, a pioneer announcer. This took place at Dempsey's training quarters a few days before the Dempsey-Carpentier fight in 1921.

Actress Olga Petrova appeared before the microphone in costume, as many performers in radio would later do.

Daily Schedule Is Announced for Radio Broadcast

Oct 9 -19-1

FOR the information of those who already have receiving sets or those who may install them during the week, following is the time schedule of the numbers on the daily broadcasting schedule:

1:45 P. M.—World Series, play by play.

8:05 P. M.—Baseball comment and an analysis of the World Series game.

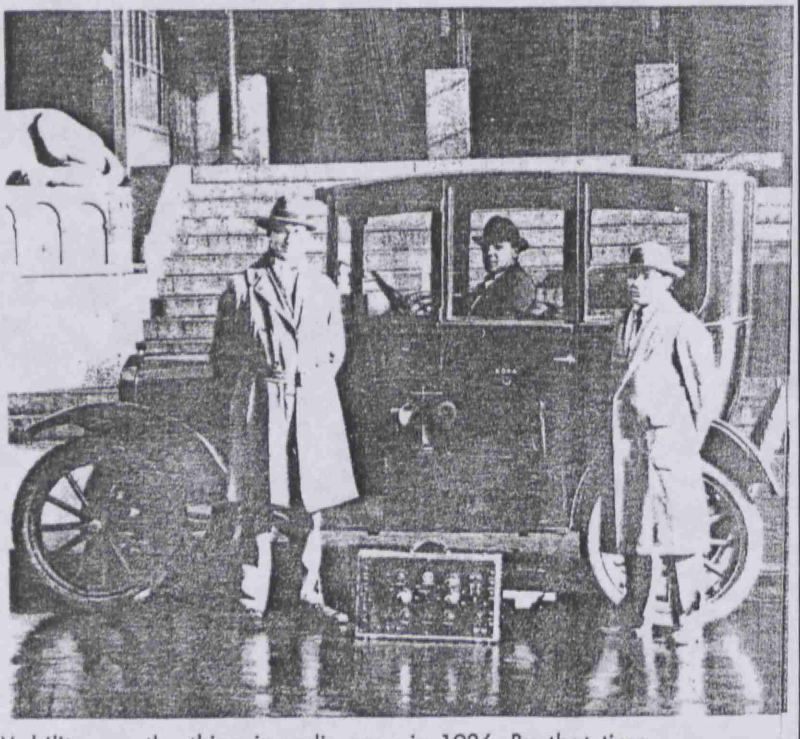
8:15 P. M.—Summary of the day's important news dispatches.

8:30 P. M.—Concert program of musical and vocal selections.

On Friday night at 7 o'clock fairy stories told by The Man in the Moon and three musical numbers especially selected for children.

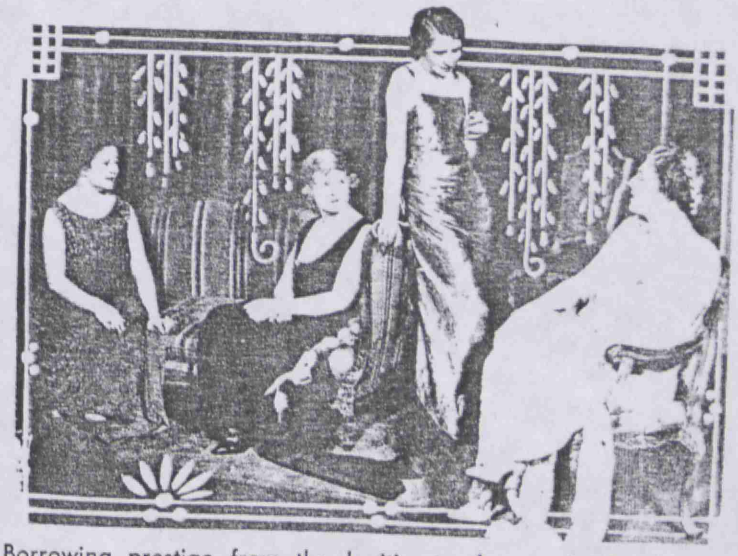
The sending of the World Series reports, of course, is governed by weather conditions. In the event that rain may prevent the game taking place, announcement of that fact will be made at several intervals during the afternoon.

A daily schedule from a newspaper of October 9, 1921.



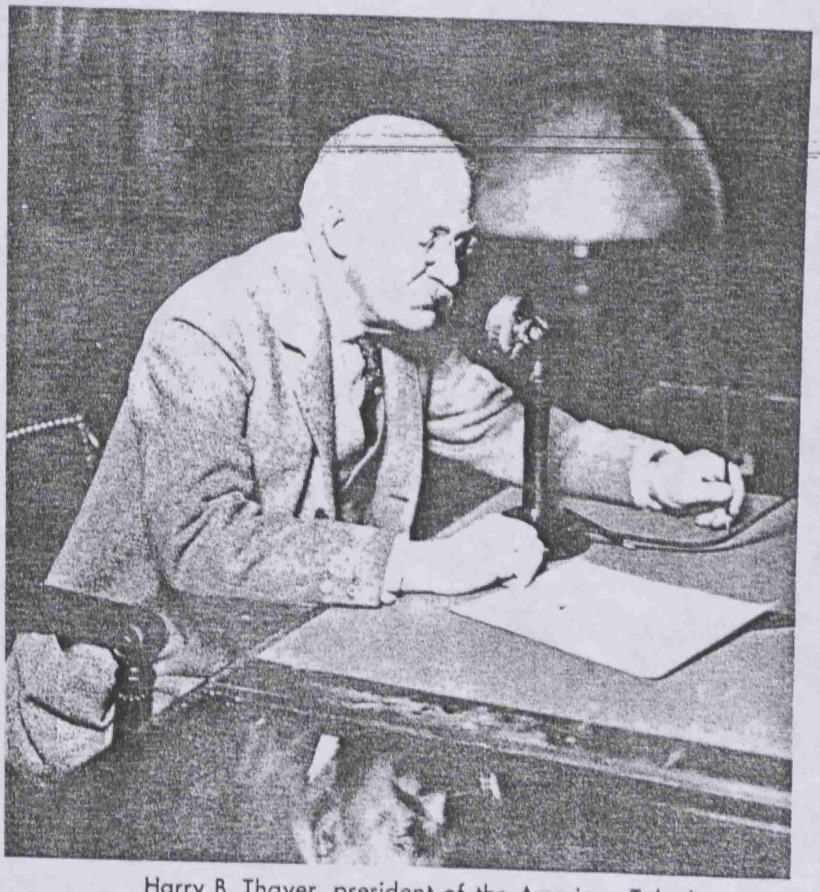
Mobility was the thing in radio even in 1926. By that time KDKA had more than forty pick-up points in Pittsburgh, besides this car and crew which were used to cover special events.

A scene in KDKA's East Pittsburgh studios in 1925. The soloist (unidentified) was required to sing extremely loud in order to have her voice carry over the airwaves.

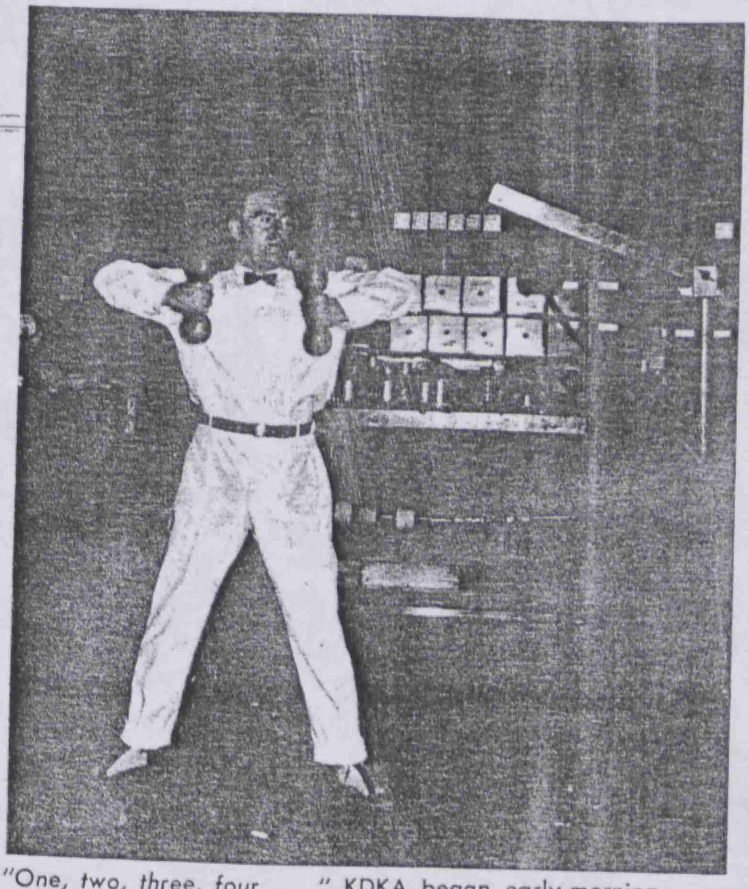


Borrowing prestige from the legitimate theatre, WJZ in 1923 broadcast *The Laughing Lady*, starring Ethel Barrymore, who was appearing in the same play on Broadway.

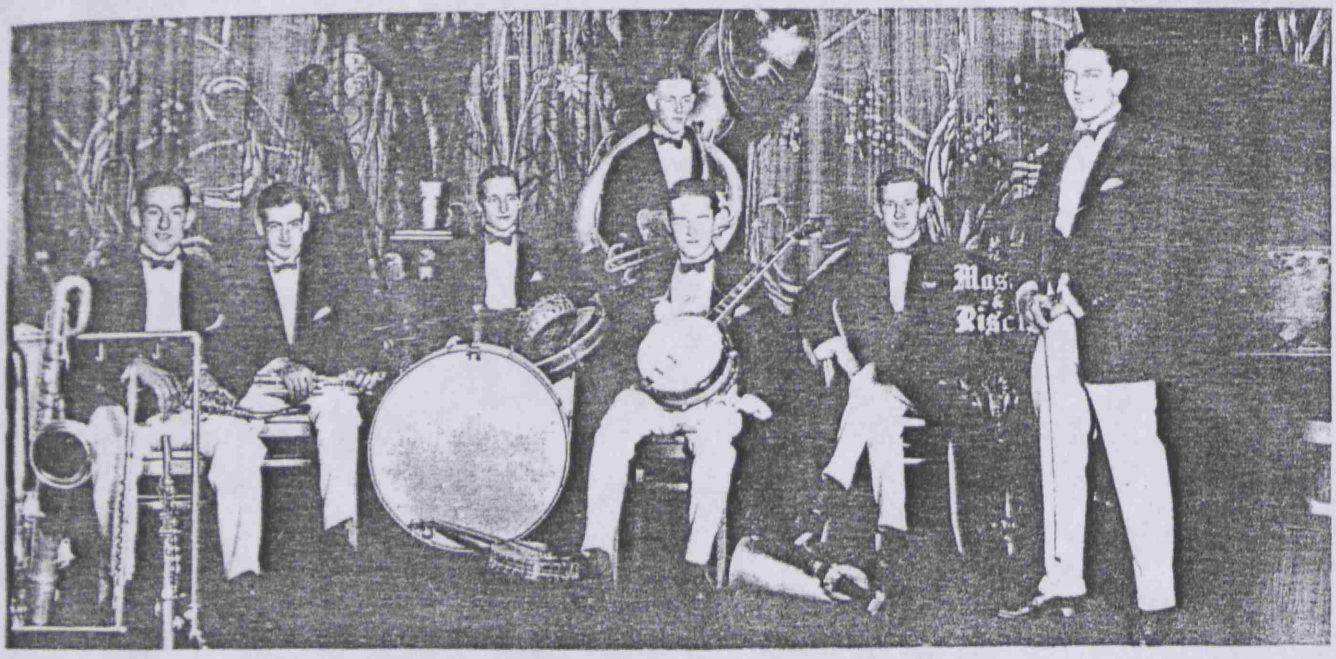
brought unique programs to the listeners of eight radio stations; the soft music of the Goodrich Silvertown Orchestra, and the singing voice of the Silver Masked Tenor, were a regular Thursday night transmission on WEAF. The famous Atwater Kent program was inaugurated in October of 1925, and brought the world's great musicians to the fast-growing radio audience. By this time, of course, the industry had succumbed



Harry B. Thayer, president of the American Telephone and Telegraph Company, speaks directly to England on January 14, 1923, over the first radio-telephone line.



"One, two, three, four . . ." KDKA began early-morning physical culture broadcasts in 1924. "Spike" Shannon was the instructor.



"The sweetest music this side of heaven." Guy Lombardo and his Royal Canadians were early performers on radio and one of the first orchestras to achieve national fame through this medium. Lombardo developed a sweet style of playing which has changed little through the years. For many people the New Year wouldn't seem official without Lombardo's "Auld Lang Syne."

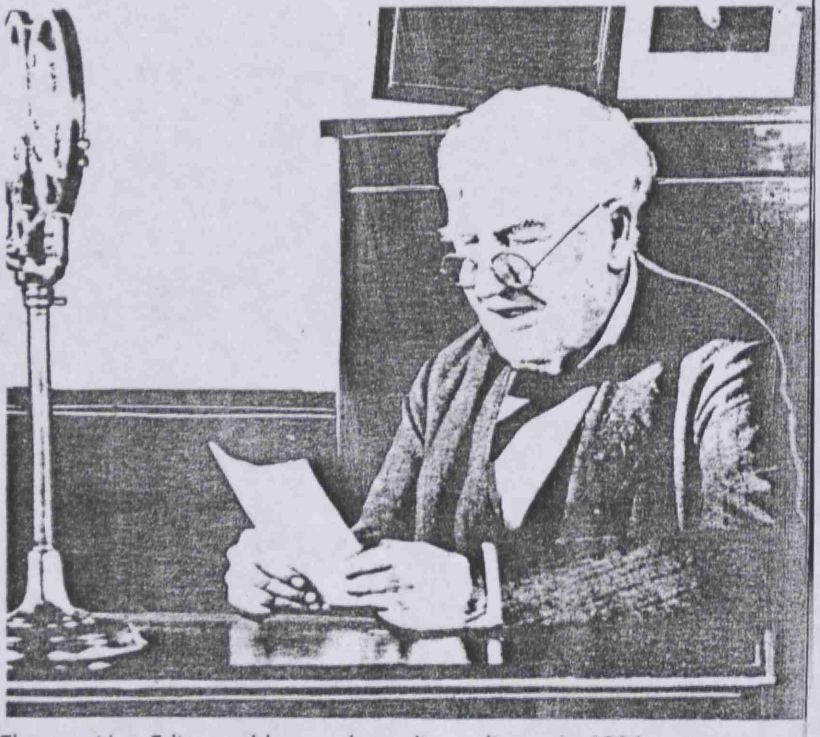
to, and was flourishing on, the financial support of advertisers.

The extent of radio's success was feared by newspaper publishers throughout the country. The American Newspaper Publishers Association warned members that advertising on radio would result in a split in advertising appropriations and therefore would mean less revenue for newspapers. This fear was so great that many newspapers refused to carry radio logs in their papers, and the very word "radio" was forbidden in news columns. However, time proved this fear to be groundless and newspaper publishers gradually realized that radio had become an important supplemental medium, in many instances helping the newspaper industry to prosper.

America's first nation-wide network, the National Broadcasting Company, was born on November 15, 1926. The new network, with WEAF in New York as its key station, combined a group of nineteen scattered affiliated stations, using more than 3500 circuit miles of special telephone wires.

The Federal Radio Commission was appointed by President Coolidge on the basis of the Radio Act of 1927, which Congress passed in an effort to control broadcasting. A period of transition had ended and a new period of rapid development was born. In January of 1927, the first coast-to-coast program, originating in California, was broadcast. It was the Rose Bowl Football game and it was broadcast over the NBC network.

In 1927, radio took on larger dimensions for the American people. It was reaching greater distances at night, and the quality of programs was improving and their number increasing. A one-hour broadcast of Floyd Bennett's funeral service in Arlington held the nation spellbound. The voice of Herbert Hoover, accepting the Republican nomination from Palo Alto,



Thomas Alva Edison addresses the radio audience in 1926.

Announcing the
National Broadcasting Company, Inc.

National radio broadcasting with better programs permanently assured by this important action of the *Radio Corporation of America* in the interest of the listening public

THE RADIO CORPORATION OF AMERICA is the largest distributor of radio receiving sets in the world. It handles the entire output in this field of the Westinghouse and General Electric factories.

It does not say this boastfully. It does not say it with apology. It says it for the purpose of making clear the fact that it is more largely interested, more selfishly interested, if you please, in the best possible broadcasting in the United States than anyone else.

Radio for 26,000,000 Homes

The market for receiving sets in the future will be determined largely by the quantity and quality of the programs broadcast.

We say quantity because they must be diversified enough so that some of them will appeal to all possible listeners.

We say quality because each program must be the best of its kind. If that ideal were to be reached, no home in the United States could afford to be without a radio receiving set.

Today the best available statistics indicate that 5,000,000 homes are equipped, and 21,000,000 homes remain to be supplied.

Radio receiving sets of the best reproductive quality should be made available for all, and we hope to make them cheap enough so that all may buy.

The day has gone by when the radio receiving set is a plaything. It must now be an instrument of service.

WEAF Purchased for $1,000,000

The Radio Corporation of America, therefore, is interested, just as the public is, in having the most adequate programs broadcast. It is interested, as the public is, in having them comprehensive and free from discrimination.

Any use of radio transmission which causes the public to feel that the quality of the programs is not the highest, that the use of radio is not the broadest and best use in the public interest, that it is used for political advantage or selfish power, will be detrimental to the public interest in radio, and therefore to the Radio Corporation of America.

To insure, therefore, the development of this great service, the Radio Corporation of America has purchased for one million dollars station WEAF from the American Telephone and Telegraph Company, that company having decided to retire from the broadcasting business.

The Radio Corporation of America will assume active control of that station on November 15.

National Broadcasting Company Organized

The Radio Corporation of America has decided to incorporate that station, which has achieved such a deservedly high reputation for the quality and character of its programs, under the name of the National Broadcasting Company, Inc.

The Purpose of the New Company

The purpose of that company will be to provide the best program available for broadcasting in the United States.

The National Broadcasting Company will not only broadcast these programs through station WEAF, but it will make them available to other broadcasting stations throughout the country so far as it may be practicable to do so, and they may desire to take them.

It is hoped that arrangements may be made so that every event of national importance may be broadcast widely throughout the United States.

No Monopoly of the Air

The Radio Corporation of America is not in any sense seeking a monopoly of the air. That would be a liability rather than an asset. It is seeking, however, to provide machinery which will insure a national distribution of national programs, and a wider distribution of programs of the highest quality.

If others will engage in this business the Radio Corporation of America will welcome their action, whether it be cooperative or competitive.

If other radio manufacturing companies, competitors of the Radio Corporation of America, wish to use the facilities of the National Broadcasting Company for the purpose of making known to the public their receiving sets, they may do so on the same terms as accorded to other clients.

The necessity of providing adequate broadcasting is apparent. The problem of finding the best means of doing it is yet experimental. The Radio Corporation of America is making this experiment in the interest of the art and the furtherance of the industry.

A Public Advisory Council

In order that the National Broadcasting Company may be advised as to the best type of program, that discrimination may be avoided, that the public may be assured that the broadcasting is being done in the fairest and best way, always allowing for human frailties and human performance, it has created an Advisory Council, composed of twelve members, to be chosen as representative of various shades of public opinion, which will from time to time give it the benefit of their judgment and suggestion. The members of this Council will be announced as soon as their acceptance shall have been obtained.

M. H. Aylesworth to be President

The President of the new National Broadcasting Company will be M. H. Aylesworth, for many years Managing Director of the National Electric Light Association. He will perform the executive and administrative duties of the corporation.

Mr. Aylesworth, while not hitherto identified with the radio industry or broadcasting, has had public experience as Chairman of the Colorado Public Utilities Commission, and, through his work with the association which represents the electrical industry, has a broad understanding of the technical problems which measure the pace of broadcasting.

One of his major responsibilities will be to see that the operations of the National Broadcasting Company reflect enlightened public opinion, which expresses itself so promptly the morning after any error of taste or judgment or departure from fair play.

We have no hesitation in recommending the National Broadcasting Company to the people of the United States.

It will need the help of all listeners. It will make mistakes. If the public will make known its views to the officials of the company from time to time, we are confident that the new broadcasting company will be an instrument of great public service.

RADIO CORPORATION OF AMERICA

OWEN D. YOUNG, *Chairman of the Board*

JAMES G. HARBORD, *President*

This newspaper advertisement proclaimed the founding of NBC in 1926. It heralded the dawn of a new era in home entertainment and public service in broadcasting.

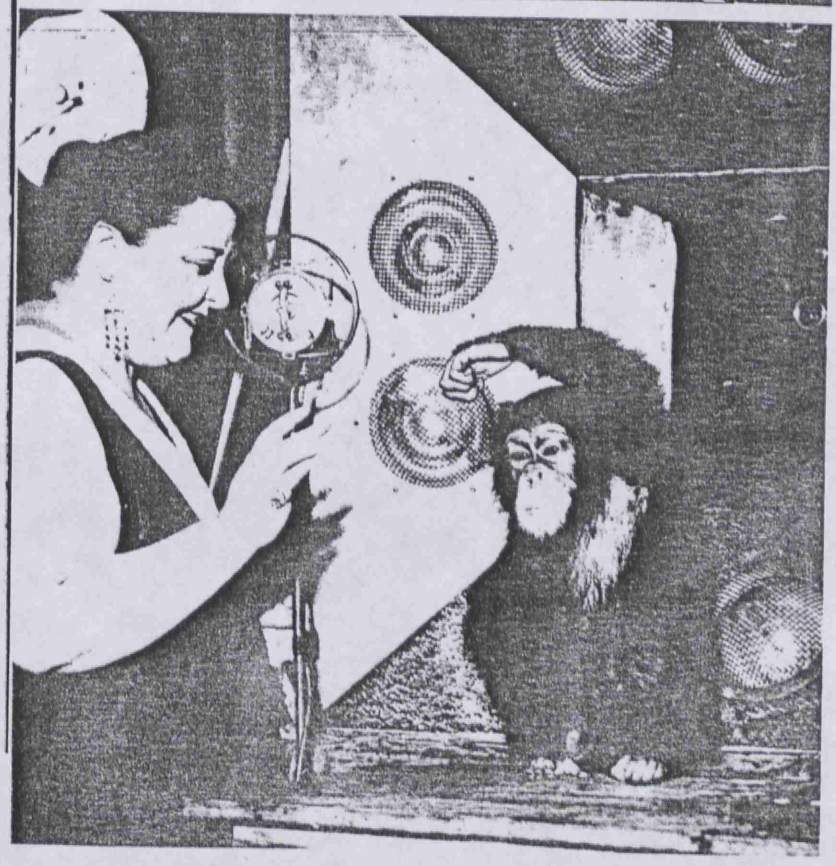
Here goes! Chief Engineer O. B. Hanson (*standing, right*) gives the signal to put the first NBC show on the air on November 15, 1926.

was a major radio event. Americans were listening to Moran and Mack, the "Two Black Crows," and sitting in rapt attention before their loud speakers for the Sunday afternoon broadcast of the Columbia Symphony Orchestra. Sponsors like Dodge, Listerine, Wrigley, and Studebaker were buying time on radio. By now there were eight million radio families in the country. This year, too, found such popular programs as that of Ida Bailey Allen and her cooking school. One of the country's popular radio personalities was an announcer named Ted Husing, whose specialty was sports events, but who doubled in anything that came along. It was Husing who broadcast the arrival of the *Graf Zeppelin* over New York in its first transatlantic flight. It was also Husing who made the memorable broadcast of the 1928 election returns.

During the same year, NBC was organized into two semi-independent networks, the Blue and the Red. The Blue Network consisted of WJZ and the older Radio Group Network. The Red Network encompassed WEAF and the older Telephone Group Network.

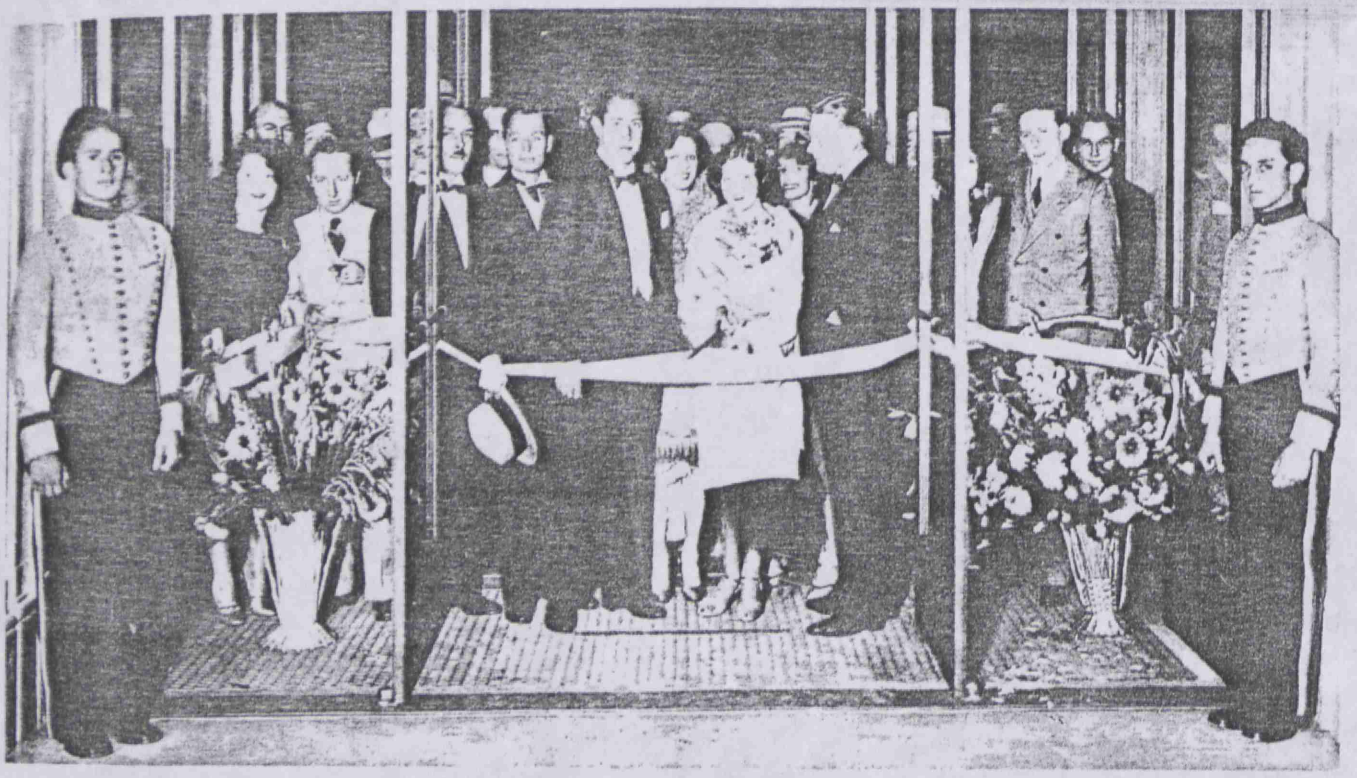
The Columbia Broadcasting System was founded in 1929, under the aegis of William S. Paley, the twenty-seven-year-old heir to a tobacco fortune. Paley

Veteran stage trouper Alice Brady faces a lamp shade that hides a microphone. Even experienced performers "froze up" when faced by a mike in 1926.



Vaughn de Leath is said to be the original "radio girl" and the first woman ever to have sung on the air. According to one story, Miss de Leath was invited into the original De Forest Laboratory, where she faced a phonograph horn. Then, it is said, she sang "The Old Folks at Home"—just for a lark. In any case, Vaughn de Leath, in the early 1920's, created the style of singing known as "crooning." Her style was imposed on her by the limitations of the radio equipment of the day, since the high notes of sopranos often blew out the delicate tubes of the transmitters. Ben Gross of the New York *Daily News* reported that "after her first broadcast, more than thirty years ago, Vaughn received one of the first radio fan letters ever written. It read: 'You have inaugurated a new form of song which, no doubt, will become very popular."

Miss de Leath also participated in the early NBC television broadcasts. Here she is on a novelty program in the late 1920's. She shares the camera with "Young Tarzan."



When CBS opened its new building at 485 Madison Avenue on September 18, 1929, President William S. Paley was on hand to supervise the ceremonial cutting of the ribbon.

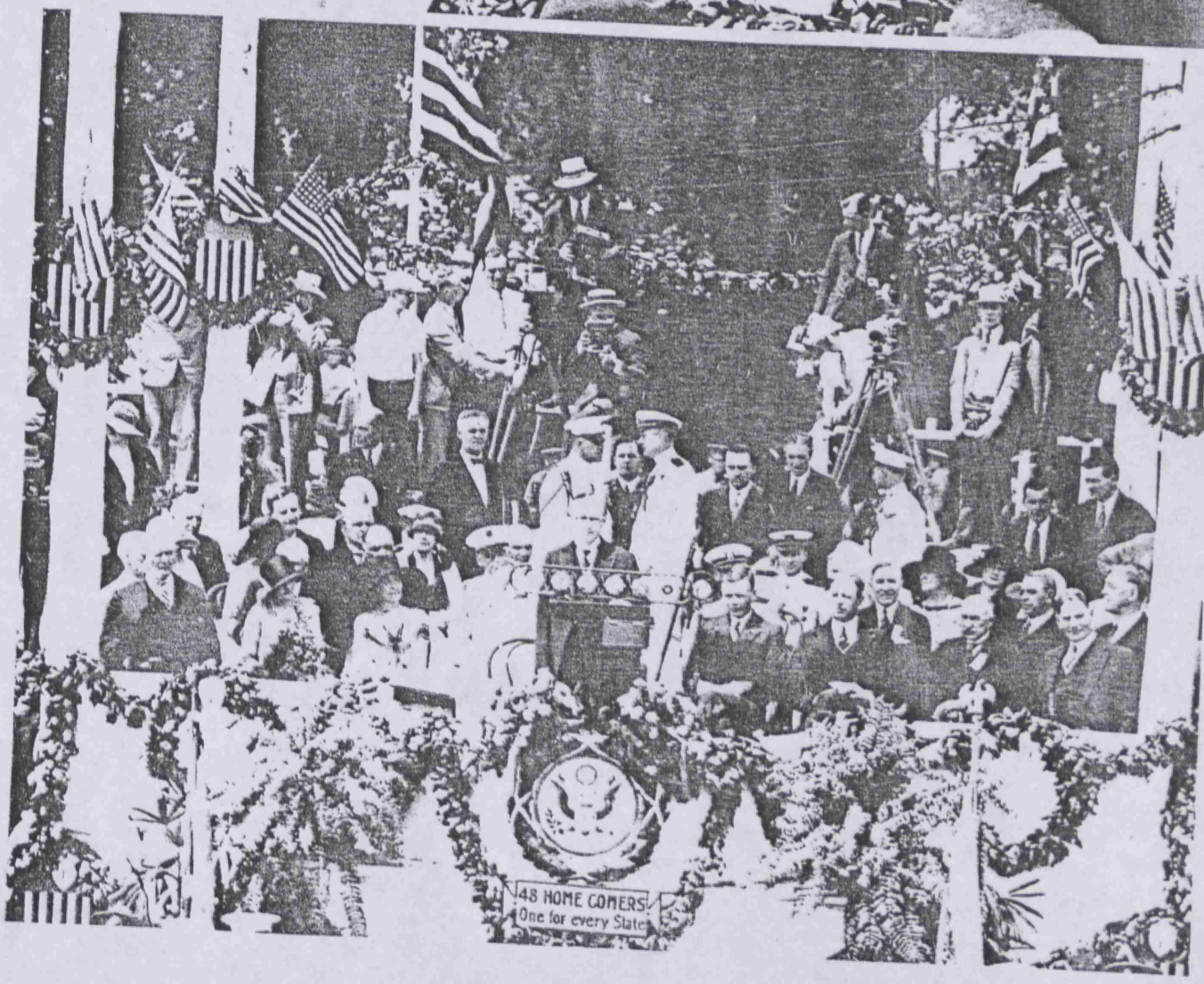
had been greatly impressed by the boost in cigar sales as the result of a program broadcast over the almost-bankrupt Columbia Phonograph Broadcasting Company network. He merged the network with an organization called United Independent Broadcasters, which had been formed to supply talent for independent stations, and retained the Columbia name (although he sold the record company). The new network went on the air with 47 stations, with WABC (now WCBS) in New York as its key station. Interestingly enough, CBS in 1938 would repurchase the record company that gave it its name and build it up to the position of prestige it holds today.

The first sponsored opera broadcast originated from the stage of the Chicago Civic Auditorium in 1927. Cities Service, one of radio's oldest continuous sponsors, started its concert series in February of that year.

A major event of 1927 was the arrival of Charles A. Lindbergh in Washington, D.C., after his historic flight to Paris. The arrival was broadcast by Graham McNamee on a coast-to-coast network, with one of the greatest radio audiences in history listening in. The Dempsey-Tunney prizefight was broadcast from Chicago over 69 stations, the largest network of stations ever to carry a program to date. On November 7, General Motors began its first series on NBC, and the following month, the "Palmolive Hour" began.

In 1928, Al Jolson, already a star in other fields of entertainment, made his radio debut, and later that

Weber and Fields, vaudeville immortals, brought their act to radio in the early days.


48 HOME COMERS
One for every State

Charles A. Lindbergh's solo flight across the Atlantic in May, 1927, was probably the event that more than any other epitomized the decade. "Lindy" was young, goodlooking, and daring—a made-to-order hero for a generation that reverenced these qualities above all others. The nation went wild when the news came that he had landed "The Spirit of St. Louis" safely outside of Paris and wilder still when he arrived home aboard a United States battleship. Graham McNamee was on hand in Washington to describe the hero's return to radio listeners. President Coolidge made him welcome in ceremonies broadcast from the foot of the Washington Monument. Later, Governor Alfred E. Smith of New York awarded him the State Medal in ceremonies held in Central Park.

In 1931, CBS awarded the aviator the Columbia Medal for Distinguished Service to Radio during a broadcast that was carried by the largest network of stations ever assembled up to that time.

Tragedy entered Lindbergh's life in 1932, when his infant son was kidnapped and later found dead. The picture shows a group of NBC newsmen making an on-the-spot broadcast in connection with the case.

Dr. S. Parkes Cadman, noted Brooklyn clergyman and nationally syndicated columnist, pioneered in a regular weekly religious series over NBC in 1928.

Microphones were getting fancy in the late 1920's and so were performers on radio, as more and more movie stars and Broadway actors tried the new medium.

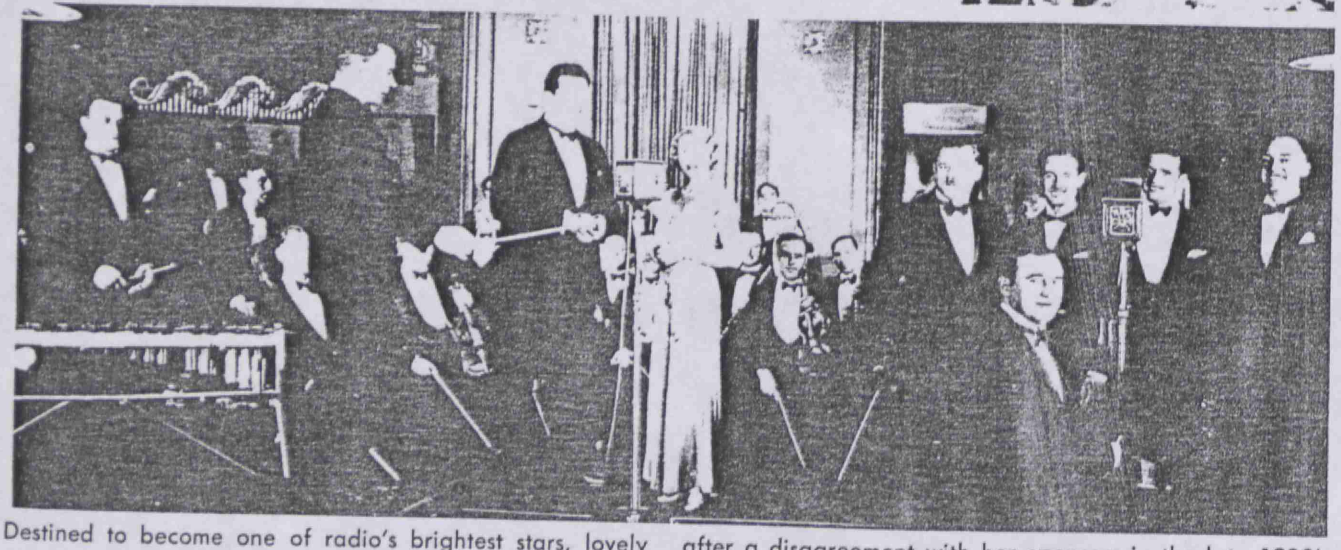
Broadway showman S. L. Rothafel became well known to radio listeners as "Roxy." The famous Roxy Gang, broadcast from the Capitol Theatre in New York, was an NBC favorite for many seasons. Roxy gave the country such personalities as Erno Rapee, James Melton, "Wee Willy" Robyn, Caroline Andrews, and Marie Gambarelli.

year one of the first religious programs, the "National Radio Pulpit," became a network offering.

The broadcast coverage of the Republican Convention in June of 1928 was one of the most comprehensive ever attempted, and the Democratic Convention was covered to an equal extent during the same month. On August 6, one of the first dramatic series was begun. The program was called "Real Folks," and attained immediate popularity. The same year saw the inaugural programs of the "National Farm and Home Hour" and the "Music Appreciation Hour" with Dr. Walter Damrosch.

Radio listeners heard Herbert Hoover accept victory and Alfred E. Smith of New York concede defeat. Smith's "raddio" became a humorous expression throughout the country.

The "Voice of Firestone" began on December 24, and December 23 saw the inauguration of NBC's



Destined to become one of radio's brightest stars, lovely Jessica Dragonette gave up the concert stage for broadcasting. In the picture at the bottom Miss Dragonette appears on a Cities Service concert in the late 1920's. With her are conductor Rosario Bourdon and announcer Ford Bond *(at microphone)*. When Jessica Dragonette retired from radio after a disagreement with her sponsors in the late 1930's, listeners were so distressed that in some cities fans resolved to boycott radio until she returned. During a concert tour 150,000 people turned out to hear her in Chicago's Grant Park, and in Minneapolis 15,000 people braved a blizzard and a taxi strike to hear her.

coast-to-coast network of 58 stations on a permanent basis.

1929 was also the year of Bing Crosby, of blindfold tests, and of Paul Whiteman. The La Palina Smokers' broadcast brought leading entertainers of stage and screen into America's living rooms. A CBS commentator named H. V. Kaltenborn excited the public with his reports and analyses of major news events. This was the year that radio broadcast the ratification of the Kellogg-Briand Pact, and the short-wave flash of Byrd's flight over the South Pole.

The first short-wave broadcast from England was

The beloved Sir Harry Lauder was always a welcome guest in radio's first decade.

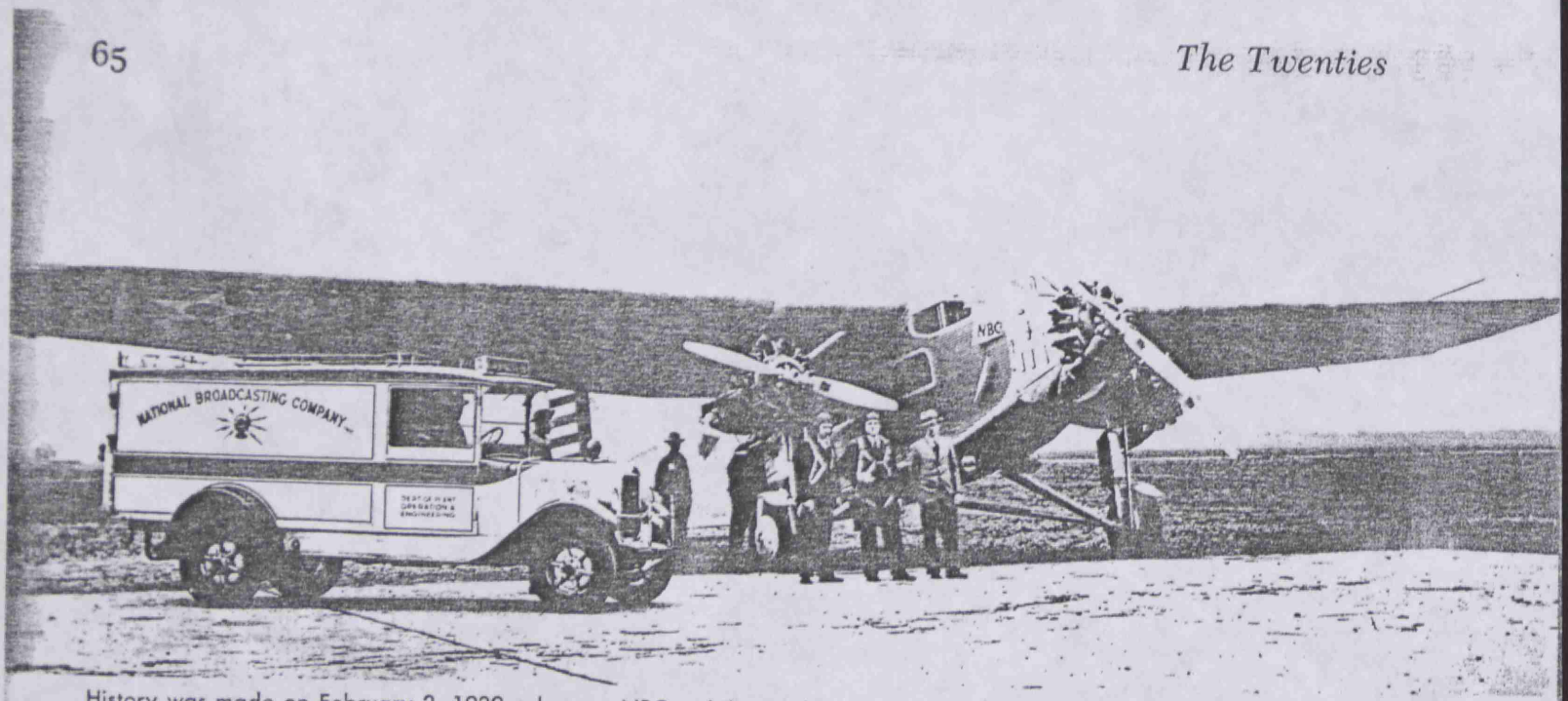
Herbert Hoover broadcast his acceptance of the Republican nomination for President in 1928. As Secretary of Commerce under Harding and Coolidge, Hoover played a large role in the early development of broadcasting.

made on February 1, with a program of symphonic music from Queen's Hall, London. Other "firsts" during this period included a regular weekly West-to-East program broadcast from San Francisco, the first airplane broadcast called "Over and Under New York," and the first re-broadcast from Sydney Australia. A parachute jumper broadcast his sensations as he floated down to earth one day in October. He was equipped for this NBC broadcast with a 25-pound, two-watt pack transmitter.

In the feverish autumn of 1929, the lugubrious strains of "A Perfect Song" every weekday evening announced "Amos 'n' Andy," and millions of listeners settled down for a much-needed laugh. Expressions

Graham McNamee interviews Babe Ruth during a game at Yankee Stadium.

Elsie Janis, vaudeville and Broadway star who became known as the "Sweetheart of the A.E.F." because of her indefatigable entertaining of the troops during World War I, made frequent radio appearances after the war. She was featured in several network productions, including "Hollywood on Parade."

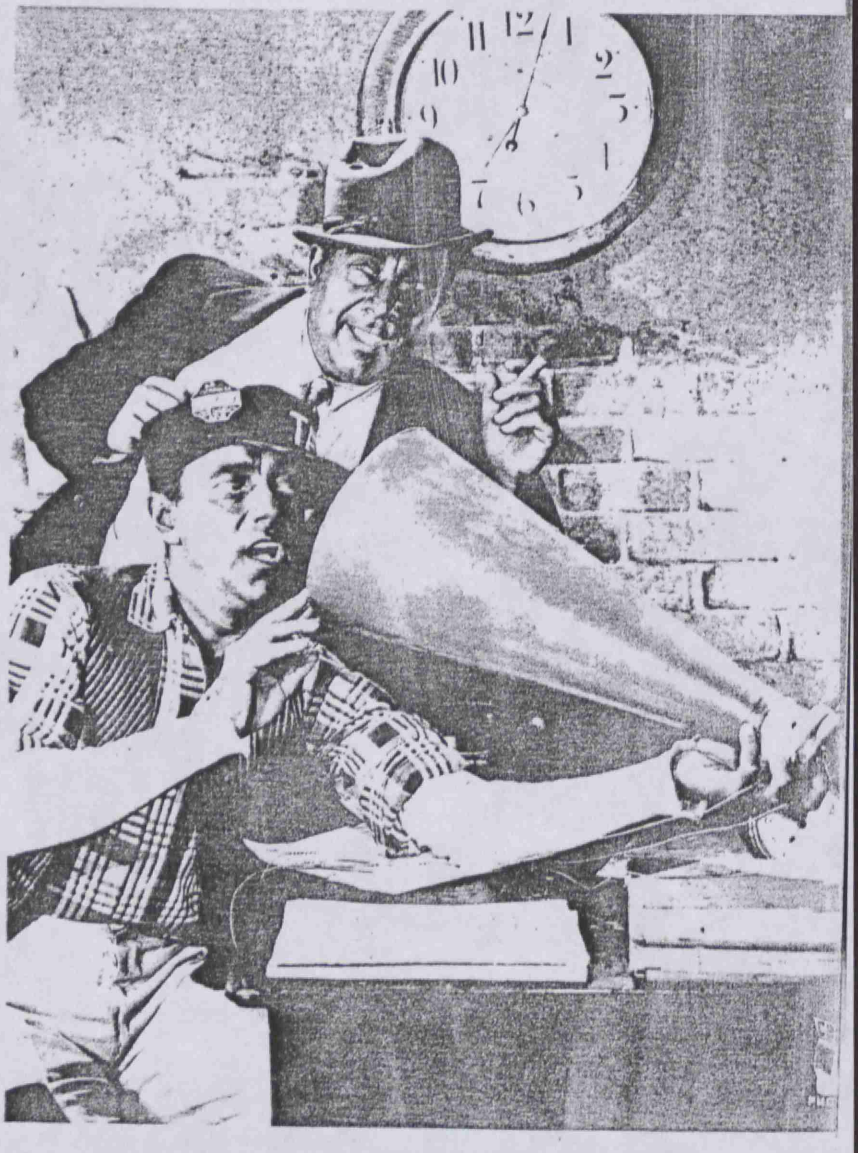


History was made on February 2, 1929, when an NBC mobile unit brought voices from a plane in flight into the nation's living rooms.

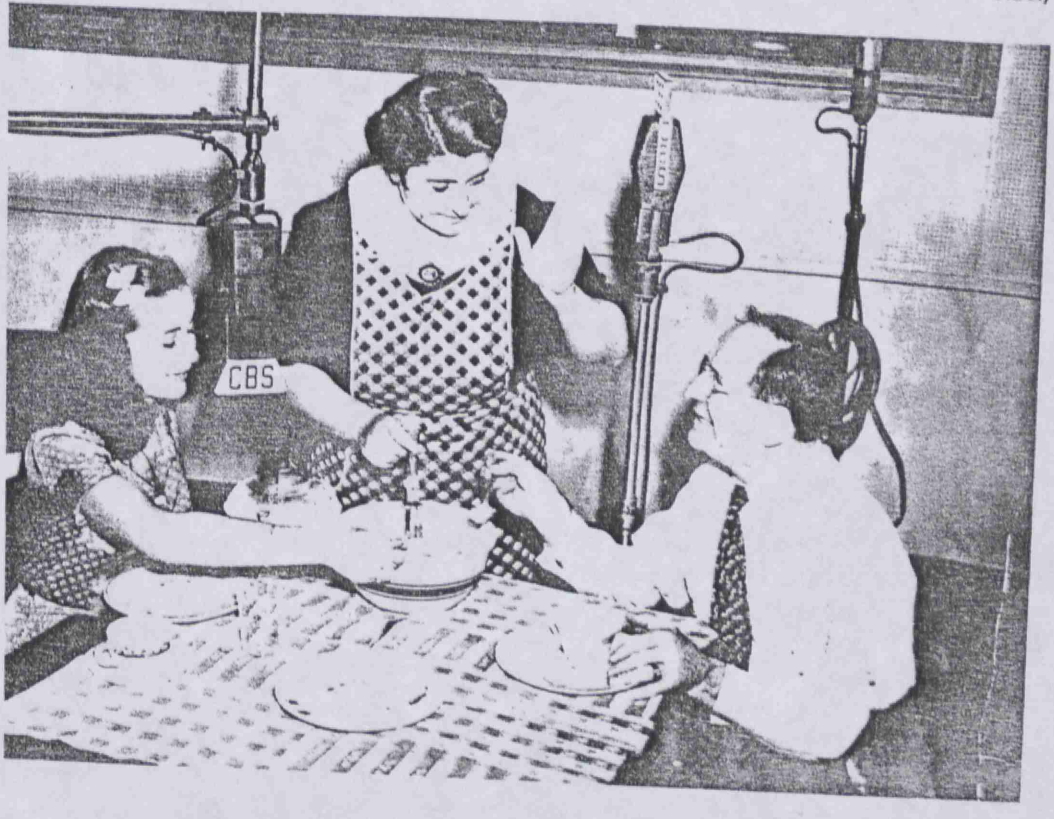
Freeman Gosden ("Amos") and Charles Correll ("Andy") met in 1919 and formed a vaudeville team, doing a black-face act called "Sam 'n' Henry." They brought "Sam 'n' Henry" to Chicago radio in 1926 and in 1928 changed the act's name to "Amos 'n' Andy." Under the new name the show, which had been only moderately successful, became an immediate hit and in August of 1929 it went on the NBC network under the sponsorship of Pepsodent.

In the early days Gosden and Correll played all the roles on the program, but later other actors were added. The original team stills plays "Amos 'n' Andy" on radio, but other actors handle the roles on TV.

The tremendous and enduring popularity of "Amos 'n' Andy" was well deserved, for the program had real warmth and wit, and in such characters as the raffish "King Fish" and "Madame Queen" it presented some of the few truly original creations of radio comedy.



"The Rise of the Goldbergs" made its bow on NBC on November 20, 1929. Gertrude Berg, writer, producer, and star of the program, became so closely identified with the character she played that her friends called her "Molly." The Goldbergs continued their adventures on radio until 1946, and the show was revived on television in 1949. The roster of alumni of "The Goldbergs" is a distinguished one. Among the voices to be heard at one time or another on the show were those of Everett Sloane, Van Heflin, Joseph Cotten, Joan Tetzel, and Marjorie Main.



such as "I's regusted" and "check and double-check" made their way into the speech of the nation, and the trials and tribulations of Andy and the King Fish became popular topics of conversation.

Kate Smith, the "Songbird of the South," made the first appearance of her long radio career in 1929, and on a local station in Baltimore could be heard a young man who billed himself as Red Godfrey, the "Warbling Banjoist." (Radio in its early days made extensive use of descriptive sobriquets. There as Wendell Hall, the "Red-Headed Music Maker," Arthur Tracy, the "Street Singer," Ed Wynn, the "Fire Chief," Jan Garber, the "Idol of the Airlanes," Wayne King, the "Waltz King," and so on and on.)

Rudy Vallée—he was the "Vagabond Lover"—kept millions of women virtually chained to their radios, from his opening "Heigh-ho, everybody" to the last nasal strains of "Your Time Is My Time." He and his Connecticut Yankees began their weekly broadcasts, called the "Fleischmann Hour," in October of 1929. He is often credited with being the originator of the radio variety show.

The 1920's saw the beginning of programming for children, with a host of imaginary "uncles" and "aunts" bringing entertainment to the nation's children. This trend was started by Don Carney and his "Uncle Don" program on WOR in New York. For almost twenty years his patter would change hardly at all. With parents sending him thousands of letters weekly, Carney could come up with such apparently omniscient items as this:

"Now today is the birthday of Willie Smith of Brooklyn, who has not been eating his vegetables the way he should. No he hasn't! And he ought to. But his Mama and Papa love him very much just the same, and if Willie will look behind the piano, I think he will find a present for his birthday."

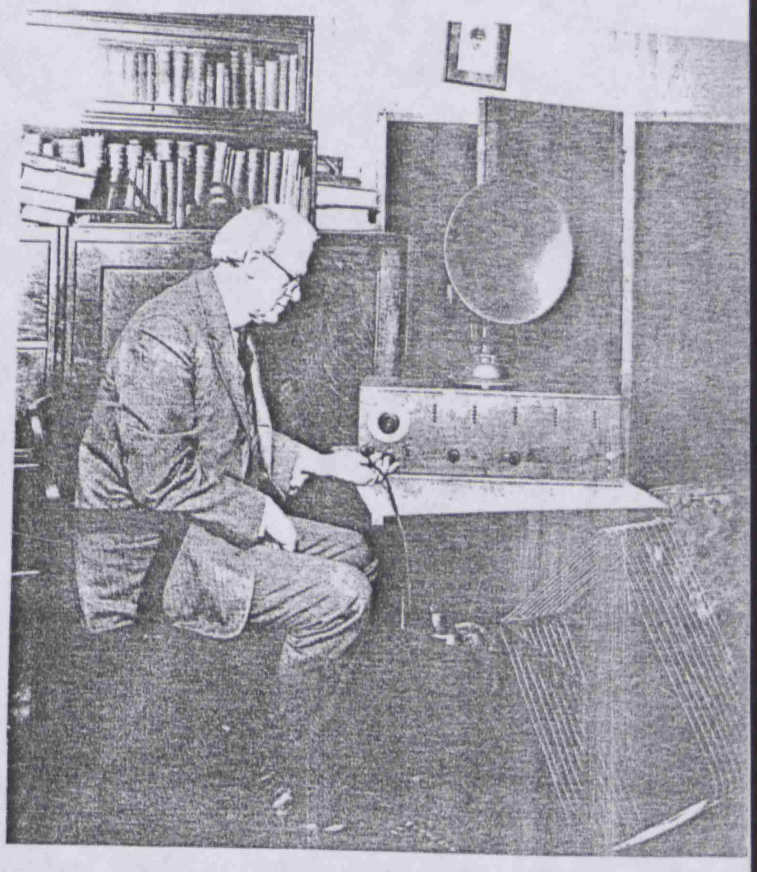
Second only to "Uncle Don" in longevity was the celebrated CBS series, "Let's Pretend," a program produced and written by Lila Mack, on which children acted out stories.

Another early favorite was Irene Wicker, the "Singing Lady," who provided programs of nursery rhymes, interspersed with little skits and stories.

The early 1930's would see the rise of "radio clubs" with buttons, badges, secret signs and codes. Typical of these was "Chief Wolf Paw," with his password, "Ho-wah-ho-so-wah-ka." Another development of the 1930's was the amateur show, such as the "Horn & Hardart Children's Hour," and the "juvenile theatre," in which the children themselves participated. This was a format which attracted both children and their parents, and was therefore commercially very sound.

Dramatizations of comic strip characters, such as

Will Rogers became America's best-loved personality by dispensing his homespun philosophy and trenchant political observations on radio. Rogers was born in 1879 in Oklahoma. He spent his early years traveling in a wild west show, and made his first appearance on the vaudeville stage in New York, twirling a lariat. Subsequently he developed a humorous monologue and successfully performed in many Broadway shows. He became one of the great stars of the *Ziegfeld Follies*, and in 1918 began to appear in motion pictures. He published syndicated newspaper articles and frequently appeared on radio. Rogers was killed with Wiley Post in an airplane accident in 1935.



During the period from 1920 to 1930 the development of the radio receiver was phenomenal, as these three pictures, with only a few years between them, illustrate.

"Skippy" and "Little Orphan Annie" would prove tremendously successful in the 1930's. This was the era of the "box top thrillers," which combined an exciting story with the opportunity to get a free prize through the mail. All Junior had to do was see to it that Mom bought the sponsor's product.

Abuses crept into these programs. In an effort to retain audiences, the element of suspense was carried to extremes and there was often an excess of physical violence. Nationwide protest reached such proportions that Congress itself was moved to act, and bills were introduced designed to restrict the radio stations and networks in their programming for children.

Responding to the pressures, and in an effort to head off restrictive legislation, the networks promulgated their own codes for children's programs, eliminating "torture, horror, use of the supernatural or superstition likely to arouse fear" and banning profanity, vulgarity, kidnapping, and "cliff-hanging."

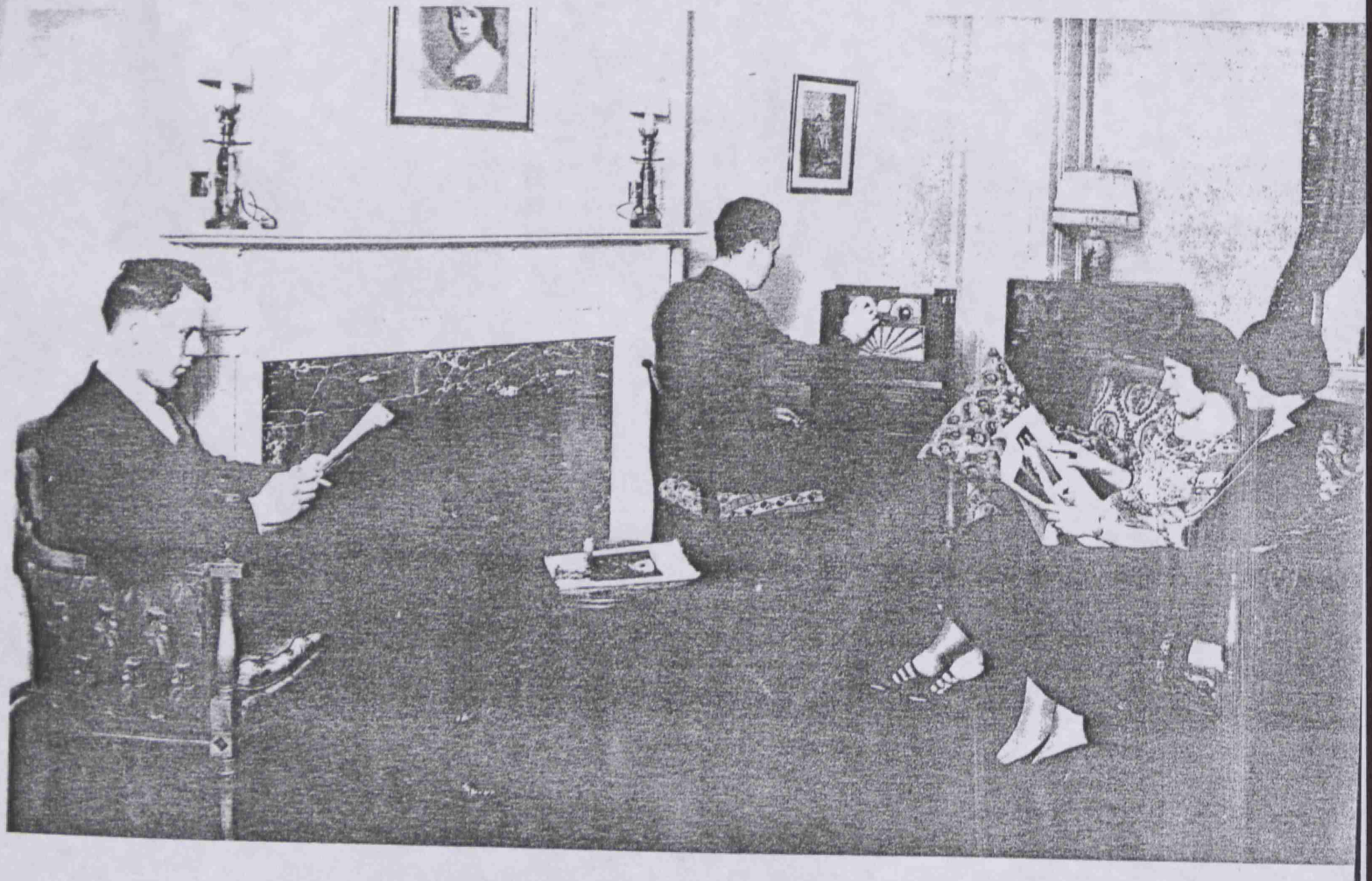
A program which adhered scrupulously to the code and yet achieved such popularity that it is probably the best-remembered of all children's serials was "Jack Armstrong, All-American Boy." When she heard its theme song ("Wave the flag for Hudson High, boys . . ."), Mom knew that the kids were about to have a painless lesson in law and order, clean living, fair play, and good behavior.

Popular in the late 1930's and into the 1940's were such serials as "Buck Rogers," "Dick Tracy," "Captain Midnight" "Superman," and "The Lone Ranger."

The latter program, incidentally, was destined to make a peculiar contribution to American history. "Hi-yo, Silver!"—the "Lone Ranger's" familiar call to his horse—was actually used as a password by American troops entering Algiers during World War II.

Radio had taken root in the 1920's, and its branches rapidly expanded into all phases of American life. Both programming and listening during this decade were changing their patterns. Program personalities were beginning to attract loyal listeners. Obscure announcers and crooners became public heroes, to be idolized by millions of people who knew them only by voice.

The stock market crash and the subsequent depression were destined not to depress radio, but to add substantially to its ever-increasing audience. While movie houses closed, night clubs languished, and theatrical stock companies disappeared, radio boomed. Here was a medium of entertainment that was free, a mode of amusement provided to rich and poor alike without cost and in the privacy of the home. Thousands of families who had purchased much of their household equipment on credit gave up their vacuum cleaners, their cars, and their furniture, but kept up the payments on their radios. Radio had become a



part of their lives with which they could not part.

New national figures suddenly came into prominence. Radio philosophers arose who lectured to the millions on the ways of life and regularly received thousands of letters requesting help on personal problems. On the swelling tide of radio came scores of unemployed vaudeville and movie actors, night club performers, and concert stars to lend lustre and ingenuity to broadcasting. Advertisers, amazed by the huge audience, moved out of other media into radio, giving rise to a boom the like of which had never been experienced by any other industry. People loved radio and believed in it. Glued to their ever-more-elaborate sets, they were entranced by singing commercials, crooners, soap operas, mystery shows, comedians, quizzes—everything the magic box had to offer.

But there was criticism of the new medium, too. Lee De Forest, speaking to a convention of broadcasters, cried out in dismay: "What have you done with my child [radio]? You have made him the laughing stock to intelligence, surely a stench in the nostrils of the gods of the ionosphere. Murder mysteries rule the waves by night and children are rendered psychopathic by your bedtime stories. This child of mine is moronic, as though you and your sponsors believe the majority of listeners have only moron minds."

Taking up the cry with De Forest were educators, sociologists and many government officials in the halls of Congress.

But the tide continued in the late twenties, and the industry was not to stop and take stock of itself until the 1930's, when mounting criticism caused the networks to set up their own codes of behavior and put forth increasing numbers of public service programs.

Scenes from the Westinghouse movie "On the Air," recreating the birth of radio broadcasting, appear in this photomontage centered around the garage in which Frank Conrad built his experimental transmitter. From left, starting at the top, are shown: Dr. Conrad's transmitting equipment; Dr. Conrad and assistants in his laboratory; phonograph music being sent over the air; an early radio fan with a primitive crystal set; department store salesmen trying one of the first retail sets; a home audience enjoying their first loud speaker.

THE BROADCASTING STATION

A famous star singing to the "unseen audience" from radio receiving station.

AT present there are perhaps 125 to 200 radio telephone broadcasting stations in the United States which are regularly sending out news and entertainments to the hundreds of thousands of listeners who have receiving apparatus. They are located in the larger cities, which is essential for two reasons: that their programs may reach the largest number of people possible and that artists of recognized ability may be secured to join the other entertainers.

A broadcasting station is generally divided into two or more rooms. The studio, with its piano, phonograph and other equipment for the artists, resembles the music room to be found in a home, except that the ceiling and walls are generally covered with some cloth or material which will eliminate any reverberating sounds or echoes.

One or more small "pick up" instruments known as microphones, mounted on standards, are usually the only pieces of electrical apparatus to be found in this room. Wires from these convey the voice or music into another room, which in many cases is at quite a distance from the studio. The latter resembles a laboratory with its various pieces of electrical apparatus, transmitting vacuum tubes, panel boards, storage batteries, etc. Here the music or speech is put through a number of steps of amplification by means of smaller vacuum tubes which increases the volume of the sound waves thousands of times. The amplified speech currents then enter another bank of vacuum tubes, known as modulators or molders of the electric waves sent through the ether.

Vacuum tubes, made in the same manner and containing the same number of elements as the small tubes used for receiving, but much larger and therefore capable of handling more power, usually are used for radio broadcasting.

Direct current at a high voltage is necessary for the operation of a transmitting station. To obtain this, a low voltage alternating current, such as used for lighting purposes in the home, is boosted to a high voltage by means of a motor-generator. This voltage is then applied to a number of vacuum tubes. The electric power supplied to these tubes causes electrical oscillations in the aerial wire system known as the antenna, and the antenna in turn radiates electrical waves which are molded to the form of the inflexions of the voice or of music, by other tubes termed modulators.

The power used at a broadcasting station is measured by the energy delivered to the antenna system, rather than the energy taken from the power lines. For this reason the rated power of a broadcasting station seems rather low to the uninitiated.

Many of the broadcasting stations employ 500 watts of radiated energy, which is equivalent to nearly one horsepower. However, one of the largest broadcasting stations in the United States, located in Schenectady, New York, and owned by the General Electric Company, has facilities for greater power, but this is used only for special experimental tests. The masts used to support the antenna at this station are 183 ft. high and have been erected on the roof of a five story building.

Operators at broadcasting stations must possess the faculty of clear diction; they must be able to carry on a conversation in moderate tones sufficiently modulated and at low enough speed to insure correct and faultless reception at all the receiving stations.

A corner of the Radio Corporation—Westinghouse Station "WJZ".

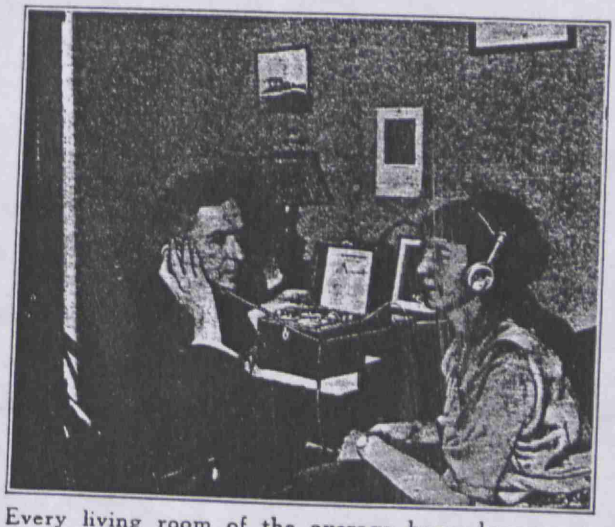
The average range of the several high power broadcasting stations now in existence is 100 to 500 miles, although the stations maintained by the Westinghouse Electric and Mfg. Co., the General Electric Co. and the Radio Corporation of America have been heard over several thousand miles. In one instance an operator on board a ship more than a thousand miles at sea received a complete concert from a broadcasting station near New York with great enough intensity to pass it over the ship's telephone lines to 25 different staterooms at the same time.

It is estimated there are between 500,000 and 750,000 receiving sets in use, and artists at the larger broadcasting stations have had their entertainment heard by more than one hundred thousand people simultaneously.

As previously explained, the range of a receiving station depends upon a number of variable factors and the distances pointed out here have been covered by receiving stations employing sensitive apparatus, involving several stages of vacuum tube amplification. These facts should be considered in purchasing radio receivers.

THE FIVE FUNDAMENTALS OF RADIO RECEPTION

MOST of us know that there are various types of apparatus for the reception of radio broadcasting. Some of these "sets," as they are called, are more sensitive than others. Sensitivity, in the sense we apply it to receiving sets, is a quality analogous to power in transmitting apparatus. Most receiving sets, have five distinct functions—intercepting, tuning, detecting, amplifying and reproducing. It will be helpful to us later, when we consider receiving sets as complete units, if these functions are understood.



Every living room of the average home becomes a radio receiving station.

Intercepting

"Antenna" and "Ground," the externals of a radio receiving set, intercept the broadcasted signals and lead such energy as they collect to the receiving set by means of wires. In practice the ground usually consists of a wire connecting a certain binding post or terminal connection on the set with a water pipe, or other metallic conductor which leads to the ground. The antenna, in its simplest form, may consist of a single bare wire, thoroughly insulated from adjacent objects, seventy-five to one hundred and twenty-five feet long and raised horizontally to the earth as high as possible. This also is connected with the receiving set by means of a wire called the lead-in; details for the installation of the ground and erection of antenna are furnished in printed directions which accompany every set sold by the Radio Corporation of America.

Tuning

All radio broadcasted speech or other signals arrive at the receiving antenna on a definite radio wave length, that is, the wave length to which the broadcasting station is adjusted or "tuned." Every sound we hear, therefore, is carried through space by electrical waves, but these electrical waves are not audible to the human ear until, first, they have been "tuned in" at the receiver, and second, made audible by the "detector" and the head telephone. The radio transmitting station does not radiate a "sound wave." It radiates an electrical wave which serves to carry through space the inflexions of the human voice or of music or of telegraph signals.

Tuning, as applied to radio, means the manipulation of wave changing controls on the receiving set so that the apparatus may be adjusted for a maximum signal from the broadcasting transmitting station. Once the receiver has been tuned to the wave length of the distant station, no further tuning manipulation is necessary for the reception of the entire concert. Nor is tuning a difficult operation for the beginner; all that has to be done is to turn the controlling knobs or levers on the tuning elements until the signal is heard loudest.

Detecting

The detector rectifies or "changes" the energy received by the radio set into a form of energy which will produce an audible sound in a reproducer such as the head telephone or loud speaker. There are two classes of detectors, mineral crystals, and vacuum tube detectors. A vacuum tube detector is better

than the crystal detector because it is much easier to adjust and it performs its functions with greater efficiency as it amplifies incoming radiophone signals many times.

A receiving set equipped with a crystal detector is known as a "crystal receiver"; a receiving set which employs a vacuum tube detector is called a "vacuum tube receiver"; a receiving set using a vacuum tube detector which has special means for amplifying signals is called a "vacuum tube regenerative receiver."

Amplifying

Amplifying devices are used when the receiving set is far removed from the broadcasting station, or when it is desired to have the received signals actuate a loud speaking device.

The essential of an amplifying device is the vacuum tube. Each vacuum tube utilized in such apparatus (not to be confused with the detector tube) is known as one "step" of amplification.

Amplifier tubes operate on an electrical principle analogous to the mechanical principle of a firearm. Pulling the trigger of a gun requires very little physical energy, yet it releases a terrific energy stored in the shell in the form of powder. When energy is impressed on the amplifier tube, it "triggers off," from a battery storing electrical energy, a given signal having many times the energy of the original.

In some receiving sets, the tubes are so placed as to amplify the signal before it is fed to the detector tube. This is called "radio frequency amplification." In other sets, the tube is made to amplify the signal after it has passed through the detector. This is known as "audio frequency amplification." Where extreme amplification is desired, the set may contain amplifier tubes in both positions.

Reproducing

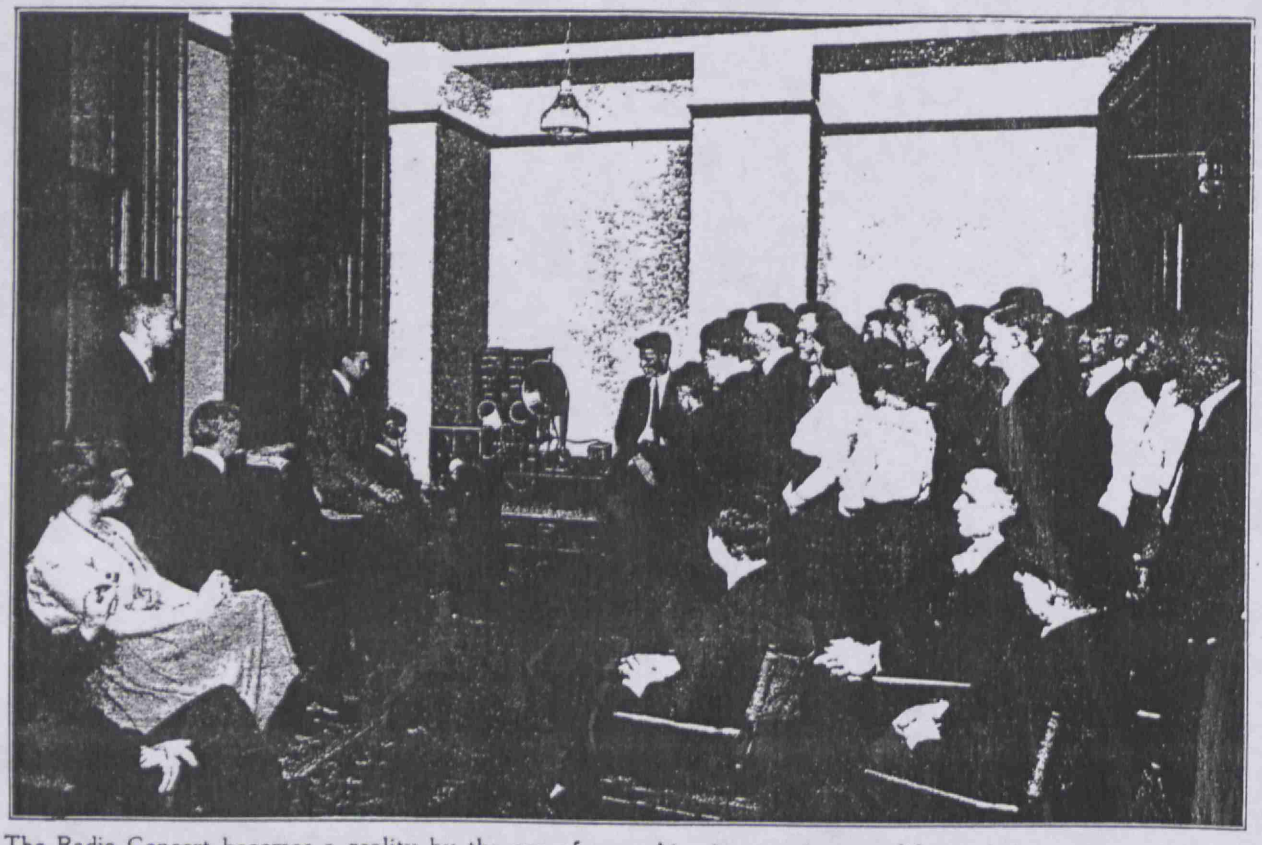
The function of the reproducer is to convert the energy which has been passed through the various apparatus described above from electrical pulsations into sound waves. A pair of head telephones constitute one type of reproducer. Another is the loud speaker, consisting of a sensitive telephonic reproducer attached to a suitable sound chamber or horn.

A very slight vibration from the head telephone will suffice to convey the sound to the ear. On the other hand, a loud speaker, to make the signal audible over an entire room, must have a diaphragm vibrating vigorously. Obviously, a loud speaker requires a signal of much greater intensity than a telephone headset, and it is one of the functions of amplification to furnish this louder signal.

General Remarks

The strength and quality of the audible sound made by the reproducer is directly dependent upon how well each of the five functions is performed by the receiving set.

Crystal receivers do not amplify signals; they simply tune, and rectify or change the energy at the detector and pass it directly to the reproducer, which is invariably a head telephone set.



The Radio Concert becomes a reality by the use of a combination receiver-amplifier unit in conjunction with a loud speaker.

CLASSES OF APPARATUS AND THEIR APPLICATION

ONCE any of the telephone receiving sets, intended for concert reception, is installed in your home, there is no need for technical knowledge. The usual questions that are asked can be briefly answered here:

"How much will it cost and what distance will it carry?" " Do city conditions differ from those of the country in regard to radio reception?"

In general it may be said that there are four classes of radio apparatus, each one designed at a specific price and for a specific use. These are:

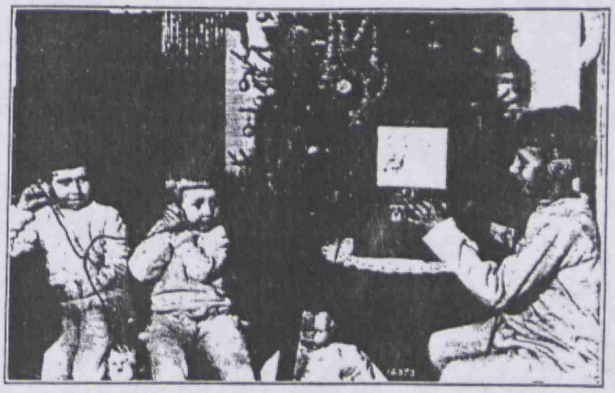
(1) The simple circuit crystal type receiver which may cost from $18 to $50, and which may receive effectively from five to twenty-five miles, according to skill in setting up antenna, and atmospheric conditions.

Crystal detector apparatus necessitates the use of an outdoor aerial, and reception is accomplished by means of head telephone receivers.

(2) This class of apparatus may be said to be practically the same as Class 1, except in this instance we depart from the simple crystal detector to the vacuum tube detector, with an improvement in receiving qualities. The cost in this instance may range from $65 to $100.

It is also necessary to employ the outdoor antenna, as well as the head telephone receivers. It is not possible in this instance to make use of loud-speaking devices, for the energy received by the single vacuum tube detector is not strong enough to handle the loud speaking device unless the set is located within 2 or 3 miles of the transmitting station.

The "Man in the Moon" in action at "WDY" Broadcasting Station formerly at Roselle, N. J.



Bed time stories and music by radio have delighted thousands of little tots within a radius of several hundred miles from Newark, N. J. and New York.

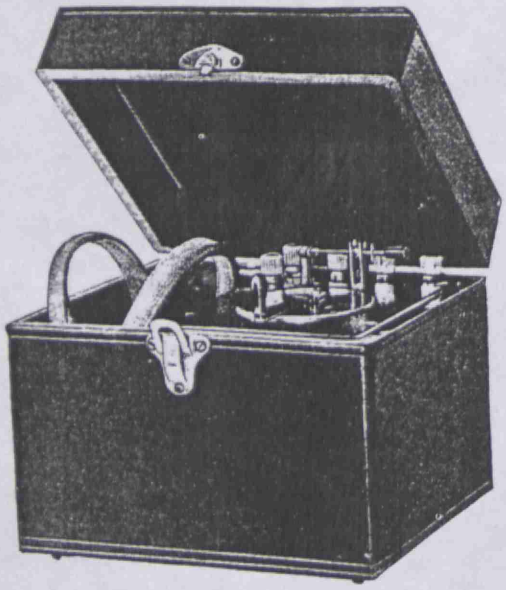
(3) In this class, it is also necessary to use the antenna and ground contact of the other systems mentioned. But much greater efficiency is obtained because vacuum tube amplification is employed. Receivers of this type usually consist of a receiving or tuning unit, a vacuum tube detector and two stages of vacuum tube amplification. This type of receiving equipment may cost from $150 to, possibly, $300. It has a much greater range of operation than the other types, and will function quite well up to 100 miles, although under exceptional receiving conditions, as much as 1000 miles may be obtained, employing the head telephone receivers.

It is also possible, in this instance, to employ a loud speaker and thus eliminate the head telephone receivers, thereby permitting a roomful of people to hear radio. The extra two stages of amplification permit this, for they increase the original intensity of a signal to such a point as to effectively operate the loud speaker.

(4) This is the de luxe type of radio receiver, usually embodied in a complete cabinet, similar to that of the phonograph. All necessary instruments are enclosed in the cabinet and the tuning and adjusting devices are greatly simplified. It is designed for the use of the technically uninformed general public. A unit known as the "Aeriola Grand" is now on the market which incorporates these desirable features, and which is sold for $350.

RADIO BROADCASTING RECEIVING OUTFITS

AERIOLA JR. RECEIVER, MODEL RE



Aeriola Jr. is compact, inexpensive, requires no batteries, and is easy to operate

AERIOLA JR. is a complete Radio receiving outfit designed and manufactured by the Westinghouse Electric and Manufacturing Company. Its range varies from ten to twenty miles. Any one who can operate a talking machine or a camera can operate an Aeriola Jr.

Simple Adjustments

No technical knowledge is required. The only adjustments necessary include the occasional finding of a "sensitive spot" on the crystal detector and the simple turning of a tuning control arm to obtain the maximum intensity of reception.

The complete receiver is built in a very substantial and attractive wood cabinet which has a compartment for storing the telephone receivers when the set is not in use.

The tuning elements and the crystal detector are mounted on a black panel which forms the top of the receiving set when the cover is lifted. All the metal parts are finished in nickel. Under the tuning control arm, there is a calibrated dial. Where the receiving station is within range of several broadcasting stations operating on different wave lengths, it is possible to determine just what setting is necessary in order to hear any of the stations at a given time by noting the position of the tuner control arm with relation to the calibrated dial. With Aeriola Jr. there is no maintenance cost. Once the antenna has been erected and the ground connection made according to the instructions given, it is only necessary to adjust the detector and rotate the tuner control arm until radio signals are heard in the head telephone receivers. The wavelength range of Aeriola Jr. is particularly adapted to broadcasting reception on the 190-500 meter wavelength band.

Reliable and Inexpensive

Aeriola Jr. includes everything necessary for this type of receiver—a tuner, a fixed condenser, a supersensitive crystal detector, and a high grade set of head telephones. In order to secure the best results from this outfit it is but necessary to follow the directions given in another section of this book and devoted to the erection of the antenna and securing the ground connections.

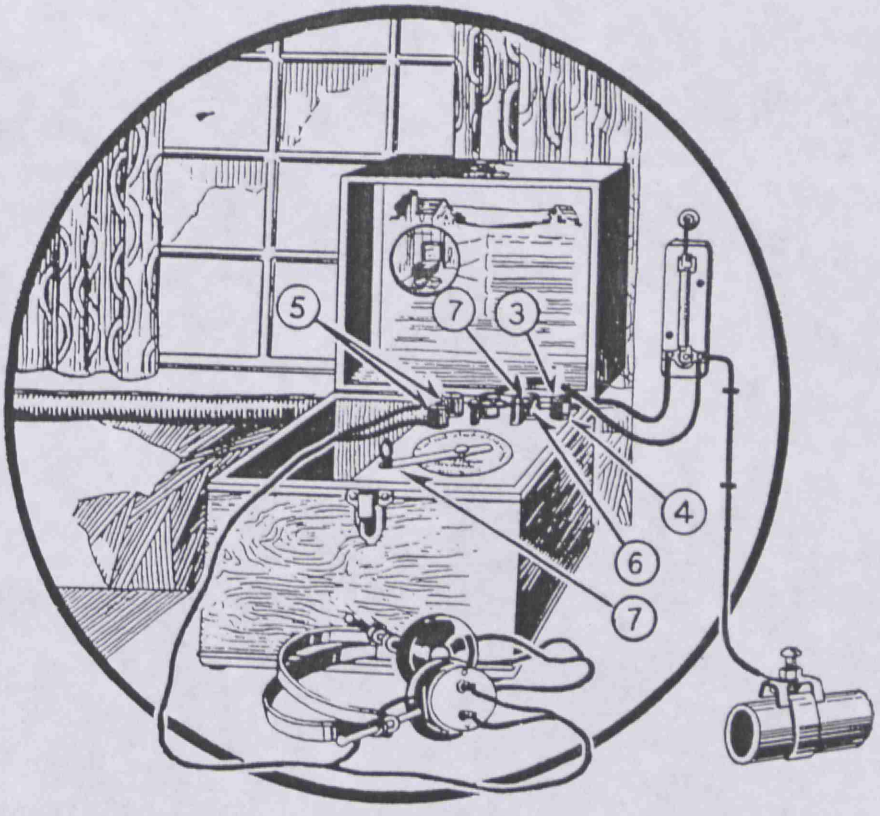
The entire design assures a degree of selectivity and reliable operation not usually found in this type of receiver.

Aeriola Jr. may ordinarily be employed for receiving from the broadcasting stations up to a maximum distance of 20 miles. Under some circumstances this range may be increased; often the Aeriola Jr. will pick up broadcasting over distances up to 35 miles.

The farmer located within easy distance of a broadcasting station may use Aeriola Jr. to advantage for the reception of market and weather reports.

Aeriola Jr. Makes an Ideal Set for the Beginner. It is Portable, Compact and Inexpensive. Requires no Batteries of any Kind.

OPERATING INSTRUCTIONS FOR AERIOLA JR.



Text numbers correspond with above diagram.

No. 1. First, refer to accompanying sketch, then erect antenna and place protective device in position as described on page 56.

No. 2. Connect a wire leading from terminal marked R on protective device to binding post indicated by arrow for stations below 350 meters.

No. 3. For stations between 350 and 500 meters, connect the above wire to this post.

No. 4. Connect this post with terminal G of protective device.

No. 5. Connect telephone receivers to these two posts. Adjust detector by pulling movable crystal away from stationary crystal and then allowing it to come in contact again at various points. While making this adjustment, rotate tuning handle (7) slowly over the scale, listen until sound is heard in the telephone receivers. Temporarily stop adjustment of detector and manipulate tuning handle until maximum strength is obtained. Leave tuning handle in this position and readjust detector. After a short time, the operator will become skillful in finding delicate adjustments on this crystal detector. Various stations may be heard by simply rotating the tuning handle over scale.

Note: As crystals are rubbed together, a black deposit appears on the movable crystal, decreasing the sensitivity of the set. This deposit may be scraped off lightly with a knife. Further precautions regarding the care of crystals are pointed out in part 4 of this book.

Complete Aeriola Jr. Broadcasting Receiver, Model RE, 190-500 Meters, with Head Telephone Receivers, Spare Crystals, Antenna Equipment and Full Instructions $32.50

Aeriola Jr. Broadcasting Receiver, Model RE, as above, less Antenna Equipment $25.00

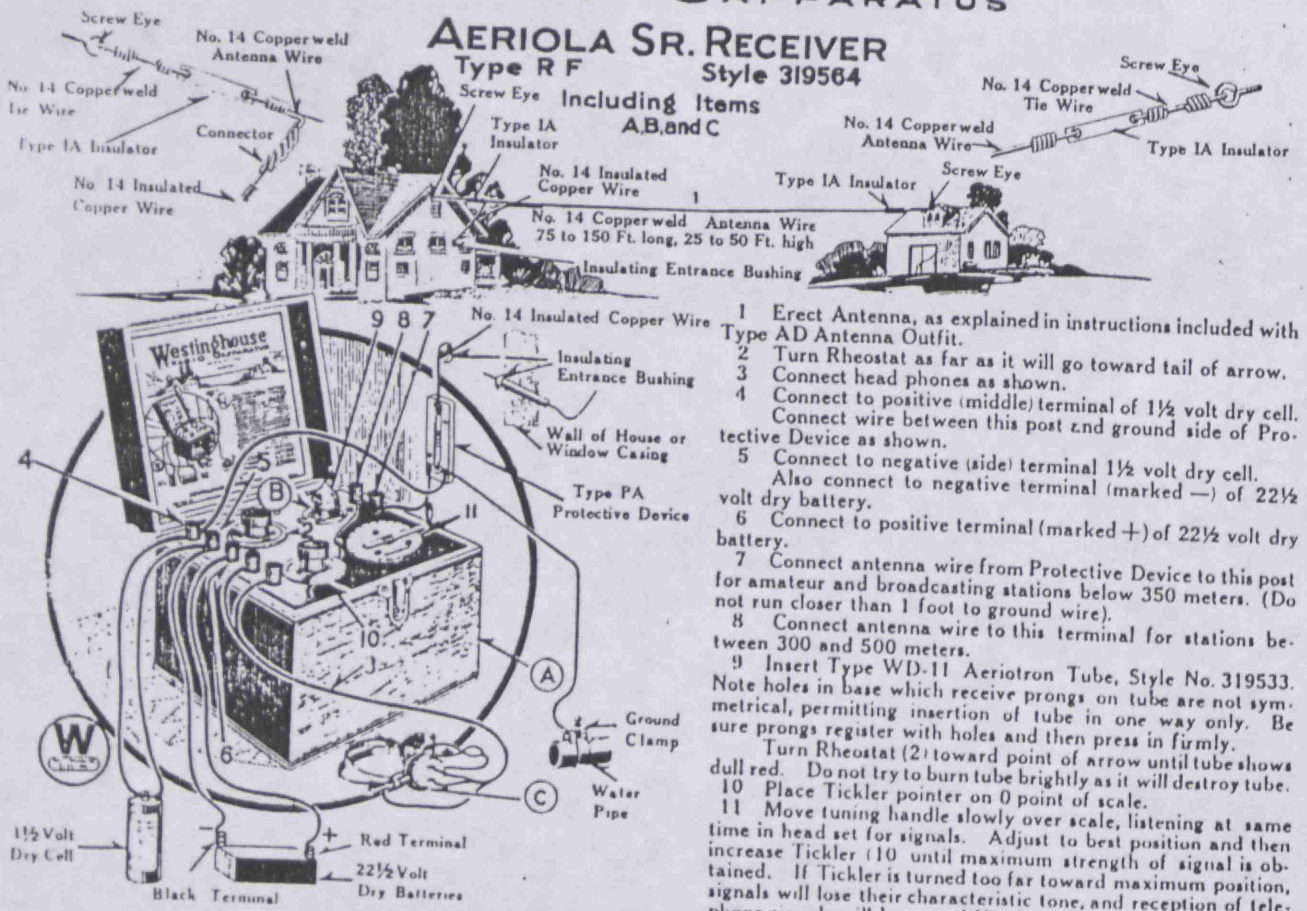
Dimensions: 7 in. x 8½ in. x 7¼ in.

Weights: Net, 5 lb.; Shipping, 10 lbs.; with Antenna Equipment, 17 lbs.

NOTE: For Prices of other Complete Receiver Combinations, see page 35.

Westinghouse
RADIO APPARATUS

AERIOLA SR. RECEIVER
Type R F Style 319564
Including Items A, B, and C



1 Erect Antenna, as explained in instructions included with Type AD Antenna Outfit.
2 Turn Rheostat as far as it will go toward tail of arrow.
3 Connect head phones as shown.
4 Connect to positive (middle) terminal of 1½ volt dry cell.
Connect wire between this post and ground side of Protective Device as shown.
5 Connect to negative (side) terminal 1½ volt dry cell.
Also connect to negative terminal (marked —) of 22½ volt dry battery.
6 Connect to positive terminal (marked +) of 22½ volt dry battery.
7 Connect antenna wire from Protective Device to this post for amateur and broadcasting stations below 350 meters. (Do not run closer than 1 foot to ground wire).
8 Connect antenna wire to this terminal for stations between 300 and 500 meters.
9 Insert Type WD-11 Aeriotron Tube, Style No. 319533. Note holes in base which receive prongs on tube are not symmetrical, permitting insertion of tube in one way only. Be sure prongs register with holes and then press in firmly.
Turn Rheostat (2) toward point of arrow until tube shows dull red. Do not try to burn tube brightly as it will destroy tube.
10 Place Tickler pointer on 0 point of scale.
11 Move tuning handle slowly over scale, listening at same time in head set for signals. Adjust to best position and then increase Tickler (10) until maximum strength of signal is obtained. If Tickler is turned too far toward maximum position, signals will lose their characteristic tone, and reception of telephone signals will be very difficult.

WESTINGHOUSE ELECTRIC & MANUFACTURING CO.
EAST SPRINGFIELD WORKS
SPRINGFIELD, MASS

I. L. 1096-A

The Pittsburgh Press

TELEVISION/RADIO

Dees echoes Randolph c

RADIO NOTES

Gene Romano, program director, says he pilfered the idea from another station. And now WTKX-FM in Pensacola, Fla., has launched its own "Gulf Coast Breeders' Cup." But the winning husband and wife — there are three couples "competing" — get only $1,000. So kudos to WDVE for being more generous *and* pragmatic.

Incidentally, I talked with Pittsburgh Planned Parenthood about 'DVE's promotion. A spokeswoman there said as long as couples chose to participate, they have no objection.

I figured as much, but I still was curious.

KDKA celebration

It's safe to say most listeners enjoyed KDKA's 24-hour anniversary bash Friday.

Talk show host Fred Honsberger broadcast for 4½ hours from a shack — a replica of the building where the station's first regularly scheduled broadcast took place 70 years earlier. It was created by the Pittsburgh Antique Radio Society.

Original equipment from that first night was used during Friday's broadcast.

Honsberger spoke with the son of Leo Rosenberg, the announcer for KDKA's broadcast of the Harding-Cox presidential election returns, and played material from the era.

Highlights included the truly dippy jingles written for the station over the years; projections into the future by local business figures in 1959, guessing what the world would be like in 1979 (nuclear power was hot then); portions of a 1937 anniversary special; and my favorite: the inept hurricane report from Corpus Christi, Texas, by someone who must have sprung from "Greater Tuna."

WIXZ-AM in East McKeesport provided essential equipment for the Honsberger show. The shack will be open to visitors in the lobby of the Westinghouse Building, Gateway Center, Downtown, until Christmas.

Around the dial

A glance at WTAE-AM's talk show schedule has convinced me I'm going to have to

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Bill Adams

Yester Days

Radio's early days included Peoria

☐ First local station operated from Bradley Polytechnic Institute

As noted last week, it took a long time to develop electronics and the subsequent inventions of the telegraph, telephone and wireless telegraph. But once we knew that sound could be transmitted through the air, radio came on the scene at a fast pace.

It's impossible to know when it first occurred, but station KQW in San Jose, Calif., produced its first radio broadcast in 1909, and ran a regular schedule in 1912. In 1916, station 2ZK in New Rochelle, N.Y., was broadcasting music regularly. By the late summer of 1920, the Detroit amateur station 8MK was broadcasting regularly, and both Dr. Lee DeForest and Reginald A. Fessenden were doing experimental broadcasting that year.

But what is generally accepted as the beginning of commercial radio as we know it today also came in 1920, with the first licensed station listed with the U.S. Department of Commerce (the FCC came later). It was station KDKA in Pittsburgh, Pa.

This all began, though, back in the teens during World War I. Dr. Frank Conrad, an assistant chief engineer at Westinghouse Electric and Mfg. Co. in Pittsburgh, was operating an experimental radio station in his garage behind his house in Wilkinsburg, Pa., a Pittsburgh suburb. Its call letters were 8XK. His station was used to test U.S. Signal Corps equipment built by Westinghouse. After the war he aired musical programs from the garage.

He made regular talks over the radio, and later began playing recorded music. Conrad began announcing in advance a series of "broadcasts," which is said to be the first use of that term.

When his supply of records ran out, the Hamilton Music Store in Wilkinsburg offered him a continuous supply of records if he would announce that they were from that store. This "trade-out" became the first radio commercial.

On Sept. 29, 1920, the Joseph Horne Co., a Pittsburgh department store, ran an ad in the Pittsburgh Sun newspaper, describing a radio program that ran for about 20 minutes the previous Saturday night about 10. It stated that Victrola phonograph music was played, consisting of two orchestra numbers and a soprano solo, plus a juvenile "talking piece." The advertisement ended with this sentence. "Amateur Wireless Sets, made by the maker of the set which is in operation in our store, are on sale here $10 and up."

This newspaper ad impressed a Westinghouse vice president, H.P. Davis. He reasoned that if a well-known store saw merit in advertising radio sets, maybe there was something to this "broadcasting" thing. He sold other Westinghouse officials on building a more powerful transmitting station than Dr. Conrad's.

A license application was submitted on Oct. 16, 1920, and on Nov. 2, KDKA in Pittsburgh went on the air. The first program consisted of election returns of the Harding-Cox presidential election. This has been considered the world's first regularly scheduled commercial radio broadcast.

The returns were received by telephone from a Pittsburgh newspaper. During intervals between returns, phonograph music was played, and two live banjo artists also played. These election returns had impressively demonstrated radio's potential. Later, Harding's inauguration ceremonies were broadcast. President Harding, himself, was intrigued with radio, and delivered a series of messages to the American public via radio. The new medium was to affect the American way of life as nothing had ever done before.

Sporting events boomed as a result of radio. On July 2, 1921, the Dempsey-Carpentier fight was broadcast from Boyle's Thirty Acres in Jersey City. The announcer was J. Andrew White, who also gave radio's first blow by-blow description. This bout and the Jess

Please see ADAMS, Page A6

FROM PAGE A5

ADAMS

Willard-Luis Firpo fight in 1923 were two my dad listened to with the use of headsets.

Other stations grew rapidly. The Detroit News station WWJ had been operating a radiophone, and was granted a license in 1921, and WJZ in Newark, N.J., also broadcast its first program in 1921.

In 1921, Westinghouse also produced its first popular-priced home radio receiver. It cost approximately $60, not including headsets or loud speakers. (It must have been difficult to hear anything on it without them). But sales grew so quickly the manufacturer couldn't keep up with the demand. During this period radio stations weren't selling advertising time. They were broadcasting primarily to sell radio sets.

Other organizations entered the field, including General Electric, AT&T, and RCA. As yet, no one had discovered how a station could make money. They had not yet discovered the paid commercial. But by 1923, there were nearly 600 licenses.

It was during this exciting time of the early '20s that Peoria's first experimental station went on the air. A professor at Bradley Polytechnic Institute, Eric G. Shalkhauser, built a transmitter and was doing "unofficial" broadcasts in the summer of 1921. A government license was obtained on Jan. 4, 1922, and station 9YAN went on the air, a little over a year after KDKA, Pittsburgh.

The transmitter and receiver was built and assembled in the physics laboratory at Bradley's Main Hall. It was located on one of the lecture tables in the basement. The antenna consisted of a wire stretched between a tower of Bradley Hall and the chimney of the power house across Glenwood Avenue.

PEORIA RADIO SALES CO., 127 S. JEFFERSON ST. CIRCA 1921-22.

Photo courtesy of Peoria Public Library

Station licenses and renewals were issued on a three-month basis then, and a new application was made to the Department of Commerce on March 18. The renewal was received on April 23 but carried new call letters. 9YAN became WBAE and the license was good until July 20. But the school year ended in June, so no more regular broadcasts were aired after that, because much of the programming consisted of talks by the faculty, and music programs from Bradley's music department.

Newspapers were now expressing interest, so a new application was made on July 18 by the Peoria Star. The Star joined Peoria Radio Sales Co., a partnership between Eric Shalkhauser and Lyle H. Gift, and a new station went on the air in August. The call letters were WJAN. It was located on the third floor of the new Peoria Star building at 125 SW Madison. Shalkhauser built it with much of the equipment from the former WBAE and 9YAN. It operated for three years, until the early fall of 1925.

That same summer of 1922, Shalkhauser was contacted by Brown's Business College, which was interested in a radio class. He built and licensed another station for that purpose with the call letters WFAP. It also went on the air that summer and operated for about one year, in cooperation with the Peoria Journal.

It wasn't until about 1½ years after WJAN went off the air in 1925 that Enos Kahler went on the air from the living room of his home at 107 E. Glen Avenue in Peoria Heights. The date was Feb. 14, 1927, and he chose the call letters WMBD, which represent "World's Most Beautiful Drive." His house was near Grandview Drive, which former President Theodore Roosevelt described as the world's most beautiful during a visit here in 1910.

Yes, Peoria was right there "among 'um" back in the early 1920s, when experimental radio began.

. . . and it (almost) seems like only yesterday!

(Some of the above facts are from the book, "A Pictorial History of Radio" by Irving Settel.)

Play Nostalgia Quiz with Bill Adams every week on TelEdition. Call him on a touch-tone phone at 682-5050. Then press 5555. He'll tell you instantly whether your answers are correct.

WESTINGHOUSE ELECTRIC CORPORATION

CHRONOLOGY OF RADIO BROADCASTING

1915

Dr. Frank Conrad, assistant chief engineer at Westinghouse, becomes interested in radio as a result of a $5.00 bet on the accuracy of his $12.00 watch; builds small wireless receiver to hear time signals from Navy transmitter at Arlington, Va.

1916

Conrad builds transmitter over garage at his Wilkinsburg (Pa.) home. Station licensed 8XK. First listed in government records August 1, 1916.

1917

Apr. 7: Radio amateurs under security ban as the United States enters World War I.

Conrad's facilities used during World War I, under special authorization, to test military radio equipment built by Westinghouse for the U. S. and British governments.

Conrad develops one of the first practical vacuum tube receivers.

1918

Conrad vacuum tube receiver placed in production at Westinghouse for the U. S. Army Signal Corps.

1919

May Westinghouse generators aboard U. S. Navy seaplane NC-4 power first continuous over-water plane-to-shore radio transmission on historic North Atlantic crossing.

Oct. 1: Wartime security ban on amateurs lifted.

Oct. 17: Conrad delights "hams" with phonograph record concert; later announces series of "broadcasts", first recorded use of this word to describe a radio service.

more

1920

Oct. 16: Westinghouse files application for radio station at East Pittsburgh.

Oct. 27: First KDKA license granted. Letters assigned from roster of ship calls.

Nov. 2: KDKA PRESENTS WORLD'S FIRST REGULARLY SCHEDULED BROADCAST. Harding-Cox election returns.

Conrad turns attention to shortwaves. Begins experiments with frequency modulation (FM) at 8XK.

1921

Jan. 2: First regularly scheduled church broadcast and necessary remote pickup.

Jan. 15: First broadcast by a national personage, Herbert Hoover, speaking for European Relief.

Mar. 4: First Presidential inauguration speech broadcast. Harding speech read on air while being delivered in Washington.

Mar. 10: First broadcast from a theatre, Davis Theatre, Pittsburgh.

Mar. 19: First official of cabinet rank on air, Secretary of War John W. Weeks.

Apr. 11: First blow-by-blow boxing broadcast, Johnny Ray vs Johnny Dundee, Pittsburgh.

Apr. 13: First regular broadcast of baseball scores.

May 19: First market reports. Forerunner of all farm radio services.

May First broadcasting studio. Tent on roof of Westinghouse East Pittsburgh factory building.

June Westinghouse builds first popular-priced home radio receiver, Aeriola, Jr.

July 2: First World's Heavyweight Boxing Championship, Jack Dempsey vs George Carpentier.

Aug. 5: First play-by-play baseball, Pittsburgh Pirates defeat Philadelphia Phils 8-5.

Sept. 12: First political broadcasts. Free time provided for candidates of all major parties in Pittsburgh primaries for mayor.

Sept. 15: Westinghouse WBZ, Springfield (Mass.) licensed.

Sept. 19: WBZ makes inaugural broadcast from Eastern States Exposition, West Springfield. Second station to provide regularly scheduled service.

more

1921 (Con.)

Sept. 19: Westinghouse becomes first operator of a group of radio stations with opening of WBZ.

Sept. 20: First radio news room, Pittsburgh POST.

Sept. 30: Westinghouse WJZ, Newark (N.J.) licensed.

Oct. 1: WJZ makes inaugural broadcast.

Oct. 3: First indoor studio, East Pittsburgh.

Oct. 5: First World Series, New York Yankees vs New York Giants. Announcer: Grantland Rice.

Oct. 8: First play-by-play football, Pitt 21, West Virginia 13.

Nov. 11: Westinghouse KYW, then in Chicago but since 1935 in Philadelphia, makes inaugural broadcast.

Nov. 28: First Catholic broadcast. Forerunner of Catholic Hour.

1922

August Westinghouse shortwave service inaugurated with 8XS established at East Pittsburgh.

Dec. 4: First Musical organization formed exclusively for broadcasting. KDKA Little Symphony under the direction of Victor Saudek.

1923

Mar. 4: KDPM, second Westinghouse shortwave station, installed at Cleveland (O.). First radio "repeater" station. Milestone in radio link transmission and prominent factor in television network development.

May 15: WJZ sold to Radio Corporation of America.

August 8XS attains international stature when shortwave broadcasts of KDKA programs are heard in England.

Nov. 22: KFKX, third Westinghouse shortwave station, installed Hastings, (Neb.).

Electronics television pickup introduced by Dr. Vladimir K. Zworykin, physicist in Westinghouse Research Laboratories. System made obsolete prior mechanical scanning and still is in use in the iconoscope, eye of the television camera.

Westinghouse introduces thermionic vacuum tube, eliminating batteries and making possible operation of radio receivers from ordinary house current.

more

1924

January First radio Barn Dance.

Jan. 17: KDKA Far North Service inaugurated.

June London Conference considers radio link Europe to South America. Conference favors ultra-long wave. Shortwave substituted at a saving of three and a half million dollars after dramatic demonstration by Dr. Conrad using small receiver and curtain-rod antenna in London hotel room.

Conrad transfers 8XK license to Westinghouse. Company releases 8XS, shifting Pittsburgh shortwave activities to 8XK.

1925

Mar. 30: Lowell Thomas makes radio debut at KDKA.

1929

March 8XK call letters changed to W8XK.

Dr. Zworykin demonstrates electronics television receiver, the kinescope. Demonstration is final step in invention, development and showing of all-electronics television at Westinghouse.

1930

January Westinghouse opens second international shorwave station, W1XAZ, Springfield (Mass.).

1935

W1XAZ call letters changed to W1XK.

1939

August W8XK becomes WPIT; W1XK becomes WBOS.

1940

Dec. 16: WPIT moved to Boston.

1941

Jan. 1: WPIT and WBOS merged as WBOS, Boston.

1942

Nov. 1: WBOS taken over by Office of War Information and Coordinator of Inter-American Affairs. In Psychological Warfare Service.

NOTE TO EDITORS

All "firsts" are KIKA's unless otherwise noted.

in behalf of WWJ is based upon imperfect recollection rather than upon facts susceptible of proof.

Further evidence on the point confirmatory of this conclusion of fact was obtained for the author by Wayne L. Randall, Director of Publicity of the National Broadcasting Company. At the author's request, Mr. Randall wrote to Col. Patterson, Assistant Secretary of Commerce, and received a report under date of July 16, 1938, signed by Alexander V. Dye, Director of the Bureau of Foreign and Domestic Commerce, from which the following is a quotation:

"The early records of these amateur stations were listed under the heading of 'Radio Service' by the Bureau of Navigation, Department of Commerce, in a publication entitled, *Amateur Radio Stations of the United States of America.* In this bulletin, published June 30, 1921, on page 156, Station 8CS is listed as belonging to W. J. Scripps, of 3664 Trumbull Avenue, Detroit, Mich., and as having a capacity of 20 watts.

"In the same volume on page 160, there appears the name Radio News and Music Company, Inc. of Detroit, Mich., as the operator of Station 8MK with a power of 1000 watts. Whether this is a station established by the *Detroit News* is not evident."

The report confirms the date given by the author for the first listing of WBL, November, 1921, and states that the name was changed to WWJ in March, 1922. As previously noted, this change did not appear in the *Radio Service Bulletin* until June, 1922.

Now that official records have demonstrated that Station 8CS (operated by W. J. Scripps, now manager of WWJ) was first listed in a bulletin published June 30, 1921, whereas KDKA was listed eight months earlier, we may safely conclude that the Pittsburgh station is entitled to priority on that score alone. But as previously indicated, KDKA could claim Dr. Conrad's experimental station as its origin and go back to August 1, 1916. It would seem therefore that WWJ's claim to priority is disproved on all counts.

Sec. 118a. Station KDKA Broadcasts from a Tent.

Immediately after its successful performance on election night, November 2, 1920, KDKA established an evening broadcasting schedule that ran until 9:30 P.M. Its program was at first not unlike that of Dr. Conrad's amateur station—largely drawn from phonograph records. The astute H. P. Davis, the godfather of this new form of public entertainment, soon perceived that mere phonograph music over the air could never stimulate growth of the industry. People would not buy expensive radio sets in order to listen to phonograph records that they themselves might play on their own phonograph. No indeed, something more vital must be provided.

Band music—broadcast from an actual concert—was a logical idea. Westinghouse already had an excellent band. Mr. Davis resolved to utilize the Westinghouse band. A difficulty, however, was at once encountered. The rude penthouse on the roof was only large enough for the operators. Dr. Conrad believed that an auditorium could be utilized as a broadcasting studio. An auditorium of East Pittsburgh soon became the headquarters of Station KDKA but complaints from the radio audience began to pour in. There were disconcerting echoes and distortion in the broadcasts. The pioneers had encountered that bug-a-boo of early broadcasting—resonance! Try as they might the auditorium was unsatisfactory for band music.

In desperation they took the band out-of-doors and lo! the broadcast improved amazingly. Back went the studio to the roof-top for out-of-doors band concerts. Stormy weather, however, made necessary a large tent to shelter the musicians. The tent worked admirably—no resonance was encountered. Thus during the Spring and Summer of 1921 Station KDKA lived its life like a true pioneer—in a tent!

This first broadcasting station was now equipped with a 100-watt transmitter, a mere toy in comparison to the present-day equipment of radio broadcasting stations. It was, however, much more powerful than amateur stations of the locality. Amateurs had hitherto had the air to themselves but now that KDKA was on the air every evening amateurs were seriously inconvenienced. A virtual feud speedily developed. Since the average amateur was equipped with a spark set, he was not without the means of retaliation. The Westinghouse band may have produced true harmony within its tent on the roof-top but squeals and squeaks and sudden thunder from amateur sharpshooters all too often accompanied the Westinghouse music in its circuit of the upper air. The receiving sets that were being offered to the public in the pioneering days of KDKA have thus been described by George H. Clark, Historian of RCA:

"These receivers had but a single circuit, for the Westinghouse designers figured that reception in the home must be simplified down to the utmost, if home-folks who could not even replace a burned-out fuse were to be able to operate the devices. No 'forest of knobs' here; no complicated table of settings; merely one circuit and one handle to vary it. I can recall the personal scorn with which this single circuit receiver was viewed by 'old-style' radio engineers, i.e., myself, for it was held that this was going back to the days of 1900. But later, we . . . I . . . realized that the new transmitters were so much more sharply tuned than the old spark sledge-hammers that a single circuit receiver was in 1921 actually workable! Little by little, actual use showed that for handling by people who knew nothing of radio's technicalities the single circuit was just what had been needed. It was

a bold psychological move in the struggle to bring radio out of the attic into the sitting-room, and it worked. How well it worked I can realize today, as I stroll home from the office at seven P.M. and find that, as I pass house after house, I am never out of touch with what Amos is saying to Andy."

Sec. 119. RCA Absorbs International Radio Telegraph Company.

It will be remembered that the agreement between The International Radio Telegraph Company and the Westinghouse Company had called for the payment of $2,500,000 for certain shares of stock, complete payment to be made within two years. This agreement had been entered into on June 21, 1920. A year had now elapsed—a year of disappointment. The International Radio had discovered that it could never be international in fact—that the Radio Corporation of America had already acquired almost everything worth-while. It was true that The International Radio had made certain successful raids on patents not already captured by RCA, but such successes as they had gained were like guerilla operations of a defeated army—small comfort to the commanders of the defeated host.

To make matters more disheartening the Westinghouse sponsors had held back on their promises of funds. Their agreement gave them two years in which to pay $2,500,000. Very well, they would take their time. For twelve months the International stock had remained in escrow, or nearly all of it, for in June, 1921, only $300,000 of Westinghouse money had been paid over to the agents of The International Radio Telegraph Company. As previously noted, the Westinghouse officials were in reality using the communications corporation as a pawn in a contest for industrial equality.

It should be noted that Station KDKA, that was already attracting the attention of the scientific world, was owned and operated by Westinghouse Electric and Manufacturing Company. The International Radio could not claim any credit for this achievement. It is small wonder under these depressing circumstances that The International Radio should have been in a mood to surrender to the Radio Corporation of America. Surrender it did—and with the blessings of Westinghouse, since we find the following significant facts, unearthed by the Senate investigation of the merger of RCA and International.

On June 30, 1921, a sales agreement was drawn up between International and RCA,[1] yet the same was not formally executed and delivered until August 8th following. On the same day that the sales agreement was drawn, June 30, 1921, the Radio Corporation concluded a cross-licensing agreement [2] with the Westinghouse Company

[1] See Appendix, Exhibit "E."
[2] See Appendix, Exhibit, "F."

in which the RCA-International Radio merger was ratified. All the patent rights so laboriously acquired by Westinghouse were cross-licensed to RCA. Thus the last sections of Owen D. Young's famed jig-saw puzzle were at length fitted into place. On the dizzy heights of Olympus the financial gods had completed transactions that were to cost headaches to Senate investigators and wholesale heartburnings in various quarters.

No fair-minded person could question the necessity of following the consolidation tactics that Mr. Young had outlined. Critics maintained, however, that they had done the job altogether too thoroughly, had set up a complete and iron-clad monopoly of wireless transmission. Senate investigations will be set forth in the progress of this recital.

Sec. 120. Pioneering in Radio Program Building.

Since Station KDKA had been preceded by more than a year of continuous operation of Dr. Conrad's experimental station it was naturally in a position to blaze the trail for all other radio stations. After all, a radio audience needs to get beyond the novelty stage of broadcasting before the influence of its desires can be of much value to the managers of a radio broadcasting station. A phenomenon of the times no doubt aided Station KDKA immeasurably. The radio listeners were then so impressed by the magic of being able to capture voices and music from the air that they wrote letters freely. Anything and everything in a broadcast program affecting them favorably or unfavorably was sure to be commented upon in this fan mail. Thus those in charge of programs were kept on their toes, so to speak, to please, to enthuse the unseen audience out there in radio-land.

In December, 1920, the Westinghouse station in Pittsburgh, under the progressive administration of its station manager J. C. McQuisten, and Vice-President Davis, decided to undertake the hazardous venture of broadcasting a church service. They reasoned that if Lee deForest had succeeded in broadcasting grand opera ten years previously, at a time when broadcasting instruments were much inferior to their own equipment, there should be no question of the feasibility of their project. The U. S. Signal Corps had broadcast services of Trinity Church, Washington, D. C., August 24, 1919.[3]

It so happened that one of the Westinghouse engineers was a member of the choir of the Calvary Episcopal Church of Pittsburgh. The rector of the church, Dr. E. J. VanEtten, was consulted. Fortunately he proved to be a progressive man, broad of vision and impressed by the possibilities of radio broadcasting. He gladly consented to the plan. The date of the initiation of the service was fixed for Sunday, January 2, 1921.

[3] Private records, RCA.

An exclusive and most recent photograph of King George and Queen Mary with the royal family, made at the Buckingham palace shortly after the return of the Prince of Wales from his tour around the world. From left to right, sitting, her majesty the queen, his majesty the king and Princess Mary. Standing, left to right, the Duke of York, the Prince of Wales and Prince Henry.

MILITARY FUNERALS FOR WAR VICTIMS

Bodies of Wilkinsburg and East End Soldiers Arrive in Pittsburgh.

The bodies of three local world war veterans, who died while serving with Uncle Sam's forces in France, arrived in Pittsburgh yesterday. Arrangements have been completed to give each a military funeral.

The names of the soldiers are Private Howard B. Maxwell, son of Mr. and Mrs. William J. Maxwell of 1423 Coal street, Wilkinsburg; Lieutenant Clinton L. Sutton, son of John A. and Annie Sutton of 1959 Ellsworth avenue, and Lieutenant Joseph J. Mason, son of Rev. L. Walter Mason of 5261 Avondale street.

Funeral services for Lieutenant Mason will be held at 3:30 o'clock this afternoon. Interment will be in the Homewood cemetery. Mason was an American aviator and was killed in France, July 19, 1918. He was a graduate of old Central High school, Cornell and the University of Pittsburgh school of economics. At the time of his enlistment, at the outbreak of hostilities with America he was export manager of the McElwain Company of New York.

Lieutenant Sutton was a member of American flying squadron in France and was accidentally killed August 14, 1918. A military funeral will be held tomorrow afternoon in the Shadyside Presbyterian Church, at 2:30 o'clock with interment in the Allegheny cemetery. Lieutenant Sutton was a graduate of the Shadyside Academy, where he was a member of the Delta Pi Society, manager of the academy football team and vice president of his class of 1917. Besides his parents, Lieutenant Sutton leaves one sister, Edna, and four brothers, Robert W., William S., J. Blair and Donald L.

Obsequies for Private Maxwell will be held at 2:30 o'clock Sunday afternoon from the family home. Maxwell enlisted in the regular army in May, 1918, and shortly after arriving in France succumbed to pneumonia and influenza in October 16, 1918. Members of the Sergeant David T. Rankin Post, Veteran of Foreign Wars, will act as an escort of honor and will provide a firing squad, a bugler and a chaplain. The body will be borne to the Woodlawn cemetery on a gun carriage, while the services will be held in the First United Presbyterian church with Rev. F. R. Elder officiating. In compliance with a proclamation issued by Burgess John G. Miles, business houses of the borough will display American flags during the hours of the funeral.

Railroad Fined $2,600 For Smoke Violations

Fines amounting to $2,600 were imposed on the Pennsylvania Railroad Company yesterday by Alderman Charles D. Charlton, who heard testimony in 26 suits instituted by H. B. Meller, chief of the city bureau of smoke regulation. Each case was based on the charge that through careless-

WIRELESS PHONE PROVES SUCCESS ELECTION NIGHT

Westinghouse Concerns Distribute Returns From East Pittsburgh Plant.

PREDICT GREAT FUTURE

One of the interesting sidelights of the election this year was the great success of the wireless telephone broadcasting the returns. So convincing were the results obtained, it is predicted, that four years hence the radio method of sending news of the election will be almost universally used. Tuesday night the returns were received from press association wires by telephone communication and were sent out by wireless telephone from the station of the Westinghouse Electric and Manufacturing Company and its subsidiary, the International Radio Telegraph Company at East Pittsburgh. Wireless operators within the vicinity of several hundred miles were able to get the news promptly. In many cases the results were known some time before they were heard by means of the telegraph.

In Vandergrift the returns were received and bulletined in the street for the benefit of hundreds of people there, the bulletins being shown from 10 minutes to a half hour received over a special telegraph wire between Vandergrift and Pittsburgh. In addition, the wireless set was connected by a cable with the nearest telephone exchange, and the wire chief sent the news to subscribers who had arranged for the service. He also gave the returns to any person making inquiries.

WIDE AREA SERVED.

At Latrobe the same methods were followed, enabling large crowds to get the messages early.

At Irwin a large hall was filled to capacity to receive election returns, motion pictures being shown throughout the evening.

Not only in the immediate vicinity of Pittsburgh were the returns as sent from the Westinghouse plant heard, but throughout Ohio and West Virginia they were interpreted with equal clearness.

Also in Pittsburgh the radio method of sending returns was utilized in two ways. Persons having simple sets did not need to leave their homes. By means of apparatus installed in clubs throughout the city, large assemblages were able to have social functions while receiving the returns. At the Edgewood Club a sounding horn was in use, and persons all over the large ballroom could hear the voice of the speaker at East Pittsburgh through the radio apparatus.

In addition to the phonograph music, banjo duet selections were played during the intervals between of the election returns. The clear tone and loudness of all the music greatly astonished the gatherings.

DUQUESNE DRIVE OPENS SATURDAY

Team Captains and Workers to Be Addressed at Dinner by Bishop Canevin.

The $1,000,000 drive for Duquesne University will open Saturday night at 6:30 o'clock with a dinner for team captains and workers at Kaufmann's dining room. Willis F. McCook will preside, while the principal address will be made by Bishop Canevin. At this gathering full instructions will be given to the canvassers, who are to cover Pittsburgh and the 19 counties of the Pittsburgh diocese.

Chairman McCook, of the campaign committee, is gratified at the complete organization which has been built up in three weeks to give Duquesne university a much-needed new building. The priests of the diocese are organized and are working for success.

A committee of priests among the alumni of the school has established headquarters and is canvassing the graduates, determined to raise the $200,000, which they pledged themselves to secure for the building fund. Two young priests have started the fund with contributions of $1,000 each.

Following the recent address of M. J. Slattery at Emsworth the Sacred Heart parish of that place secured pledges of $4,000.

A business men's committee has been organized by Chairman McCook. It is headed by John J. O'Conner and an active canvass is to be made of manufacturing and business men, who, it is believed, will be glad to help.

Every Knights of Columbus council in Western Pennsylvania has organized the members into volunteers to help in the canvass. Frank T. Lauinger is chairman of 150 workers at St. Paul's Cathedral, while J. Frank McKenna reports 60 canvassers ready for work in the Sacred Heart parish, East End.

City Plan Secretary To Deliver Lecture

The second of a series of lectures arranged jointly by the citizens' committee on city plan of Pittsburgh and the University of Pittsburgh will be given in the Chamber of Commerce auditorium tomorrow afternoon. Frederick Bigger, executive secretary of the citizens' committee, speaking on "What the City Plan Means to Pittsburgh." C. D. Armstrong, president of the citizens' committee on city plan, will introduce Mr. Bigger, who will speak of the historical types of city plans, including those of Paris, London, Karlsruhe and Washington, and will apply the principles of these plans to Pittsburgh's problems.

Recollections of an "Old-Timer"

One of the Broadcast Listeners of Days Gone by Compares "Yesterday and Today"

BY "ZERO L. B."

Back in thhe late 90's and early 1900's I was mildly interested in radio. It was in the days of coherers and electrolytic detectors, and it did not take long to satisfy my love of playthings in that direction. I did not pay much attention to radio after 1906, and was quite disappointed in 1910, when I casually visited the radio cabin of one of our New York boats, to find how seemingly little radio had progressed. The sparks sounded about as bad and wide as they did in 1906, and their interference was worse, because there were more of them.

THEN CAME BROADCASTS

Other than being briefly interested to know the essential story about crystal detectors and tubes when they first appeared, radio was a dead letter with me until 1921, when I learned that radiotelephony was practically achieved, and broadcasting was actually in progress.

In February, 1921, I set up a crystal set, and at first only heard WBF and NAD on sparks that did not sound any better or less wide than similar sparks had in 1906. I also heard innumerable amateurs with less powerful but not any less breadthed waves than their big commercial brothers. Truthfully, I was not impressed with the wonderful advances in radio I had just heard about. About the second or third evening that I listened, however, I heard some very faint squeaky phonograph music at about 275 metres, which being picked up with better success after the practice of two or three more nights, turned out to be from 1QR, J. C. Ramsey, Jr., of Brookline.

My interest was thoroughly aroused, and I lost no time in arranging a tube set (somewhat to the detriment of my pocketbook, more so in 1921 than better apparatus would be today).

In referring to my old notes, I discover that on March 13, 1921, I listened to a Sunday afternoon concert from 1QR and that several times during March and April I heard the same station, also 1AB, broadcasting phonograph records.

March 30, 1921, was the date of the first regular concert from 1XE at Medford Hillside, and while fooling around with them I picked up KDKA for the first time. Genial Mr. Arlin was on the job that night, just as he still is, and said his pleasant "Good-night" just as he says it now (which many announcers have tried hard to imitate and can't). Right here I would like to pay a tribute to that same Mr. Arlin, having listened to him regularly since the date mentioned. He has never failed to announce in clear measured tones that are perfectly understandable. He never tries to be funny, I never heard him put over a cheap joke. Once in a while he injects a little touch of subtle wit that is as pleasing as it is unexpected, coming from him. He has apparently striven to maintain his announcing in strict concordance with the dignity and excellence of old KDKA. That he has succeeded and lasted unspoiled through five years of alleged funny man, popular idol competition from other stations redounds to his credit.

No voice is better known or more quickly recognized by the members of my family than his, and I am sure that if any one of us should hear him speak in persoh anywhere, we would involuntarily turn in pleasant recognition and say "Hello Mr. Arlin," forgetting that we have never seen him, and that he has never heard of us.

Hears Dempsey Fight

Through that spring, 1XE broadcast on every Wednesday and 1QR almost every night for one-half hour, and I find that they, with KDKA, 1AB, NSF and NOM, constituted all the available entertainment talent on the air.

On May 6, 1921, I recorded for the same evening 2XQ, NSF, 1FF and 1AB, quite a successful night for those times. On May 5 I visited station 1QR on invitation of the owner, that prince of good fellows, James Ramsey, and had a most enjoyable evening. On May 11, I was similarly the guest of another good radio scout, Howard Tyzzer, at 1XE.

These visits increased my interest, and those two radio-wise engineers imparted to me tips on receiving hook-ups, which afforded pleasure in proportion to the nth power of the pocketbook decrement, which was easily of measurable magnitude.

On July 1, thanks to dope from Friend Furlong (1FF, that's what FF stands for), I hooked up on 1600 metres, and received WJY on its practice shot, preparatory to the big event next day.

July 2, WJY on Dempsey fight received in broad daylight on three tubes, one radio, two audio, a reception that I would have to score even today as nearly perfect. Our sport-loving family doctor was my guest, he even got almost excited as the important blows were announced. When the fight was over, he rushed up town to where the crowd was watching the alleged up-to-the-minute ringside reports bulletined by the local paper, found they were two rounds behind, told to the crowd the true story of the rest of the fight, was laughed at by our local editor and others, only to see a practical repetition of what he had told bulletined through the succeeding 10 minutes, whereupon the let-him-tell-it-up-to-date-news-service-journalist was sore as a pup, for he had paid good money for the wire service. His friend, the good doctor, had for nothing heard the band, and the bell and the blows, and had publicly turned the laugh on him and his paper.

DX Record

KDKA was received a few times through that summer.

In November frequent receptions of WJZ, KDKA, 1YC, 3ZO, 2XB and WBZ are recorded, and on Nov. 26, 1921, KYW was received. This was DX record for me at this time, and I have reason to believe it was for the station, as they mentioned it in a write-up in one of the technical papers.

On Dec. 7 and 10, KYW was again received, and the note on the second date says the reception was good. If I recollect correctly, it was the opera "Madame Butterfly," and one whole act came through perfectly on the loud speaker.

From Dec. 24 on, for nearly a month, the notes are chiefly taken up with accounts of almost nightly reception of a station in Cazenovia, New York, operated by C. B. Meredith. It had no call letters then, but subsequently became 8BSS and WMAC. Mr. Meredith was only using two five watt tubes, so it is a testimonial to the efficiency of his apparatus and his skill as a radio engineer that a duffer 300 miles away could pick him up night after night on a single tube and make the observations he directed by voice, not code, as he made changes in plate voltage, counterpoise, wave length, etc.

Mr. Meredith used to call me by putting on the phonograph record, "It's a long way to Tipperary," and he frequently used repetitions of the same record for me to make the necessary observations. Imagine my amusement a few days afterward, listening to a Third District station, running [illegible] the observer who chose the tune; because it was an easy one to recognize, not resembling modern cubist music in any particular.

In January, 1922, 1QR began the experiments on short waves by going down to 140 metres. I built a set and reported to him on this, also on 8XK and 1HX. They, a little later, had gotten down to 100 metres, and on June 3, 8XK relayed KDKA on the short waves. What this pioneer work of Mr. Ramsey and Mr. Conrad led to, in the use of short waves for long distance broadcasts, is now common knowledge.

Sets Cut and Recut

The recollections of being a duly invited duffer observer on their tests are most pleasant, and I am indebted to both distinguished gentlemen for many most interesting radio experiences. It is quite probable that I am the first person who ever heard the human voice transmitted any great distance, at so low a wave length as 56 metres. There was no data available then on short wave sets, and more than once I have sat down and wound a new set, on the telephonic request of 1QR, to listen to him on some new wave length. I used mostly soft tubes in those days, and it was not always possible to make such tubes oscillate with any old combination which figured right in wave length. On short waves you cannot go on putting turns on the tickler indefinitely, so that my sets were often cut and tried and recut and retried before I could tell good old 1QR that he was coming in QSA.

Another interesting set of early 1922 observations were made on the KDOW-2XJ experiments. KDOW was the S. S. America and attempted to keep in telephonic communication clear across the Atlantic. I succeeded in hearing them when they were 1350 miles out. I never knew whether 2XJ heard them at that distance, they were not getting them at the time I was. Unskilled observations were also made frequently for Mr. Beale of 3ZO, who often shouted a merry salute to "Zero L. B.," just as he did to "Uncle Johnny" night after night.

On July 30, 1922, Shepard Stores, afterward WNAC, was noted on the air, and there were hosts of other stations of about the same period. As this brings us down to a condition not dissimilar to the present day, I will