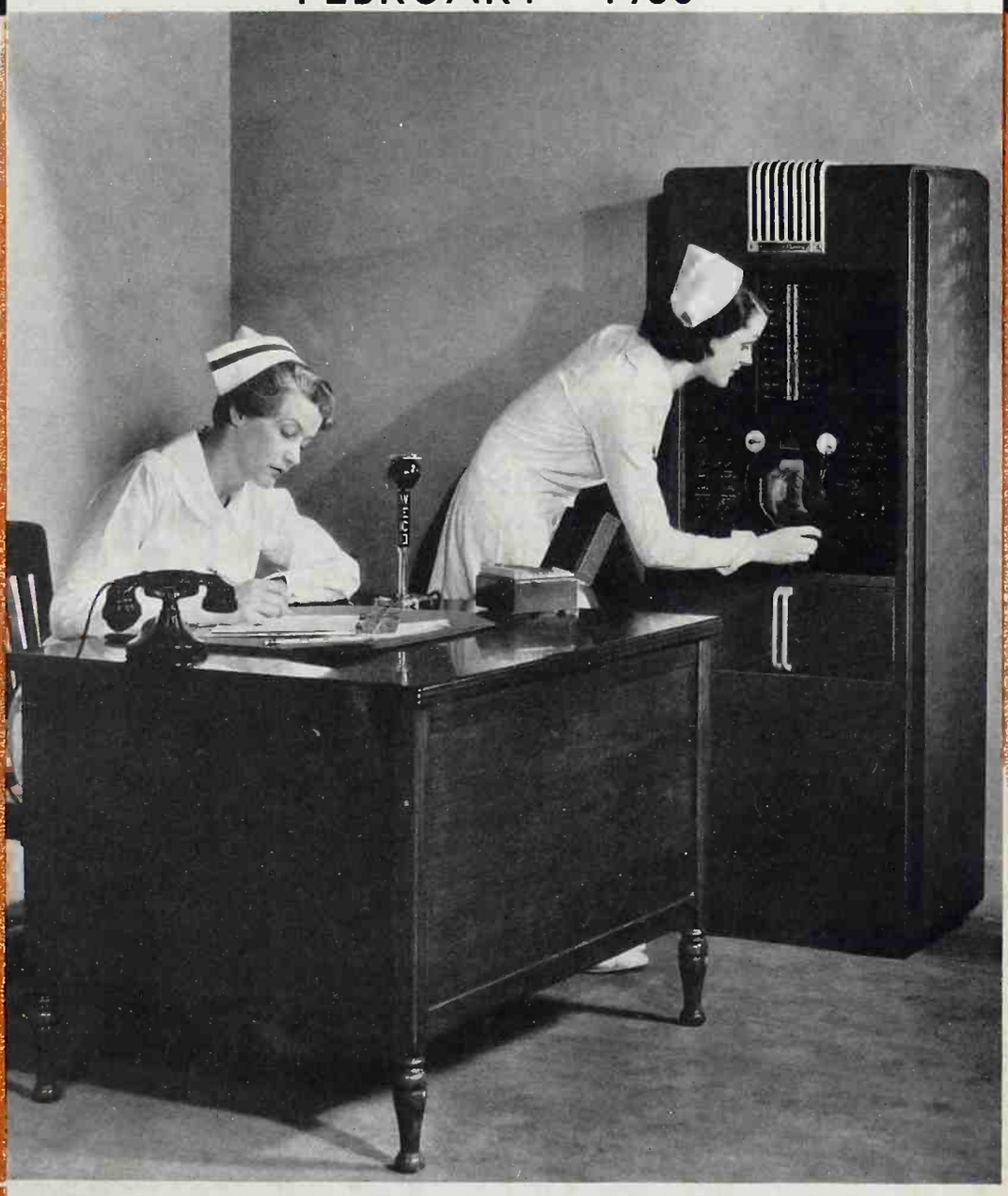
# PICK-UPS

FEBRUARY · 1936



PUBLISHED BY
Western Electric

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## In This Issue

"1936—Broadcasting's Biggest Year," says Leo Fitzpatrick

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New Ultra-Modern Sound System Supplies Three Kinds of Programs

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"Okey-Doke 22, Come On In!"

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The Relative Importance of Frequency Components of Noise in Radio Broadcasting Equipment

•

How New York Police Radio Patrols 317 Square Mile Area

•

A Jumbo Voice for Jumbo

# — 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*
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WILL WHITMORE, *Editor*
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FEBRUARY, 1936

Husband-seeking women are not the only ones who will get a break this leap year. Leo Fitzpatrick says this will be the biggest year broadcasters have ever seen. He bases his prophecy on better business conditions and the fact that all presidential election years are good times for the broadcasters. PICK-UPS interviewed Fitzpatrick in Detroit. You'll find the result on the opposite page.

•

Perhaps like most of us, you have wondered how so many planes can take off and land at an airport without accident or delay. Out to busy Newark airport went an inquiring reporter to get the answer. It's all done by a radio traffic cop, the writer found, and the story in this issue answers many other questions you've no doubt puzzled over.

•

How can one man control 500 radio police cars patrolling an area of 317 square miles comprising the five boroughs of Greater New York? To the uninitiated it may seem like a gargantuan game of chess, but in reality the job has been reduced to a never-failing system. Thomas W. Rochester, Chief Engineer, Police Department, City of New York, gives you the details in this issue of PICK-UPS.

•

As modern as next year's automobile and just as attractive is the new Western Electric Program Sound System described in this issue. Designed particularly for schools, hospitals, hotels and department stores, it has a number of unique features.

•

Everybody likes to look at pictures. That's why PICK-UPS gives you so many. In this issue you'll find a double page of pictures of the new 50,000 Watt High Fidelity Western Electric Transmitter at Station WJR, Detroit, and there's another two pages of pictures on the new Woodmen of the World Station, WOW, Omaha. It's really a WOW!

•

PICK-UPS brings you a choice selection of other items. There's the story of Milton Boom of Chicago who has been successful in public address work. How radio made possible one of 1935's greatest transportation achievements; how an investment banker was able to pursue his hobby of music after deafness came to him.

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# 1936-

# BROADCASTING'S BIGGEST YEAR

says

LEO FITZPATRICK

WJR

An interview with the President of the National Association of Broadcasters

By

WILL WHITMORE

LEO FITZPATRICK

*The year 1936 will be the greatest year in the history of Broadcasting.* Such is the prophecy of a man who knows radio from A to Z, a man who has his finger on the pulse of the entire industry, and above all a man who loves radio as passionately as you and I love—well, whatever it is we love most.

He is Leo Fitzpatrick, Vice-President and General Manager of Radio Station WJR, Detroit, and President of the National Association of Broadcasters.

"There can be no doubt that radio will make tremendous strides in 1936," he says. "It will be a great year for the broadcasters, the manufacturers of radio sets and equipment, the advertisers and the public. I base this upon the general improvement in business as a whole and the fact that this is a presidential year. Such years have always been good broadcasting years. Look at 1924. That was the first presidential year in which radio played an important part. That year really put broadcasting on a firm foundation. Similarly, 1928 and 1932 were good broadcasting years.

"Further, broadcasters have made certain house-cleaning moves which will bring greater success and a new prosperity to the industry. I refer to the move to take many objectionable sponsored programs off the air and to limit the amount of uninteresting advertising time in programs. Such moves will undoubtedly result in increased listener acceptance in 1936."

Fitzpatrick is a man who knows whereof he speaks. Last September 30, WJR shut down power on its 10,000-watt transmitter and went on the air with a new 50,000-watt high fidelity Western Electric transmitter. With that increase in power went a corresponding increase in rates, yet today WJR's time on the air is almost completely sold for 1936.

Fitzpatrick is one of the most fortunate of men. Many go through the years carrying on in jobs for which they have no real interest. He, however, has found the niche into which he best fits. It is hard to think of him in any other endeavor except radio. It is equally hard to think of him in any other city than Detroit. Radio and Detroit were tailor-made for his great energy, his dynamic personality, and his limitless enthusiasm.

Like most other successful men he has held many jobs, had many experiences before he found himself in radio, but these jobs proved a valuable

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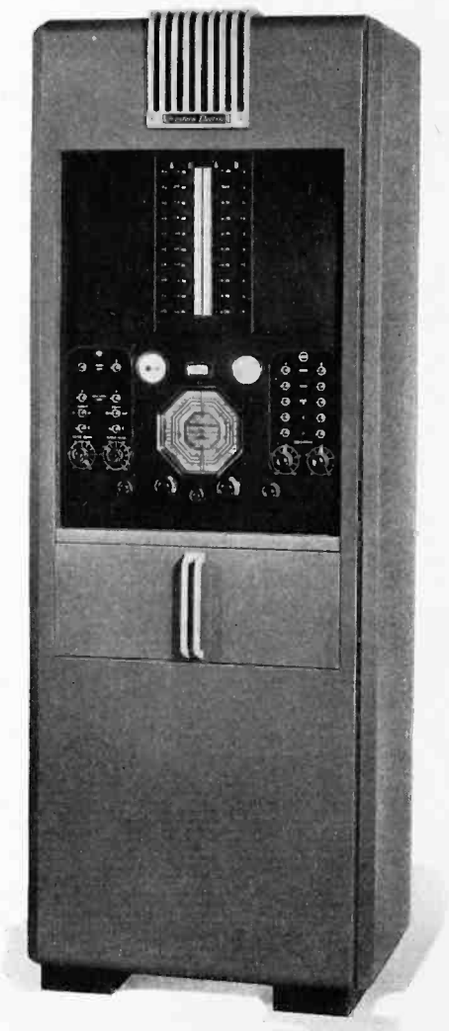
# New, Ultra-Modern Sound System Supplies Three Kinds of Programs



## Distributes Programs from Three Sources . .

- Record Reproducer
- Radio
- Microphones

A school principal sits at his office desk and addresses 400 pupils in 12 classrooms at one time. Thirty students in another room are listening to a current events lecture delivered in a distant city. A smiling boy in a hospital bed follows the thrilling adventures of Buck Rogers through ear phones. In the same building a nurse is paging Dr. Jones on five floors at the same instant. Guests in the lobby of a 42-story hotel enjoy the hit number from "Jubilee" played by an orchestra on the roof. From his office on the tenth floor the manager of a department store gives a pep talk to his sales force throughout the building. The President speaks from the platform of Madison Square Garden and countless thousands inside and outside the mammoth auditorium hear his words.

Such scenes as these are being enacted throughout the country where public address systems are in use. Had this strange juggling of time and space been predicted 50 years ago the world would have scoffed at the idea. Today equipment that can distribute and amplify voices and music is becoming as commonplace as telephones and airplanes.

When public address first made its debut it was primarily put to work in large auditoriums or amphitheatres to carry the voice of a speaker or orchestral music to a multitude of listeners. Before long, various other uses were discovered for the new equipment.

In hospitals it could page doctors in any part of the building and furnish music and entertainment to patients in wards or private rooms alike with the aid of headsets.

Hotels put it into operation and such service proved invaluable. Music, banquet speeches and radio programs could be wafted to various public rooms and guests' rooms. Guests could be paged more quickly and efficiently than by the weary bell hop who trudged through crowded lobby or restaurant "C-a-l-l-i-n-g Mr. Meshbesher—Mr. Beshmesher—" or was it "Heshbesher"? Sometimes the guest was located. More often he was not.

Within the past few years the sound system has gained favor in schools and department stores. Through this medium a principal can address all classes from his office desk. Fire drill instructions and emergency announcements can be made instantly. Teachers have found the radio and phonograph attachment a decided asset in instructing classes in such

subjects as languages, current events and music appreciation.

In department stores the system serves a similar purpose. The manager can talk to his entire sales force at one time posting them on store news and pointing out improved selling methods. Announcements can be made throughout the store calling attention to exhibits, special sales or daily bargains. Also musical programs can be broadcast.

For some time past Bell Telephone Laboratories have been at work on a program sound system that would more adequately meet the need for such widespread service and at the same time be more economical in initial cost and maintenance of operation than equipment heretofore available. Such a system, now perfected, was introduced by the Western Electric Company the first of the year.

The equipment which is mounted in an attractive cabinet little larger than a modern floor type radio set serves a threefold purpose. It supplies sound programs from radio, phonograph records or microphones to individual or groups of loud speakers. The new system is available in two types. One type, equipped with one amplifier, handles only a single program at any given time. The second can deliver two programs at the same time by means of two amplifiers. For example, a school principal may be addressing groups of students in five classrooms while three other classes are listening to a lecture broadcast over the radio and relayed through the program sound equipment. In hospitals doctors may be paged and at the same time the phonograph unit or radio receiver can be placed in operation to entertain patients (who use headsets) or groups of patients.

An all wave, high fidelity radio receiver with a frequency range of from 520 to 22,000 kilocycles is contained in the cabinet. By merely twisting a dial foreign broadcast programs, police, aircraft and amateurs may be heard as well as domestic broadcast stations. The dial which regulates these various programs is a full vision four section airplane illuminated type. A switch controls the choice of the tuning range desired. There is also a device that to a large extent eliminates the fading of foreign short wave stations. In addition, the receiver includes a visual tuning meter which makes possible the highest accuracy in tuning.

The phonograph unit of the system is contained in a drawer beneath the radio receiver. Standard 10 or 12 inch lateral cut records are used and there is included a two-speed turntable motor and high quality pick-up.

In addition to the radio receiver and phonograph reproducer, three other input circuits are provided. These may be used for microphones, such as the new Western Electric non-directional dynamic

(*Continued on Page Twenty-five*)

DEPARTMENT STORES, SCHOOLS, HOSPITALS, HOTELS, and many other institutions recognize the value of this new system in providing services in step with our modern tempo.


# "Okey-Doke 22, Come on In!"

## How the "Radio Traffic Cop" Controls Planes Coming and Going at Busy Newark Airport

By M. M. BEARD

*Okay 404—runway's clear, the field's yours—come on in 404.*

"22 calling WREE—calling WREE—do you get me—I'm five miles south of Newark."

"Okey-doke 22—what's your altitude? —I advise you to drop to 1,000—we have a TWA Ford flying blind—I'll send him up to 2,000. Stand by 22 I'll advise landing."

"Plane 407 to WREE Newark—plane 407 over Martin's Creek to Newark—arriving in 20 minutes—what are your ground conditions Newark?"

"Okay 407 — I get you — ceiling 800 feet — visibility two miles — thickening haze — wind northeast—four miles. Got it 407?"

Translated from plane lingo into plain language this conglomeration of figures and staccato phrases spells "Airport Traffic Control by Radio."

In a glass enclosed tower known as station WREE overlooking the Newark Airport this radio traffic cop carries on 24 hours out of 24. There is scarcely a moment's silence particularly on a rainy day like this when a thick gray haze blankets the field. The metallic voices booming forth from five loud speakers drown out the steady downpour on the glass roof. The man on duty seems to have ten ears and as many hands. Four or five pilots or ground station operators may be calling in at one time but he gets them all and answers them in rapid succession. He twists a dial, jots down some figures on his log pad with his left hand and then grabs the microphone.

"Okey-doke 22—come in on east runway. 508—the way's clear to take-off."

"American Airline from Buffalo over Martin's Creek."

For perhaps three minutes the voices cease and the silence is startling. The operator glances over the field through the wet window panes and watches the graceful descent of plane 22 nearby. Like a great silver gull it circles, dips, glides to the ground and taxies up to a passenger station. Five passengers step out and hurry into the building out of the storm.

A boy climbing the spiral staircase that leads to this dome of voices brings noonday coffee and the news that Katharine Hepburn has just landed at the far end of the field.

"You should 'a' seen her," says the boy

breathlessly. "She got away before the reporters could snap 'er—just ducked an' ——." But the operator is not listening. He has guided so many celebrities to safety. He is much more interested in that TWA flying blind over the field. He must keep it out of the way of the American Airliner due now in 10 minutes and the U. S. Army plane preparing to take off at the north runway. For the haze is growing more dense and even the three silver ships being refueled nearby are becoming misty. His eyes rest on the funny little red fueling carts that are scurrying back and forth across the muddy ground.

"Plane 96 calling WREE—calling—"

The voices start again and he grabs the microphone.

It is a one man job for only one can have the complete picture of all air traffic movements. He must know just what planes are approaching the field, what planes are preparing to take off and those flying in the vicinity or over the airport for testing purposes. In fact, he must know what is happening on every part of the field and in every strata of air over the field.

The blue coated traffic cop at the corner of 42nd Street and Broadway waving his arms to cars, trucks and pedestrians has an easy time of it in comparison with the man at WREE. For he directs his traffic in air levels as well as on the ground. He must continually bear in mind the altitude of the flyers as they approach or leave the field, particularly in foggy or rainy weather when the visibility is poor. It is a kaleidoscopic picture which he shifts from one level to another. In the twinkling of an eye he builds his airways through the microphone. This plane leaving must fly at 2,000 feet. That transport approaching the port he directs to keep at 3,000. He lowers or raises the ships as the case may be to avoid the possibility of a collision.

Weather conditions may be of little moment to the Broadway cop, but they are of vast importance to the operator in Newark's tower. Calls are continually coming in requesting information as to the velocity and direction of the wind and ground conditions at the port. The street traffic cop has only a few square yards to supervise. The air cop has 300 acres of field space and is in touch with planes 10 miles out from the field. Also he is advised of their scheduled arrival from even greater distances. He is likewise in constant touch with the ground stations of the four airlines that use the Newark port as a terminus. Added to these various duties he must keep a log of such traffic movements as arrivals and take-offs.

Station WREE is a beehive of activity, for Newark is one of the busiest airports in the country. During certain periods there is a plane arriving every 10 minutes. There are about 97 scheduled runs in and out of the port during the day and night and sometimes as many as 50 itinerant planes coming and

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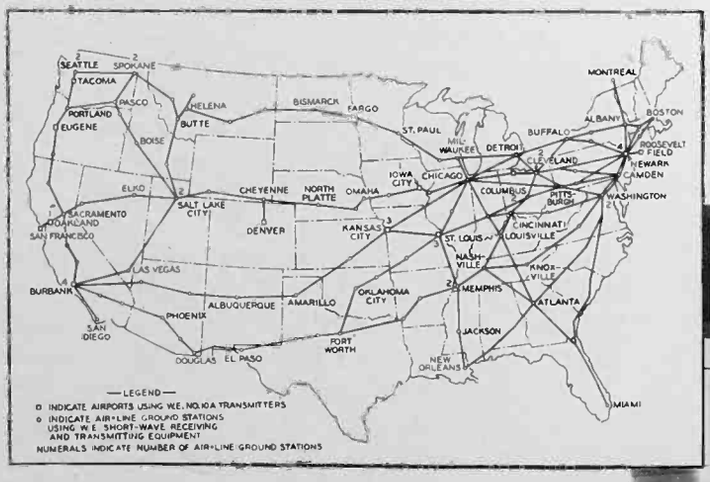
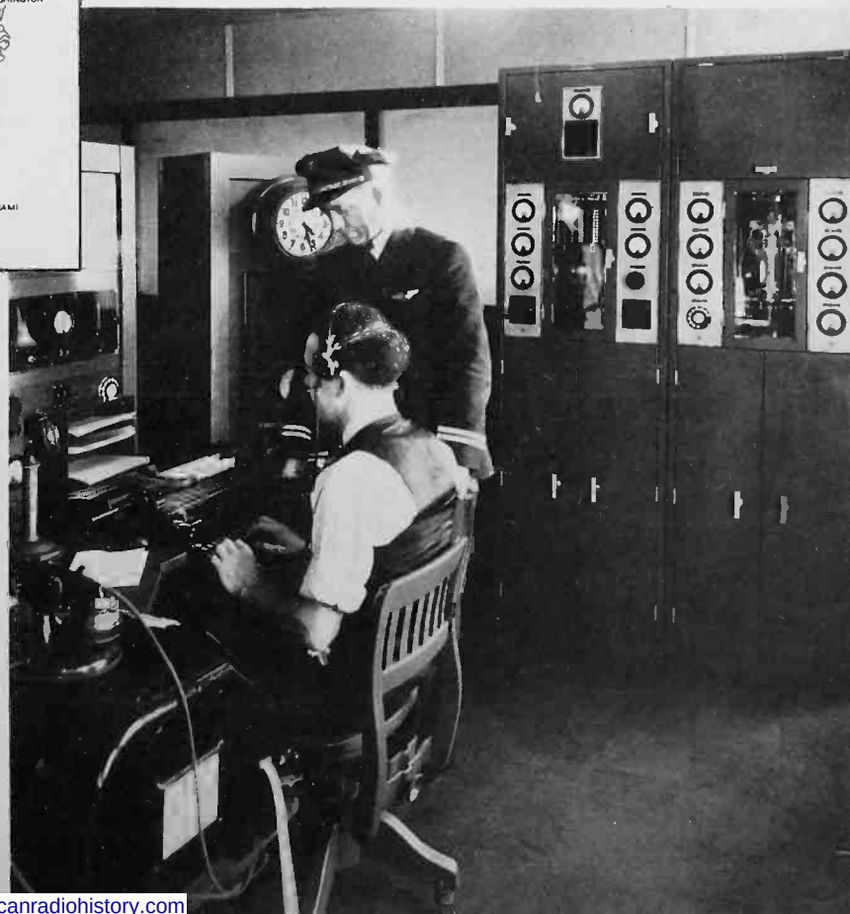



Map shows location of airport and air-line ground stations using Western Electric radio equipment. It does not indicate extensive use of Western Electric apparatus in planes, themselves.



Radio ground station of Eastern Airlines at Newark Airport. E. L. Saunders, radio operator, is typing a message for Fred A. Jones, pilot. In the background is the Western Electric 400 Watt Transmitter. To the left is a cabinet containing control equipment and loudspeaker for the receiver, and next to this is speech amplifying equipment.

# The Relative Importance of

# Frequency Components of Noise

## In Radio Broadcasting Equipment

By E. L. OWENS

Member, Technical Staff, Bell Telephone Laboratories

Since speech and music are composed of complex sounds of varying loudness it is necessary in any program-transmission system to transmit signals at various levels corresponding to the loudness of the original sounds. This variation in signal level is known as volume range and is limited by the difference in level between the maximum signal the equipment can deliver and the minimum signal which can be transmitted without objectionable interference from electrical disturbances in the lines or associated equipment, commonly referred to as noise.

These electrical disturbances become more pronounced as the amplification in the system is increased and in high-quality speech input equipment where high-gain amplifiers are necessary they become one of the major design problems. Since such electrical disturbances are usually composed of complex waves it is necessary to study the effect of the various frequency components before their importance can be determined.

Noise can be defined as any disturbance present in the system which would be reproduced with the program, and may be divided into two classes: acoustical disturbances in the studio picked up by the microphone along with the program, and electrical disturbances in the lines or equipment which would be superimposed on the program and would appear in the output as background noise. The noise referred to here does not apply to acoustical disturbances in the studio or electrical disturbances in the lines but to the internal electrical disturbances in the equipment since this is obviously the only type of noise which can be explicitly dealt with in the design of equipment.

While similar noises may be expected in any amplifier system employing vacuum tubes, this article deals specifically with the noises encountered in speech input equipments for radio broadcasting using high-gain, high-quality, a-c. operated audio frequency amplifiers. The noise in such equipment is due to several causes; namely, a-c. power operation, microphonic action of vacuum tubes, contact and thermoelectric potentials, and electronic disturbances present in all vacuum tubes.

The noise caused by a-c. operation is limited to certain definite frequency components, a few of which are usually of considerably greater magnitude than the others. Noises from the other sources may be classed as random noises because they may not be continuous and may contain frequency components scattered more or less uniformly over the entire audible frequency band.

In a system for the transmission of programs consisting of speech and music, noise is objectionable largely because of its interference with the programs as perceived by the listener. While we are considering the electrical disturbances in the system which cause noise, these electrical disturbances must be translated into acoustical energy before they can be perceived by a listener as noise. Therefore, it is necessary to consider the way in which the ear responds to acoustical energy of various frequencies in order to evaluate the electrical disturbances in the system according to their importance.

Extensive tests were made in Bell Telephone Laboratories to determine the relative interfering effects of noises of various frequencies on listeners to radio programs. A number of observers and various types of program material were used in these tests. Since high-grade music was found to be the most susceptible to interference, the interfering effect of the noise was based on this type of program. From this information the weighting curve shown in Figure 1 was obtained. This curve shows the relative amounts of power at different frequencies which produce equal interfering effects on listeners to radio programs.

The chief reason why the weighting curve is of this shape is because the sensitivity of the ear is not the same for sounds of all frequencies. The

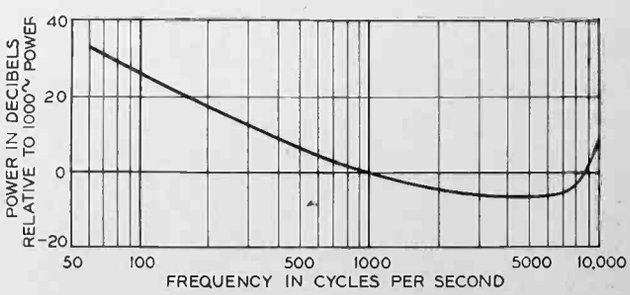



Figure 1

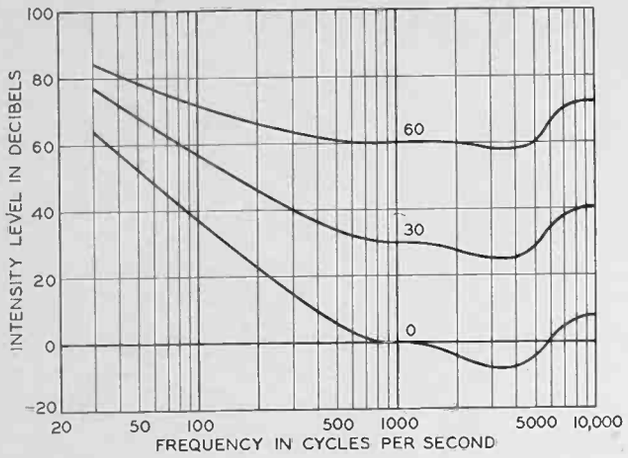



Figure 2

curves shown in Figure 2 taken from an article by Harvey Fletcher and W. A. Munson, entitled "Loudness—Its Definition, Measurement, and Calculation," show the magnitude of a signal of any frequency between 30 and 10,000 cycles per second necessary to produce an equally loud sound, for loudness levels at the threshold and 30 and 60 db above the threshold of audibility. The standard reference tone for loudness comparisons is a frequency of 1,000 cycles per second and the reference intensity has been set at $10^{-16}$ watts per square centimeter which is near the threshold of audibility for this frequency.

Intensity level of a sound is defined as the energy of the sound in db above the reference intensity level. The loudness level of any sound is equal to the intensity level of a 1,000-cycle tone required to produce an equally loud sound. As can be seen from the curves, this value is not uniform for all frequencies and for frequencies below 1,000 cycles a much greater intensity level is required to produce an equally loud sound.

After consideration of the above facts, it can be seen that different types of noise have different interfering effects and that any noise measurement which does not take into account the frequency components of the noise gives a false indication of the true noise condition. Since noise is objectionable because of its interference with programs as perceived by the listener, its importance is in proportion to its interfering effect. Therefore, all noise measurements should be made with the aid of a filter designed to weight the noise in accordance with the disturbing effect of its various frequency components.

In a large number of instances, noises in broadcasting equipment have been measured with instruments which give a uniform response for all frequencies in the audible range. The fallacy of this method can be readily seen from the shape of the above-mentioned curves. A measurement of this type will give practically the same indication regardless of the frequency components of the noise. When the major components of the noise are above 800 cycles per second, the noise level indicated will be substantially correct, but when the major components are at lower frequencies an erroneous indication is obtained.

If, for example, a noise measurement is made on equipment with a noise output composed of frequencies in the neighborhood of 1000 cycles per second and a reading corresponding to an intensity level of 30 db is obtained, this noise level would be about 30 db above the threshold of audibility and clearly audible at most locations where radio programs are received. However, on equipment operated from 60-cycle alternating current, much of the noise is at a frequency of 120 cycles per second, and at this frequency the measured value falls below the threshold loudness curve. Therefore, the noise from this source, instead of being 30 db above threshold, is non-existent as far as the listener is concerned since it is below the threshold of audibility.

Another popular way to observe noise is to disconnect the program source and listen at the output of the speech input equipment with headphones. This method may be useful in determining the nature of a noise, but is very misleading for determining the intensity of the noise, because at this point in the system the normal program level is close to the threshold of feeling for headphone listening. Since this is approximately 40 db higher than normal listening level, the use of headphones under this condition has the same effect as increasing the noise level by this amount. An approximate idea of the system noise level can be obtained in this way only when the gain of the system is reduced to such a value that normal headphone volume is obtained at the output or when the headphones are connected at a point in the system where the program level is proper for headphone listening.

As previously stated, all noise measurements should be made with the aid of a filter designed to weight the noise in accordance with the disturbing effect of its various frequency components. Therefore, the filter should have an attenuation characteristic closely approximating the weighting curve shown in Figure 1. The frequency characteristic of suitable equipment for making noise measurements is shown in Figure 3. Noise measurements made with such equipment give an indication of the true noise conditions since the measuring equipment automatically attenuates the various frequency components in proportion to their importance.

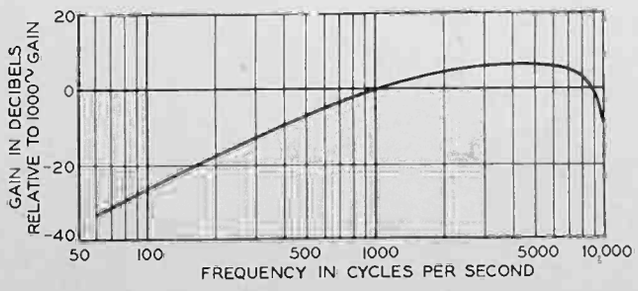
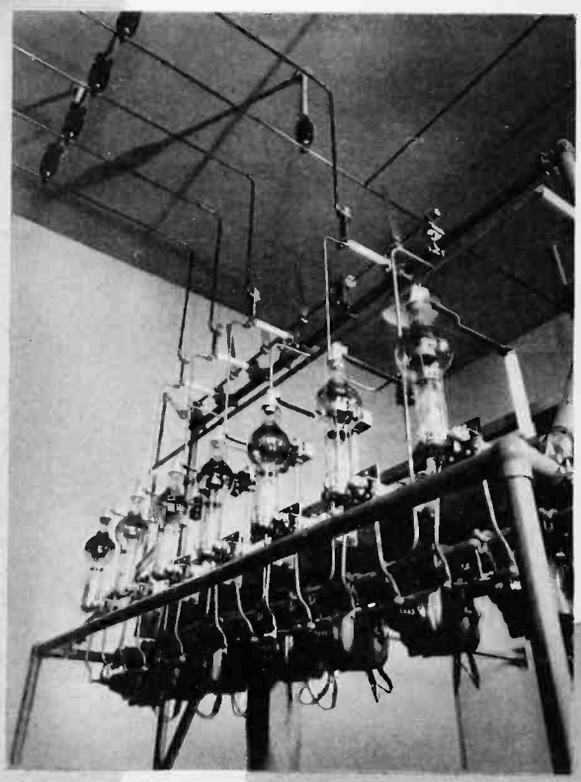



Figure 3

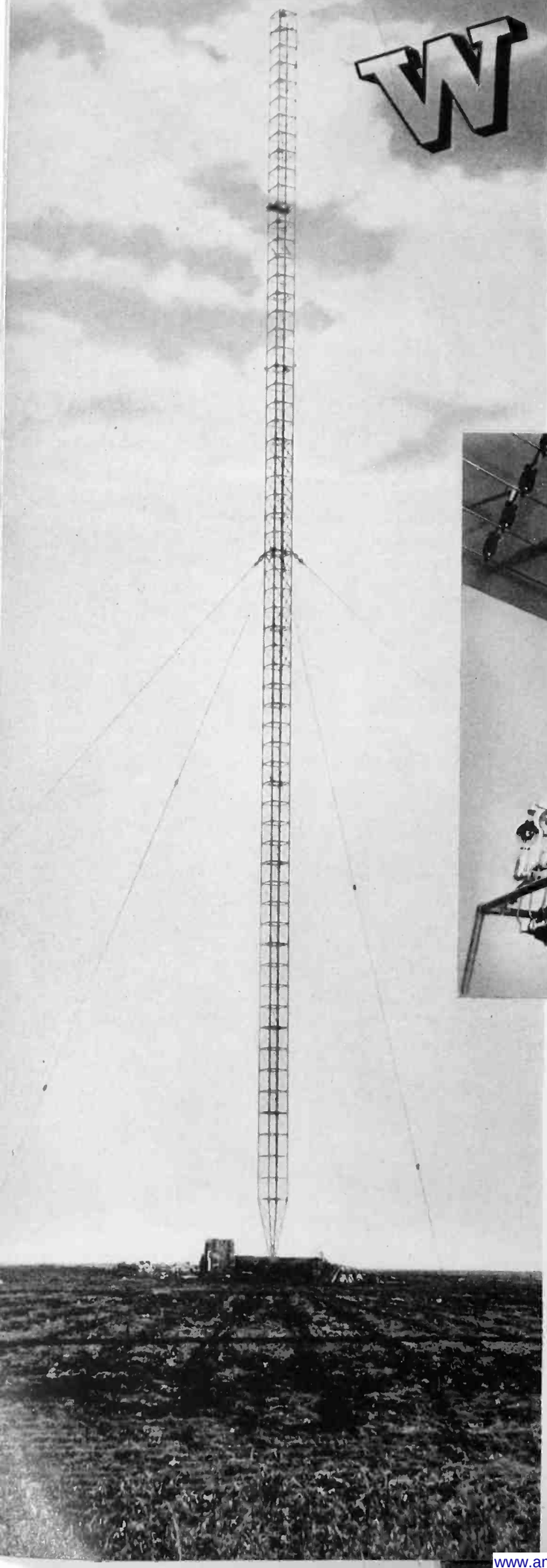
# WOW
## OMAHA

New Western Electric 5,000 Watt High Fidelity Transmitter and a new suite of ultra-modern studios place WOW among the best equipped stations in the country. Thus Woodmen of the World goes into its 13th year of "Fraternalizing the Air."



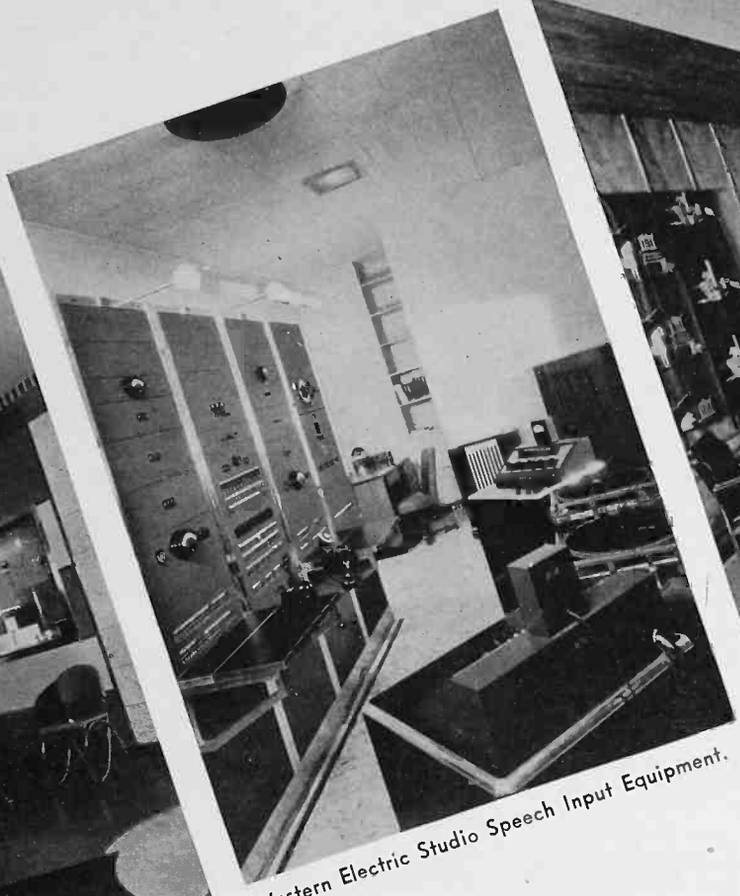
Bank of rectifier tubes which supplies 12,000 volts direct current to the 5,000 Watt Amplifier.

The transmitter station and five-room home for the resident operator.



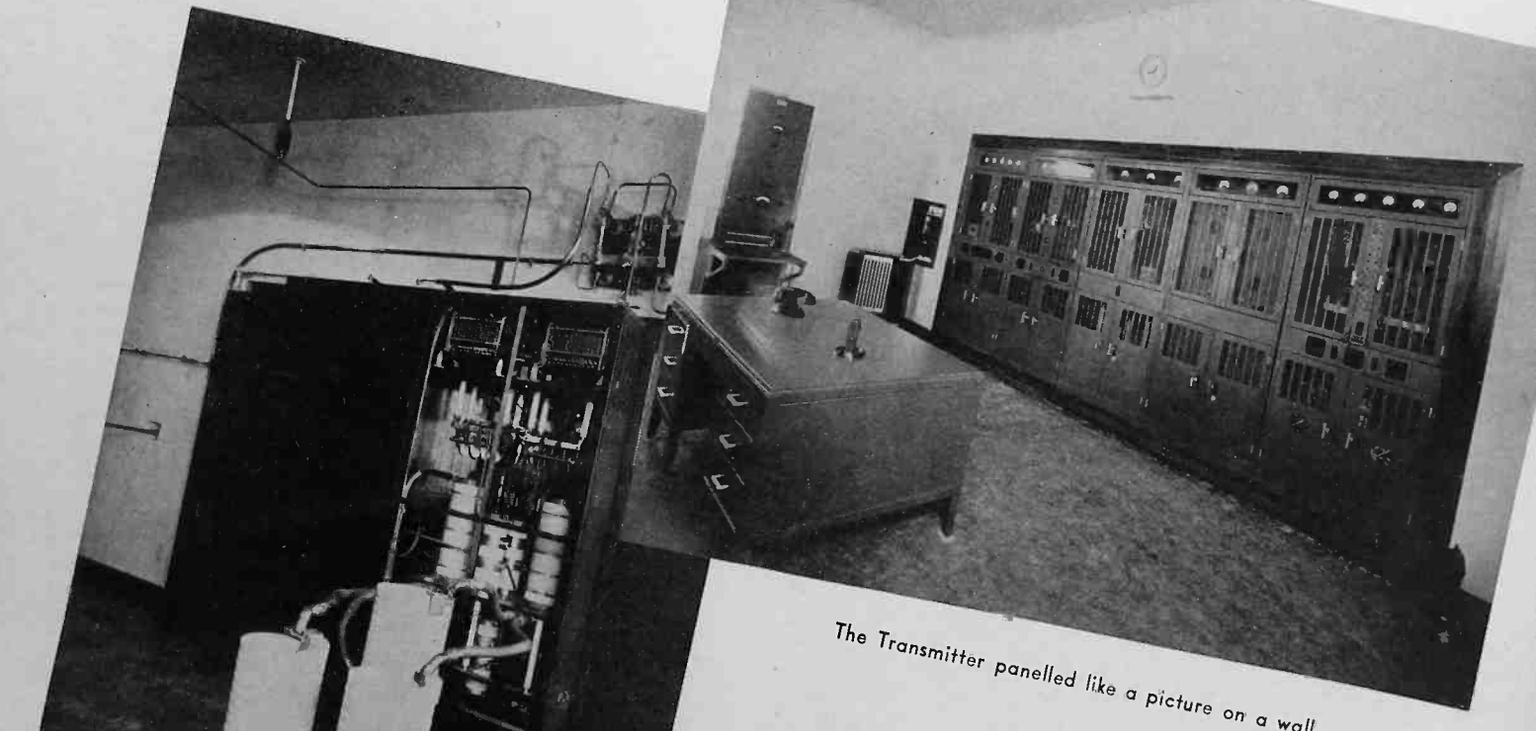
Four hundred fifty-four feet into the air rises WOW's radiator.

A studio modern in treatment.



Western Electric Studio Speech Input Equipment.

One of WOW's offices.



The Transmitter panelled like a picture on a wall.



Rear view of the transmitter and cooling system.

Chief Engineer Rochester (standing at left), and Gerald Morris (center) watch an alarm go out from the Radio Tower Room.

# How New York Police Radio System Patrols 317 Square Mile Area

By THOMAS W. ROCHESTER

Chief Engineer, Police Department, City of New York

*I got scared when I saw how radio worked. So I quit.*

These words, embodied in the confession of an alleged kidnaper, are filed at New York Police Headquarters. That police radio works is a foregone conclusion. How it works and the comparatively simple but remarkably effective system of operation back of it in the world's greatest metropolis is a story in itself.

Such a story has its opening chapter in a quiet tower room at 240 Center Street—police headquarters. Two men are on duty. One sits before a city map mounted on a large "U" shaped table that is covered with glass. He is the dispatcher and the director of the fleet of radio patrol cars which cruise the streets of the five boroughs. To him the cars are black disks spotted over the map. Each disk is numbered. On one side the numerals appear in white designating that the car is ready for action. Red numbers on the reverse side indicate that the car is not available for call.

The second man, the announcer, is stationed before a microphone. A few feet away stands a radio transmitter, now dark and silent. At the moment there is not a sound in the room. No telephones buzzing, no signals flashing, no excited voice "Calling all cars." Suddenly the stillness is broken by the tinkle of a telephone bell at the "U" table. The dispatcher takes the receiver. The announcer flips a switch at the microphone. Tubes flash blue as the plate current surges through the transmitter circuits. And police radio goes into action.

Is it robbery, assault, kidnaping, murder that is setting the great network of communication in motion? The dispatcher's expression tells you nothing. As he takes the call his eyes are on the map noting the location of the scene where the crime has been committed. He jots down the message and "923" and "864"—cars to be assigned to the job—then turns the paper over to the announcer. Disks 923 and 864 are turned with red letters showing, indicating that these cars are busy. Meanwhile the announcer has sent out the call to attention—a 1,000 cycle note lasting three seconds. Every car in the fleet hears it and stands ready.

"Calling cars 923 and 864—the address is 142 Bleecker Street, Manhattan—signal 31—station WBEG — time 1:45 P.M. — No. 60," says the announcer. This alarm not only goes over the air through the headquarters transmitter but is immediately repeated through either the Bronx or Brooklyn auxiliary stations or both to give complete coverage

of the entire city. When a general alarm is broadcast all three stations are operated. Signal 31 means "arrest for felony — dangerous persons — be cautious." "Sixty" is the announcer's number.

Quickly, calmly, efficiently the tower room has sent out its message.

The scene switches to Bleecker Street. Here noise and confusion are rampant. An excited crowd is milling around the little cigar store at No. 142. Within 45 seconds from the time the alarm winged over the air car 923 is at the scene and 864 half a block away. All other cars within a radius of five blocks of Bleecker Street are also responding to the call. From some of the bystanders the officers learn that the storekeeper has been robbed—not injured—and that three armed bandits dashed away in a black sedan and just turned the corner down Broadway.

Car 923 gives chase. Car 864 swings around in the opposite direction to head off the escaping trio. Seven minutes later the sedan has been crowded to the curb on Canal Street—the bandits handcuffed and on their way to headquarters. Fifteen minutes from the time the alarm was broadcast car 923 has telephoned back to the dispatcher in the radio room that the job is completed and has given details of the whole proceeding. The dispatcher turns disks 923 and 864 back with white letters uppermost indicating that these cars again are available for call.

While excitement reigned at Bleecker Street the dispatcher has been busy with his map. Interspersed with alarms coming through are various calls from radio patrolmen. Car 428 reports that the radio equipment is not working properly. It has failed to pick up the regular test signal sent out by the announcer every half hour. The dispatcher places a metal ring around the disk and the announcer sends out a call for a radio repair car to go to 428's location. One radio repair car is assigned to each borough. If not on call the repair crews are stationed at a shop, reconditioning radio equipment. On the map the repair cars are represented by a silver disk. When the repair crew reaches 428 the dispatcher turns that disk over in the ring with red numbers up indicating it is being repaired and places the silver disk nearby. Radio equipment is not repaired in the car, for time is always an essential factor. A new set is quickly substituted and the old one taken to the shop. These emergency cars carry eight spare sets. When the new set has been installed in 428 the dispatcher removes the ring and turns the disk to its original position.

Another car reports needing oil. The dispatcher turns the disk on its rim inside the metal ring indicating it will be at a garage but the patrolmen may still receive calls and hop into action if necessary. Car 203 is out of commission—brakes need adjusting—and the dispatcher has removed the disk to the margin of the map and placed the metal ring at 203's location.

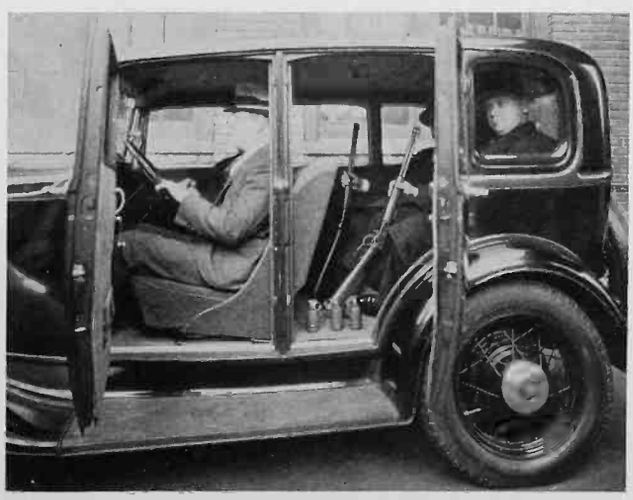
Thus the "U" map with its disks and rings tells a complete story of the radio fleet's activities every second of the day and night.

At the present time the city has 500 cars equipped with radio. Of these, 300 are assigned to regular patrol duty and are manned by 2,000 men on eight hour shifts. The remaining 200 include executive cars, detective cars, repair and auxiliary cars. Each of the 80 precincts throughout the five boroughs have from two to five cars allotted them depending upon the size and location of the precinct. A division comprising four or five precincts has one detective car, each manned by four men. These harmless enough looking sedans carry a pretty deadly cargo. In the rear compartment are smoke bombs, tear gas and floodlights as well as rifles. The radio cars also carry rifles as well as the officers' revolvers.

Five hundred cars operating over the city's 317 square miles means that one car patrols approximately two-thirds of a square mile. With the old signal box system it took a patrolman 20 minutes or more to reach the scene. Now radio gets there in 45 seconds. And these 45 seconds are significant since it has been estimated that the small hold-up job takes just about this length of time to carry out. Thus the criminal is very likely to be caught in the act or at least apprehended before he has time to make a getaway. Should he escape from the scene his dash for freedom is short lived as a general alarm is broadcast and every radio car along the line of escape is on the lookout.

This radio patrol fleet that protects New York never rests with the exception of a few hours every ten days when the cars are taken to a service station for a complete check-up. Naturally this period of rejuvenation is staggered so that the fleet may be kept practically in full operation at all times. The expert care given the cars is extremely important when it is realized that the average radio car travels 90,000 miles a year—equivalent to 30 trips across the United States. Under the old system a police car covered about 40,000 miles a year.

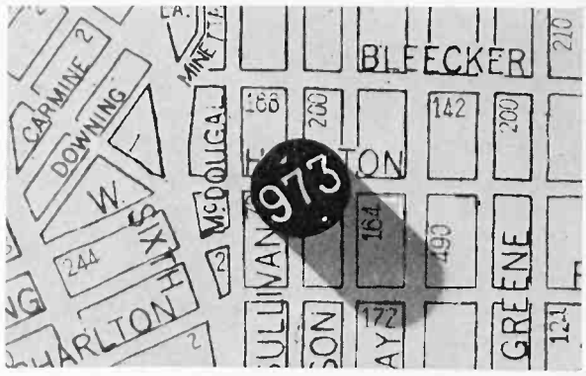
(*Continued on Page Fifteen*)



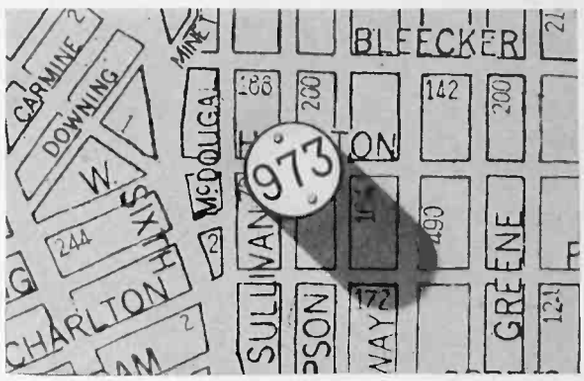
Typical sedan equipped with radio showing smoke bombs, tear gas, flood lights and rifles.

# "U" Map and Disks Tell Complete Story of Radio Fleet's Operation

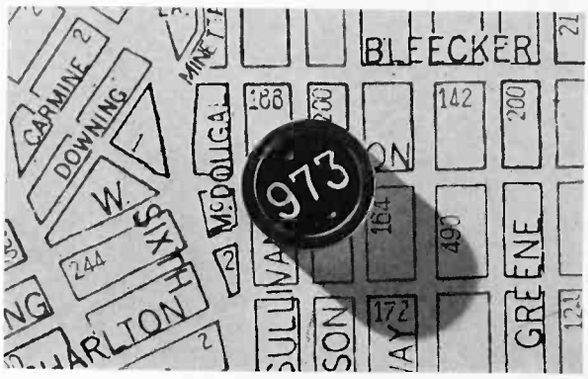
On Patrol



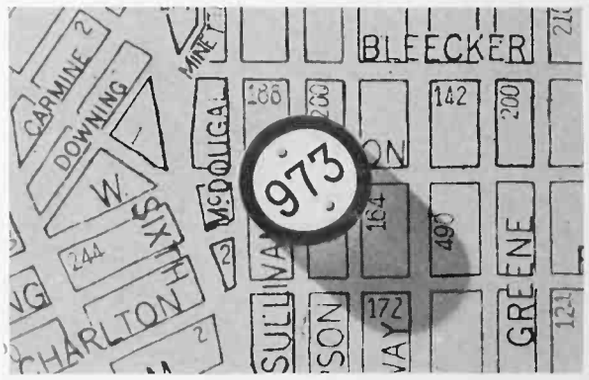

Answering Alarm



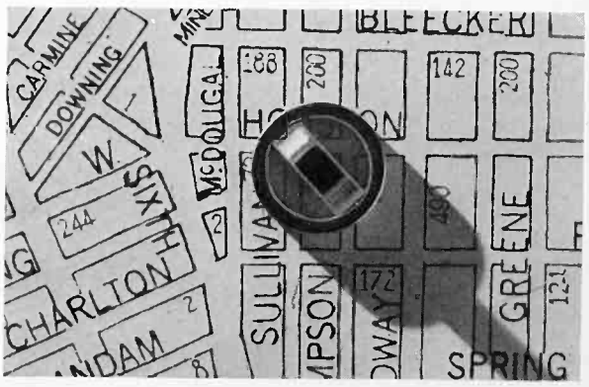

Awaiting Radio Repair



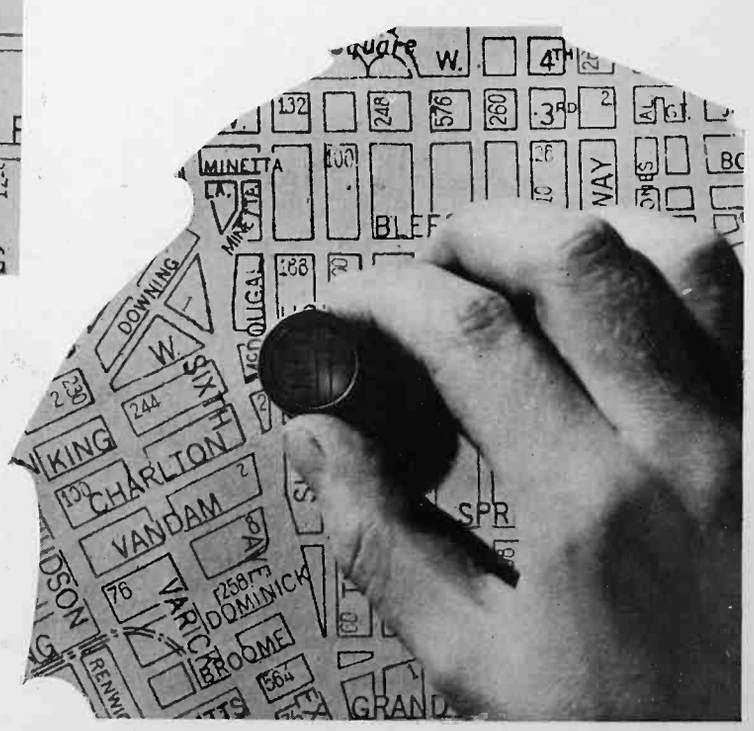

Radio Being Repaired




Car Being Oiled




Car Out of Service




Positions of disks and rings on map show Headquarters Dispatcher at a glance the activities of the entire fleet of radio patrol cars in the five boroughs of New York.

(*Continued from Page Thirteen*)

Approximately 100 police radio calls go out over the air every 24 hours. For a city of such size this number seems surprisingly small. However, only messages of prime importance are handled by radio motor patrolmen. The extensive teletype and telephone systems are used for the transmission of information concerning minor crimes or where a long interval has elapsed between the commission and reporting of the crime.

Despite the fact that radio is classed as the most dangerous branch of police service, since it handles only major crimes, the majority of men on the force are eager to make the assignment. Just what danger lurks at the end of a call they never know, but they rush into action without hesitation even though it may be their last ride. In the three and a half years that police radio has been in operation never has the tower room failed to get a message through to the cars and never have the patrolmen failed to respond to the alarm.

Contrary to general opinion the code signals included in broadcasting alarms are used for the sake of brevity, not for secrecy. In fact police radio has little need for secrecy. Its power lies in speed and the remarkably efficient system of operation controlling it. After a code signal has been called the announcer supplements it by any additional information he may have received. Only three code numbers are used—30, 31 and 32. Signal 30 means "A serious crime has been committed or is being committed—proceed to location given—take necessary action." When 32 is called the patrolmen know they are to "investigate—suspicious persons—not particularly dangerous." Signal 31 was explained in a previous paragraph.

According to Gerald Morris, operating superintendent of police communications, Friday night is the busiest night in the tower room. This is largely due to the fact that payrolls are made up toward the end of the week. Money being distributed about the city means a possible haul for the hold-up man. And hold-ups, particularly small ones, are listed as the most common crime in the big metropolis. However, since radio has been in operation the hold-up man's business has materially decreased. During these few years, radio cars have been responsible for 11,200 arrests and recovery of $3,500,000 worth of stolen property.

Nor is this the only saving effected for the city's citizens. About a year ago police radio was pressed into the service of the Fire Department. Motor patrolmen were ordered to respond to all fire alarms with a view to eliminating false alarms by making the necessary arrests. Four months later the Fire Department reported that false alarms had dropped from 35 to 5 a day. It has been estimated that each fire call brings out on an average of four engines and costs the city about $200. A drop of 30 amounts to a saving of $6,000 a day. These figures taken all together weigh pretty heavily on the credit side of the sheet as compared to the cost of New York's radio system which totalled $100,000.

Inspecting one of the 279A Vacuum Tubes used in the 1,000 Watt Western Electric Transmitter which is installed at New York Police Headquarters.

But far more important than dollars and cents are the mounting columns of arrests, the decrease in crime and the saving of lives chalked up to the credit of New York Police Radio.

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# Chicago and Southern Lines Get 400 Watt Transmitters

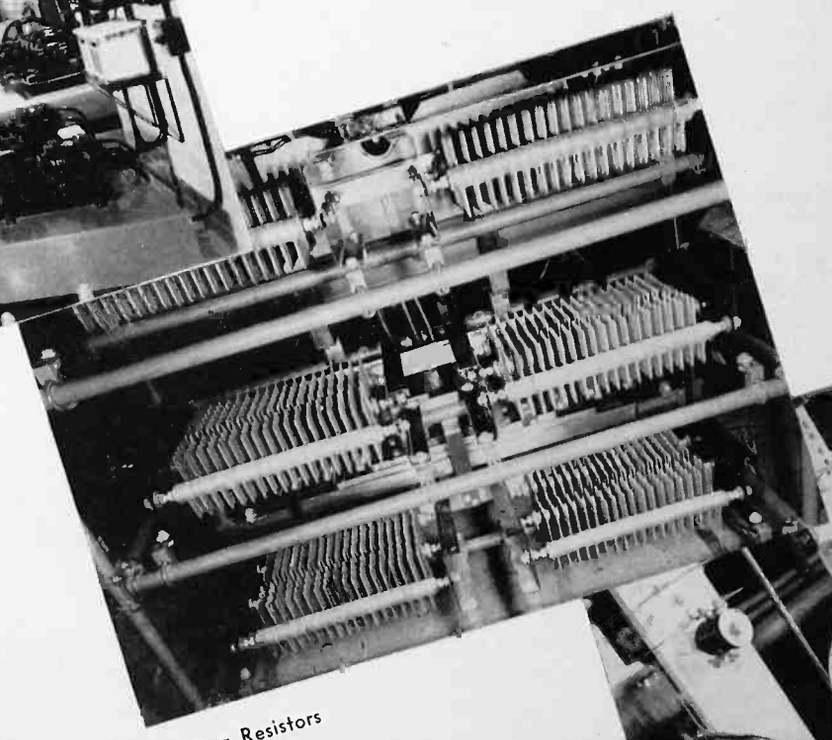
Chicago and Southern Air Lines is one of the latest transport lines to install the new Western Electric 400 Watt Radio Transmitting Equipment for ground station radio communication. With this equipment it is possible to select any one of 10 frequencies in the range of 2 to 18.1 megacycles by merely twirling a telephone dial. The shift from one frequency to another takes from one-half to one and one-half seconds without interrupting communication service.

Radio telephone will take care of communication between stations and planes in flight for weather and position reporting, and for this purpose the frequency of 3,485 KC is used at night and 5,682½ KC is in use during the day.

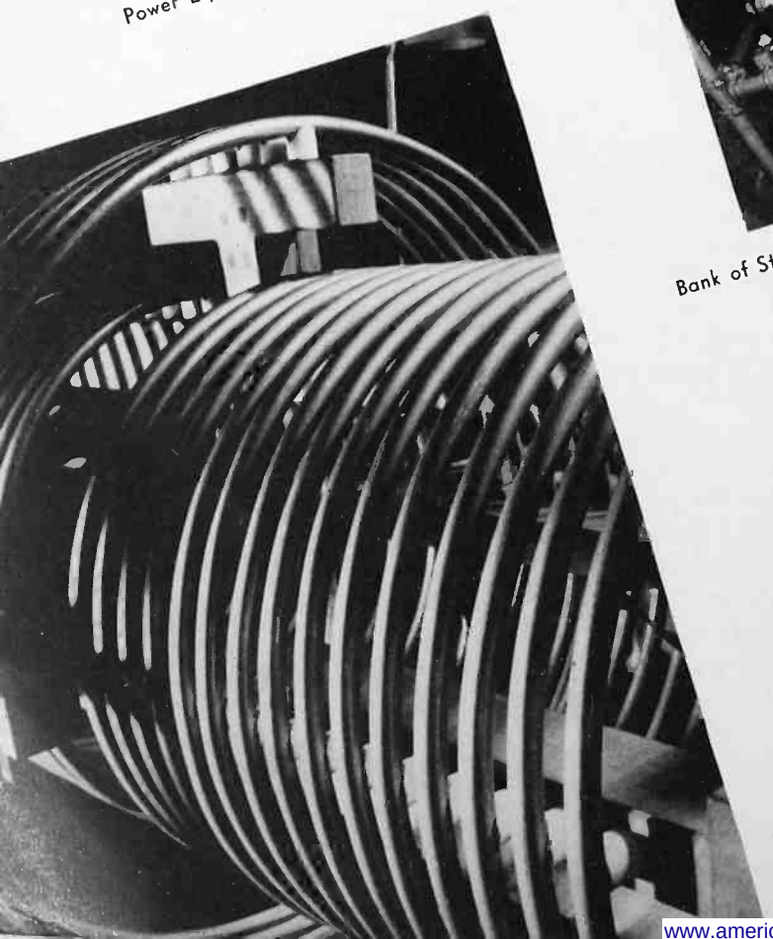
New radio buildings, mast and antennas are being constructed in St. Louis and Memphis. In Jackson, Miss., both transmitter and receiver will be installed in the radio room of the present administration building.

Panel layout of Western Electric 50,000 Watt High Fidelity Transmitter.

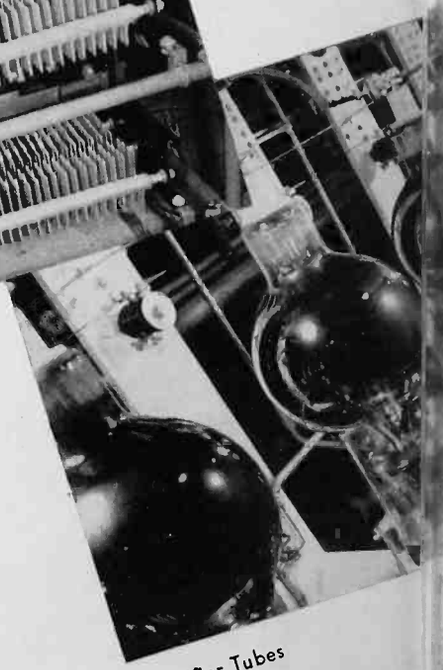
Power Equipment in Basement.



Bank of Starting Resistors



Coupling Inductance



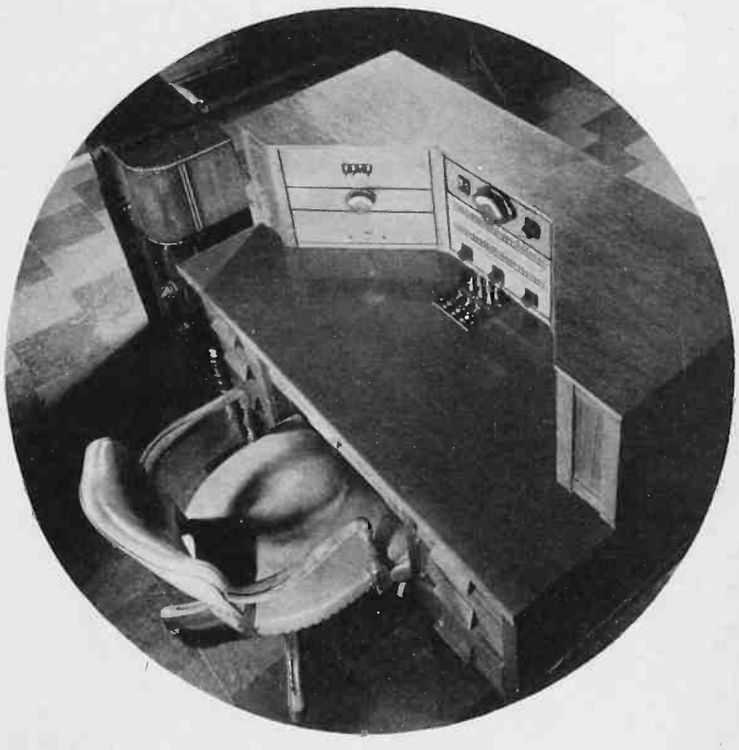
High Voltage Rectifier Tubes

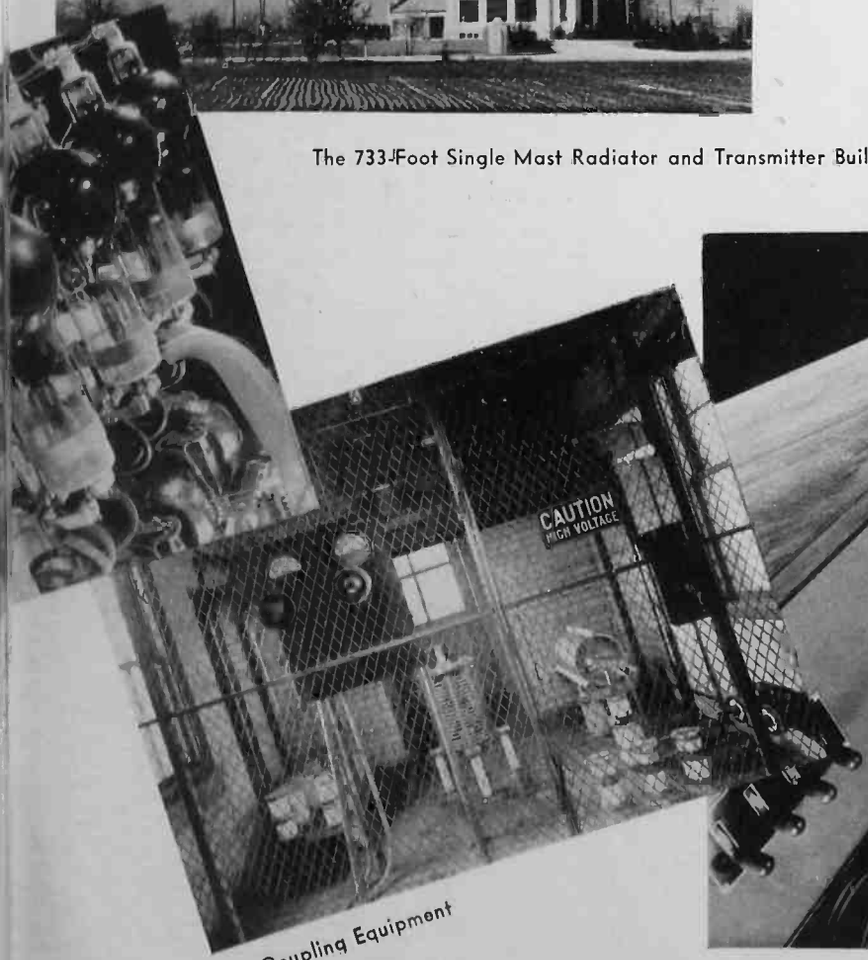
# WWJ Detroit

## "The Good-will Station"—50,000 Watts

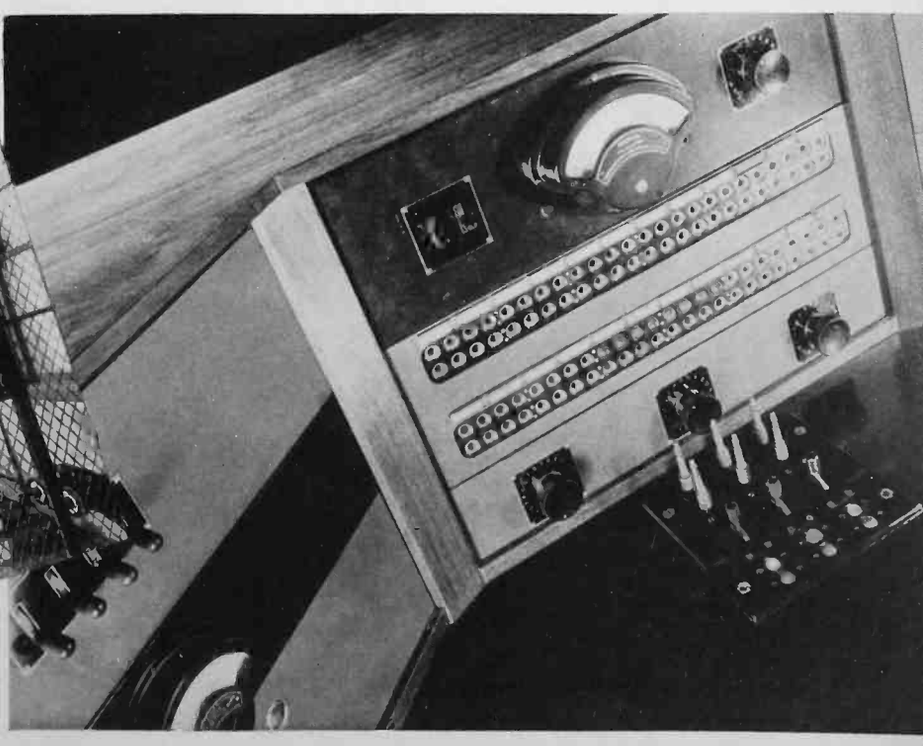
The 733-Foot Single Mast Radiator and Transmitter Building

Transmitter, Speech Input Control Desk






Transmission Line Coupling Equipment



Close-up of Control Desk

# A Jumbo Voice for Jumbo

## Public Address Plays a Star Role in Billy Rose's Big Show At the New York Hippodrome

By MADELEINE MOSCHENROSS

When Billy Rose's long-awaited JUMBO finally opened at the new Hippodrome, such old circus-day favorites as "super-show," "greatest on earth," "breath-taking" and "death-defying" broke modestly into print in all metropolitan dailies. Drama critics for the nonce forgot to be blasé, and sprinkled their reviews with "tremendous" and even "stupendous"—while the Broadway columnists to a man (for once) agreed that it was COLOSSAL.

For sheer brilliance, bigness, color, spangled splendor and eye-filling spectacularity, this combination circus-vaudeville-melodrama will probably go down in theatrical history as one of the most unique shows ever staged.

And for sheer brilliance of planning and development, the engineering marvel which gave JUMBO a voice and a thrill to forty-three hundred listeners must go down in sound annals as an achievement of the first water. Nor is there any point in being modest about it. No one—not even Billy Rose himself—will deny that without a voice, JUMBO would be just a pretty pantomime, having neither rhyme, rhythm nor reason. Let us see why.

The vast cream-and-crimson interior of the Hippodrome is dark save for a blob of golden light in the center of the sawdust ring. A girl and a boy are speaking. High up in the tent-like bandstand many feet away, a tiny torch flicks rhythmically as Paul Whiteman directs his unseen orchestra. The incidental music dies away to a whisper, then breaks brightly into the Hippodrome musical hit "My Romance."

Beautiful and crystal-clear come the blended voices of Gloria Grafton and Donald Novis as they enact another of their sentimental scenes. The music stops. The song is ended. The spotlight fades and several thousand palms beat against each other in approval.

*Muted music . . . pleading voices . . . "My Romance" . . . a crackle of applause . . . and the scene shifts again.*

A cannon is rolled on the stage. The stage manager gives a signal. There is a roll of drums and a woman is shot through space into the waiting arms of her partner. The band swings into a stirring circus tune, the cannon disappears on the huge revolving stage; the house applauds, then settles back for another bit of fascinating fantasy.

*Roar of cannon . . . bang of cymbals . . . beat of drums . . . and the melodious strains of a circus tune.* Applause. Lights. *"Fresh roasted Jumbo peanuts!" "Get your bag o' popcorn!" "Hershey bars ten cents a bar!" "Get your souvenir!"*

Now the silvered plane over the vast ring comes to life. A throb, a buzz and a whir . . . The Daring Young Man of the Flying Trapeze leaps out onto a slender bar . . . head down, only the toes of one foot sustaining him, he whirls dizzily through the air with the greatest of ease. You can almost hear the sharp intake of breath from an enthralled audience.

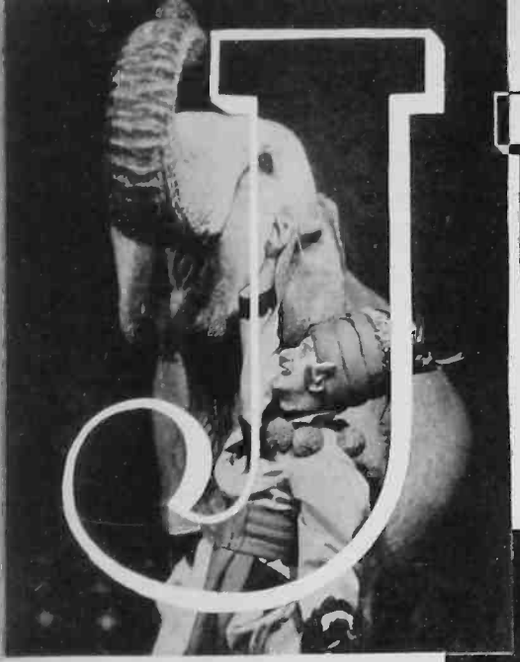
And so it goes . . . a den of roaring lions . . . the thin piping voice of a talented child . . . deep intonations from the Hippodrome organ . . . Jimmy Durante's raucous voice down to the famous whispered *ha cha cha* . . . lusty singing of the male chorus and tender love scenes . . . gags, girls and gayety . . . the muffled echo of horses' hoofs and always Paul Whiteman and his epauletted orchestra.

All through the two-and-one-half hours of entertainment the special amplifying system coordinates sight with sound so accurately and so effortlessly that the listener in the last row of the top balcony, and the ringside seat customer hear equally well. The effect is the same as when you turn a dial and tune in on a radio program emanating from a studio many miles away. It's all done by dials.

When part of the mouldy old Hippodrome was torn out, one solitary top tier box remained. This was transformed into the sound-booth. Here sits a shirt-sleeved man, his hands never idle, his eyes glued upon the stage. Upon him depends the smooth functioning of the elaborate sound system.

When engineers from Electrical Research Products (a Western Electric subsidiary) were called upon to install an amplifying system for the newly renovated Hippodrome, they faced one of the toughest assignments of their careers. In the first place, everything about the great auditorium was just about wrong for good results. It had a stage and it had a

(*Continued on Page Twenty-five*)

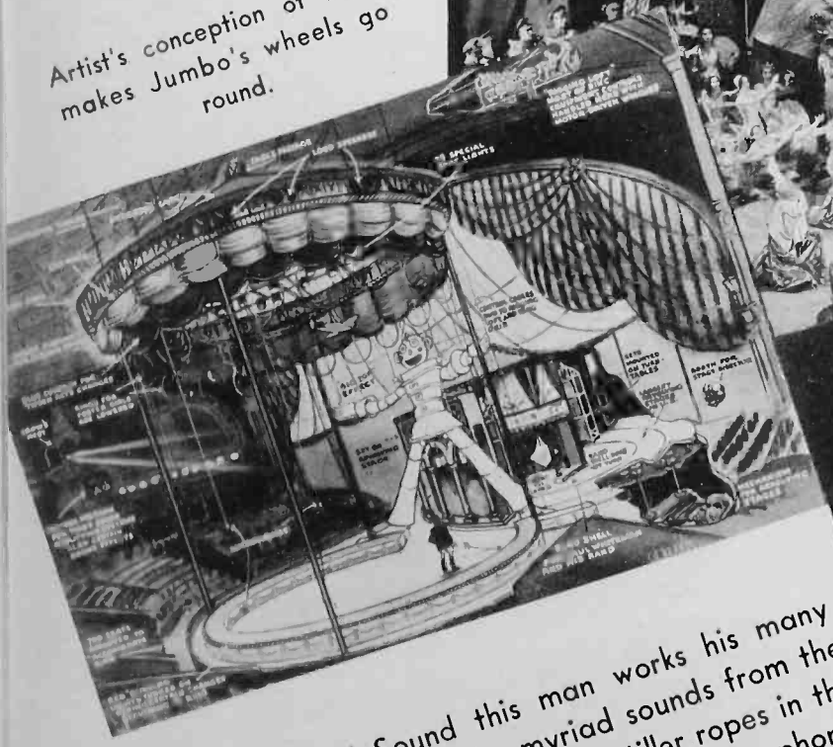


# JUMBO

Take one part circus and one part musical comedy and put them in a 4,300 seat theatre and you've got a "musical circus," provided you use a giant public address system to provide perfect hearing.

The first act finale of Jumbo.

Artist's conception of what makes Jumbo's wheels go round.



Like a God of Sound this man works his many controls and regulates the myriad sounds from the Jumbo ring below. By pulling the tiller ropes in the foreground, he raises and lowers the microphones around and in the ring.

# '36 — Radio's Biggest Year, Says Fitzpatrick

(*Continued from Page Three*)

training ground. One of his associates writing about Fitzpatrick says this:

"As a prelude to broadcasting, Leo Fitzpatrick drove a truck, toured a Chautauqua circuit, joined the Navy, worked for the International Harvester Company, studied to be a civil engineer at the University of Kansas, sold oil burners, demonstrated vacuum cleaners, was a circus press agent, owned and exhibited a live sea cow. The cow died, wiping out the investment. All other ventures paid dividends in a good form of American currency known as 'Experience'."

It was as a feature writer for the Kansas City Star that he was first introduced into radio. "Almost overnight our newspaper began to bristle with a brand new set of words like crystal detector, catswhisker, microphone, and what not," recounts Fitzpatrick. "Our city editor told me to find out what they meant, to write a story about radio." Before he was finished with the story, it had taken him to New York and to those first broadcasting stations which filled the air with strange sounds.

The story must have been good because only a short time later when the newspaper erected a broadcasting station, Fitzpatrick was made general manager and chief announcer. Before long the station, WDAF, and Fitzpatrick were famous. He became known throughout the length and breadth of WDAF's listening area as "The Merry Old Chief." In 1925 he went to Detroit to be program director of WJR. Since then the growth of one has been linked to the growth and success of the other.

Seated in his office in the tower of the Fisher Building, he can be calm and quiet in conversation. But say one word against radio and his eyes begin to flash, his hands move quickly, and before he knows it himself he is on his feet talking with all the intensity of his being.

I know. Purposely, I asked him a question designed to bring him to the defense of radio. It had the desired effect. "Isn't the radio industry failing to develop new program talent?" I asked him. He was on his feet in a flash with proof to the contrary.

"What's the most popular program on the air today? Major Bowes' Amateur Hour," he shot back in answer to his own question. "That one program and all the other amateur hours are the finest training and proving grounds for new talent radio could ever devise. They are producing new talent every day. Sure it's true that radio has drawn talent from the stage, the screen, and opera, but radio has given to these same forms of entertainment many stars who have made good there. Radio does not have to fear any dearth of talent." For every radio star borrowed from the screen, Fitzpatrick came back with the name of an equally famous star developed by radio. If you want to see him in action, just give him an argument about radio.

Fitzpatrick, however, is aware of the weak spots in broadcasting, as well as its merits.

"Every radio station has certain definite obligations which it owes to its immediate community, to its state and to the nation at large. Unless a station recognizes these obligations and patterns its programs and runs its business in accordance with these obligations, that station is neither fulfilling its duty nor observing the very principles of public interest, convenience, and necessity under which it is permitted to operate.

"There are still many objectionable programs on the air which must be eliminated. Perhaps there might have been some excuse for them in the height of the depression when most stations were waging a desperate financial struggle to keep on the air, but with the return of better business, even that weak excuse no longer exists. If such programs, even though they do no more than violate good taste, are continued it will be to the detriment of the entire industry."

Very definite policies regarding the obligations of a radio station to its listening area are in force at WJR. For two years during the depression, the station kept a microphone permanently established on the desk of the Mayor. That microphone was at the instant command of the Mayor to be used to meet any public emergency which might arise.

Today Station WJR is doing its part in the country's drive to reduce automobile accidents. From one-thirty to two o'clock each afternoon, six days a week, WJR broadcasts directly from the Detroit traffic court. These broadcasts have been extremely successful in promoting the city's safety campaign, resulting in more good-will for the station. This is just one of the many community services rendered.

Educational features have a definite place in the program of WJR. At least seven hours each week are given over to the University of Michigan for broadcasts of lectures, and other educational features. These programs have been on the air for several years and have won nation-wide recognition, not only from the listening public but from educators as well.

"I am convinced that broadcasters are rendering a far better educational service to the public than educators in full charge of such work could achieve," says Fitzpatrick. "Educators are too prone to forget that education over the air must be entertaining as well as educational. Broadcasters, however, know how to sugar-coat the pill. We have learned to put the parsley on the fish.

"I believe such programs as the Ford Symphony Orchestra and the General Motors broadcasts are tremendously successful in elevating the public's taste in music. If you will study these programs

Leo Fitzpatrick shows the porcelain tipped base of WJR's 733-foot single mast antenna to two interested spectators.

you will find that they contain some of the world's best music, yet they contain enough popular music to make them palatable to the average listener as well as to the lover of classical music."

Newscasts, which may be regarded as educational, are given the same careful consideration at WJR. Every story which goes on the air is specially written and the material is selected according to a formula devised by Fitzpatrick. This formula divides each newscast into three parts, one part foreign news, one part interesting domestic and local news, and the third part sports and financial news. It requires at least two human interest stories on each newscast. Fitzpatrick dictated two sample newscasts which are used as a pattern by the two radio-trained ex-newspapermen who prepare the programs.

It is good to visit the studios of WJR. One is at once aware of the spirit and driving force of the entire staff which has helped to make WJR one of the ranking stations in the country.

It is good, too, to visit with Fitzpatrick. His last words to me seemed a pretty fair picture of the scope and power of radio. "God help us," he says, "had there been no radio the last five years. I believe that during the depression period, when amusements were curtailed, when a feeling of hopelessness was rife throughout the land, radio was a veritable God-send, a guiding force and a compensation during those dark days. With the return to better business, and a more hopeful outlook for all of us, radio has even greater achievements ahead."

## Nashville Gets Police Radio

The largest installation in the United States of a Western Electric Ultra High Frequency Two-way Police Radio System was recently completed at Nashville, Tenn.

This equipment includes 11 two-way police cars and 10 additional one-way cars. The headquarters transmitter is installed in a pent house on one of the largest office buildings in the city. The 100-foot supporting structure for the antenna is erected on the roof.

Installation of two remote automatic receivers further augments the efficiency of the system. Exhaustive tests have shown that all locations inside the city limits have highly satisfactory signals both from the main transmitter and car transmitters.

The contract for the system was signed with the Nashville House of Graybar Electric Company.

## WOR's Radio Beacon Warns Flyers of Antenna Towers

Aviators flying in the vicinity of the 385-foot antenna towers of radio station WOR are safeguarded by a Western Electric radio transmitter recently installed at Carteret, New Jersey. Although the usual warning lights mark the towers, the Bureau of Air Commerce requires this additional protection for flyers approaching or leaving the Newark Airport. The new marker beacon is of particular value in "thick" weather when the towers are blanketed by fog.

WOR's broadcasting station is situated eight miles south of the Newark port and a trifle east of the main Philadelphia-Newark airway. The Newark radio range beacon transmits a constant 700-cycle tone to pilots flying directly along the range.

The new marker is set close to the frequency of the Newark range beacon so that the pilot, as he nears the towers, gets the WOR signal if he has his beacon receiver tuned for Newark. WOR's warning is a five-dash signal repeated 24 times a minute. When the pilot gets within two miles of the towers the repeated five-dash tone comes in on his receiver. The antenna of the marker beacon and the power output of the transmitter are so adjusted that the signal has a reception radius of only two miles.

When the pilot hears this five-dash warning he is flying in the vicinity of the towers. If the visibility is poor he checks his altitude and if necessary climbs to a higher level. Shortly the five-dash signal fades out and he knows he is safely past the towers.

This marker radio beacon is one of the first to be operated by a commercial broadcasting station.

## Merrill R. Mitchell—W J R

Like so many men in radio, Merrill R. Mitchell, Chief Engineer of Station WJR, Detroit, learned the rudiments of wireless as an amateur. As far back as 1914 he had a five-kilowatt spark transmitter on the air. From that day to this he hasn't been out of the game, and it's extremely doubtful if he ever will be.

Merrill R. Mitchell

The war caught up with him in 1916 when he joined the Canadian Thirty-fourth Aviation Squadron. Because of his previous experience, he was made a radio instructor. Out of the army in 1918 he served as radio operator on ships in the Great Lakes, and later became an operator for the old Intercity Radio Company.

In 1921 he began experimental work for Ford and became the first man ever to handle train dispatching by radio. The demonstration held on the Detroit, Toledo and Ironton Railroad, then owned by Ford, was witnessed by Ford, Edison and Firestone.

During the fall of 1921 he entered the broadcasting field in earnest. The Rochester, N. Y., Times Union newspaper commissioned him to build and install a radio station in Rochester. It became Station WHQ. The following spring he began work which has carried through to his present position. It was the erection of a Western Electric 1A 500 Watt station for the Detroit Free Press known as WCX. When the Book Cadillac Hotel was constructed in 1923 the station was moved to that location and Mitchell went with it.

WCX was sold to the Jewett Radio and Phonograph Company in 1925 and had its call changed to WJR. Even though the company and WJR failed the following year, it was a great year for the future of WJR. Then it was that a young fellow came from Kansas City and Station WDAF to be chief announcer. In Kansas City and to thousands of listeners throughout the country he was known as "The Merry Old Chief," none other than Leo Fitzpatrick. That was the beginning of a friendship and a business relationship which has carried Mitchell and Fitzpatrick along together.

Mitchell has a smile and a laugh which will warm the heart of any man. Physically, he's not the big brawny type; in fact when he serves you a drink in his private basement bar about all you can see are his head and shoulders, but he has that do or die air about him which sees every job to its completion.

"When the boss asks me if I can do something, I say 'yes' and figure out how to do it later," he says. That's about the way he has always operated. He was the first man to operate a 100 watt radiophone from an airplane. Eddie Stinson asked him to do that, and he did it. Another time he installed a giant public address system in a plane and advertised Kelvinator Refrigerators all the way from Detroit to Atlantic City. In 1927 he did the unusual again by loading a transmitter and a 10 piece orchestra in a plane and broadcast the music from the ship.

Now he prospects for gold and other precious metals in the wilds of Canada 400 miles north of Toronto. He uses special oscillators developed by himself for these geophysical surveys. Whether these treasure hunts pan out or not, it's a lot of fun, he says.

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## Illinois Gets Police Radio

Over two years ago the state of Illinois decided that the efficiency of the State Police Department could be immeasurably improved by the addition of a state-wide police radio system. Specifications called for a quality of transmission equalling that of the highest grade commercial radio broadcasting systems. After making an intensive study of various police radio systems, state authorities placed the order with the Graybar Electric Company for seven 1000 watt Western Electric transmitters together with speech input amplifiers, microphones and other supplementary equipment.

Installation of the transmitting and speech input equipment now is under way at Springfield, the first of the chain of cities to be thus equipped. The remaining six transmitters will be shipped during the winter and early spring. They are to be installed at Chicago, Sterling, Pontiac, Macomb, Effingham and Duquoin.

The present plan of operation is to have each transmitting location equipped with an elaborate control desk closely associated with the radio transmitting equipment. Each location will also have a remote control point with facilities to enable one man to control the transmitter and duplicate, in effect, the facilities on the local control desk.

The transmitting equipment has a flat frequency characteristic within 2 db from 30 to 12,000 cycles. This feature together with the high fidelity circuit which reduces audio distortion to much less than the value required by the Federal Communications Commission will give Illinois a higher quality of transmission than any other police system in the country at the present time.

Those in charge of the project are contemplating the use of a bank of ten radio receivers tuned to the frequencies of various local police systems with loud speaker outlets at both the local and remote points. Thus the men on duty at state police headquarters can be kept informed constantly of local police matters.

# Radio Guides Clippers to Orient

Since the China Clipper roared through the Golden Gate westward on her first triumphant flight to Manila, the air route to the Orient has become routine procedure. Pan-American Airways' giant ships are spanning those 8000 miles on scheduled runs. Bridging the world's widest ocean in five daily leaps is a reality. Yet had it not been for radio this tremendous achievement might have remained a fantastic scheme never to be realized. As one writer expresses it, "The radio towers are the pillars of the bridge and the directional signals are its paving."

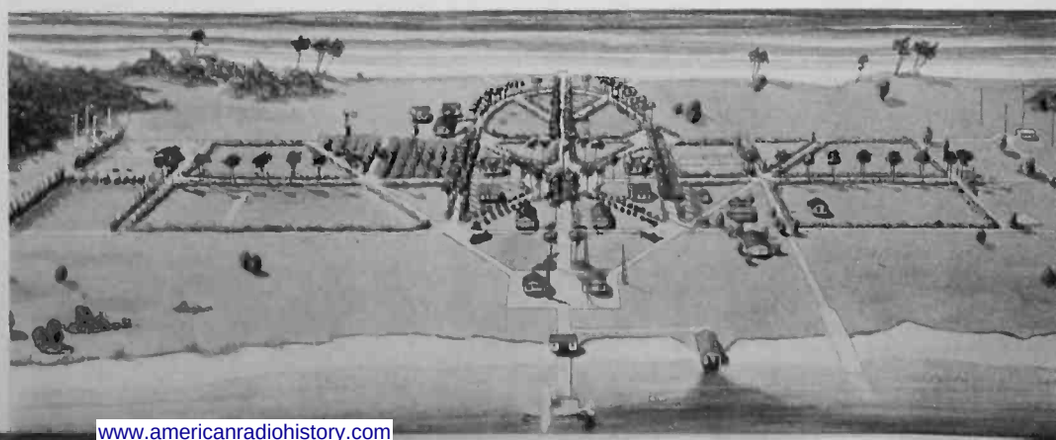
Four years ago Pan-American Airways began to lay the foundations for the Trans-Pacific route. The project was considered feasible by their engineers despite the terrific handicaps involved in such a venture. Although shore and ship radio capable of spanning great distances had been commonplace for some years, it was necessary to develop light weight, low-powered equipment of sufficient range to cover the entire Pacific when mounted in a plane. But the greatest difficulty lay in devising direction-finding apparatus suitable for such long-range service.

These handicaps, it was found, could be surmounted and the bridge was visualized. Its pillars would be planted at San Francisco, Honolulu, at the atolls of Midway, Wake and Guam; Manila and finally Macao on the China Coast. The whole scheme down to the last detail took form in New York—to be carried out thousands of miles away over the blue Pacific. Airplane builders were called to construct gigantic clippers which could safely span the air trail. Radio experts gathered together to devise adequate communication equipment. A flying laboratory made test flights over the Caribbean to train men for the big venture. Plans to transform the barren little atolls into landing bases were drawn up.

By the spring of 1935 the preliminary work had been completed and the S.S. North Haven with six thousand tons of material aboard sailed away toward the coral reefs that were to become miniature cities. Listed among those materials were the 500 Watt Western Electric Radio Transmitters modified for telegraph use which were to form an important link in the communication chain between ship and landing base and for point to point telegraphic service along the route. Two transmitters were installed at San Francisco and one on each of the island bases.

Even in those early stages of the project the transmitters were put to work. Because of the formation of the atolls, the North Haven was forced to anchor a mile or more off shore and the material had to be ferried across to the islands. The transmitters were immediately set up and communication between the construction crews on shore and the steamer was thus established. In fact the North Haven's stops along the island chain began with the erection of radio and ended with the calibration of direction-finder stations.

Today the chain of radio stations extending across the Pacific maintains hourly communication schedules with the control stations in the Philippines and California transmitting weather reports and other information. And the clippers are winging their way across this 8000-mile airway as though it were a long-established route. In the space of four short years these things have been accomplished.

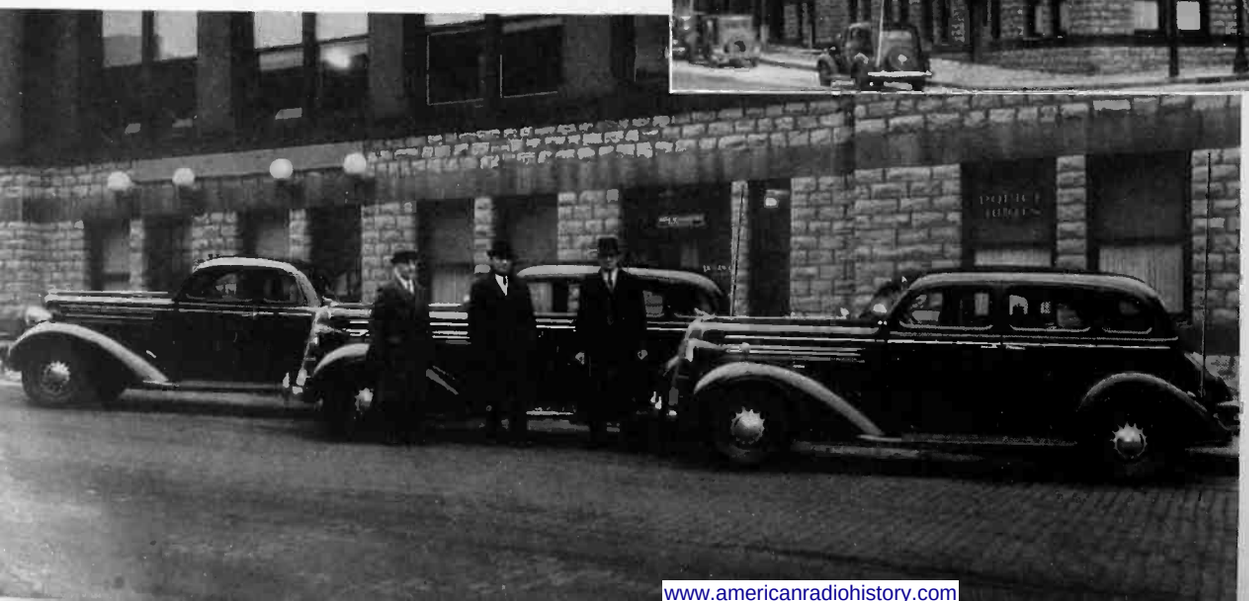


Architect's drawing showing Midway Island transformed into miniature city — second refueling base on the Trans-Pacific route.

# W9XIY, Elgin's Two-Way Police Radio

Elgin, Illinois, brings added protection to its citizens with Western Electric Two-Way Police Radio.


Above: Sergeant Rufus Page operates the 50 Watt Ultra-High Frequency Transmitter. Below: The patrol cars showing the flexible antennas. The men are, left to right, Burt Splithoff, Chairman of Elgin Police Board, Mayor Myron Lehman and Joseph G. Huber, Chief of Police.



Above: Police Headquarters showing the transmitter antenna on tower.

# A Jumbo Voice for Jumbo

(*Continued from Page Eighteen*)

sawdust ring and it had 4,300 seats which rose gently on an incline and it had balconies and an orchestra pit in a raised "box." Posts were there, and pits, and pillars, and the acoustics in general were undesirable.

All in all, it took 19 loudspeaker units of three different types located at strategic points. These included horns as well as loud speaking telephones with directional baffles.

Practically all of the action of JUMBO takes place in the vast circus-ring, over which are suspended six movable microphones. At proper distances, to get the best sound effect, the stage manager has placed marks on the great sawdust (simulated) carpet. These marked spots are for the players' benefit and invisible to the audience; precluding the necessity for raising their eyes to locate the mikes.

Two more mikes are on poles. They are stationary and of head height. Four more are hidden in the footlights, making a total of 12 in all. In the bandstand there is a special one to pick up string instrument tones. It points directly at the strings. Without it, the delicate tones of these instruments would be completely obliterated by the drums and brasses in the orchestra. Because of his distance from the stage, Paul Whiteman wears a headset when there is action out front, to ensure proper coordination between music and singers. That makes in reality 13 microphones in all.

The main amplifier system with controls in the sound booth is a simple panel arrangement. Each microphone is represented by a dial on the mixer panel. The operator manipulates the "sound" strings in the way a puppeteer manipulates his marionettes. With his left hand he pulls at the endless rail lines which rise to the roof and disappear through holes in the ceiling—lifting or lowering the microphones as the action of the moment requires.

He knows every cue by heart. For example, he knows when the stepladder scene takes place and is ready to hoist up the mike so that the circus Romeo and Juliet can sing their sentimental number. At the same moment his right hand is moving the dial . . . a bit to the right, a bit to the left until the exact volume is produced. A yank too high or a move too sharp and the entire effect would be spoiled for the audience.

He must watch the players with an eagle eye. Sometimes in the fervor of acting, they move too fast or get too close to the mike. Jimmy Durante, said the sound-man, is unpredictable.

On the opening night the sound booth was in a slight panic because of the many magnificent fur coats in the audience. The mink and ermine, silks and sable, in some way deadened the sound to a noticeable degree. Half full houses (if any) and full houses show a slight variation in sound effect. A way, of course, had to be found to meet all these contingencies.

The difficulties encountered in perfecting the installation would cover many pages more. It was during one of the crucial points that Billy Rose, in despair, said to the engineers:

"Boys, if you lick this thing I'll buy you a gold-plated suit."

Well, the thing was licked—but what could the boys do with a gold-plated suit?

To satisfy this reporter's inquiring mind, the first top-of-the-roof customer to emerge from the side entrance of the Hippodrome was collared.

"How do you think the sound system worked?" A simple enough question.

"What sound system?"

(Not a bad ad.)

"Could you hear all right?" This in an anxious tone.

"SWELL."

Need more be said?

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# New Program Sound System

(*Continued from Page Five*)

instrument, another radio receiver or other sources which have suitable electrical characteristics.

Emergency announcements over all loudspeakers may be made immediately, regardless of whether the loudspeakers are in or out of circuit.

Another innovation of this new system is a "talk-back" feature that is of particular interest to schools. The principal or another supervising the operation of the equipment may monitor the work going on in any classroom by merely turning a switch. When this feature is operating the classroom loudspeaker becomes, in effect, a microphone. Thus, for example, pupils reciting or teachers instructing can be heard in the principal's office or wherever the cabinet is installed. The monitoring loudspeaker, which is built in at the top of the cabinet, may also be used as a microphone. Through this loudspeaker-microphone the principal may in turn talk to the various classrooms. It is through this microphone that paging service can take place.

The control switches and rows of loudspeaker keys which operate the equipment are mounted on the front panel of the cabinet. These keys are available in groups of 20. As many as three of these groups may be used, depending upon the number of loudspeakers in service. Each key is used to control an individual loudspeaker or a group of speakers.

The entire outlay of equipment, so compactly mounted, is extremely simple to manipulate. Flip a switch—twist a dial—turn a key—and Program Sound System is at your service—economical in purchase price—economical in operation.

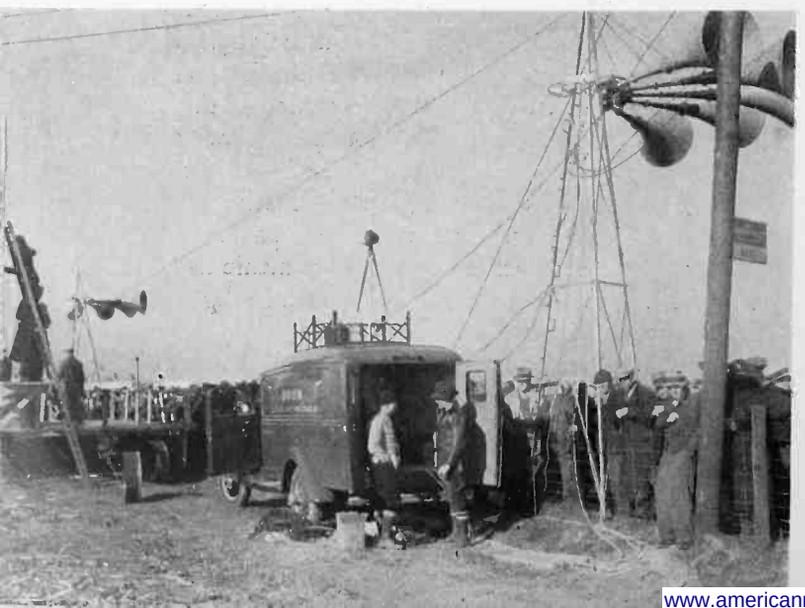
Making crowds hear as he did for these 120,000 at the National Corn Husking contest, Newton, Indiana, is no unusual job for Milton Boom (left). The horn towers and truck (below) are part of his regular equipment.

# He Makes Public Address a Business

The gods who determine our destinies must have chuckled when they decided to make a public address engineer out of Milton A. Boom. But they chose his profession wisely, too, for he has been just as successful as his name might indicate.

Milton Boom of Chicago is one of the pioneers in the business of making big voices out of little ones. Today when a politician or department store or a newspaper wants a public address system the Boom Electric and Amplifier Company is more than apt to get the business, particularly if the client wants the highest quality of reproduction, reliable service and honest treatment, for Boom believes in giving these three guarantees.

There are few people who have been as successful in the public address business as Milton Boom. The reason for that success is that he has regarded it as a business and not a side-line in which to pick up a few extra dollars now and then. There are other good reasons why he has succeeded in his profession, but they are all part of and subordinate to his one idea—that there is money to be made in public address work, provided the business is operated according to the same principles on which all prosperous enterprises are conducted.



"You can't make a living being a chiseler," he says. "Since I have been in the public address business, I have handled more than 2,000 individual jobs, and I have never failed to render service on a single one. I have never failed to satisfy a customer, and the greater part of my business comes from old customers or new ones recommended to me by the old ones."

Actually Boom sells nothing but sound waves. It is his job to pick up small sound waves and reproduce them in any magnitude sufficient to provide perfect hearing to his audience, whether it be a hundred or a hundred thousand. But even though sound waves are his only wares, he looks upon them as merchandise just as does a merchant selling shoes.

"I cater to quality customers, and you can get them only when you sell them quality merchandise. I know that I can continue to please my clients only so long as I give them the best possible sound reproduction. I have the reputation of charging

the highest prices of any public address man in town," he almost boasts. "I won't take any job for less than $25 no matter how small it may be. I have studied costs and I know you can't send a truck out for less. I could not get higher prices unless I consistently give better service, and faithful, life-like reproduction of the sounds I reproduce.

"There is much to be derived from using the best equipment. When I approach a new client, I know that I can win his confidence and respect simply by telling him that I use nothing but Western Electric apparatus. There is a personal satisfaction to be derived, too. What a kick I got recently when I made it possible for 120,000 people on an Indiana prairie to hear as perfectly as if the audience had been only one man! Or again when President Roosevelt spoke to 15,000 at the University of Notre Dame, and his voice reached every listener with every shade and tone of his voice faithfully reproduced."

Being a public address man has brought fun and travel as well as profit to Boom. In 1928 he rode 26,000 miles through 43 states on the private train of Vice-President Charles Curtis during a barnstorming political speaking tour. "That was a job," says Boom. "We seldom had more than 20 to 30 minutes to set up the equipment, but we never had a failure."

He has reproduced the voices of Coolidge, Dawes, Admiral Byrd, Lindbergh, and scores of other celebrities. His equipment has announced practically every type of sports event imaginable, from football to the National Corn Husking Contest held at Newton, Indiana. Broadcasting companies, newspapers, and department stores are among his best customers. One of his longest jobs ran for the entire second year of the Century of Progress when he reproduced the Chicago Symphony Orchestra concerts at Swift Bridge.

"The surface hasn't been scratched," declared Boom, when he was asked if there was an increasing demand for public address services and equipment. "It is inexcusable in this day and age for even one person not to hear in any gathering large or small."

## Radio Squad Arrests 14,325

The police radio squad of Chicago made 14,325 arrests near or at the scene of the crime during the first 11 and a half months of 1935, according to a report published in the Chicago Tribune. This statement was issued by Captain William Killeen, head of the radio and broadcast department.

The 188 squad cars operating with police radio received 244,570 messages. A total of 34,140 were sent to those suburbs whose squads receive instructions via Chicago's radio.

Chicago uses Western Electric police radio equipment.

Frank W. Becket at work on one of his own compositions with the aid of his Western Electric Audiphone.

## Audiphone Enables Banker To Follow Life-Long Hobby

While answering a telephone years ago Frank W. Becket, investment banker of New York City, had his first intimation that he was losing his hearing. Today a one-way telephone system on a miniature scale enables him to hear. So adequate is this electrical aid that Mr. Becket can carry on his life-long hobby—music—although his hearing is 75 per cent gone. Recently he broadcast his own piano compositions over WEAF.

Soon after he became aware of his difficulty he began using one of the first electrical devices ever manufactured to aid the hard of hearing. It was a Western Electric Audiphone about the size of a satchel. Since then Bell Telephone Laboratories engineers have made many improvements in the Audiphone until today the one worn by Mr. Becket and by thousands of others who receive similar aid is so small as to be almost unnoticeable.

Originally he discovered for himself that he could hear the piano better through the bones of his head than through his ears. He fashioned a V-shaped contrivance of wood, one end of which he pressed against the piano and the other against his temples. Today when he is seated at the piano he replaces his earpiece with the tiny bone conduction receiver which rests against his head just back of his ear. With this arrangement the sound waves pass around the affected members of the middle ear and are mechanically communicated to the bones of his head and thence directly to the inner ear or audition nerve.

When Mr. Becket first heard the melodious strains of his beloved piano in this way he was so elated that tears of joy filled his eyes. In describing the happy experience he says it was as though doors long shut had re-opened, and he lived in a world of sound again.

# "Okey-Doke 22, Come In!"

(*Continued from Page Seven*)

going. On a clear day five or six planes can land and take-off at one time but in overcast weather the tower takes care of one landing and take-off at a time.

A one man job! How does he do it all? The answer lies in the six black cabinets standing in the center of the tower room. Here are his co-workers that never rest—five Western Electric radio receivers and one Western Electric transmitter. Four of the receivers take care of the incoming calls from the transports and ground stations of the airlines using the port. The fifth provides for reception from itinerant flyers. The sixth cabinet houses the transmitter. On the operator's desk forming a semi-circle are the five corresponding loud speakers and a microphone. Back of them stand two wind indicators—one for velocity and the other for direction.

A simple layout of equipment, it occupies but a few square feet of space yet it performs a tremendous job. For the lives of hundreds of pilots and passengers depend to a large extent upon this radio traffic cop as air travel begins or ends at Newark.

Ship 22 is safe in port. But what happened on 22's long journey from the South? Let's hop over to the ground station of Eastern Airlines nearby where more Western Electric equipment is in operation and follow the ship on the last lap from Washington to Newark. In the radio room are two receivers—one for emergency use and one tuned to the control tower. Four more receivers are located at Linden, N. J., about 10 miles away, which are controlled over telephone lines. The operator at the airport simply twirls a telephone dial and can control his distant receivers as easily as you adjust your home radio set. These remote receivers are used for picking up the planes and ground stations on radio telephone and for the line's point to point telegraph circuit. The transmitter combines two units and can transmit on radio telephone or radio telegraph. At other locations on the field Western Electric equipment is similarly at work at the ground stations of Transcontinental & Western Airlines, American Airlines and United Air Lines. These four major lines use Western Electric equipment in all their ground stations throughout the country.

It is much quieter at the EAL station than at the tower. But intermittently the loud speakers are working. The voices may be coming from pilots en route—from the ground stations of the three other airlines or from the control tower.

"Ship 22 to Newark — our position about 10 miles south of Wilmington on top at 5,800."

On top at 5,800 means the ship is flying above a bank of clouds or "overcast" at that altitude. There may be sunshine up there but it is still raining here and the haze is heavy. The operator at EAL repeats 22's call to verify it.

"Ship 22 to WEEP (the station's call letters)—we are over Camden—are there any ships between Camden and Newark?"

The operator immediately talks to the tower to report the approach of his plane and to learn what ships are nearing the field. He then relays the information to 22.

"WEEP to 22—there is a TWA in the vicinity—ought to be out of your way by the time you arrive—come through the overcast so you can see where you're going—better fly at 1,800."

A different voice is heard. This time it is the operator at American Airlines talking to EAL over their common field interphone system. He gives a weather report from one of his ships just landed. The EAL operator relays it along.

"Hello 22—American Airlines just in reports ceiling 1,700—visibility about three miles—wind 12 miles northeast. Have you broken through the overcast yet?"

Had the fog been extremely dense at Newark, 22 would be instructed to land at the Camden field for the ceiling must be at least 300 feet for landing. The trip might also be delayed if there were a number of other planes ahead en route to Newark. In that case 22 would be advised to circle over Princeton until the way is clear. Today it is "okay" for 22 to continue on her course. By now the pilot has broken through the overcast and is winging toward the field at 1,800 feet. Ten miles from the Newark port he is again in touch with the EAL operator.

"WEEP to 22—I am now turning you over to WREE."

The pilot then tunes his beacon receiver to 278 kilocycles and listens for WREE. From now on the control tower takes charge.

For outgoing planes the procedure is reversed. When the pilot is 10 miles out of Newark, he signs off from the tower and his own ground station takes control. From then on to Washington the EAL operator is on the job. He is in direct communication with his planes every half hour. But there are many "off schedule" calls when the pilot requests additional information or when the ground station gives further instructions. If the plane is making the trip through to Atlanta, Miami or New Orleans, other EAL stations along the line take over the ship in turn.

Thus radio ceaselessly weaves an invisible network of communication to safeguard the traveler who sails the skies.

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### Additions to List of Newspaper Stations

To the list of Western Electric equipped broadcasting stations owned or operated by newspapers PICK-UPS adds the following: KFIZ, operated by the Fond Du Lac Commonwealth Reporter, Fond Du Lac, Wisconsin, and WCOA, operated by the Pensacola News Journal, Pensacola, Florida.

# Toledo Tube Ad Burns Kelly PICK-UPS Gives First Aid

Although only a youngster two issues old, "PICK-UPS" has been called upon to do a man's job: i. e., to administer First Aid and pour oil on the troubled waters of Howard O. Kelly's injured feelings. Incidentally "PICK-UPS" believes in keeping on the right side of the police and Kelly is supervisor of the Police Radio Department in Minneapolis. Aside from this, its sympathy is entirely with the gentleman in question. It was the picture of a Western Electric tube that burned Kelly. The whole story of the conflagration came out in the following letter:

"I am enclosing a copy of the nice big ad which Western Electric Company ran on the 251A Vacuum Tube in the November issue of Electronics. Whoever prepared this ad has injured the feelings of Howard O. Kelly, Supervisor of the Police Radio Department in Minneapolis, very, very much. Howard wants to know why the police department at Toledo, Ohio, station WRDQ should be given so much national publicity over a comparatively new vacuum tube.

"Howard has two stations, KGPB and KGPR, with No. 9 Transmitters. When he saw this ad he called to ask why these people received this publicity on a tube which has been retired and says, 'What about the tubes we have that are still giving us good service, with many thousand more hours than the Toledo tube?'

"Howard put the first No. 9 transmitter on the air on May 30, 1930. Last May he told me that he was taking the original 251A Vacuum Tube and putting it on the shelf for a rest, as it had been in constant service with the filament lighted 24 hours a day and seven days a week, since the transmitter first went on the air.

"I told Howard that it might be all right to put an old horse out to pasture, and soften up his knees a bit, but that the vacuum tube was made of glass and metal and as long as it continued to operate satisfactorily it should be permitted to work. When it did not, it should be thrown in the junk pile. Howard put the 251A tube back in the socket. About 9 A.M. November 18, 1935, he called to say that the tube had finally become a little erratic and was removed from service.

"Deducting the time that the tube was given a rest, it was in service with the filament lighted 46,428 hours, or something over double the life of the much advertised Toledo tube. Now there is just one way in the world that Western Electric and Graybar can square themselves with Howard Kelly. That is this—his 251A tube with 46,428 hours service must have a story in 'PICK-UPS'."

Howard O. Kelly, Supervisor of Police Radio Department in Minneapolis, displaying famous tube that burned 46,428 hours.

## Audiphone Goes to Court

The Western Electric Audiphone has been taken to court—tried—and sentenced to serve an indefinite term at the judge's desk. The chief witness for the prosecution was Clyde H. Marshall, well-known shorthand reporter. Marshall contended that most reporters work in courtrooms where the acoustics are poor and that to remedy this difficulty the defendant should be put to work.

His testimony reads as follows:

"It became evident to me that what was needed in the new courtroom was a loudspeaker of some sort for the judge, and I cast about and found a device consisting of a small microphone, about twice the size of a silver dollar, which I hung on a little hook out of sight on the side of the judge's desk. There is attached to the microphone a flexible wire also out of sight, leading to a small battery placed in my coat pocket, and another short wire leading from the battery to a tiny rubber fitting attached to my ear.

"This device is manufactured by the Western Electric Company and is called an Audiphone. There are several models of it, with different degrees of voice amplification, and by experiment I found that the one with the lowest degree suited my purpose the best.

"The result of the experiment was highly satisfactory, and I have purchased the Audiphone and shall continue to use it under present conditions. It makes the faintest utterance of the judge or the witness clearly audible. It enables me to hear conversation between the judge and the witness that the lawyers cannot hear at all."

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

# 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
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Tacoma
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Toledo
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Youngstown

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