

PICK-UPS

NOVEMBER · 1935



In This Issue

On the Air With the Sensational, New Non-directional Microphone

•
High Fidelity Reproduction Brings New Beauty to WTCN Broadcasts

•
A Two-Way Voice for Private Flyers

•
Veteran of the Broadcasts

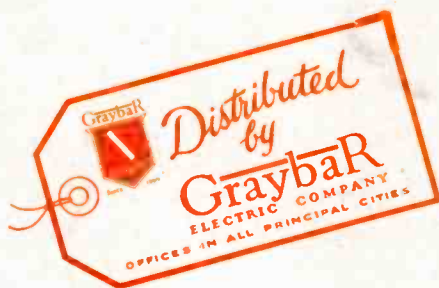
•
The 307A Power Pentode

•
Safeguarding Evansville the New Way—With Two-Way Police Radio



PUBLISHED BY

Western Electric



Graybar Branch Houses

Akron
Albany
Asheville
Atlanta
Baltimore
Beaumont
Birmingham
Boston
Brooklyn
Buffalo
Charlotte
Chicago
Cincinnati
Cleveland
Columbus

Dallas
Davenport
Dayton
Denver
Detroit
Duluth
Durham
Flint
Fort Worth
Fresno
Grand Rapids
Hammond
Harrisburg
Hartford
Houston

Indianapolis
Jacksonville
Kansas City
Knoxville
Los Angeles
Louisville
Memphis
Miami
Milwaukee
Minneapolis
Mount Vernon
Nashville
Newark
New Haven
New Orleans

New York (2)
Norfolk
Oakland
Oklahoma City
Omaha
Orlando
Philadelphia
Phoenix
Pittsburgh
Portland
Providence
Reading
Richmond
Roanoke
Rochester
St. Louis

St. Paul
Salt Lake City
San Antonio
San Francisco
Savannah
Seattle
Spokane
Syracuse
Tacoma
Tampa
Toledo
Washington
Wichita
Winston-Salem
Worcester
Youngstown

PICK-UPS

BEING A PERIODICAL DEVOTED TO DEVELOPMENT
IN SOUND TRANSMISSION. PUBLISHED BY THE

Western Electric Company

EDGAR S. BLOOM *President*
H. B. GILMORE *Secretary*
F. H. LEGGETT *Treasurer*

195 Broadway, New York, N. Y.

WILL WHITMORE, *Editor*
M. M. BEARD, *Assistant Editor*

Copyright, Western Electric Company, Incorporated, 1935

VOL. 1 NOVEMBER, 1935 No. 1

Beginning

You cannot see, touch, taste, or smell them, yet they play a tremendous role in our every day lives. It is difficult to imagine modern civilization existing without them. They make themselves manifest in only one way: through the ear. They are sound waves.

The double metamorphosis of sound waves into electric waves and back to sound waves, first accomplished by Alexander Graham Bell, ranks as one of the world's greatest inventions. Today, because of that invention, one can with reason call this the age of reproduced sound.

Think for a moment in how many ways your own life is affected by reproduced sound. Naturally you think of the telephone and the radio as necessary elements of communication and entertainment, but they also contribute to your safety and comfort. What a feeling of security the radio telephone gives you flying in the air in a fog-bound airplane. Today at least half of the citizens of the country are given added protection against crime by police radio. Public address equipment directs the movements of tremendous crowds. School children, hospital patients, apartment house dwellers profit from and enjoy the benefits of sound distribution

systems. And so it goes. Just think what this old world of ours would be without reproduced sound!

In each field of reproduced sound three phases stand out in the mind of every man engaged in the business or art of sound reproduction. They are: Designed by Bell Telephone Laboratories; Manufactured by Western Electric; Distributed by Graybar.

This, the first issue of PICK-UPS, and its succeeding issues appearing periodically, bring you the news of developments in the field of sound, of the organizations and men who use the equipment designed by Bell Telephone Laboratories, manufactured by Western Electric and distributed by Graybar.

This Issue

	<i>Page</i>
<i>On the Air With the Sensational, New Non-directional Microphone</i>	3
<i>Photographs of WTCN Installation</i>	4
<i>High Fidelity Reproduction Brings New Beauty to WTCN Broadcasts</i>	5
<i>A Two-Way Voice for Private Flyers</i>	6
<i>On Guard—Station WQFA, New Haven</i>	8
<i>Bell Telephone Laboratories—Birthplace of Sound Marvels</i>	9
<i>Veteran of the Broadcasts</i>	11
<i>The 307A Power Pentode</i>	12
<i>Safeguarding Evansville the New Way—With Two-Way Police Radio</i>	13
<i>Photographs of Evansville Installation</i>	14
<i>The Big Voice at the California Pacific International Exposition</i>	17
<i>Photographs of San Diego Public Address System</i>	18
<i>Sanford Helt—WLAP</i>	24
<i>Western Electric Bulletins Issued Recently</i>	26

On the Air With The Sensational, New Non-directional Microphone

•

This Diminutive Dynamic
Transmitter, First of Its
Kind, Is Radical in Design

•



For the first time in the history of radio a truly Non-Directional Dynamic Microphone makes its bow in the world of sound pick-up technique. This new instrument, no larger than a billiard ball and embodying a number of striking advances in design, is introduced by the Western Electric Company. Because of its diminutive size and special acoustic properties, performers need no longer hide behind the microphone nor must their faces be even partially concealed. The well-worn phrase "behind the mike" will become as antiquated as "the cat's whisker" of crystal set days.

The midjet transmitter was launched on its broadcasting career with the signing of the first order at the N.A.B. Convention in Colorado Springs. Among those present were R. S. Bishop, of KFJZ, 100 watt broadcasting station of Fort Worth, Texas, the purchaser; W. C. Jones of Bell Telephone Laboratories who supervised the design of the microphone, and Vernon Young, Graybar representative who completed the sale.

The new instrument marks the greatest advance in microphone development during recent years. Its frequency response is independent of the angle of sound incidence and is uniform over an extended frequency range, making high-grade pick-up throughout the range of from 40 to 10,000 cycles without regard to the direction of sound approach, entirely practicable. Moreover the uniformity of response is such that the use of microphone equalizers or equalizing transformers is unnecessary.

The difficulty of achieving such a result is apparent when it is realized that the mere presence of a microphone or any other object in a sound field tends to distort that field. This is due largely to diffraction. When the length of the sound wave is small as compared with the dimensions of the microphone,

the effect of diffraction is to cause the pressure at the face of the microphone to differ from the pressure at that point in the field before the microphone was placed in position. This change in pressure is also dependent upon whether the microphone faces the sound source or whether it is turned at an angle to it. Consequently, the response of the microphone will differ depending on the size and shape of the instrument and on the direction from which the sound waves reach it. Previous microphones have shown a marked directional effect, the response differing not only with the angle but also with frequency for any one angle.

In the new microphone, these difficulties have been overcome after extensive studies of the causes of the directional effect. Among the factors that have made this possible are drastic reduction in size, acoustic streamlining, and the use of an especially designed acoustic screen.

Basically, the microphone is of the well-known dynamic or moving coil type. Among the many features that have made dynamic microphones so popular with users of high quality apparatus, and that are to be found to an even greater degree in the new instrument, are freedom from electrical interference and high signal to noise ratio permitting its use far from the sound source.

Another dynamic microphone characteristic is the low electrical impedance which allows its use several hundred feet from amplifying equipment. Hence, this instrument is lighter and more flexible in application than microphones requiring closely associated amplifying equipment. Ruggedness, dependability and freedom from temperature, barometric and humidity effects are other important factors in the success of the dynamic microphone, all of which this new

(Continued on Page Twenty-two)



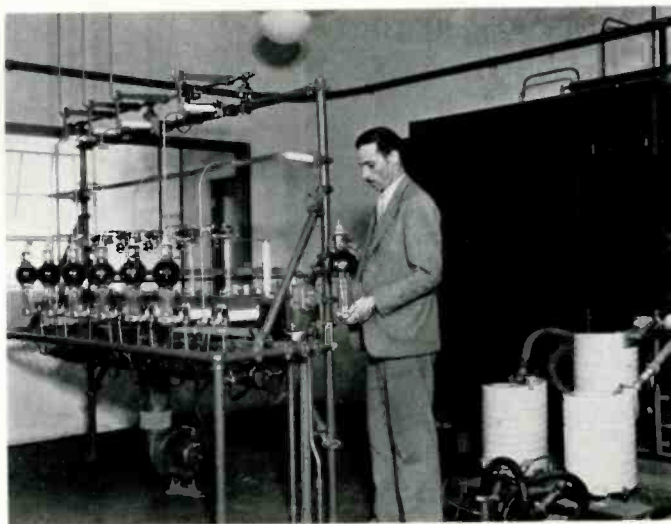
W T C N

MINNEAPOLIS - ST. PAUL

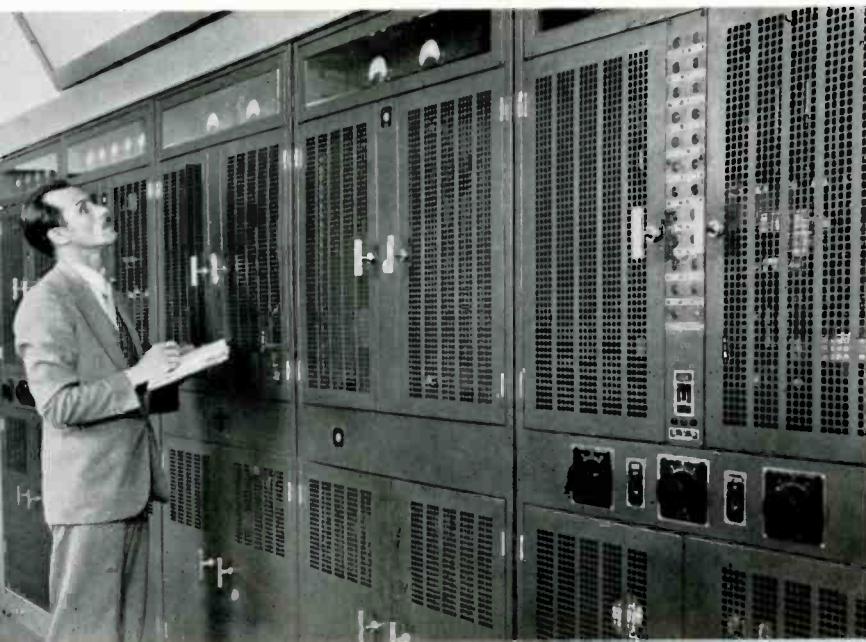
5000 Watt Voice for
the Northwest, owned
and operated by the
Minneapolis Tribune —
St. Paul Press Dispatch

Beauty in Broadcasting

Single mast antenna and transmitter building located equidistant between the Twin Cities.



Above: Rectifiers and rear of transmitter.



Left: Impressive panels of the 5000 Watt high fidelity Western Electric transmitter

High Fidelity Reproduction Brings New Beauty to WTCN Broadcasts

Western Electric's New Five Kilowatt Transmitter Gives Twin Cities Listeners Most Modern Developments in Radio Art

Towering skyward, midway between the Twin Cities, stands WTCN's new antenna, symbolizing a new "voice" for the Northwest. The power behind this voice is a 5,000 watt transmitter which embodies the most recent improvements in high fidelity sound transmission and greatly widens the station's coverage. WTCN, owned and operated by the Minneapolis Tribune—St. Paul Press Dispatch, now ranks with the best equipped broadcasting stations in the country.

When the new system went on the air for the first time a few months ago Twin Cities radio listeners accorded it a gala welcome. Crowds flocked to witness the dedication. The trim, buff colored brick structure which houses the transmitter became the center of attraction. Engineers on duty escorted the stream of enthusiastic visitors through the building explaining the workings of the intricate apparatus that performs the modern miracle of broadcasting today.

High fidelity in the reproduction of sound is an outstanding feature of WTCN's new transmitter. From it, programs go over the air with such life-like quality that the shadings and tones of voices and musical instruments are not lost in the process of transmission. As a result, speakers, vocalists and orchestras sound to listeners, possessing modern radio receivers, virtually the same as they do in the studio.

The new location in rural Ramsey County, five miles from the Minneapolis City Hall and the same distance from the state capitol in St. Paul, is ideal for broadcasting purposes. This central spot equalizes the strength of the signal sent out over the air to both Minneapolis and St. Paul areas. As there are no nearby buildings to distort the transmitted wave, uniform coverage is assured to both cities.

Characteristics of the five kilowatt transmitter are of special interest, for the transmitter represents the newest developments in the family of Western Electric equipment. One hundred per cent modulation of the carrier is effected at low level by grid modulation. The purity of the signal is maintained in the processes of modulation and amplification; the distortion contribution of the transmitter being less than five per cent at 100 per cent modulation and less than two per cent at average program level.

The audio frequency characteristic is linear within \pm one db from 30 to 10,000 cycles. The

noise level is at least 75 db below the signal at 100 per cent modulation as measured with a program noise meter. The carrier frequency stability is maintained to well within 50 cycles of the assigned frequency, and the harmonic radiation on any multiple of carrier frequency is at least 70 db below the carrier.

Major components of the new five kilowatt transmitter are assembled in compact, attractive cabinets which are easy to install. They occupy comparatively little floor space. There are five cabinets in all, each of which has doors which provide convenient access to the circuit components. These doors are grilled to provide full ventilation.

Complete modulating and radio frequency units and part of the rectifying equipment are housed in the five cabinets. The first cabinet contains the crystal oscillator, buffer amplifiers and modulating amplifier together with their associated power supply equipment. The oscillator unit is calibrated at the factory and needs no further adjustment when installed. The vacuum tubes used in the oscillator and the two buffer amplifier stages are of the equipotential type—271A. Resistance-capacity coupling is used from the oscillator to the first buffer and a band pass transformer from the first to second buffer. The second buffer stage uses two tubes in parallel. The amplifier is neutralized and is inductively coupled to the grid circuit of the modulating amplifier.

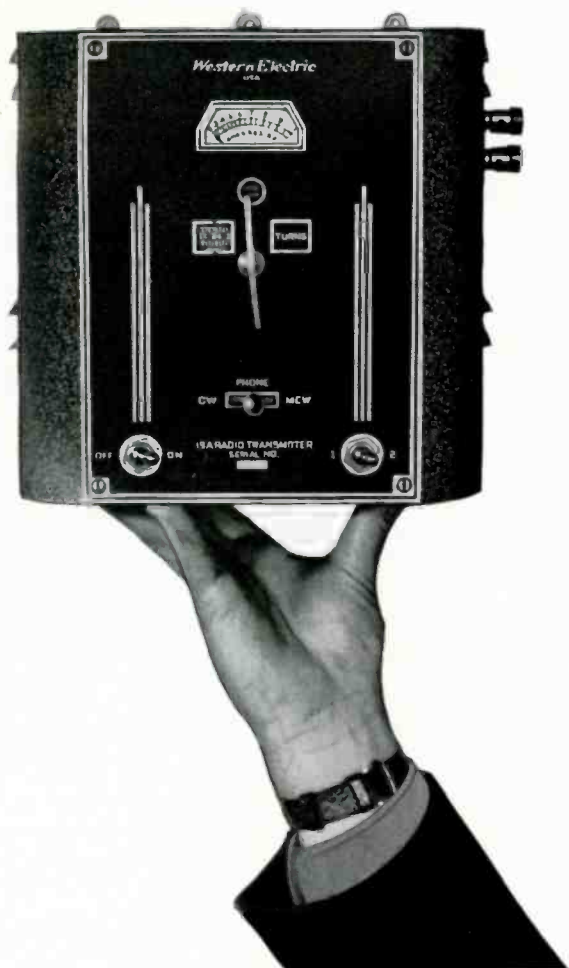
The modulating amplifier uses two 212E tubes in a push-pull circuit where modulation is accomplished by the grid method. The amplifier is neutralized and provides excitation for the intermediate amplifier contained in the next unit. Control of the radio frequency grid excitation and consequently the power delivered to the antenna is obtained by potentiometer adjustment of the grid bias on the first buffer amplifier. The power supply apparatus for the first unit is contained in the cabinet.

In the second cabinet is the intermediate amplifier, a single stage amplifier using two 279A tubes in push-pull. It is a self-contained unit having rectifiers for grid and plate voltages. The output circuit is inductively coupled to a load circuit providing grid excitation for the power amplifier.

The third cabinet contains the power amplifier tube unit. This consists of two 220B tubes in push-pull together with the load resistor and other

(Continued on Page Twenty-five)

A Two-Way Voice



The private flyer of today may go up and over the top with a feeling of greater security if he sails the skies with two-way radio installed in his ship. He is no longer the lone airman traveling his course unaided. Out of sight he may be but not out of touch with the world below. Fog and wind, sleet and snow may drive him from his course or may obscure the airport. These factors become less hazardous when he guides his ship with the help of his fellow men on the ground.

A radio telephone transmitter enables him to request weather data or other information which may not be included in the regular weather broadcasts but may be specially vital to him. By picking up a microphone he is in communication with an airport to obtain landing information which is particularly important if he must make a hurried landing because of storm or some mishap to his plane. Correct

The 19A Transmitter, Using Latest Types Pentode Tubes, Is Crystal Controlled. Weighs Only 11 Pounds. Easily Installed in Any Place in Plane

landing information is also a real necessity for those using radio for traffic control.

Since America has become more air-minded, the need for dependable radio communication equipment suitable for small, lightweight planes is growing. To meet this need the Western Electric Company has introduced a midget two-way radio system which was designed, developed and test-flown by Bell Telephone Laboratories. The total weight of the new equipment, including transmitter, receiver, two associated dynamotors, microphone, cords and headphones is only 46 pounds. Both transmitter and receiver are so small that they can be held in the palms of the hands. Because of the diminutive size they may be readily installed in the plane.

As an aviator must focus his attention on the job of flying, he needs a radio set that is simple to manipulate. This is especially so when heavy weather threatens his course and he wishes to keep in constant touch with the ground. Easy operation is one of the outstanding features of the new equipment. The transmitter operates on 'phone, CW and MCW, by simply throwing a three-way switch for the type of operation he desires. On 'phone it is 100 per cent modulated. Filament power is obtained from a 12-volt battery, voltage for the tube plate being supplied by a dynamotor operated from the plane battery. Only two tubes are employed of the filamentary pentode type. Any two frequencies within the band may be obtained by merely inserting the proper crystal and adjusting the single tuning control. Once tuned, no further adjustment is required.

A twin crystal unit enables the pilot to transmit on either 3105 or 3120 kilocycles without returning. These are the frequencies assigned by the Federal Communications Commission for calling and working with any Department of Commerce Station along the commercial airlines or with any airport

For Private Flyers

This 17A Double-Duty Receiver Covers Both the Department of Commerce and Broadcast Bands. Weighs Only 10 $\frac{3}{4}$ Pounds

equipped for such service. To shift from one frequency to the other the pilot simply flips a switch on the front of the transmitter. He knows he is on frequency.

The receiver used in conjunction with the transmitter has two frequency ranges; one covering the complete broadcast band, and the other, the complete beacon and weather bands. This midget instrument has a powerful audio output and possesses unusual sensitivity and selectivity. It also contains a special static reducer, a tiny cylinder about three-quarters of an inch in diameter, which is called a varistor.

To the radio listener safe at home, static is merely a source of annoyance but to the air-



The 19A Midget Transmitter and the 17A Receiver installed in a plane — a complete two-way system.

man guiding his plane by a radio beacon, it may mean disaster. During an electrical storm when static is most severe, is the very time that he needs audible reception so that he may clearly hear the beacon signals that direct his course. With these static crashes are automatically limited to unobjectionable volume. The beacon signals come in with regularity and precision but the heavy static crashes that might drown out the important signals are curtailed so the hearing of the pilot is not temporarily affected.

For some time past two-way radio has been considered a necessary precaution in transport travel but it is still comparatively new in the field of private flying. That field is widening. Such safety devices as dependable telephone communication systems between earth and sky may hasten the day, predicted by some, when individually-owned planes will vie with automobiles and America's skyways will be as heavily traveled as are her highways today.



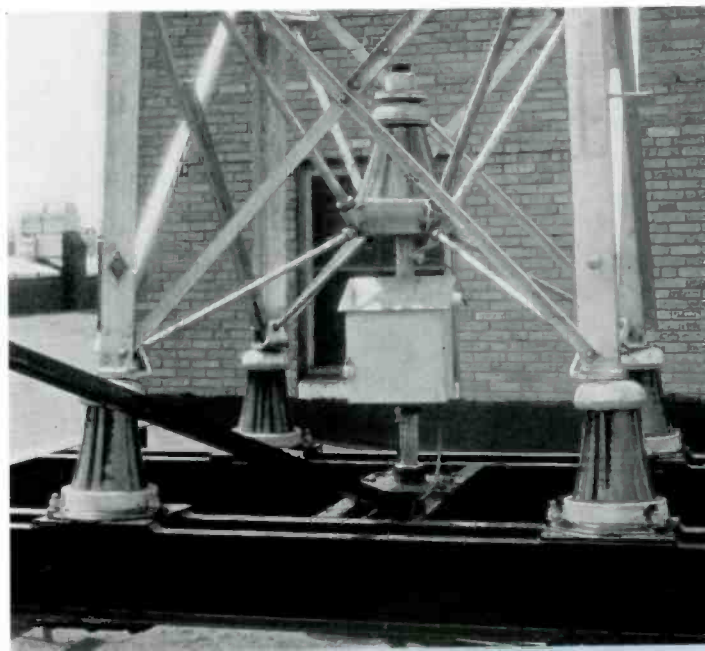
On Guard!

Station WQFA, New Haven

where the recently installed Western Electric Police Radio gives added protection to the city's citizenry. Above: The dispatcher behind the line of action who directs the patrol fleet through the microphone on his desk. Back of him stands the 100-watt transmitter; at his left, the city map with disks indicating position of police cars.

Left: Towering from the roof of Police Headquarters is New Haven's antenna using intermediate wave length.

Right: The antenna base showing coupling.



Bell Telephone Laboratories . . **. . Birthplace of Sound Marvels**

From This Shop of Modern Miracles Have Come
the Wired and Wireless Pathways of Speech
and Sound That Have Revolutionized the World

Faced by the Hudson River and New York's great elevated motor highway stands a 13 story building similar in appearance to hundreds of other business structures that dot the congested streets of the big metropolis. But here the similarity ends. Those high walls with their multitude of windows harbor one of the most important and fascinating research organizations in existence—Bell Telephone Laboratories.

Here through the years scientists and engineers at work over intricate and delicate machinery have brought forth electrical wonders that have amazed a doubting world. From this shop of modern miracles have come the wired and wireless pathways of speech and sound that today reach to the most remote corners of the earth, to the depths of the sea and above the clouds. This work of research, development and design in the art of communication is a thrilling story of pioneering without parallel.

The tale of achievements had its opening chapter 59 years ago in a Boston attic where Alexander Graham Bell and his assistant Thomas A. Watson were manipulating crude machinery in their attempt to transmit the voice over a wire electrically. That attic was the birthplace of Bell Telephone Laboratories. The two-man personnel has grown to 4000. The simple tools have been replaced by every variety of the most intricate and elaborate machinery ever invented.

Today in the Laboratories there is a room where the torrid heat of the tropics can be reproduced while next to it is one which has the temperature of the far North. There are rooms with air as dry as a desert and constant temperature rooms which maintain a normal temperature that never varies. There is a strange crystal ring a few inches in diameter which regulates broadcasting stations and divides seconds into one hundred thousand parts.

At times there are conditions of service to be met that cannot be set up at the Laboratories. Therefore it has been necessary to establish outposts to further experimentation. Airplane radio telephone requires a flying field with hangars and fuel facilities; these are obtained at Hadley Field near New Brunswick. Experiments on broadcast transmitters must not annoy nearby listeners. This work is done at Whippany, N. J. On the other hand, short-wave reception

must not be disturbed by man-made static; a "quiet" location is found at Holmdel, N. J. Within easy motor-ing from Holmdel is the short-wave transmitter laboratory at Deal. Another electrically quiet spot is at Mendham, N. J., where radio receivers for police, airplane and broadcast use are studied.

At Chester, N. J., is a strange sight—a pole line heavily loaded with wires marching up a hill—and ending there! These wires carry no telephone calls, but they tell the engineers a great deal about the effects of wind on wire lines. At the same place are carried out tests on cables and outside-plant materials. A small forest of poles is planted there to see how well different products protect the wood against rot.

From time to time Laboratories' engineers go to other locations for special jobs. Some of them have become quite salty sailors after trips on fishing boats with the new radio telephone and compass apparatus. Others have spent months at Provincetown and Green Harbor, Mass., while testing a cross-bay radio link. Occasionally they visit Gulfport, Miss., or Limon, Colo., to inspect pole samples planted there for life tests.

Since its inception, the primary function of the Laboratories has been the design and development of telephone apparatus and equipment which is manufactured by the Western Electric Company. Through the Western Electric's distributors—the Graybar Electric Company, the Electrical Research Products, Inc., the International Standard Electric Corporation, and the Northern Electric Company, Ltd., many commercial products which the Laboratories have developed are placed on the market. For out of the fundamental studies of speech transmission have come by-products of telephony which have revolutionized many lines of industry and speeded the progress of mankind.

Motion pictures were given a voice through a device developed at the Laboratories and the "talkies" from being a sensation became a practical and lasting source of entertainment giving pleasure to countless millions. Last June the 10,000th world-wide Western Electric Sound System began operation. Branching out from the amusement world the sound picture found its way into the field of education where



Every civilized man has benefited from these laboratories

It has been established as a definite and essential teaching medium. From the same Laboratories came the artificial larynx restoring speech to afflicted human beings and the audiphone, aiding the deafened to hear.

Broadcasting stations have sprung up in rapid succession throughout the land using equipment originating from this wonder place of science. Each year transmitting and receiving apparatus has become more powerful, more far reaching. Each year has seen greater improvement in high fidelity transmission. Reception has been so clarified that one may tune in on short-wave circuits and hear a program from London, Germany, Moscow, Tokio or Australia, as distinctly as though it were originating from a nearby studio.

WOR is an outstanding example of broadcasting progress. At this station not long ago the first high fidelity, high power radio broadcasting equipment started operating when the Western Electric 50,000 watt transmitter went on the air. The directional antenna system, first of its kind to be used by a commercial radio station, was specially designed by Bell Telephone Laboratories. Two steel towers and a suspended cable send forth a pattern of radio waves that concentrate on New York, Philadelphia and other cities and diminish over thinly settled areas. Thus its power is focused where the greatest number of listeners reside. The new system also has extended WOR's service over a much greater area than formerly was possible.

PICK-UPS

The development of the microphone is typical of the never-ending work carried on by the Laboratories' engineers to refine and perfect all products manufactured by the Western Electric Company. Recently they introduced to the radio world a non-directional, dynamic instrument which is considered the greatest advance in microphone development in late years. A description of this may be found on Page 3.

The old slogan "Safety First" might well apply to the work carried on at West Street. The continued improvement in aviation, police and marine radio, in ship-to-shore telephony, has brought about safer flying, safer sailing, and greater protection for the country's citizens at large. When the airman, piloting his plane some thousands of feet above the ground, first was able to receive messages from the earth, it seemed almost too amazing to be true. Now his ship is equipped with two-way radio and he can converse with his fellow men on the earth with the utmost ease.

Police radio, one of the most effective modern aids in combating crime, has progressed in a similar manner. First came the one-way system whereby police headquarters could communicate with patrol cars and direct their activities. There followed the more recent two-way system, now in successful operation, which enables the patrolman in his prowler car to talk to headquarters without leaving the wheel.

Bell Laboratories' engineers have also pioneered in the design and development of television and telephoto, public address systems and music reproducing systems, electrical recording and the electrical stethoscope. One of their most recent contributions to the field of communication is a coaxial cable which among other things will transmit simultaneously some 200 or more telephone conversations over a single circuit. It is predicted that the coaxial cable also will be a definite means for perfecting wire television.

Since some of the best trained engineering and research minds in the world are gathered at Bell Telephone Laboratories, and as there are available there many types of rare and expensive instruments, the personnel is called upon from time to time by government and civil authorities to aid in tests entirely foreign to the telephone industry.

But those keen minds, backed by more than fifty years' experience in the development of sound transmission in all its phases, are primarily at the service of every telephone user, every broadcasting station, every ship, plane, car, hospital, theatre or hotel where products originating in the Bell Laboratories are utilized.

Two Western Electric Non-directional Microphones have been sold to La Presse, owners of Station CKAC, Montreal, Canada. They will be the first in Canada to use these new mikes. The order was placed with the Northern Electric Company.

Ten



Veteran of the Broadcasts

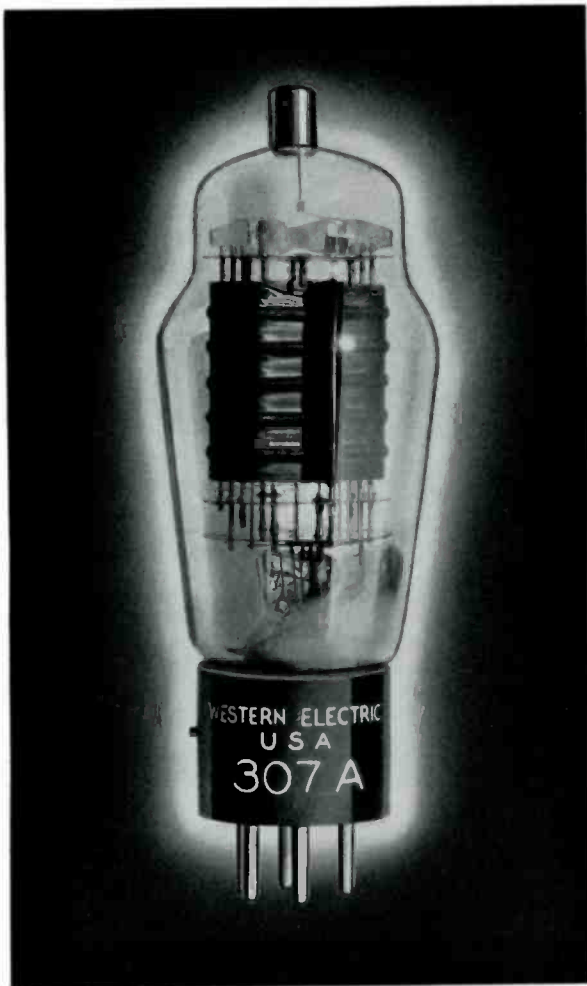
There's life still in this Western Electric 222A Vacuum Tube, retired after 18,543 broadcasting hours of uninterrupted service.

The 307A Power Pentode

General Discussion of Power Pentode Tubes and the 307A in Particular

By E. A. VEAZIE

Vacuum Tube Development
Bell Telephone Laboratories



In the early design of radio frequency amplifiers the inherent limitations of the three-element vacuum tube introduced many complexities. If reasonable gains were expected, neutralization was necessary to prevent feedback from the output to the input circuit, and the maximum theoretical gain could never be reached because of the losses due to this neutralization. To modulate the output stage of such an amplifier an audio-frequency power level comparable with the radio power output was required.

As the tube art progressed, four-element tubes were developed in which the outermost grid

served as an electrostatic shield between the plate and the control grid. The capacitance between the plate and the control grid was sufficiently reduced by this means to eliminate the need for neutralization. These four-element "screen grid" tubes found wide use as voltage amplifiers at radio frequencies but new difficulties appeared caused by the emission of secondary electrons from both plate and screen grid. If the instantaneous plate voltage dropped below the screen voltage as the plate potential varied, secondary electrons knocked from the plate traveled to the screen. It was therefore necessary to limit the instantaneous plate voltage to values greater than the screen potential to avoid excessive distortion of the signal and the consequent limitation of plate efficiency. Secondary electrons emitted by the screen grid were also a continuous source of trouble, and placed serious limitations on the circuit supplying the screen voltage.

A third grid was added to the screen-grid tube to overcome these limitations, thus producing the pentode. This grid was located between the screen grid and the plate and was originally tied to the cathode within the tube. Its sole function was to prevent the flow of secondary electrons in either direction. Hence it was appropriately called a suppressor grid.

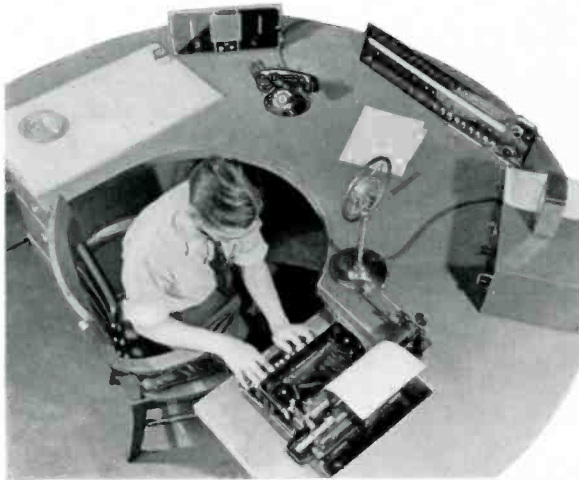
This development satisfactorily overcame the disadvantages of the screen-grid tube while retaining the advantages. These pentodes are characterized by a comparatively high power output at a low plate voltage, and a high gain per stage — thereby effecting economies in plate-voltage supply equipment and in radio frequency driving power. These two items of themselves would result in a widespread use of this form of tube. On closer examination it is seen that there are still further possibilities contained in this three-grid structure.

If the suppressor grid be disconnected from the cathode, and the radio-frequency output current of the tube be examined as a function of voltages applied to this grid, it will be seen that there is a possibility of using the suppressor for the purposes of modulation. The Western Electric 307A tube, intended for use in mobile transmitters, has been designed to take full advantage of this possibility. Basically this tube is a suppressor grid pentode, but separate leads are provided for each of the three grids,

(Continued on Page Twenty)

Safeguarding Evansville The New Way—With Two-Way Police Radio

Since Installation of New Western Electric System Crime Has Decreased 17 Per Cent While Arrests Have Risen 60 Per Cent



The police at Evansville, Indiana, gained a powerful ally in their never-ending war against crime when Two-Way Radio joined the force. Just how effective this ally has proved to be is evidenced by the decided reduction in criminal cases and the marked increase in arrests since the new equipment began operating the early part of the year. When the system had been in service but five months crimes had decreased 17 per cent while arrests had risen 60 per cent.

The following figures furnished by Roy E. McConnell, Chief Engineer of Evansville Police, tell a heartening story of crime on the wane in this mid-western city. During the first five months of 1935, after the installation of Two-Way Radio, 18 robberies, 113 burglaries, 24 grand larcenies, 300 petit larcenies, and 147 auto thefts were reported with arrests totaling 179. For the same period in 1934, robberies totaled 31, burglaries 128, grand larcenies 15, petit larcenies 340, auto thefts 205 and arrests 134.

Today more than 60 city, county and state police systems use Western Electric police radio telephone. To Evansville goes the distinction of being the first city in the country to install the new Western Electric Ultra-High-Frequency, Two-Way Police Radio Communication System. This equipment enables the motor patrolman not only to receive alarms, he also acknowledges them—requests further instructions—

reports crimes or suspicious circumstances and informs headquarters of his position and progress without leaving the wheel of his car.

In cases of pursuit he does not even need to slacken his pace as he keeps in constant communication with headquarters. Meanwhile the dispatcher—*behind* the lines—directs the chase through the microphone at headquarters. Although miles away from the scene of action he can visualize the entire situation as he follows the movements of the patrol cars assigned to the chase. As in a game of chess he strategically moves his cars here and there in accordance with the reports that are continually pouring in.

With such a complete picture spread out before his eyes—such thorough cooperation between the dispatcher at headquarters and the patrol fleet in action the criminal's chances for escape are materially lessened. Two-Way Radio also enables patrol cars to communicate with each other. Thus the protective network of radio telephone communication spread throughout the city triples its effectiveness.

The new Western Electric two-way system at Evansville provides complete receiving and transmitting equipment for both headquarters and police cars. The cars used are four-door sedans that have a tool compartment in the rear of the back seat where the radio transmitters are installed. When the cushion is in place, the instrument is entirely concealed. The call W9XEX was assigned to the first transmitter to go into operation.

Filament power is supplied directly from the car's 6-volt storage battery and plate power from a 300-volt dynamotor. Four 306A tubes are employed which were designed especially for this type of service. The type of crystal used in this transmitter is the same as that in the headquarters transmitter. With this crystal the carrier frequency of the transmitter is maintained to better than $\pm .025$ per cent.

If it is desired to operate this transmitter as a fixed station, both filament and plate power may be furnished by a suitable power-supply unit connected to an alternating-current source.

The radio receivers used in the Evansville cars are mounted under the dashboard. They are seven-tube superheterodynes with automatic gain con-

(Continued on Page Sixteen)

Policing Ev

Indiana
Electric

This M
Another



Chief Radio Engineer McConnell "Calling All Cars." At his left, P Receiver—at right, an amplifier—in the center, a signal board contain of red lights at top and green lights at bottom with car numbers in be



ansville Via Two-Way Radio

City First in Country to Install New Western Ultra-High-Frequency Two-Way Police Radio Communication System

Modern Method of Combating Crime Adds
Dramatic Chapter to Long History of
Police Communications.

ecinct
g row
ween.



Transmitting antenna on patrol car used for both receiving and transmitting calls. From left to right are: Officer Horn, Chief Engineer McConnell and Officer Youngblood. Left: Chief Engineer McConnell at central control desk discussing new system with operators Morris and Montoux. The Ultra-High-Frequency Transmitter is seen at left of group.

Safeguarding Evansville

(Continued from Page Thirteen)

trol and automatic noise suppression features. The filament voltage is supplied directly from the car battery and the plate voltage from a dynamotor. A flexible steel rod affixed to the car body at the left rear acts as a vertical radiator which performs the dual purpose of both transmitting and receiving. Should the rod strike an obstruction as the car follows the chase, there is no delay, for the rod simply bends over and when free springs back in position. Only about two feet of cable are used to connect the transmitter to the antenna.

The microphone, which is similar to the standard telephone "handset," is suspended from a bracket on the control unit which is fastened to the instrument panel of the car. The "on" and "off" switch with a signal lamp which shows when the transmitter is in use also are mounted on this control unit.

The fixed station W9XEH is located on the top floor of the Police Headquarters building.

The transmitter is compactly assembled in a neat metal cabinet which is entirely dead front. The identifications for the various controls and meters are photo-etched and chromium-plated on the front panels. Full protection is afforded the operating personnel by a door switch which removes the high voltages when the door is opened.

The transmitter is a 50-watt unit operating on a frequency of 30,100 kilocycles. The radio frequency unit contains a quartz crystal oscillator, a frequency multiplier stage, a radio frequency amplifier stage and a modulating amplifier stage. The crystal is an "A-Cut" quartz plate which maintains the carrier frequency accurate to well within .025 per cent without the aid of a temperature-control oven.

The transmitter will operate from either 110 or 220 volt, 60 cycle A.C. main.

The radio receiver used at headquarters contains a built-in loudspeaker and is similar electrically to the car receivers, except that it is operated from the regular A.C. power main.

The half wave antenna at headquarters is mounted vertically on the 100 foot, hollow steel flagpole on top of the Police Headquarters building. The transmission line runs thru the flagpole to the antenna and is of the concentric type, consisting of two copper tubes, one within the other. The outer tube is grounded and the inner tube is insulated from it by dielectric details.

Before the equipment went into operation at Evansville, extensive tests were carried on for both the headquarters and patrol car transmitters, to determine the signal coverage. It was proved that reliable two-way communication could be carried on between headquarters and the patrol fleet transmitters from any point within the city and up to a distance of seven and one-half miles in any direction from headquarters. Although there are a number of steel bridges

and underpasses, the signals from either the fixed or mobile transmitters have not been lost.

During the first few months of operation 12 cars were equipped with receivers. One of these was used by Ira C. Wiltshire, Chief of Police; three were in detective cars; seven in patrol cars and one in an armored emergency car. According to Chief Engineer McConnell, station and operating procedure is well standardized. The telephone switchboard is situated in an adjoining room together with a fire alarm tape recorder. All incoming calls are routed to various departments by the switchboard operator. The commanding officer of that particular department calls "Radio," and gives the order for assignment to a particular car or cars. The radio operator then transmits the message—except emergency calls which are sent directly to the radio operator.

The operating personnel are employed by the city through the Department of Safety and report to the Director of Safety, Col. Louis L. Roberts. In a Police Radio School under the supervision of Chief McConnell police officers are being trained for third class radio telephone licenses. After passing examinations they will be assigned to the patrol cars equipped with transmitters.

Thus prepared Evansville rides to battle crime with one of the most effective weapons ever used in the long history of policing.

Police Radio Contracts

Two more New Jersey towns have contracted for complete installation of Western Electric Two-Way Police Radio systems. They are Morristown and Westfield. The systems for both towns are similar consisting of a 5-watt headquarters transmitter and receiver with associated mobile units. Westfield will have three patrol cars equipped with 18A transmitters and 18A receivers; Morristown two cars.

Westfield's fixed transmitter will be installed on the first floor of the Municipal Building where police headquarters is located. It has a guaranteed radius of four miles in all directions which more than covers the town's area. The headquarters antenna, a 65-foot steel mast, is to go on the building's roof.

According to Lieutenant Shriber, members of the Westfield police force have already obtained licenses to operate the patrol cars. His department will be fully prepared to put the system into service as soon as the station is completed. The following call letters have been assigned: fixed station—W2XIO, mobile stations—W2XIP, W2XIQ, W2XIR.

A demonstration of the equipment held at Morristown was enthusiastically received by the town's leading officials. Among those attending were Mayor Todd, Commissioner of Public Safety Whitney and members of the Board of Aldermen.

Contracts for both systems were made with the Newark Branch of Graybar Electric Company.

The BIG VOICE

at the California Pacific International Exposition

Entire Area of San Diego Fair Is Covered by Giant Western Electric Public Address System

San Diego has been the goal for thousands of travelers from all parts of the globe since the California Pacific International Exposition opened its gates last May. Among the countless attractions this gay city has to offer are the vast halls of exhibits telling the story of man's achievements in science, industry and art.

Typical of one phase of the progress made by science through the years is a network of equipment which although not on display yet performs one of the most important functions in San Diego's mammoth show. It is the official public address system — The Voice of the Exposition.

Through this network, music and announcements are supplied to all parts of the fair grounds. By means of it, programs from the Spreckles Amphitheatre, the Cafe of the World, the Ford Music Bowl and the Patio of the Ford Building are broadcast. From 10 in the morning to 11 at night the equipment is continuously in operation.

The system, manufactured by Western Electric, was engineered and installed by the C. C. Langevin Company of San Francisco. It is also operated under their supervision. Many new features never before attempted on an installation of such magnitude were introduced.

Perhaps the most unusual feature of the installation is the provision for wide range reproduction of speech and music. Every effort was made to produce the highest possible fidelity in reproduction, and altogether five audio reproducing stations were equipped with wide range set-ups. These stations "cover" practically every square foot of the fair.

Essentially the system consists of two completely outfitted broadcasting studios, especially constructed and of the live-and-dead-end type; seven audio stations from which music and announcements are reproduced over the entire area of the grounds; from 12 to 14 permanently installed program loops together with telephone loops; permanent remote control equipment for picking up programs at four separate locations; reproducing equipment for playing phonograph records; a complete radio receiving equipment for reproducing radio programs, and the necessary amplifying and monitoring equipment in the main control room.

The two broadcasting studios are complete with their speech input equipment and bridged

monitor amplifiers. The output of these studios is fed into the main control room for distribution to any of the audio stations on the grounds or to radio broadcasting stations, including both the Columbia and National Broadcasting networks.

With the 12 to 14 permanently installed program loops it is possible to pick up programs originating at almost any other point on the grounds. Such programs are picked up, amplified and sent over the loops to the main control room from which they are routed either to the broadcasting stations or to the audio channels within the grounds. Portable pick-up equipment is installed at these points only when programs are to originate there.

The four permanent control equipments are installed in the Cafe of the World, the Ford Music Bowl, the Patio of the Ford Building and at the Spreckles Amphitheatre. From these locations programs are regularly picked up and broadcast both over the air and the audio chain. All incoming program loops are grouped in a number of patching strips so that any incoming program, originating from any location, including either broadcasting studio, any remote position, or transcription equipment, can be transmitted to any one or all of the loud speaker stations.

Of the seven audio stations, five are equipped for wide range reproduction. The other two audio sections are intended chiefly for use as individual public address stations. They are located at the organ amphitheatre and the Ford Bowl. The speaker banks of the five wide range stations consist of horn projectors equipped with moving coil receivers for the higher frequencies and dynamic loud speakers with baffles to cover the low frequency end of the audio spectrum. The division of frequency between the middle and high range and the low range, occurs at 800 cycles.

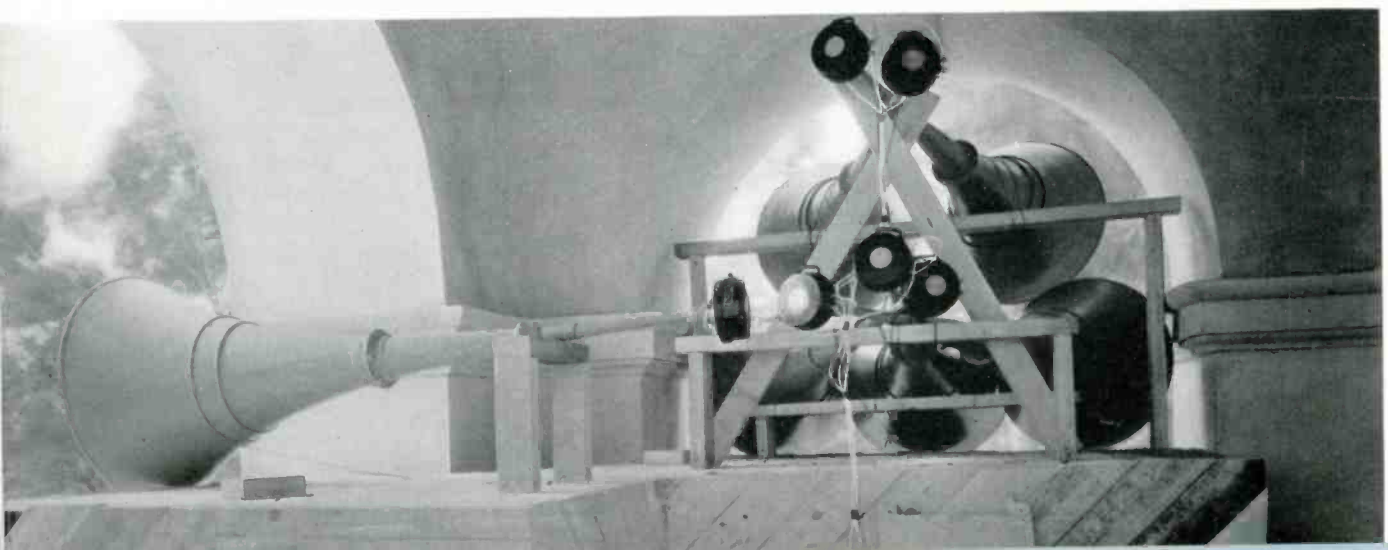
Programs for these stations are fed over loops into an intermediate amplifier, which in turn feeds the power amplifier. In the case of two of these stations, one in the Arch of the Future in the Plaza Del Pacifico and the other on top of the Hollywood Hall of Fame Building, a slightly different frequency dividing arrangement is utilized, since more audio power is required at these stations. The incoming loop feeds an amplifier, and an 800 cycle dividing network is fed by this amplifier through an auto transformer. The high frequency end of this dividing network then leads

(Continued on Page Twenty-one)

WIDE RANGE

Is Feature of San Diego

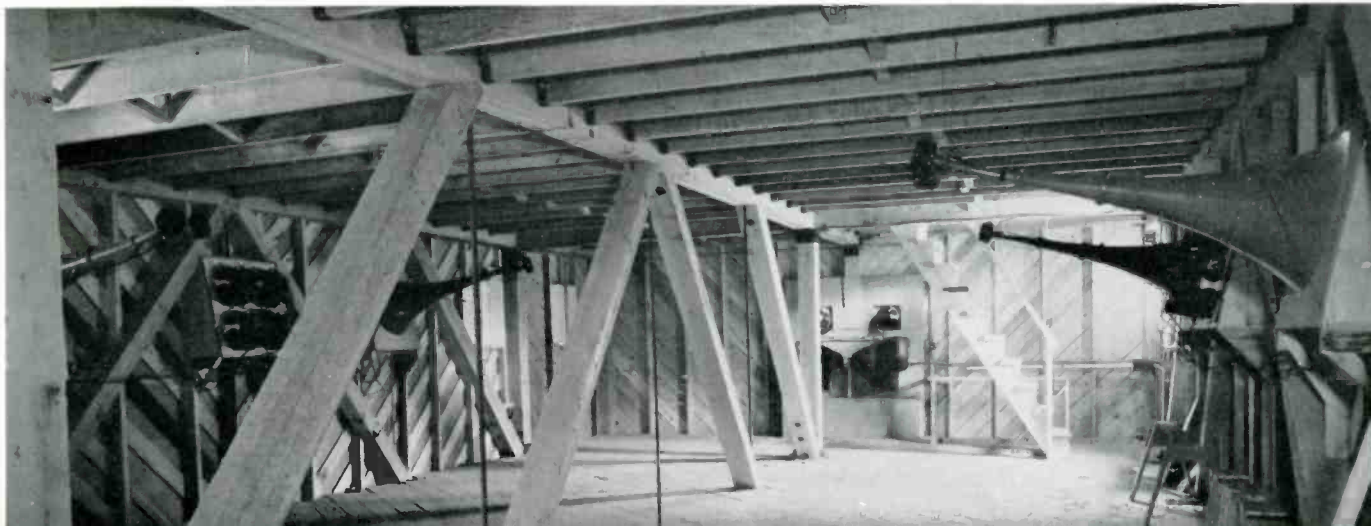
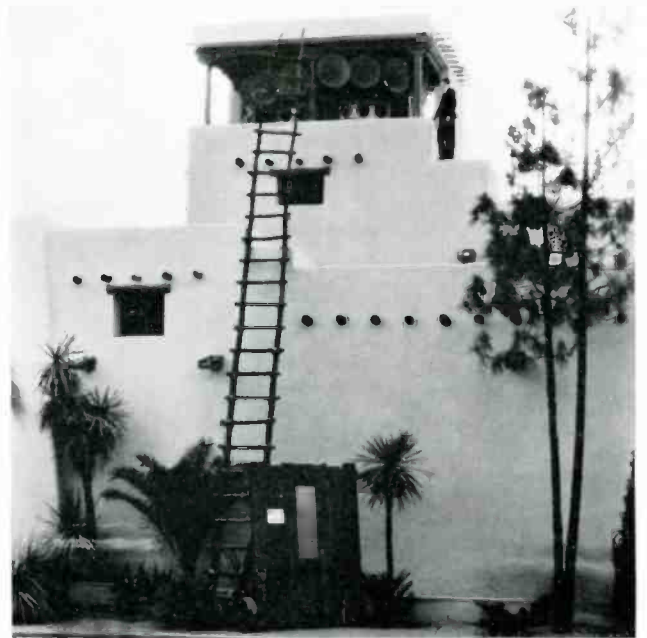
High Fidelity in both music and voice reproduction is keynote of Western Electric equipment at San Diego. Left: Victory Arch containing 12 receivers, working in 8 exponential horns, and 12 low-frequency units. Below: Main control room: racks, house line amplifiers, bridging amplifiers, patching panels, radio receiver, monitor amplifiers. Bottom: Loud speakers on tower of Foods and Beverage Building. Low frequency speakers are installed underneath horns in enclosed structure.



REPRODUCTION

Public Address System

Right: Loud speakers at top of Spreckles Organ Amphitheatre. Below: Speaker groups in Better Housing Building. Center right: Hollywood Hall of Fame with loud speakers with distribution wide range to an arc of 180 degrees. Bottom: An interior view of the Victory Arch in the Plaza del Pacifico showing low frequency and high frequency units installed. Photographs displayed on these pages were taken with the screens removed from in front of the horns.



307A Power Pentode

(Continued from Page Twelve)

thus permitting the application of any desired voltages to each.

The innermost of these grids, through control of the rate at which electrons leave the cathode, performs functions similar to those of the grid of a triode. The second, or screen grid is maintained at a fairly high positive potential, and provides the principal accelerating force tending to draw electrons out from the cathode. Because of its open structure, however, practically all the electrons pass through this grid into the space beyond. The suppressor grid plays only a small part in controlling the number of electrons drawn from the cathode, but its potential determines the way in which the total current divides between the screen grid and the plate. When its potential is zero, practically all electrons passing through the screen have sufficient velocity to overcome the retarding effect of the suppressor and continue on to the plate. As the suppressor is carried more and more negative, the fraction of the electrons turned back increases, and consequently the plate current decreases. It is possible to reduce the plate current essentially to zero by making the suppressor sufficiently negative.

Characteristic curves for the 307A tube are shown in Figures 1 and 2. In Figure 1 the plate current is shown as a function of the plate voltage for several values of control-grid voltage, the potential of the screen-grid and suppressor-grid being held fixed. The smoothness of these curves in the region where the plate voltage approximately equals the screen-grid

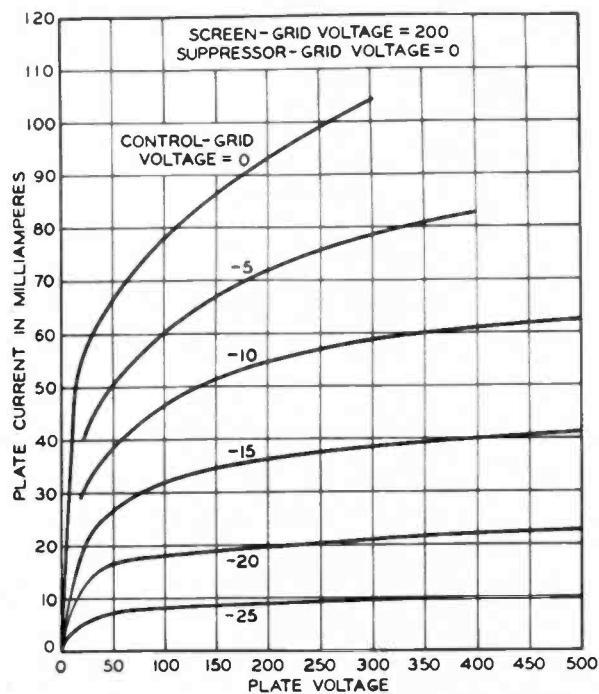


Fig. 1—Static characteristics of 307A tube showing plate current as a function of plate potential. Screen-grid potential 200 volts and suppressor-grid potential zero.

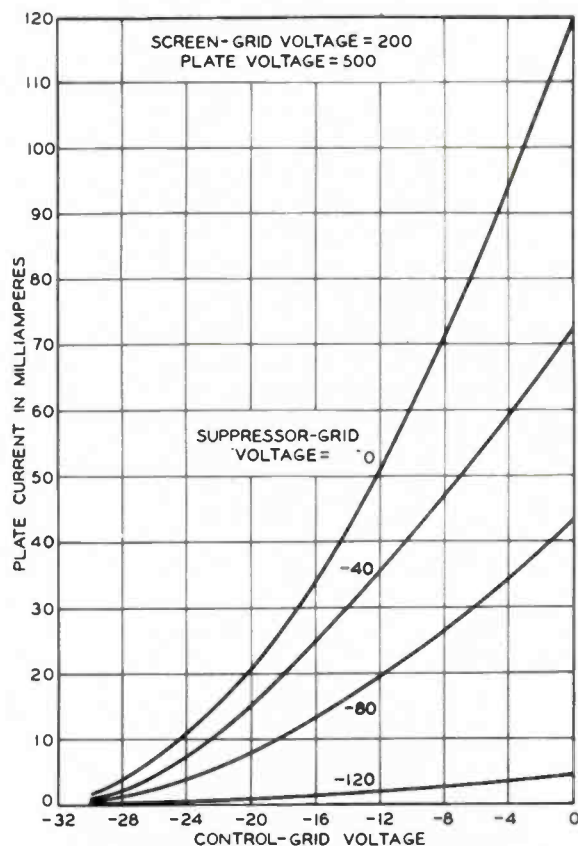


Fig. 2—Relation between plate current and control grid potential of the 307A tube for a plate potential of 200 volts and a screen-grid potential of 200 volts.

voltage indicates the complete effectiveness of the suppressor grid in preventing flow of secondary electrons. The curves of Figure 2 show the plate current as a function of control-grid voltage for several suppressor-grid voltages with plate and screen potentials constant. These curves indicate the parts played by the control and suppressor grids in controlling the current to the plate.

When the tube is used as a modulating amplifier, a radio-frequency input is applied to the control grid. This results in corresponding radio-frequency variations in the plate current. The amplitude of these variations in current and the magnitude of the plate circuit load determine the high-frequency power output of the tube. Under these conditions the amplitude of the current variations is reduced as the voltage on the suppressor grid is made more negative. Thus the high-frequency output power of the tube depends directly on the potential of the suppressor grid.

It is this dependence of the high-frequency output on the suppressor potential that makes it possible to use the tube as a modulator. In an ideal amplitude modulator, the high frequency current in the load is a linear function of the modulating potential. In the pentode this requires careful mechanical design of the grid structures. How close the 307A tube comes to meeting the ideal can well be judged from the characteristic curve in Figure 3.

For radio telephone use, under the conditions for Figure 3, the suppressor might suitably be biased at - 50 volts. A swing of plus and minus 50 volts from this value causes variation of the load current from approximately double the normal value to practically zero. It is unnecessary to provide a low-frequency power amplifier between the microphone and the modulator tube because a peak voltage of about this amplitude can be obtained directly from a handset with a suitable transformer.

The greatest advantage of the 307A tube over other types lies in the fact that the output may be modulated almost completely by varying the potential of an element which being continuously negative with respect to the cathode does not itself draw space current.

The 307A tube is also suitable for use as an oscillator. A complete transmitter may be built around two such tubes, with one providing the high-frequency power necessary for driving, and the other serving as a modulator. The relative simplicity of such a circuit, with a minimum number of tubes and associated circuit elements, makes it particularly adapted to transmitters for aircraft, where both small size and light weight are factors of major importance.

The use of a filamentary type of cathode in the 307A tube, rather than an indirectly heated cathode, makes possible important operating economies.

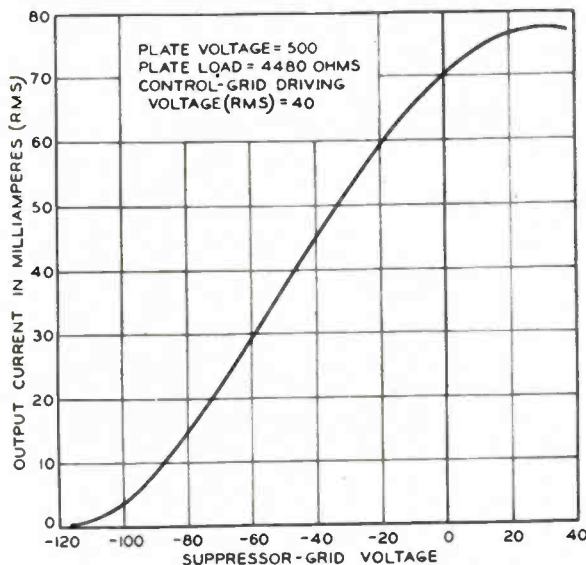


Fig. 3 — Dynamic characteristics of 307A tube for a plate potential of 500 volts.

Because the cathode used requires only a very few seconds to reach operating temperature, the transmitter may be completely shut down when not in use, but is almost instantly available when needed. Similar transmitter performance could be obtained with equipotential cathode tubes only by maintaining the cathode at close to normal operating temperature during idle periods. Both supply power and useful tube life are thus conserved by use of the filamentary cathode.

50 KW Station for Detroit

WJR, known as Detroit's Good-will Station, joined the ranks of the country's high powered broadcasting stations when the new Western Electric 50,000 watt transmitter went on the air for the first time September 30. Coincidental with the introduction of the new equipment WJR became affiliated with the Columbia Broadcasting System. In the space of a few years it has grown from a small local station to the most powerful one in the state of Michigan today.

The modernistic tile and brick building which houses the new transmitter is situated near Trenton, Michigan. Encircled as it is by flat country for miles around the location is ideal for broadcasting purposes. The increased signal strength and high fidelity quality of transmission brings to radio listeners in this vicinity clearer and stronger reception than was possible heretofore.

In the official family of Detroit's Good-will Station are G. A. Richards, president; Leo J. Fitzpatrick, vice-president and general manager; L. A. Weiss, assistant general manager; M. R. Mitchell, chief engineer; John F. Patt, general manager of WGAR; P. M. Thomas, secretary-treasurer, and William A. Alfs, counsel.

19A Transmits 300 Miles

From Private Flyer Robert Z. Glass of Dallas, Texas, comes an early report commending the operation of Western Electric's midget 19A transmitter designed for private planes. Writes Pilot Glass, "When I called Ft. Worth from the Houston, Texas, airport, he answered promptly and said I was coming in very satisfactorily on loud speaker. I was able to work both Ft. Worth and Houston continuously all the way from Houston to Dallas (300 miles). I am more than well pleased with the set."

A complete description of this equipment is carried on page six of this issue.

Big Voice at San Diego

(Continued from Page Seventeen)

into a power amplifier, the output of which supplies the high frequency speakers. The low frequency end of this network is likewise fed into an amplifier which supplies the low frequency speakers through a 1,000 cycle low pass filter. The object of the filter is, of course, to limit high frequency harmonics generated in the low frequency amplifier should the overload point be approached at any time.

Thousands of comments praising the quality and volume of the equipment have been received by the management of the Exposition and the Associated Oil Company which has sponsored the system.



J. R. Poppele, WOR'S chief engineer, showing Alfred J. McCosker, president of the Bamberger Broadcasting System, Western Electric's new non-directional dynamic microphone. Displayed on the table is the evolution of microphones used at WOR since the inception of the station: (left to right) telephone transmitter with megaphone (1922); double carbon button (1923-28); improved double carbon button type with improved mounting (1928-33); condenser microphone with amplifier (1928-33); lapel microphone (1932); dynamic microphone (1933-35).

Mayor Lauds N. Y. Police

Since the introduction of police radio and teletype the efficiency of the New York Police Department has increased although the number of patrolmen on duty has decreased. This statement, appearing in the New York Herald Tribune, is a part of Mayor LaGuardia's message to the Board of Estimate concerning the budget for 1936.

An excerpt from the Tribune's report reads, "Provision has been made for the appointment during 1936 of 600 new patrolmen in the Police Department. This will not mean any increase in the quota, now fixed at 17,253. The last increase was in 1931. At present the department is approximately 1200 patrolmen short of the authorized quota. While the number of men available for duty has been decreasing, the efficiency of the department has increased. Modern equipment (the radio motor patrol, teletype, etc.) has permitted this increased efficiency and the covering of more territory without proportionate increase in personnel." The police radio equipment referred to is manufactured by the Western Electric Company.

Mulrooney Praises Radio

The need for a nation-wide police radio system was stressed by Edward P. Mulrooney, chairman of the State Liquor Authority and former police commissioner of New York City, in a speech delivered before Governor Lehman's "Crime" conference recently held at Albany.

Says the Herald Tribune, "Mr. Mulrooney, discussing difficulties of detective work, ridiculed the elected sheriffs as enforcement officers, praised the Nassau County police system, and urged the creation of such centralized police organizations everywhere. He also suggested that, while the Federal Government was making appropriations, it might allot some money for the creation of a nation-wide police radio system, which, with inter-state agreements regarding the pursuit and arrest of criminals, would facilitate the capture of motorized gangs."

The Nassau County police system to which Mr. Mulrooney refers has been using Western Electric one-way police radio for the past two and a half years.

SANFORD HELT - W L A P

Radio listeners hearing the shrill whistle of a locomotive in the midst of an orchestra program might utter a few unprintable remarks about noise—receiving sets—static or even blame an innocent saxophone player for projecting a sour note in the evening's entertainment—and let it go at that. To the chief engineer of a broadcasting station it's a different story. A mixture of locomotive whistles and music may cause him a gray hair and a sleepless night. Sanford Helt, who holds such a position at WLAP, can vouch for the sleepless night if not the gray hair.



Sanford Helt

At one time when Mr. Helt was operating at a remotely located transmitter the whistle happened. He called the studio to trace the noise. No one knew anything about it, not even the saxophone player. For several days the whistle mystery remained an enigma. Finally it was solved. A telephone lineman atop a pole along a railroad where the lines ran from the studio to the transmitter had tuned in on the program with his test set. When a passing locomotive whistled, the set picked up the sound and it was broadcast along with the music.

Mr. Helt has been chief engineer at WLAP since the station moved from Louisville to Lexington, Kentucky, in 1934. He personally supervised the entire construction job and believes that WLAP has one of the best signals of any 100 to 250 watt stations in the country. Earlier in his career he organized the Panama Electric Corporation of Panama City and was in charge of this business for nearly a year. From Panama he traveled to Mobile, Alabama, to assist in the construction of WODX. Later he became chief engineer of WKBF, Indianapolis.

Mr. Helt became interested in broadcast engineering during the early days of radio. He attended the special radio school conducted for the United States Signal Corps at Maxwell Field, Montgomery, Alabama. During the succeeding summers he received instruction in the 31st Division Signal Company at Fort McClellan. When the course ended he accepted a position as factory representative for the American Radio Manufacturing Company of Kansas City.

According to him the life of a chief engineer has its happy surprises as well as its locomotive whistles. One of these occurred at WLAP. It was a broadcast of a transcription feeding back to Clem McCarthy his entire broadcast of a horse race while he was attending a dinner in a local hotel with the Thoroughbred Club of America. The program origi-

nated at the club dinner during which the line was reversed and the race broadcast fed back to the hotel and over a public address system.

Mr. Helt is a member of the Institute of Radio Engineers and at one time was radio editor of the Southern Review. His wife was Mercedes Elizabeth Williams of Mobile. There is a two-year old junior in the family to uphold the tradition of the Helts in the broadcast engineering field.

W. E. Radio for Silver Fleet

The first of five new Lockheed Electra airliners, equipped with Western Electric radio apparatus, has been delivered to Eastern Air Lines, according to a report in the Montgomery, Alabama, Advertiser.

In describing these most modern ships of the air the newspaper says, "The trim new transports will be added to 'The Great Silver Fleet,' of Eastern Air Lines for service on the company's extensive air mail and passenger system in the eastern states. They will operate on the lines from Newark to New Orleans, through Montgomery, and from Chicago to Miami.

"Innovations in the new model include the installation of de-icer equipment on the leading edges of the wing and on each stabilizer. Landing lights are also in the leading edge rather than in the nose of the fuselage.

"Western Electric radio equipment includes a 13A transmitter and 14A and 17A receivers. Two fixed antennas located under the fuselage are used for receiving, while a new automatic reel in the tail cone controls a trailing antenna for use in transmitting."

The 17A midget receiver, which is described elsewhere in this issue, is installed in the Lockheed planes as an emergency receiver. Western Electric 12 type receivers are also installed in the new transports.

41 Newspaper Stations

From its inception, newspapers have played an important part in broadcasting. That part is definitely on the increase as more and more newspapers go on the air. More than 40 radio stations, owned or operated by newspapers, are Western Electric equipped. WTCN, owned and operated by the Minneapolis Tribune—St. Paul Press Dispatch, and described elsewhere in this issue, is one of the latest. The complete list of these Western Electric equipped stations owned or operated by newspapers follows: WCLO, WTMJ, WCHS, WSAZ, WMC, WBAP, KSL, KTAR, KEHE-KELW, KPO, KLX, KERN, WFLA, WSUN, WIOD, WSB, KGFF, KGW, KALE, WHAT, WCAE, WQAM, KFH, WMT, KGGF, WHAS, KTBS, WJBO, WBAL, WWJ, WTCN, WDAF, KSD, WINS, WOKO, WWNC, WHK, WAIU, WBNS, WAIM and WISN.

High Fidelity at WTCN

(Continued from Page Five)

apparatus associated with the grid and plate supply circuits. The input tuning is in the intermediate amplifier unit. The output tuned circuits are mounted in the power amplifier tuning unit. Grid and plate voltages are supplied by rectifiers external to this unit.

Tuning circuits of the power amplifier are contained in the fourth cabinet. The circuit consists of two tuned meshes inductively coupled, the second mesh matching the input impedance of the transmission line and the first mesh offering the correct working impedance to the amplifier tube.

A monitoring rectifier is mounted in this unit and terminals are provided for connection to monitoring facilities in the speech input equipment to a monitoring loud speaking telephone and to oscillographic equipment.

The fifth unit may be mounted in the main transmitter line-up or separately. It contains time delay and control relays, rheostats, meters and the grid-bias rectifier. Twenty-four pilot lamps show when the important parts of the circuit are functioning properly and immediately indicate the location of any trouble that may arise. This enables tube replacements to be made in a comparatively short time.

A feature of the control circuit is the automatic restoring relay which returns the transmitter to operation in the event of momentary interruption of the power circuits or minor transmitter difficulty which requires the removal of the plate voltage from the vacuum tubes to clear. This feature insures a minimum loss of program time to the broadcaster from interruptions of this sort. Should more serious trouble occur, the power will be removed from the transmitter to prevent tube damage and a pilot light associated with the circuit in trouble will be extinguished in the control panel thereby providing immediate indication to the station engineer of where to look for the difficulty. When this has been cleared the pilot light can be reset and the transmitter restarted immediately.

Meters for measuring the plate voltage, filament voltage, bias voltage, and the leakage current for the final amplifier are mounted on the front panel together with controls and adjustments. The leakage current is an indication of the conductivity of the cooling water. An hour counter provides means for checking the operation of the transmitter and tubes.

In addition to the five cabinets there are also an antenna coupling unit, high voltage rectifier equipment, and a water cooling system for the tubes in the final amplifier. The coupling unit is designed for use with a coaxial transmission line and is installed at the base of the antenna.

WTCN is one of a number of stations which has recently installed the new Western Electric

five kilowatt transmitting equipment. Others include two stations of the Don Lee Broadcasting Company, KJH of Los Angeles, and KFRC of San Francisco; WSPD, operated by the Toledo Broadcasting Company, Toledo; and KMBC, operated by the Midland Broadcasting Company, Kansas City.

Installation of similar equipment is in process at KLZ, Denver; WOW, Omaha; WJAX, Jacksonville, Florida; and WJAS, Pittsburgh. Stations WDAF, Kansas City, and KFH, Wichita, Kansas, have purchased special five kilowatt amplifiers.

KALB Goes On the Air

As the clocks of Alexandria, Louisiana, chimed "seven" on September 21, early bird radio fans about the city tuned in on a brand-new broadcasting station and heard, for the first time, the voice of KALB. According to "Town Talk," a local newspaper, "The management was getting congratulatory telegrams and calls from all over this section upon the clear reception and good programs which were rendered today."

Quoting further from the newspaper's account of the station's opening the article reads: "The studios are located on the second floor of the building at the corner of Third and Jackson Streets, formerly known as Bolden Hall, while transmitting plant and towers are located just north of the city near the new state highway bridge.

"The towers, easily seen from the riverfront, are over 146 feet in height and are 388 feet apart. The transmitter is a 100-watt Western Electric 301-B. The station may be picked up for a radius of from 100 to 150 miles of Alexandria.

"KALB, the call letters, stand for 'Know Alexandria, Louisiana, Better.' The officers of the firm are: S. B. Pearce, president; Walter Allen, vice president and engineer; Eugene Levy, secretary. The station personnel includes: W. L. Waltman, manager; Eddie Vann, program director; Joel Hirsch, chief operator; Howard Griffith, assistant operator."

Radio Returns 682 Cars

Since the installation of the Western Electric Ultra-High-Frequency police radio system one year ago at Newark, N. J., the city's motor patrol fleet has chalked up to its credit the return of 682 stolen automobiles valued at \$170,448. This statement appeared in the New York Sun when the system celebrated its first anniversary recently.

Other interesting statistics were quoted by the newspaper. Radio cars answered 35,777 police alarms, 2,683 fire alarms, patrolled 763,029 miles and made 2,240 arrests.



Western Electric Bulletins Issued Recently

Non-Directional Dynamic Microphone
 Studio Speech Input Equipment
 Private Flyers — Now a Voice for Your Ship
 Program Line Panel 272A
 89A Amplifier
 Order Wire Panel 268A

400 Watt Radio Transmitter
 Telephone Panel 260A
 100-250 Watt Radio Transmitter
 1086B Amplifier
 Private Flyers — Here's Your Radio
 Combating Crime Via Two-Way Radio

(These bulletins will be furnished upon request)

Products Manufactured by
Western Electric

RADIO EQUIPMENT

Broadcasting Equipment and Accessories

Radio Frequency Distribution Systems

Aviation

Transport Plane Two-Way Radio Telephone

Private Flyers Two-Way Radio Telephone

Ground Station Two-Way Radio Telephone

Police

One-Way Medium-Frequency Transmitters

Two-Way Ultra-High-Frequency Mobile and

Headquarters Radio Telephone

Marine

Two-Way Boat Radio Telephone with Radio

Compass and Direction Finder

Two-Way Shore Radio Telephone

VACUUM TUBES

Amplifiers

Oscillators

Modulators

Detectors

Rectifiers — High Vacuum

Rectifiers — Mercury Vapor

Rectifiers — Grid Controlled

Ionization Manometer

Thermocouples

Vacuum Switches

Photoelectric Cells

Ballast Lamps

Cathode Ray Oscillographs

PUBLIC ADDRESS EQUIPMENT

Paging Systems

Announcing Systems

Program Distribution Systems — Records, Radio

Portable Public Address Systems

HEARING AIDS

Individual Audiphones — Bone and Air Conduction

Types

Group Audiphones

Audiometers

CABLE

Lead Covered

(Quadded and non-quadded)

Tape Armored

Submarine

Textile Insulated

Switchboard

RAILWAY TRAIN DISPATCHING TELEPHONE SYSTEMS