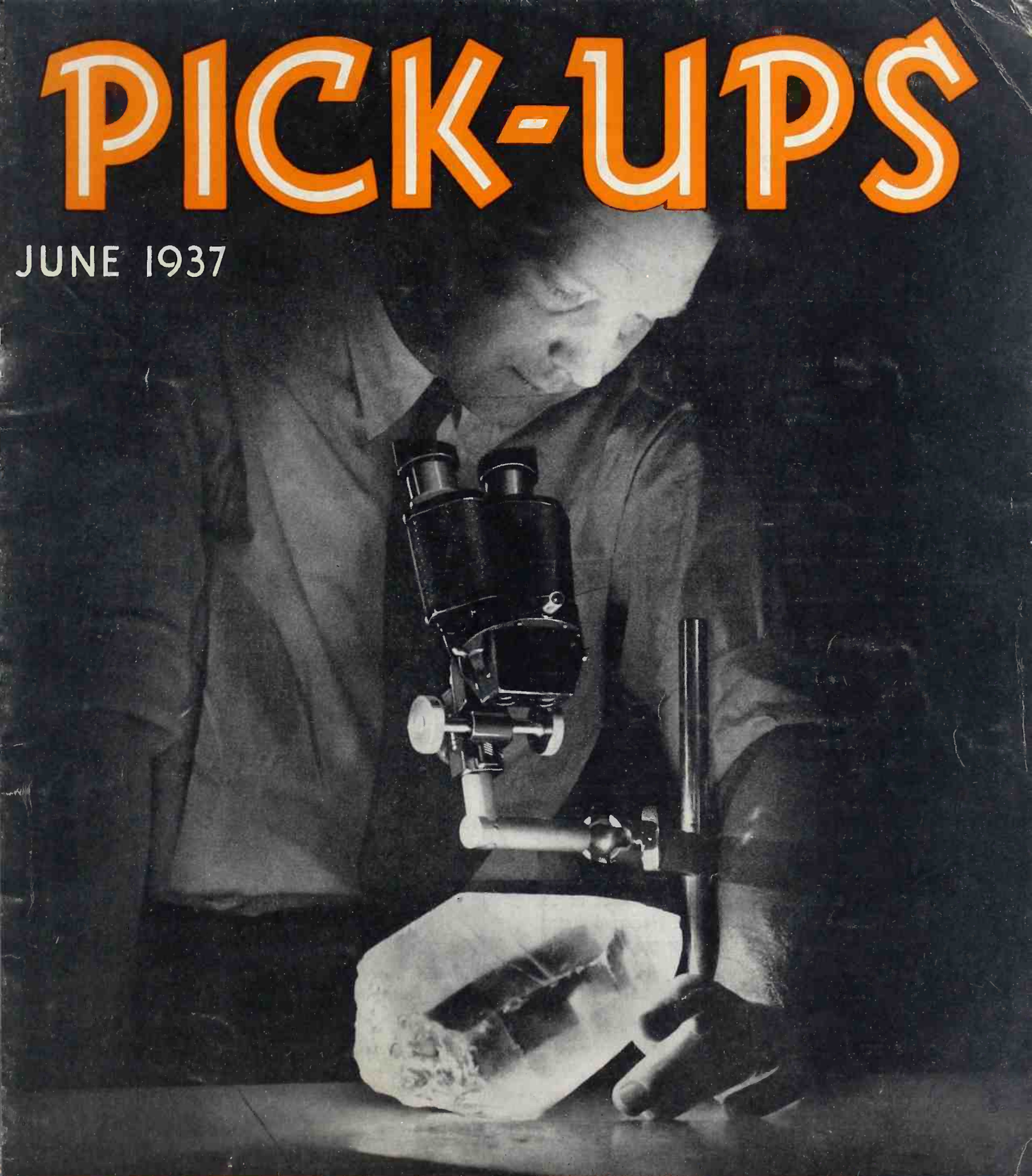
PICK-UPS

JUNE 1937



Inspecting Raw Brazilian Quartz for Flaws—See Story Page 7

SPECIAL NAB NUMBER

It Takes Science and Skill to Make These Midget Masters of Radio

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Who? J. O. Maland of WHO, Des Moines, That's Who!

•

Men of Radio—Makers of Miracles

Public Address Carries Story of Grand Coulee Dam to Ringside Spectators

•

Greetings from Past Presidents of NAB

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Western Electric Transmitters

Program Amplifier Increases Signal 3 DB, Reduces Work of Monitoring Operator

PUBLISHED BY · · · Western Electric · · · NEW YORK CITY

— PICK-UPS —

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

Western Electric Company

195 Broadway, New York, N. Y.

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

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

JUNE, 1937

The NAB Convention

In this issue, *Pick-Ups* presents pictures of and greetings from every past president of the National Association of Broadcasters. Young in years, old in experience, they are actively engaged in radio today.

This is only the 15th annual convention of the NAB, yet broadcasting is one of the country's major industries.

In seventeen years millions of people have acquired a new habit—that of tuning a radio receiver. The men who meet at this 15th annual convention of the National Association of Broadcasters have fostered that habit.

Environment Broadcasting

America is looking at itself today as never before. Our leading artists, men like Grant Wood, are interpreting America for us. They paint their own surroundings, their own environments. Newspaper columnists write about people and places. A new magazine breaks publishing records by interpreting the American scene in pictures. Millions of people are sticking candid cameras into all sorts of places, each intent upon capturing life and motion.

Broadcasters are beginning to lead the way in this new development. Microphones now go into the homes of the wealthy and the poverty-stricken alike. Wherever there is life, there is a microphone. Turn on your radio tonight and more than likely you will hear a broadcast from the living room of just an average citizen, or you will hear "the man on the street" airing his views about this or that.

We believe this trend in broadcasting is significant. For the want of a better term, we like to call it environment broadcasting. But call it what you will, it is bound to have a broad sociological effect on American life. It is a new and powerful medium for learning how the other half lives, and what is more important, how it thinks. When you know how the man sitting next to you in a street car lives and thinks, you will understand him better, be more tolerant of him, and like him more.

The whole world's a stage. It's getting to be a broadcasting studio as well.

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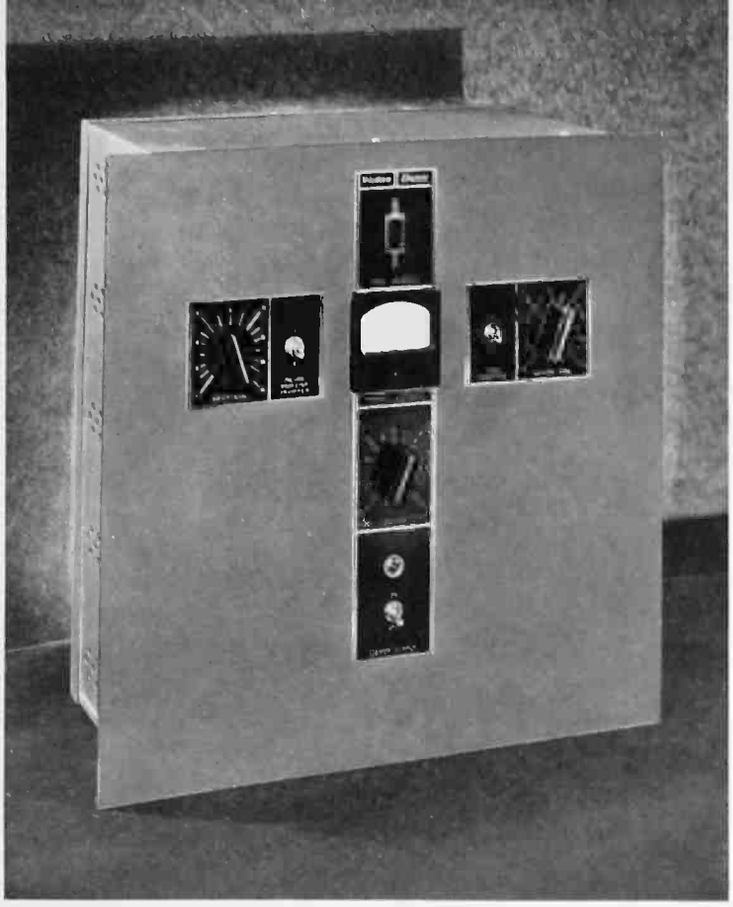
This Issue



A NEW DEVELOPMENT BY
BELL TELEPHONE LABORATORIES

Program Amplifier Increases Signal 3 DB, Reduces Work of Monitoring Operator

By O. M. HOVGAARD
Radio Development, Bell Telephone Laboratories

Twelve years of progress, 12 db increase in signal level, and the 1 KW transmitter of 1925 becomes in effect a 16 KW transmitter in 1937. Since the very first days of radio broadcasting the Western Electric Company has been making noteworthy contributions to this art. Among its most important have been those enabling the broadcaster to extend his effective coverage without increasing his power consumption. In 1927 Western Electric doubled the degree of modulation, thereby increasing the effective signal by 6 db. In 1931 it introduced the halfwave radiator which added 3 db more to the signal. Now another 3 db is added by the engineers of Bell Telephone Laboratories with the introduction of their latest development, the Program Amplifier.

Ever since the first radio broadcast, an increasingly important problem has been to adapt the fixed volume range of a radio transmitter to the frequently greater volume range of the program material. The volume range of a transmitter lies between those levels which correspond to noise inherent in the equipment and those which correspond to the greatest degree of modulation that can be obtained without objectionable distortion. When this range is exceeded by the program, a monitoring operator attempts to compress the volume range by inserting loss during excessively high passages and removing loss at those passages whose level would be comparable to the noise level. Since the coverage of a transmitter can be increased by increasing the degree of modulation, a similar technique is also employed when the program volume range is less than that of the transmitter. In this case the monitoring operator, by compressing the high level passages, avoids the distortion which would be caused by overmodulation.

The difficulty of inserting exactly the right amount of loss at just the proper time and subsequently removing it, and not affect thereby those levels that would not cause distortion must be painfully familiar to all who have practiced this art. The higher the program level is raised the oftener the peaks will exceed 100 percent modulation and the

oftener the monitoring operator must adjust the gain. Also, the more frequently he will fail to make the proper adjustment.

The objective of the monitoring operator is to keep program peaks from causing overmodulation and to do so without affecting these levels which would not cause overmodulation. In other words, if he could do his part to perfection, he would

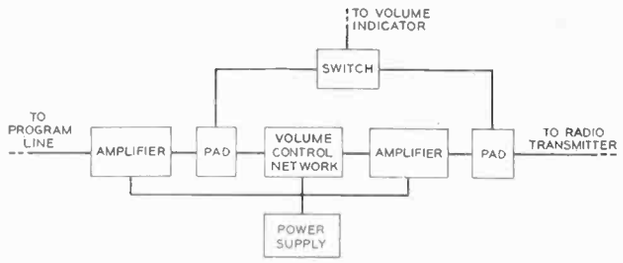


Fig. 1

be compressing only those parts of a program which exceeded some predetermined level. The failure to approach perfection is largely due to his inability to interpret the reading of the volume indicator rapidly enough to effect a correction before the need for it has passed. The realization of this inherent weakness in operating technique has brought forth from Bell Telephone Laboratories a new development—the Program Amplifier.

As shown in Figure 1, the Program Amplifier is composed of an input amplifier and pad, the volume control network, an output amplifier and pad, a power supply and a switch for connecting an external volume indicator to either the input or to output of the Amplifier. It has been designed as a complete self-contained instrument sufficiently flexible in its terminating facilities to meet a wide range of requirements.

This new instrument will automatically perform many of the functions which the monitoring operator now has to perform manually. Furthermore, it will do so with a degree of perfection which he cannot hope to attain.

Its basis is a variable loss network which is inserted as a part of the program circuit, the loss which it inserts being directly controlled by the program level. A characteristic of such a network is shown on Figure 2 which depicts the relationship between the output and input levels for a steady state single frequency. It will be seen that up to the level marked A the relationship is linear. For input levels less than A the network acts as though it were a small fixed loss and hence will not affect the character of the program. When the level A is exceeded the network inserts additional loss in an amount dependent upon the increase in program level, and the volume range beyond the level A will therefore be compressed.

As an example of its use in connection with a broadcast transmitter, suppose that when the instantaneous program level reaches the level A the transmitter is modulated 80 percent. To reach 100 percent modulation of the transmitter, the level at the output of the Amplifier must rise about 2 db, and to effect this increase the level at its input must rise about 5 db. The difference of 3 db represents the amount by which the average program level can be raised through the use of the Program Amplifier. Due to the variable loss characteristic of the Amplifier, program peaks at the input to the Amplifier which greatly exceed the level A will not cause overmodulation. To take an extreme case, an occasional peak which might exceed the level A by as much as 10 db would attempt to drive the transmitter to 178 percent modulation if the Amplifier were not in circuit; but with it this excessive input would create only about 108 percent modulation. Such extreme peaks are, of course, infrequent and of short duration but this example serves to illustrate the enormous factor of safety which the Amplifier provides.

When the system is adjusted as in the above example, the average program level will be about 6 db below the level A, and there is more than enough margin of safety to prevent accidental shifts in the program level from placing it in the compression range. Inasmuch as the relationship between the number and the duration of peaks and the average program level varies widely, means are provided which will indicate by a flashing light whenever the peaks exceed some preselected level. This flashing indicator may be set to operate at any level equal to or greater than the level A. If it has been decided to compress only the upper 5 db of the volume range, as in the example, then the indicator would be set to flash at an input level 5 db higher than the level A. As long as it flashed only occasionally the operator could feel assured that the desired operating condition was being maintained. If it flashed frequently, it would be an indication that the normal peaks were being com-

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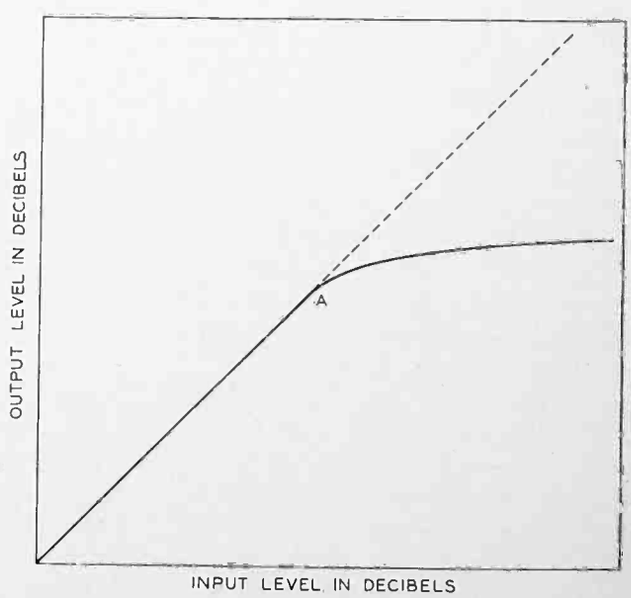

Fig. 2

Who?

J. O. MALAND

of WHO, Des Moines, That's WHO!

By
WILL WHITMORE

Such little things shape the destinies of men! And by the same token, those very things shape the destinies of great industries.

In 1921, an advertisement, thrilling in its promises, appeared in the *Saturday Evening Post*. "Buy this modern wireless receiver," it said, "and receive the finest music, and market reports from all over the world!" The ad caught the eye of a man in the little town of Frost, Minnesota. He was mayor, assistant postmaster, justice of the peace, and proprietor of a general store which sold everything from shoe strings to plows.

Frost then was more than 150 miles from the nearest broadcast station, and the little receiver, when it arrived, maintained a discreet silence. As far as it was concerned, the world-at-large remained at large. Hundreds of other men, who had had the same experience said radio was the bunk, put the receiver in the attic, and forgot about it. But not the mayor-postmaster-justice of peace-store proprietor of Frost.

He canvassed all the electrical jobbers in the Twin-Cities until he found a radio that would work. It was a Westinghouse detector and two stage amplifier, supplemented by a Western Electric amplifier and a Magnavox loud-speaker. When he turned it on full blast, it could be heard a mile from the store. Farmers stopped plowing their fields to listen. At night the store was full of townspeople and farmers who came from miles around to listen. Market reports broadcast during the day were particularly welcome and helpful to the farmers. The radio became the social center of Frost. It became, too, one of those small things which shape the destinies of men.

J. O. Maland, the man who bought it, saw how it appealed to his farmer friends and customers. He saw how it opened doors and let the outside world into farm-bound lives. He envisioned radio as an institution by and for the people. It was something of which he had to become a part.

A friend of Maland's who published a group of farm papers and owned a one-sixth interest in WLAG, Minneapolis, offered Maland a position

J. O. Maland

on the papers. By 1923, Maland was farm program director of the station. In 1928 he became Commercial Manager of WLS when Sears Roebuck sold the station to the *Prairie Farmer*.

Better service to rural communities was and always will be Maland's "Holy Grail." The year 1930 found him and Edgar Bill presenting a plan to Columbia Broadcasting System for a farm network in the Middle West. The network was formed with Maland as sales manager. There were seven stations on the network—WCCO, WBBM, KMBC, KFH, WFBM, KOIL and WIBW. "At that time," says Maland, "there were only a Western manager and one salesman, besides myself, in the Chicago office of Columbia."

While Maland was with Columbia he became convinced that the future of radio depended upon high power—at least 50,000 watts. "I checked over 23 stations to see what the future possibilities were and it was obvious to me at that time that the greatest opportunity was in Iowa," he says.

WOC, Davenport, and WHO, Des Moines, were synchronously operated. The organization had made application for a 50,000 watt license. Maland joined them in 1931, and the same year the license for high power was granted. Despite little money and the depression at its worst, building was begun at once. On April 22, 1933, WHO went on the air with 50,000 watts. Two years later there was

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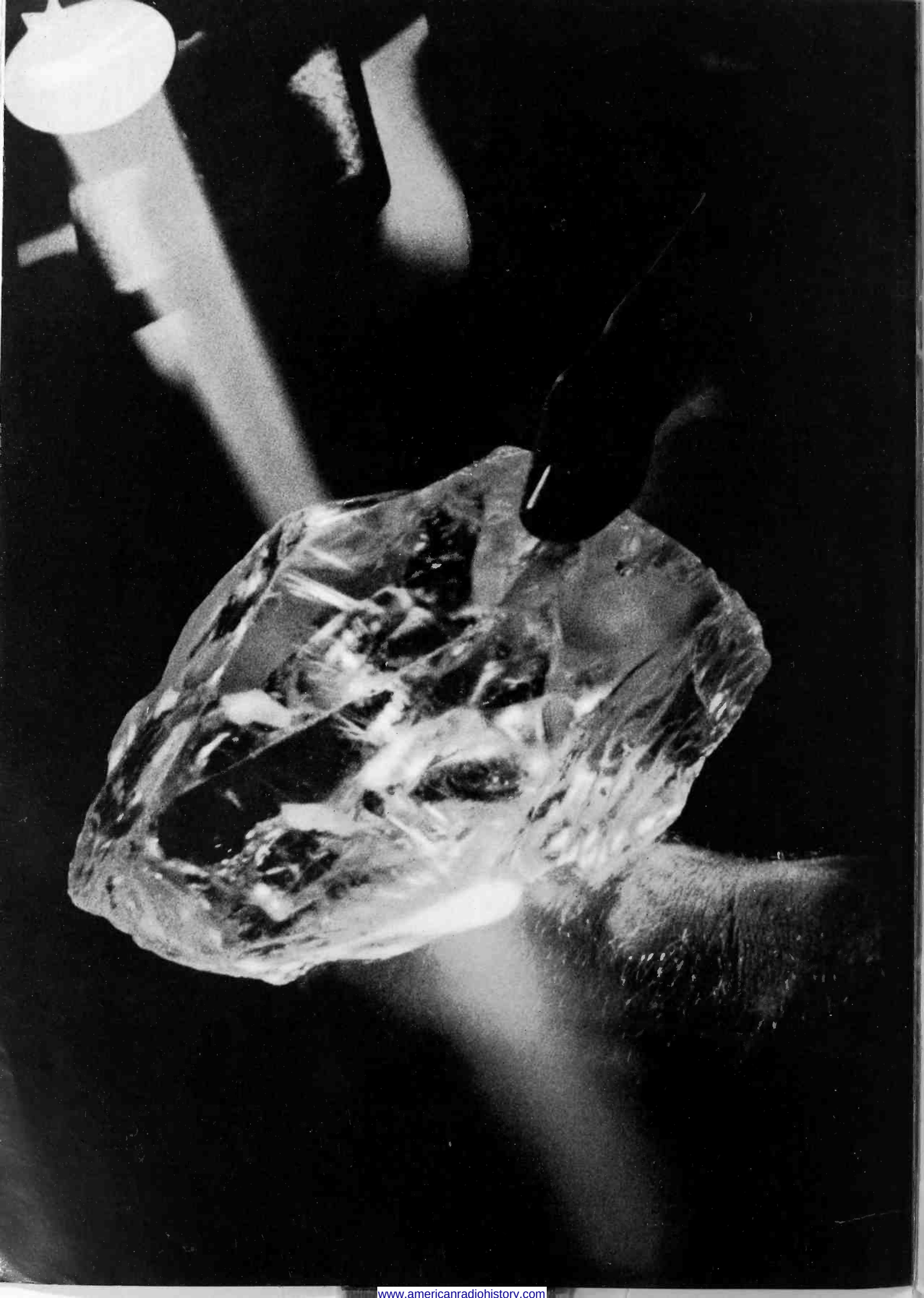

It Takes Science and Skill to Make These Midget Masters of Radio

Accuracy to the Millionth of an Inch Required to Change Raw Quartz Into Small Crystal Oscillators

By M. M. BEARD

When a listener snaps on his radio, turns the dial to a particular point, he expects his favorite station to come in, right on the dot. And it does. Why it does, he neither knows nor cares. But if it did not, his entertainment would be ruined and radio broadcasting would instantly be thrown into a hopeless chaos.

In the early days of broadcasting, stations did not always come in on the dot and interference ruled the airwaves. Now, thanks to a small square of quartz crystal, one of which is in every broadcast transmitter, each station stays on its assigned frequency.

The making of these crystals calls for an accuracy even greater than that of the lens grinder, you learn, when you visit the quartz crystal manufacturing unit at Bell Telephone Laboratories. Here it is a science in itself, where working dimensions have been reduced to sub-millionths of an inch; where the finest mechanical methods of measurement ever devised will not suffice.

First impressions of the quartz shop are the roar of fast moving wheels—the steady rhythmic whirr of grinding disks — the grating of abrasive against metal—the soft trickle of water—a faint odor of chemicals — piles of quartz slabs on tables — machinery enclosed in glass — machinery hooded with rubber sheeting and pans of mucky gray paste.

In a closet-like partition in one corner of the shop rows of raw quartz like giant clusters of rock candy are lined up on shelves awaiting inspection. Dug from the quartz mines in Brazil, they have journeyed thousands of miles by muleback, truck, train and freighter to undergo a series of drastic operations which will reduce them to slivers. Here are smooth quartz and knobby quartz — long crystal-clear hexagonal pieces and yellowish brown chunks. Some are small enough to hold in one hand — others tip the scales at half a hundred pounds.

•

Opposite page — Searching with a beam of polarized light for infinitesimal flaws in a lump of raw quartz before its metamorphosis into super-accurate frequency-controlling crystals.

As you see one of these drab shapeless lumps actually change into fragile slices of crystal, which are destined to control the frequencies of radio transmitters in airplanes, police motor patrol cars, luxury liners, trawlers and tugs, as well as broadcasting stations, you realize that radio is still the eighth wonder of the world.

First the quartz must be given a light test to detect defects. Under powerful white arc lamps some of the inner secrets of the quartz are glaringly revealed. Those lovely smoky blue streaks are called needles—the cloudy finger-like lines, phantoms—and the bubble formations, veils. Specimens showing needles or phantoms are relegated to the junk pile. Those containing veils may be used but the veils must be cut out, you are told.

Another defect known as twinning, appears when you scrutinize a piece of quartz under special polarized light. It shows up as a series of colorful red and green stripes. Most quartz has some degree of twinning, the supervisor explains. It is the result of molecules turning during the growth of the crystal. Twinning areas too are taboo and must be ground off. Another examination is made to determine the optical axis of the quartz. This is your introduction to the quartz axes which you later realize are THE determining factors in the whole process of crystal cutting. The word is bandied about so frequently that you become axis-conscious before the trip is ended.

After the quartz has passed muster it moves on to the cutting room. Here it receives a shower of water, carborundum dust and castile soap—while a large steel disk whirling through this mucky mixture cuts the lump into sections. Usually from one to four sections can be cut from the raw quartz according to its size. Each section is now inspected for twinning and given a second axis examination.

One little fraction of a degree off axis and the oscillator just won't pass muster. But the man bent so intently over these jagged specimens knows his axes and there is little danger that the finished crystal will fail to perform properly. This it MUST

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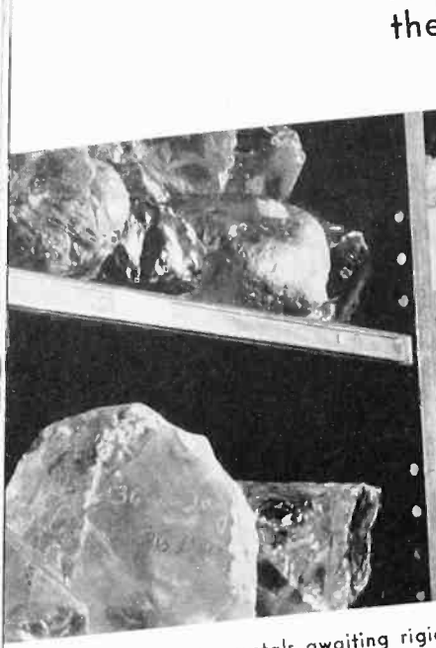
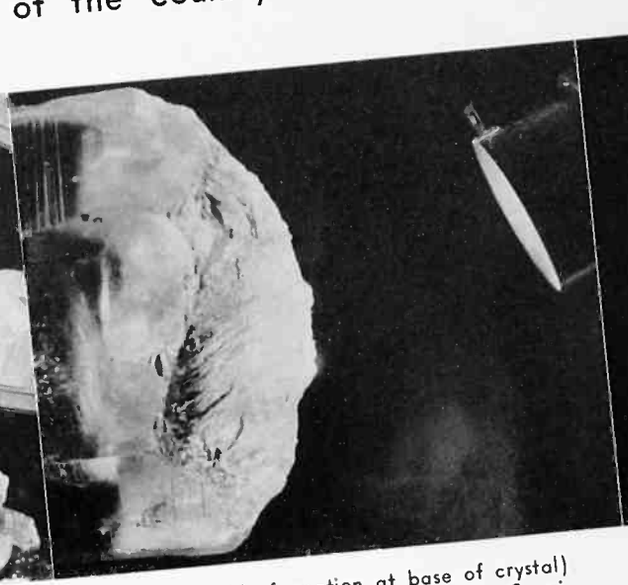
From Brazil come rough crystals destined to control the frequencies of the country's radio stations.

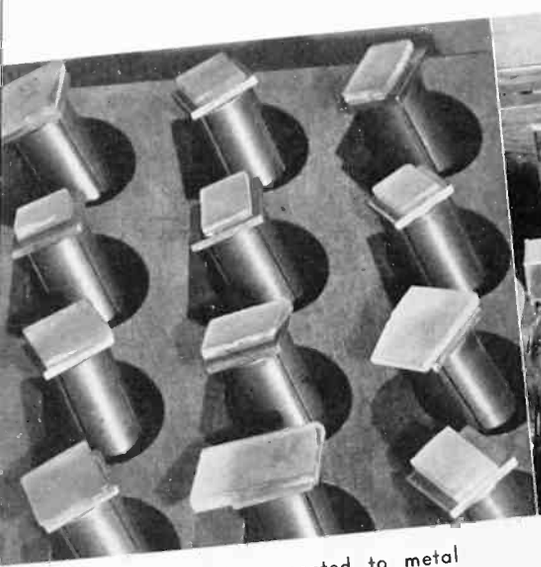


RAW quartz crystals awaiting rigid tests before starting long journey through cutting and lapping rooms of Bell Telephone Laboratories' quartz shop.

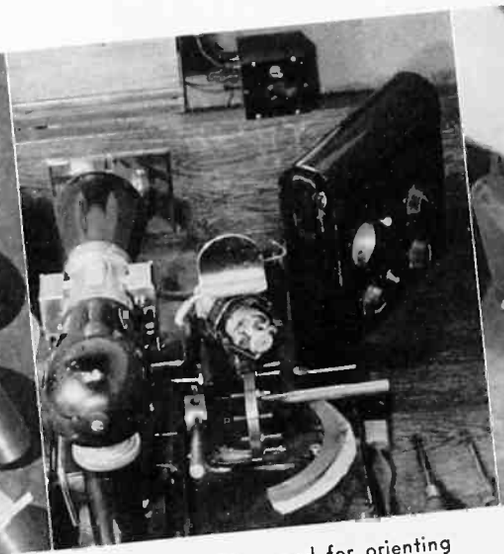


VEIL (bubble formation at base of crystal) disclosed under powerful arc light. Specimens showing this defect may be used but veils must be cut out.

PHANTOMS (cloudy finge like lines) revealed under a light. Crystals containir phantoms cannot be use

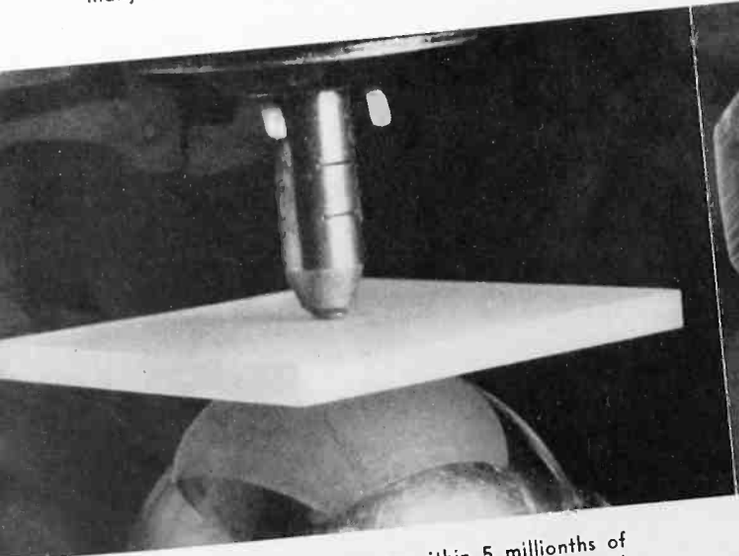


ROUGH blanks cemented to metal holder await their turn to be oriented under x-ray machine. This is one of many axes test crystals must undergo.

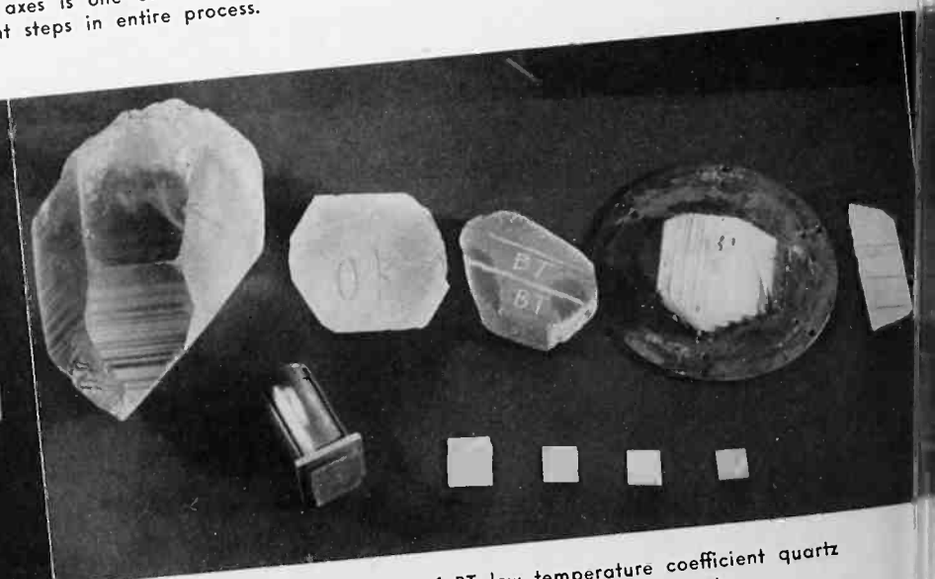


X-RAY machine used for orienting quartz plates. Determining the crystal's axes is one of the most important steps in entire process.

LAPPING one face of quartz plate to true orientation. Pressure is controlled with operator's left hand while he oscillates arm supporting crystal with right hand.

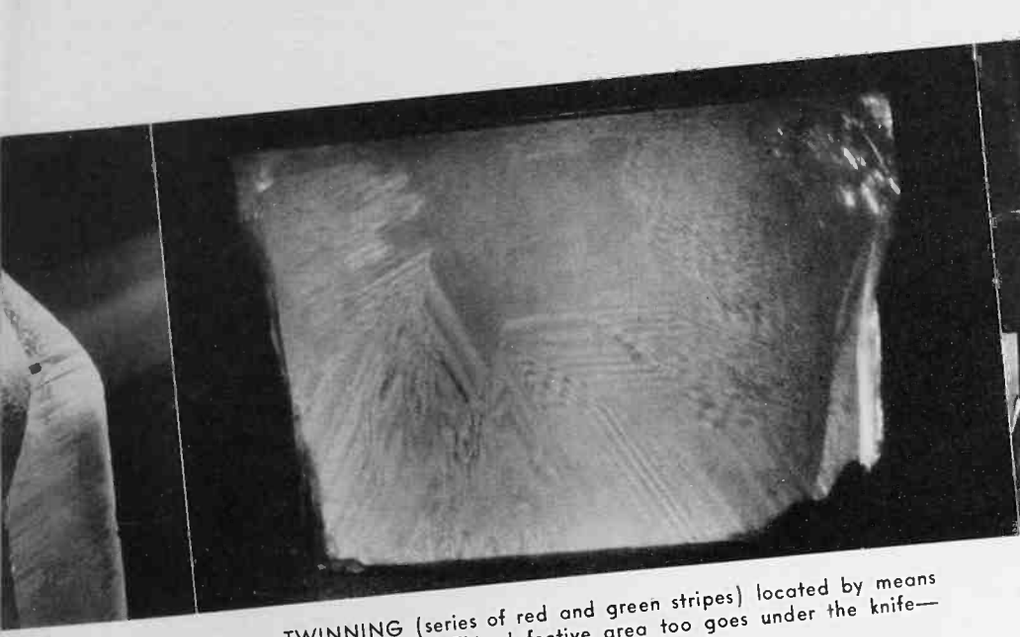


OPTIMETER tells thickness to within 5 millionths of an inch. Clamped between steel hemisphere and plunger whose tip is a sapphire to resist abrasion.



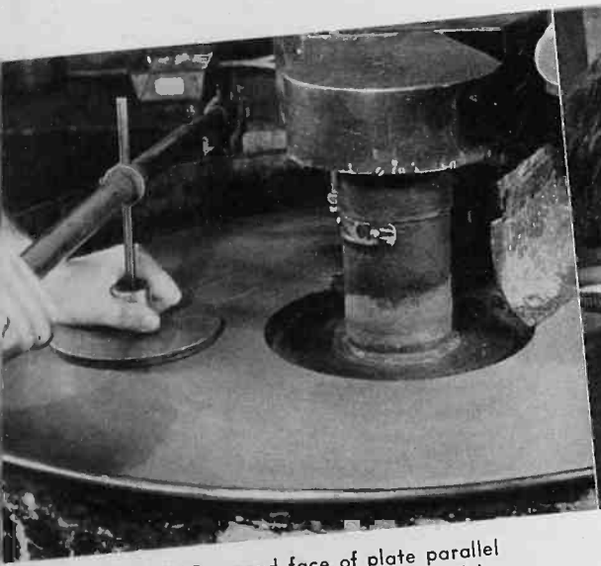
STEPS in manufacture of BT low temperature coefficient quartz plates for use in mobile radio equipment.

All pictures made by O. M. Hovgaard at Bell Telephone Laboratories

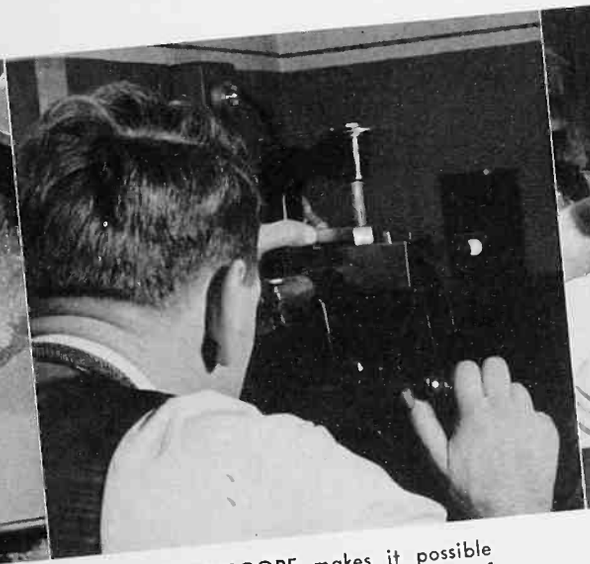


TWINNING (series of red and green stripes) located by means of polariscope. This defective area too goes under the knife—ends in the scrap heap.

MEASURING raw crystal prior to sawing it into sections. Sections are cut into slabs—then rough blanks.



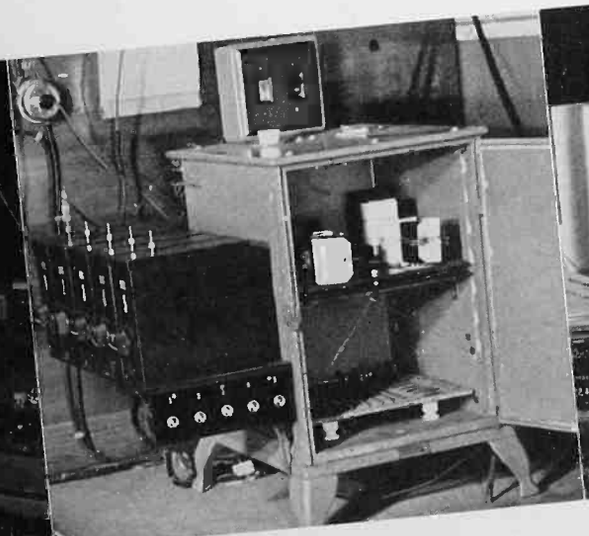
GRINDING second face of plate parallel to first. Rate of lapping is determined by pressure exerted by experienced operator.



POLARISCOPE makes it possible to correctly check orientation of quartz crystal as it continues its journey through the shop.

GROOMED for same frequency, groups of plates are lapped together. Required flatness and thickness are attained to an accuracy of 20 millionths of an inch.

CIRCUITS, simulating those in which quartz plates will actually be used, are employed in final adjustment to exact frequency.



FINAL check—crystals operating in typical circuits while ambient temperature is varied in oven throughout range to which they will be subjected in the field.

LINE-UP—702A oscillators awaiting 7A quartz plates which will control frequencies of various broadcasting stations.

Grinding crystals is a science in itself, calling for an accuracy even greater than that of the lens maker.

(*Continued from Page 7*)

do when it takes over the big job of maintaining a fixed frequency for the particular transmitter it will eventually control.

Two more cutting operations follow which slice the sections to slabs, then blanks. Each time the quartz is mounted in the cutting machine with the utmost accuracy to make sure that the axes of the natural crystal are in the correct positions. Once more it is inspected for twinning and the rough burrs on the edges ground off on a large flat disk smeared with carborundum paste. Guided by a fine measuring rule the operator now draws with pencil the pattern of the crystal, square or rectangular as the case may be, on the rough blank. You notice how careful he is not to include any of those defective portions in the area of the drawn crystal. Next the pencilled figure is trimmed from the blank on a special diamond saw. The rough crystals are now cemented to a metal holder and placed under the x-ray machine for further tests of axes.

Determination of the axes of the crystal at this stage is one of the most important steps in its entire manufacture, because upon it hinges the success of the finished product. The Laboratories determine the axes to within six minutes, or one-tenth of a degree. Such accuracy can be attained only through the use of the x-ray. All commercial crystals produced by the Laboratories are cut with this accuracy which permits a performance guarantee that no crystal will deviate more than two cycles per degree centigrade per megacycle. Actually more than fifty per cent of them are within one cycle.

Once this axis reference point is established, not even the slightest deviation from this point is permitted while the face of the crystal is brought into the axis plane. The other side of the crystal is then brought into a parallel plane.

Up to this stage the crystals have been of uniform thickness. Now they begin to take on individual form according to the frequency of the transmitter they are being groomed to control. Frequency control, you discover, depends on the thickness and dimensions of the blank—the thinner the crystal the higher the frequency at which it oscillates. When completed the blanks will range all the way from 18 millimeters square and 0.2 millimeters in thickness to 55 millimeters square and 7.60 millimeters thickness. Rectangular crystals vary similarly in size. If you are not up on your millimeters, picture an ordinary three-cent postage stamp cut in four equal parts and you have your smallest crystal blank. The larger crystals are just about the area and thickness of a small graham cracker. The 18 millimeter sliver may oscillate at an ultra-high frequency of 14,000,000 cycles while its big brother maintains frequencies as low as 250,000 cycles.

Crystals come out of the Laboratories in an endless variety of shapes and sizes, each one designed to do a particular type of work. You will see one crystal having a frequency of 550 kc. and the approximate shape of a soda cracker, and another with exactly the same frequency, yet whose size is about one-fourth of an inch square.

The first thinning process, known as a "rough grind," takes place on a large flat disk with the aid of the familiar carborundum abrasive. Edges are also ground to the approximate dimensions required for the finished crystal. Again the hard worked blanks are on the move. This time to the lapping room where they are mounted clockwise fashion in circular metal nests (from eight to twelve in one nest). Lapping or grinding down the faces of the crystals in these nests is still a machine job and is designated as "rough lapping."

From the nests they go to a precision lapping machine and, held flat to within plus or minus 20 millionths of an inch, they again dwindle in thickness. During lapping operations the crystals make frequent trips to the x-ray room to be checked for proper angle. Groups of crystals of the same dimensions are "finished edged" to the correct size within .01 millimeter of the desired surface area, or to an accuracy equal to about the thickness of a human hair.

These intricate operations of cutting, lapping, x-raying and edging are only half the story of crystal oscillators in the making, you learn, as you finish your tour of the quartz shop and enter the calibrating room. Here the climax of the tale is reached, for calibrating is THE most delicate and precise operation in the whole romantic history of quartz crystals.

To the non-engineering-minded visitor the calibrating laboratory seems a confusing labyrinth of black transmitter cabinets, power generators, oscillograph circuits, switches and more switches, ice boxes, ovens, polishing plates and again the mucky carborundum paste. Voltage cables and coupling cables zigzag across the ceiling and signs reading "Caution—High Voltage" hold up a warning finger. The whole outfit seems so mammoth compared to the diminutive bits of quartz awaiting final tests.

Men are talking of hops and wiggles, frequencies and output stability, cycles and kilocycles, temperature coefficient and heat-runs.

"Hey, Bill—is that 23A in circuit?" "Better check this 16B for hops." "How's the 19A coming?"

Suddenly a shrill sound like a fire siren shatters the quiet of the room and sends a jittery feeling down your spine. It rises to a crescendo and quickly dies. That, the supervisor explains, is the beat note of a crystal oscillator in a testing circuit.

On leaving the lapping room the crystals have been placed in small cardboard boxes. The printed figures on the cover of the box show the cut of the crystal, its dimensions, the frequency it must

(*Continued on Page 32*)

Two-way Radio Patrols Canton, Ohio

A complete new motor patrol fleet, armed with Western Electric two-way police radio equipment, recently rolled into action in Canton, Ohio.

In dedicating the new system Mayor Seccombe said to the police radio motor patrol squad, "We have given you the best equipment money can buy and we want you to use it in the service of the taxpayer. You have everything necessary for good work and it is up to you men to prove this a good investment."

The system is operated by remote control from headquarters. The 16B 50 watt ultra-high frequency transmitter and a 19A receiver are installed on the roof of the First National Bank building. A special structure was erected to house the transmitter, receiver and frequency measuring equipment. The antenna, also installed on the roof is approximately 230 feet in the air.

From this building direct lines lead to Police Headquarters' dispatching room located on the second floor of the Safety Building. Here an 89A amplifier and loud speaker set are installed. There is in addition a receiver tuned to 1596 KC which is the frequency of the Ohio State Patrol station WPHC at Massillon. With this station, also equipped with a 19A receiver, two-way communication between Canton and WPHC is possible. Thus Canton is in direct communication with an agency which can reach all Ohio State troopers, sheriffs of surrounding counties and other states. With such a widespread, protective network always in readiness officials feel well equipped to deal with crime.

Ten cruisers and a specially constructed bandit sedan comprise the motor patrol fleet. All are equipped with 18A 5 watt ultra-high frequency transmitters, 18B ultra-high frequency receivers and telephone type handsets. Car transmitters as well as the headquarters' transmitter are crystal controlled. The cars have individual call letters starting with W8XMK and ending with W8XMU. Five cruisers, assigned to strategic positions around the city are in operation 24 hours a day. These are supplied with fire extinguishers, sawed-off shot guns, rifles, night sticks and flares in addition to the regular revolvers and blackjacks ordinarily carried by members of the force. A sixth car is held in reserve at headquarters for emergency use and for special call runs. Each of these six bears the insignia "Radio Patrol."

Three more cars without insignia are at the disposal of the detective bureau. A tenth car is used entirely by the vice squad. The bandit sedan is stationed at police headquarters and goes out only on bandit calls. For this type of service the car has bullet-proof body and glass as well as a sub-machine gun, a tear gas gun, two shot guns and rifles and a portable spotlight. Portholes are provided for firing.

For the first time in the history of the Canton police department, the cruisers are being used as an auxiliary to the fire department. Each car carries a two-gallon fire extinguisher and two small extinguishers. Cruisers answer all fire calls. Since such calls are transmitted directly to the cars by radio, thereby enabling them to reach the scene almost immediately, radio patrolmen frequently put out fires before they get too far under way. In some cases this avoids the necessity for calling out an entire fire company and thus a decided saving in municipal expense

(*Continued on Page 24*)

Right: Engineer Nolan S. Walker demonstrates how quickly mobile transmitters may be removed from metal cabinets for inspection.

Left: Canton's motor patrolmen are constantly in communication with headquarters through their two-way ultra-high radio equipment.

Low-Power Stations Now Rival Big Brothers in Technical Facilities

One of the outstanding developments in broadcasting in recent years has been the extensive improvements in low power stations. Today the only difference to be found between the small station and its larger brother is in the power of its signal. Personnel, equipment, physical layout and quality of program rival that of the finest stations on the air.

As an indication of this trend 37 stations have purchased the Western Electric 310 type transmitter which made its bow to the broadcasting world just a year ago. This ultra-modern equipment gave such high fidelity performance for low powered stations that broadcasters raised it to stardom practically over night. Stations which put the 310 to work found it radiated the same high quality signal characteristic of the new high power stations. Listeners immediately sensed the improvement in reception and programs, wafted over the air channels through the medium of the 310, gained in popularity. The 100-250 watt station has indeed come into its own.

Broadcasting stations which have purchased 310 type transmitters are: WCLO, KGY, WMIN, KRKO, WMBH, WMBC, WIBX, KDB, KYOS, WJTN, WEXL, WHFC, WSGN, WCPO, KLS, WHDL, WKOK, KFXD, WRBL, WNNY, WFBG, KCMC, WLAP, WFOY, KMAC, KABC, WAIR, WBAX, WATL, WWAE, KFJB, KXRO, KRMC, KRE, KTKC, KSAL, KVOX.

The portfolio of stations displayed on the following pages shows the up-to-date transmitting equipment, the improved studio facilities and the attractive decorations so typical of many small stations throughout the country. From microphone to antenna they are ultra-modern.

Three stations now using the 310 type transmitter tell their stories in the following paragraphs.

KMAC—San Antonio

When the postman's bag grows bulgy that's news and good news, according to KMAC, San Antonio, Texas. The postman who stops at the doorstep has been delivering an ever-increasing amount of fan mail since the station started operating a new Western Electric 310B transmitter with one of the first shunt-excited antennas to be installed in the country. This written applause is as sweet to the eyes of the station's officials as the improved quality of reception is to the ears of Southwest Texas listeners.

Since its inception six years ago KMAC has expanded rapidly. During those first years the studios were located on the second floor of the Blue Bonnet Hotel, San Antonio's newest hotel at the time. The transmitter was installed on the roof. At this period KMAC was the only 100-watt station in Southwest Texas to boast of factory-built broadcasting equipment.

In 1933 Howard W. Davis, a capable leader with wide radio experience, took over the management of the organization. Plans were immediately put in motion for enlarging KMAC's facilities. By the end of 1934 the studios had been moved to the Smith-Young Tower, situated in the central part of the city. Located on the 27th floor of the Tower the studios are far removed from street noises. The attractive new quarters, decorated in modernistic style and acoustically treated, served as a stepping stone to further expansion.

Early in 1936 it was decided to install a complete new transmitting plant and studio equipment. Granted a daytime power of 250 watts, station officials selected the Western Electric 310B transmitter to carry on KMAC's broadcasting job. Western Electric 23A speech input equipment and eight-ball microphones were installed in the studios as well as a Salt Shaker microphone for the announcer's booth. Another 23A was set up at the transmitter where remote programs are handled. Cecil Ross of the Graybar Electric Company supervised the installation.

The new transmitter building which was erected on a plot 600 feet by 400 feet in the central part of the city is a four-room structure of fieldstone and houses a bedroom, bath and workshop as well as the transmitting equipment. Ground system for the 179-foot Blaw-Knox shunt-excited antenna tower required 29,000 feet of wire.

According to those Texas boys who did the installing everything went along swimmingly in more ways than one—it rained 37 days in succession while the job was in progress. Now it's all sunshine again for KMAC. The new equipment is working like a charm, with a 300 per cent increase in coverage, all local dead spots dissolved and a quality of transmission never before realized.

WFOY—St. Augustine

Over four hundred years ago, where Don Juan Ponce de Leon sought the "Fountain of Youth," wondering Indians watched strange white men erect the first permanent European settlement in the United States. Today, from this historic site in St.

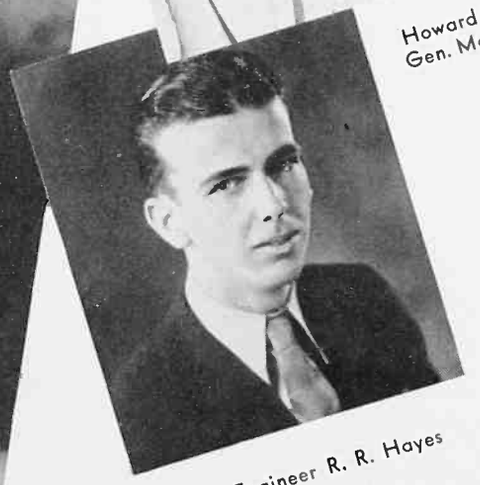
(*Continued on Page 41*)

A PORTFOLIO

OF LOW-POWER STATIONS

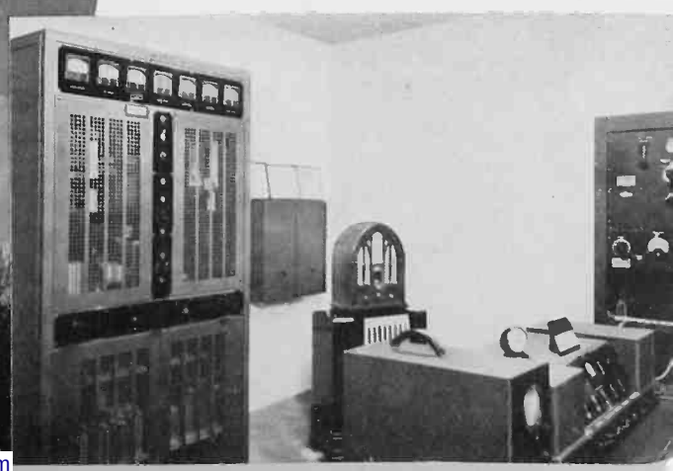
KMAC
SAN ANTONIO
TEXAS

Howard Davis
Gen. Manage



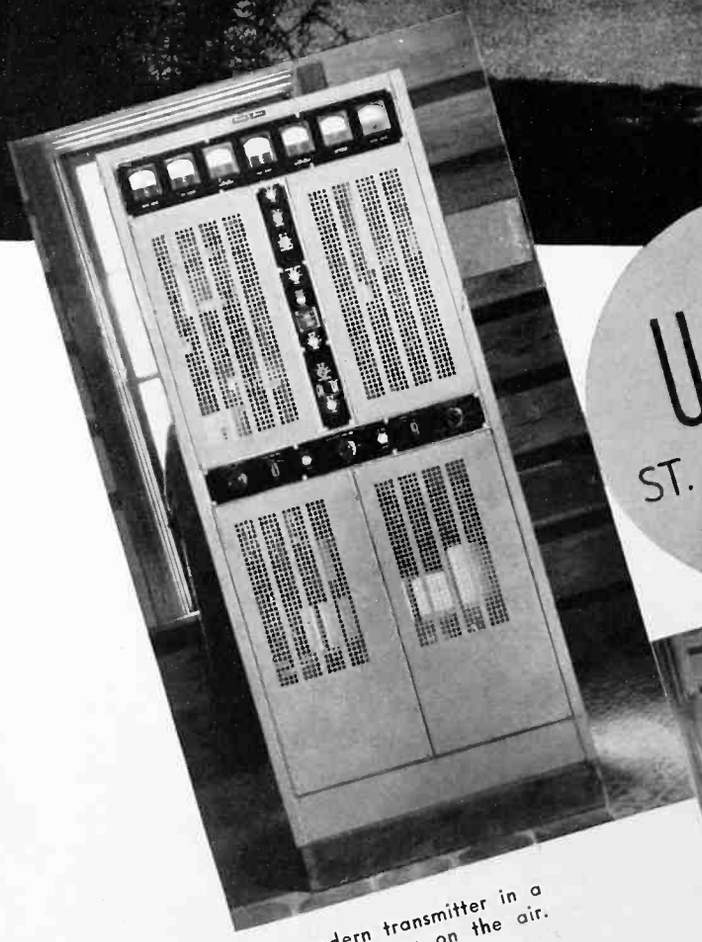
Chief Engineer R. R. Hayes

KMAC's antenna (photograph taken during construction) radiates a high fidelity signal over a wide territory. Transmitting room (below), with Western Electric 310 type transmitter at left and 23A speech input equipment on control desk.



WFOY
ST. AUGUSTINE FLORIDA

Log and moss roof and oyster-shelled walls form the quaint structure which houses WFOY broadcasting station in the famous "Fountain of Youth" park.



The 310A, ultra-modern transmitter in a 400 year old setting, goes on the air.

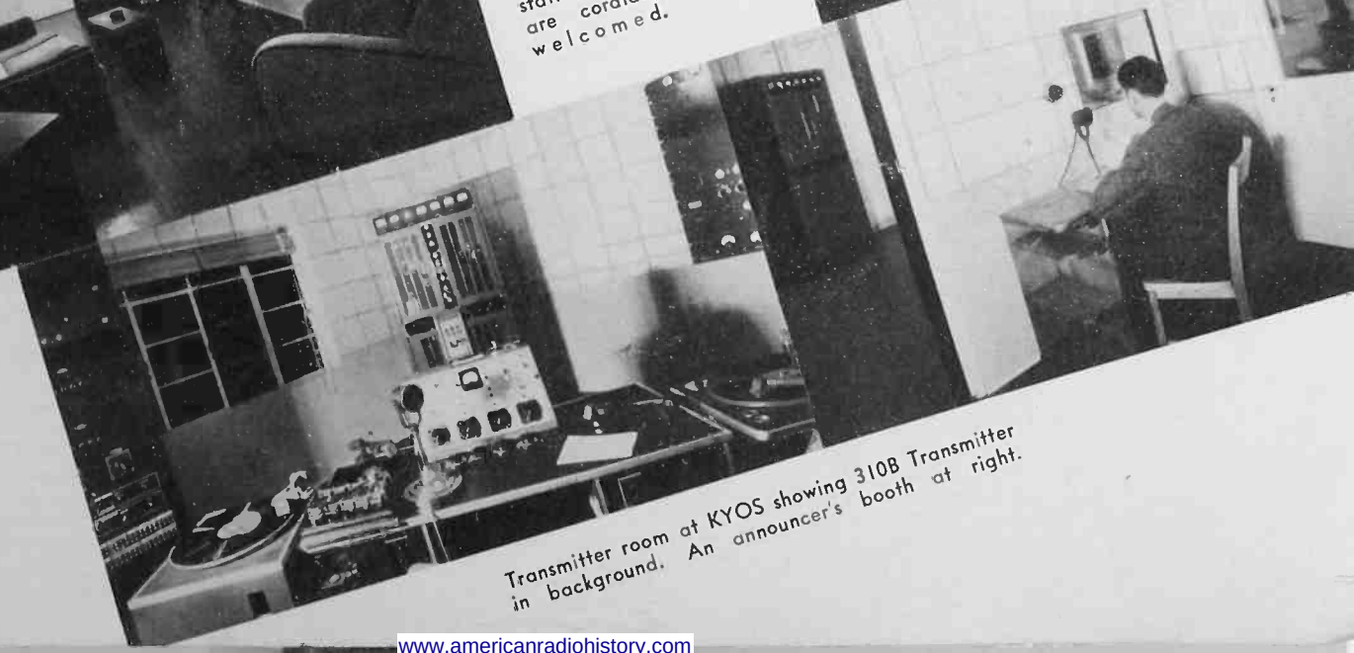
Celotex and worm-eaten cypress boards in their natural state panel the studio walls.

KYOS
MERCED CALIFORNIA

Typical example of the up-to-date small station which has gone modern in a big way.

One of the attractive studios from which KYOS programs are broadcast.

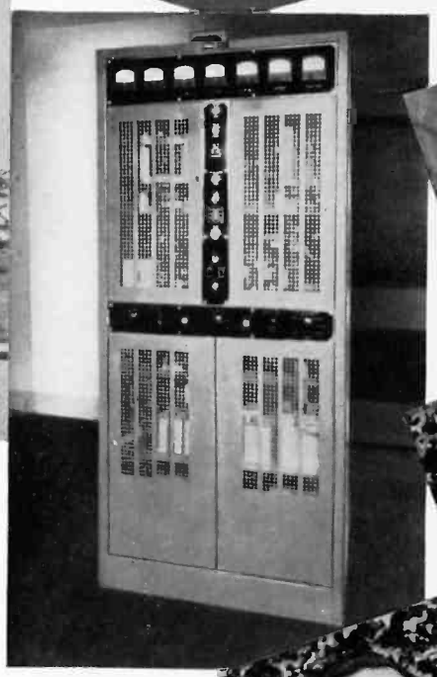
The reception lounge where station visitors are cordially welcomed.



Transmitter room at KYOS showing 310B Transmitter in background. An announcer's booth at right.

WMBH
JOPLIN MISSOURI

Looks are deceiving — this is not a private residence but the attractive suburban broadcasting station recently erected to house WMBH's new transmitting equipment. The Western Electric 310B transmitter is shown at the right.



Stewart Parsons, Studio Control Operator

J. C. Murphy, Studio Control Operator

R. J. Stark, Operator

Harry Butterfield, Operator

WEXL
ROYAL OAK MICHIGAN

With a lay-out like this you would expect nothing but the best from WEXL — 310 type transmitter in foreground.

J. Luther McFarland, Chief Engineer

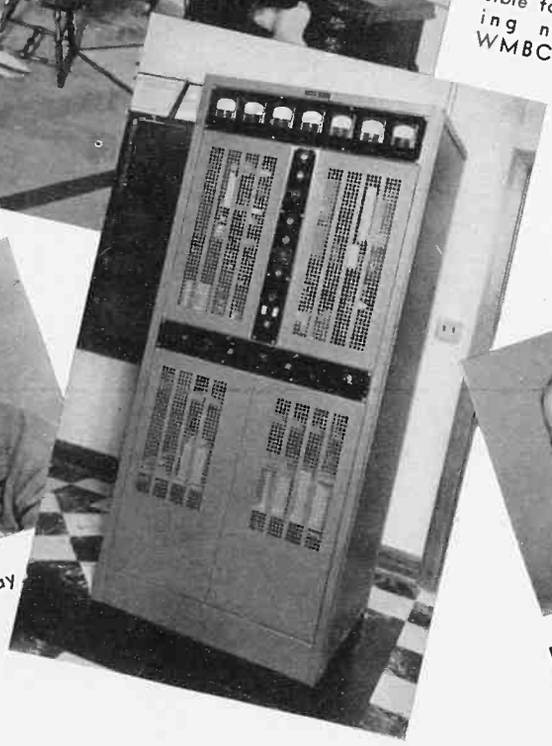
Jerome F. Steadley, Operator

Gilbert H. Rix, Operator

Charles V. Lundstedt, Operator

WMBC
DETROIT MICHIGAN

Only the presence of an Eight-Ball microphone on the desk shows that this comfortable sitting room is really one of WMBC's tastefully decorated studios.



The Western Electric transmitter responsible for the increasing numbers of WMBC's listeners.

Ray A. Johnston

Karl J. Scheiern

Albert D. Hayward

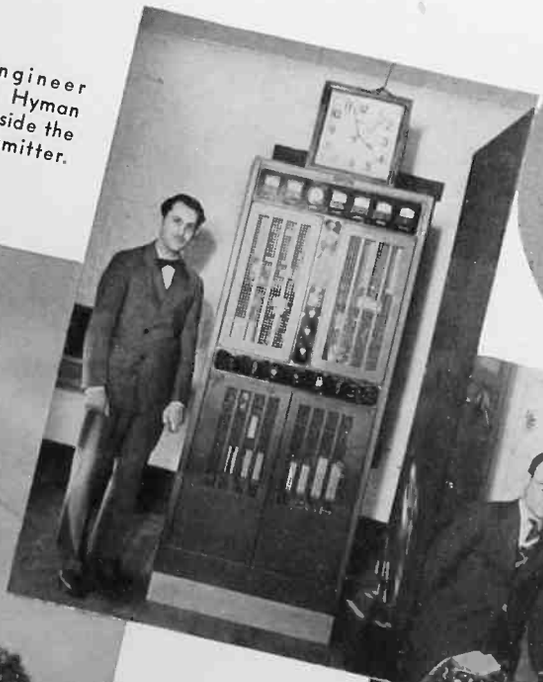
W. J. Hay

Edward H. Clark
Chief Engineer

WMBC's efficient engineering staff.

KABC
SAN ANTONIO TEXAS

Chief Engineer Kenneth R. Hyman standing beside the 310B transmitter.



This cottage-like building houses KABC's transmitting equipment.

KABC's press room, with Business Manager Pat Baxter, Chief Engineer Hyman and Operator K. C. Cates.

Men of Radio—Makers of Miracles

Tribute to Members of the National Association of Broadcasters attending their Annual Convention, Hotel Sherman, Chicago, Ill., June 20 - 23, 1937

By MADELEINE MOSCHENROSS

OH, SURE. You can't call the men of radio miracle-makers—or the radio a miracle. They've been called lots of things by lots of people since 1920. But "miracle-makers"? Those pioneers whose imagination, ingenuity and skill tapped ceaselessly the then unknown resources of the air would be the first to decry such a description. Radio men, they'll argue, are just like men in any other trade. But are they?

Listen. A little old lady, completely blind, saw Hawaii not so long ago, and it was a beautiful adventure — one more in a series of adventures which have filled an otherwise empty existence. When the announcer moved his microphone she heard the swish and roar of the surf, became aware of the vivid color of sky and sea, the gayly dressed promenaders; listened to the peculiar voweling of Hawaiian singers and the plaintive twang of guitars.

Peek through the window of any home between twilight and dusk, where there are children. What do you see? A boy, chin cupped in hands, stares raptly into the wooden box before him, oblivious to his surroundings. A little girl sits eager and expectant. Horses clop-clop over mountain trails; airplanes zoom through space; voices bark out sharp commands—and another redskin bites the dust. Uncle Don admonishes, the Lullaby Lady croons, Popeye snorts, Pa and Ma dicker, and a million kids snicker and giggle, shudder and thrill because a radio engineer once fussed around with some wires and steel and crystal.

Homes which never before knew the sound of laughter or gayety have become brighter and cheerier places to live in . . . a man with a peculiar nasal drawl informs his listeners that "it's Town Hall tonight" and unfortunates in prisons, veterans in hospitals, lonely mariners on lonelier seas, overworked mothers and underpaid fathers forget for a brief fun-filled hour that sometimes the burdens of life are heavy . . . and shut-ins all over the globe take a new lease on life.

Sermons for the spiritually-minded . . . symphonies and operas for music-lovers . . . educational journeys for the ambitious . . . recipes for the housewives . . . swing-stuff for dancing feet, "blues" for the sentimental, and Wayne King for everybody. Fun for the "old folks"—brought to them by the Irish and German, Polish and Jewish hours . . . and always the incredible phenomenon of "seeing" history in the making. Truly radio has packed some powerful thrills in an era filled with history-making events.

A giant dirigible crashes to earth, and a listening mother in Germany sends up a prayer . . . a popular monarch abdicates . . . another is crowned . . . and 180,000,000 listeners, in every corner of the globe, are "present" . . . ice-bound Arctic explorers take heart at the sound of familiar voices many thousands of miles away . . . fliers outwit storms . . . atoms are shattered . . . Broadway on New Year's Eve comes to a wistful listener down in the heart of Kentucky. . . .

Programs are sometimes dull. Comedians become unfunny. The advertising annoys. But you can't blame the "men of radio" for that. They are concerned with but one thing: to give the world a vehicle through which can be poured the greatest amount of good in the largest doses to the greatest number of listeners in the best possible fashion . . . a vehicle called one of the world's blessings to mankind.

Oh, sure. You can't call the men of radio miracle-makers, or the radio a miracle. Nevertheless, we're going to!

GREETINGS FROM PRESIDENTS OF NAB

CHARLES W. MYERS, President, National Association of Broadcasters—I consider the progress of the Bureau of Copyrights, providing a library of tax free music for broadcasting, the most important activity of the past year. Ten continuous playing hours of music have been recorded and are ready for distribution and it is planned to have an additional 15 hours ready for use by July 1st. The work of the Bureau has been discussed by the Board of Directors and a report sent to the membership.

The industry is confronted with many problems such as the threatened wattage tax, the proposed reallocation of frequencies and the activities of individual states in copyright legislation, all of which will be subject to serious discussion at the convention.

EUGENE F. McDONALD, JR. (1923-1925)—I take particular pleasure in this greeting as I was the first president of the National Association of Broadcasters. How little resemblance our present large organization bears to the mere handful of broadcasters who used to gather in the tower of the Drake Hotel in 1923 even before the Radio Manufacturers Association was organized.

I smile a wee bit of a smile when I think how we talked in those early days about having "the last word" in transmission and receivers. So far as I am concerned radio progress knows no "last word." We must be satisfied with "the latest word," knowing there is always one more word just beyond.

FRANK W. ELLIOTT (1925-1926)—My heartiest best wishes to the radio industry for its contribution to better living with radio. I send my cordial greetings to all those radio men with whom I have had such pleasant relations since 1922. I am moving to Denver, Colo., soon and will welcome any old friends in the Steele Building.

EARLE C. ANTHONY (1926-1928)—Having followed closely the activities of the National Association of Broadcasters since its infancy, it is with whole-hearted pleasure that I find a more closely knit organization as each year goes by. The invaluable part played by the NAB in attacking the serious problems of this new industry should not be discounted by any member of the broadcasting business. I feel confident that the Association will continue its aggressive and productive years.

WILLIAM S. HEDGES (1928-1930)—The fifteenth Annual Convention of the National Association of Broadcasters represents another milestone in the progress of the broadcasting industry.

When a small group of us met in Chicago in 1923 to establish the National Association of Broadcasters I venture to say that none of us visualized the vast growth that broadcasting would enjoy. In 15 years the industry has achieved an economic foundation which insures the perpetuation of the highest type of service enjoyed by the listeners of any nation in the world.

I pay homage to the men and women of broadcasting who have contributed to the advancement of the industry.

WALTER J. DAMM (1930-1931)—There are those who still say that radio is in its swaddling clothes; those who deny the fact and insist that radio today is big business and those who still call it a game.

In my humble opinion, radio, within the past few years, has not only come into its own as an entertainment, educational and advertising medium, but it has done so through the efforts of good business management, by men who for the most part have grown up in the industry and who have come to appreciate that to continue in business radio must first, last and always subordinate any thought of selfish interests to those of the listener.

The forthcoming NAB convention again gives these men an opportunity to exchange ideas and to discuss the problems of the industry.

HARRY SHAW (1931-1932)—Greetings to the annual convention of the National Association of Broadcasters! Your progress and development is a record of hard work and clear thinking of which you may be proud. May this convention be the greatest of all. It is another milestone in the progress of a great industry.

J. T. WARD (1932-1933)—Heartiest greetings to all members of the National Association of Broadcasters!

Our industry has not only weathered the storm of the past depression era but showed consistent growth. This should be an indication to all of us as to what we can expect in the future, with the bright prospects for increased business, especially to those who do not lose sight of the fact that in the operation of a broadcasting station a tremendous obligation of public trust rests upon our shoulders. Best wishes to all.

ALFRED J. McCOSKER (1933-1935)—I appreciate this opportunity to extend greetings to my fellow members in the National Association of Broadcasters. I am looking forward to being with them once again in Chicago, and it is my hope that this gathering will prove a forward step in the administration of the radio industry.

LEO J. FITZPATRICK (1935-1936)—There are still many problems which confront the radio industry, and I again urge, as I have so often in the past, that we meet these problems with a united front. It is the only method with which we can fulfill the obligations and responsibilities that are inherently ours as the result of pioneering in this great field of radio.

C. W. Myers,
President

HAROLD HOUGH

GARDNER COWLES, JR.

JOHN ELMER

NATIONAL ASSOCIATION O

OFFICERS, DIRECTORS AND COMMITTEE CHAIRMEN

L. B. WILSON

EDWARD A. ALLEN

ARTHUR B. CHURCH

JOHN F. PATT

K M. RUSSELL

J. O. MALAND

RALPH R. BRUNTON

EDWIN W. CRAIG

BROADCASTERS

GORDON PERSONS

JOHN J. GILLEN, JR.

HARRY C. BUTCHER

ALFRED J. McCOSKER

H. K. CARPENTER

J. H. DeWITT, JR.

EUGENE P. O'FALLON

BURYL LOTTRIDGE

MARTIN B. CAMPBELL

One of American Airlines' Giant Flagship Skysleepers awaiting signal to take off for an overnight coast-to-coast flight.

Sleep a Thousand Miles While Radio Keeps Watch

May you sleep a thousand miles is the cheerful "good night" wish of American Airlines to its coast-to-coast passengers. If you are a confirmed sleepy-head you may stretch your slumber miles to sixteen hundred in the de luxe Skysleepers as they wing their way across the continent overnight. Over weather, above local disturbances, you fly in perpetual starlight. A panorama of midget cities, plains, forests and rivers or a carpet of fleecy clouds paves the course over which you travel. And throughout the quiet night radio keeps vigil.

Although thousands of feet above the earth the Flagship is in constant communication with the Airlines' ground stations along the route and, when necessary, with airport traffic control stations. Radio beam and beacon signal reception, too, safeguards the journey.

Each luxury plane is equipped with three complete Western Electric radio receiving systems. The Department of Commerce beam signals and weather reports are picked up on 14B receivers. Company communications come through on 12D receivers via short wave. As an auxiliary receiver the 17A is installed. This is provided with separate batteries to assure performance in case all other electric power fails.

For transmitting calls from plane to ground stations Western Electric 13C 50 watt transmitters are used. Although the planes are seldom more than 100 miles from the nearest ground station the transmitters are powerful enough to be heard from coast to coast. The Airlines' 41 ground stations are equipped with Western Electric radio telephone transmitters which serve to carry on communications between pilots and station operators.

Thus the operations office is kept completely informed as to the progress of the flight and weather conditions actually encountered along the route. This helps in planning other flights over the same course. In addition, the pilot has at his finger tips at all times the latest developments on weather ahead.

According to American Airlines' officials approximately 30,000 such contacts are completed every month over their cross-country network. The 150 ground station operators are trained through years of experience in this particular type of work. That very little is left to chance is proven by the fact that an average of 99.6 per cent of these contacts are completed.

Such perfection of contact completion would, of course, be impossible without a corresponding perfection of operating performance from the aircraft and ground station transmitters and receivers. A crew of 38 radio maintenance experts throughout the system make this performance possible. Upon the arrival of each ship at its destination the entire installation is thoroughly checked. Any irregularities in operating performance en route reported by the pilot are given special attention. All such faults are remedied before the ship is allowed to leave again. Then, approximately an hour before each departure, the ship's radio equipment is given a final check.

With such assurance of safety and comfort it is little wonder that American Airlines recently made the record of carrying one million passengers.

Radio Patrols Canton

(*Continued from Page 11*)

is effected. Plans are in progress to install a receiver in the fire chief's car so that when he is on a fire call radio police may communicate with him.

According to Nolan S. Walker, engineer in charge of operation and maintenance, the transmission and reception from any point in the city is of the highest quality. He estimates that the radio department handles over 40 calls a day and that the average time required to answer a call is only two and a quarter minutes.

Mr. Walker stresses periodic servicing of equipment saying, "All cars are serviced regularly and frequency checked constantly. Batteries are washed weekly and new grease applied to terminals to prevent corrosion. Since the system went into operation we have not changed half a dozen batteries. The headquarters transmitter is inspected daily to make sure of good service. I cannot praise the system too highly. It has rendered a great public service and will do even a better job when all of the duties it can perform have been thoroughly worked out."

Western Electric Transmitters

Broadcast — Police — Aviation — Marine

1.—310 Type Radio Transmitting Equipment
Carrier Power Output: 100 Watts, 250 Watts
Service: Radio Broadcasting—High Fidelity

2.—350C-1 Radio Transmitting Equipment
Carrier Power Output: 100 Watts
Alternate Operation: Can be used as a driver for 353E-1 or 355D-1 Radio Transmitting Equipments
Service: Radio Broadcasting—High Fidelity

3.—353E-1 Radio Transmitting Equipment
Carrier Power Output: 1000 Watts (can be reduced to 2500 or 1000 watts)
Service: Radio Broadcasting—High Fidelity

4.—355E-1 Radio Transmitting Equipment
Carrier Power Output: 5 Kilowatts (can be reduced to 2500 or 1000 watts)
Service: Radio Broadcasting—High Fidelity

5.—407A-1 Radio Transmitting Equipment
Carrier Power Output: 50 Kilowatts
Service: Radio Broadcasting—High Fidelity

6.—309B Radio Transmitting Equipment
Carrier Power Output: 250 Watts, 500 Watts, 1000 Watts
Alternate Operation: the 15A transmitter (cabinet at left) may be operated without the amplifier as a 100 watt transmitter
Service: Police Radio
Frequency Range: 1500 to 3000 kilocycles

7.—214A Radio Telephone Equipment
Carrier Power Output: 50 to 500 Watts
Alternate Operation: the 16B transmitter (cabinet at left) may be used as a single unit to deliver an output of 50 watts, or with the amplifier, as illustrated, an output up to 500 watts
Type of Transmission: Ultra-high Frequency Radio Telephone
Service: Ultra-high Frequency Broadcasting, Police Radio Telephone
Frequency Range: 16B Radio Transmitter, 30,000 to 60,000 kilocycles; 214A Radio Telephone Equipment, 30,000 to 42,000 kilocycles.

8.—10 Channel (14 Type) Radio Transmitting Equipment
Carrier Power Output: 400 Watts
Type of Transmission: Radio Telephone, CW and MCW Telegraph
Service: Aviation, Police and Marine Radio
Frequency Range: 2,000 to 18,000 kilocycles

9.—9C Radio Transmitter
Carrier Power Output: 400 Watts
Type of Transmission: Radio Telephone
Service: Aviation and Police Radio
Frequency Range: 1,500 to 6,000 kilocycles

10.—19A Radio Transmitter
Carrier Power Output: 10 Watts
Type of Transmission: Radio Telephone, CW and MCW Telegraph
Service: Aviation and Harborcraft Radio
Frequency Range: 2,000 to 7,000 kilocycles

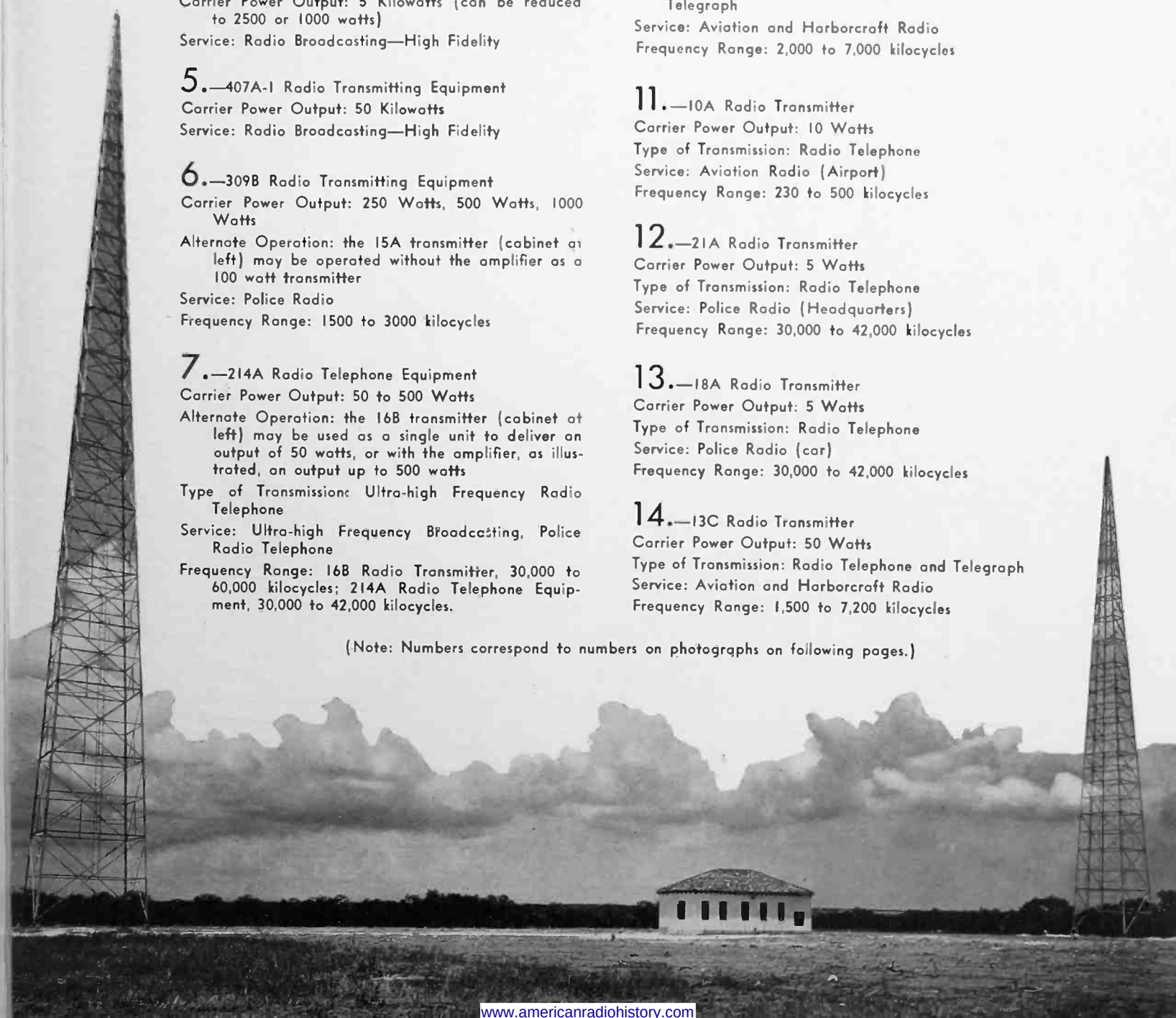
11.—10A Radio Transmitter
Carrier Power Output: 10 Watts
Type of Transmission: Radio Telephone
Service: Aviation Radio (Airport)
Frequency Range: 230 to 500 kilocycles

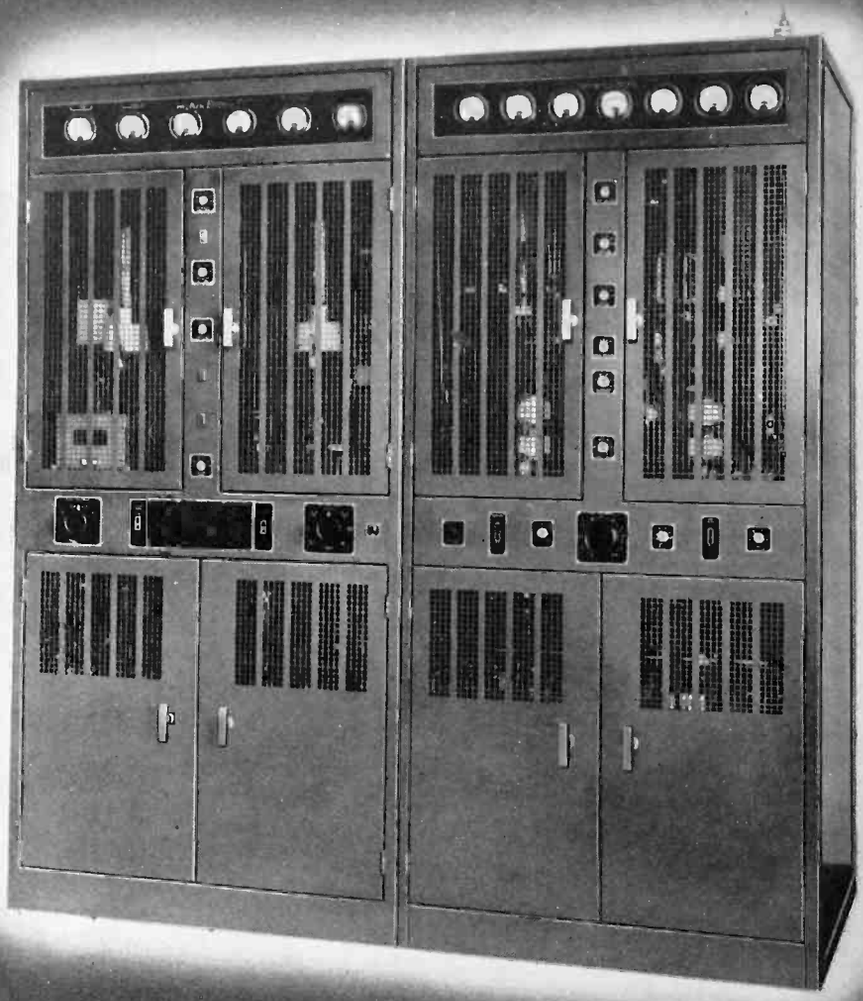
12.—21A Radio Transmitter
Carrier Power Output: 5 Watts
Type of Transmission: Radio Telephone
Service: Police Radio (Headquarters)
Frequency Range: 30,000 to 42,000 kilocycles

13.—18A Radio Transmitter
Carrier Power Output: 5 Watts
Type of Transmission: Radio Telephone
Service: Police Radio (car)
Frequency Range: 30,000 to 42,000 kilocycles

14.—13C Radio Transmitter
Carrier Power Output: 50 Watts
Type of Transmission: Radio Telephone and Telegraph
Service: Aviation and Harborcraft Radio
Frequency Range: 1,500 to 7,200 kilocycles

(Note: Numbers correspond to numbers on photographs on following pages.)





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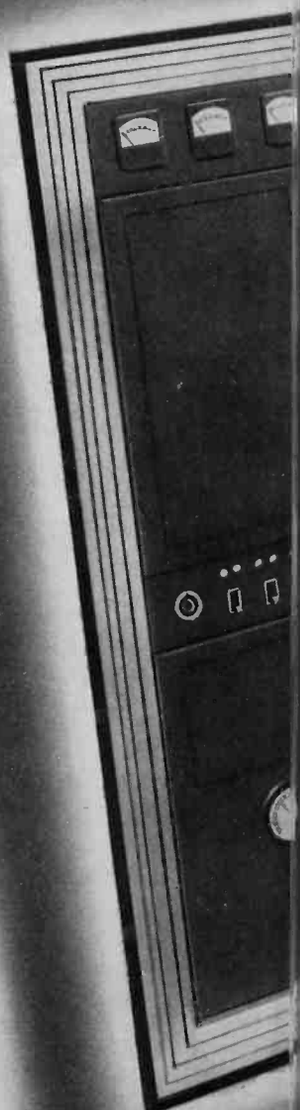
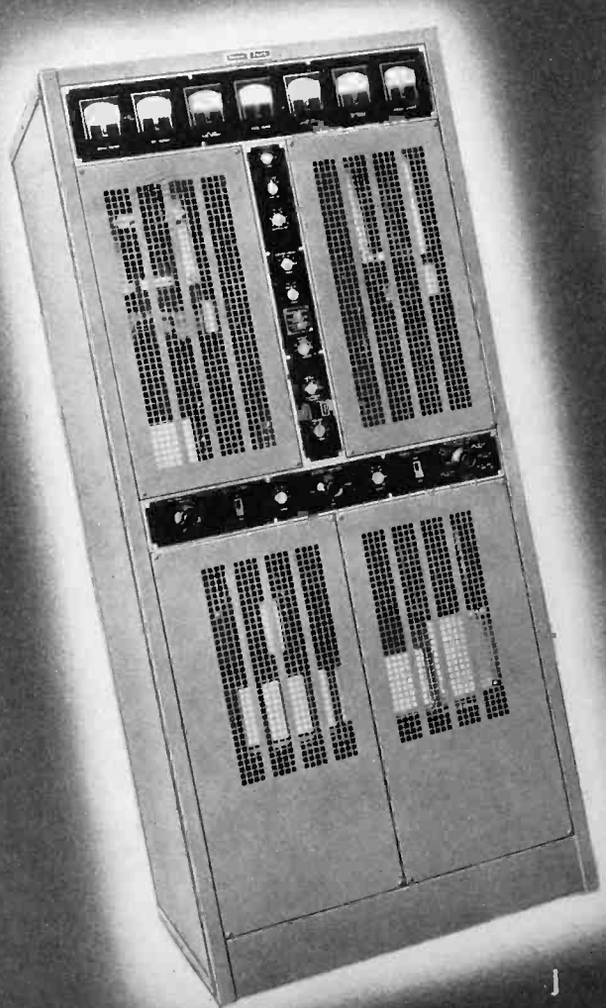
Western





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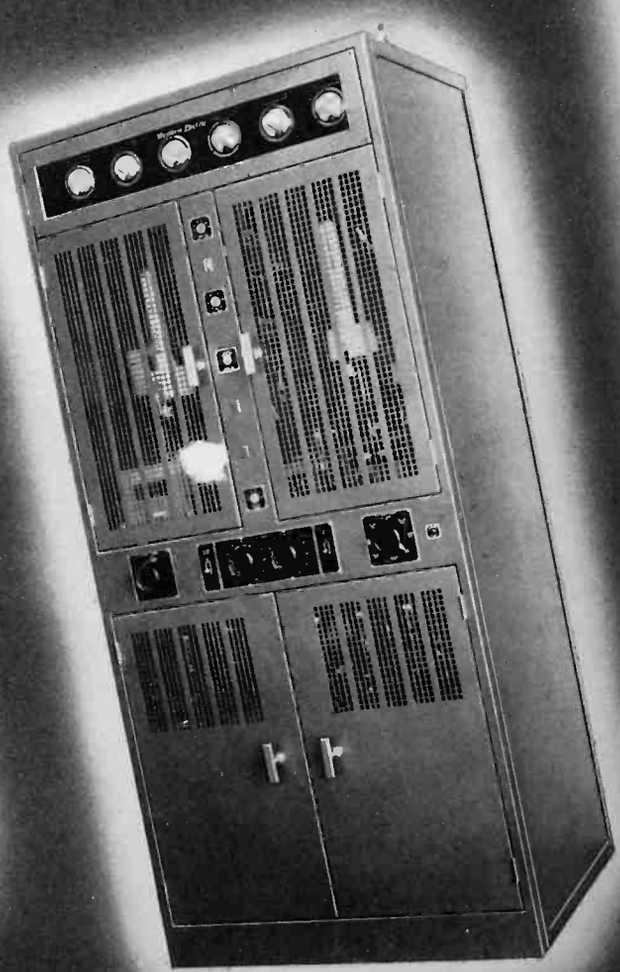

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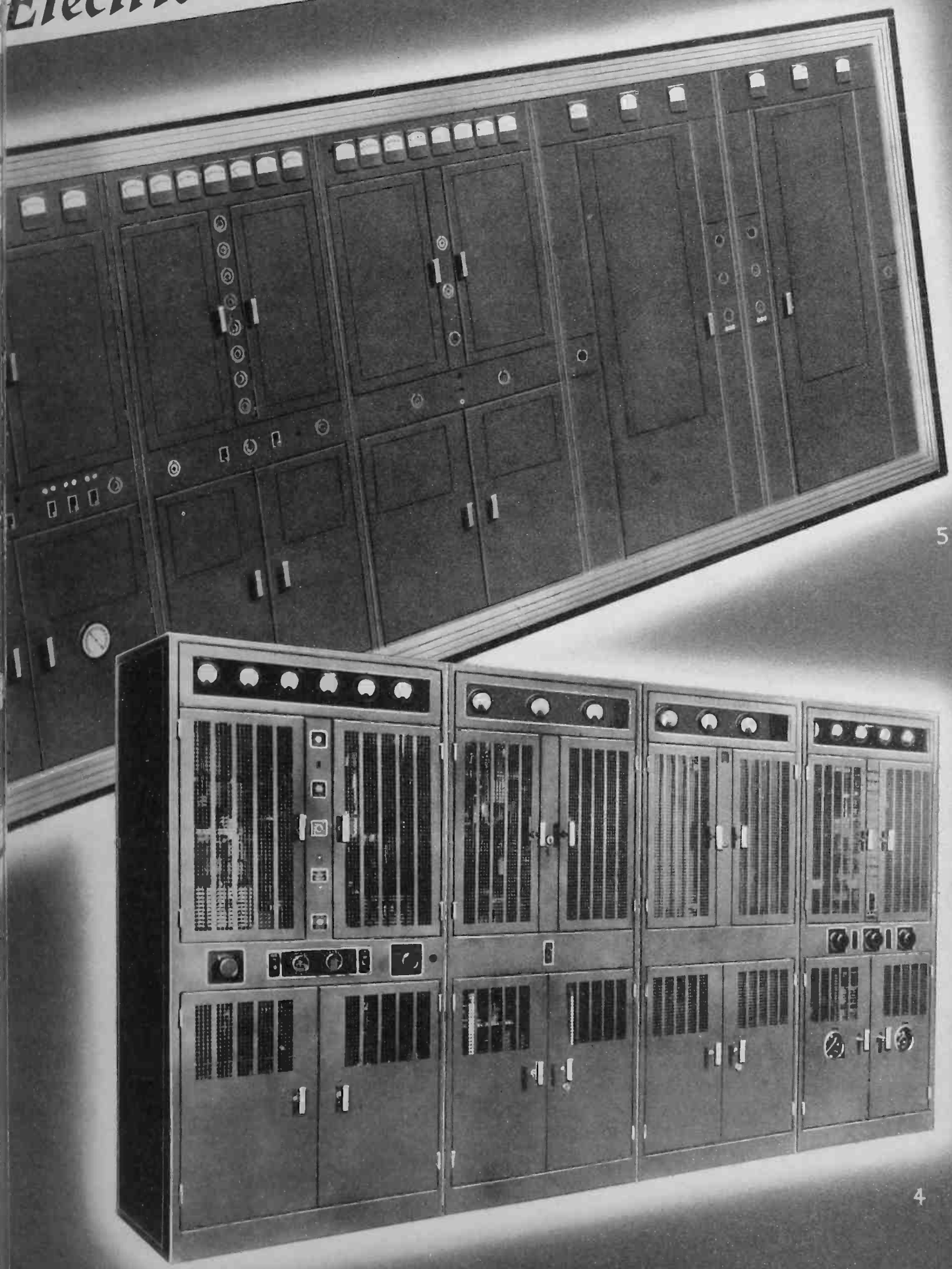
Electric BROADCAST TRANSMITTERS



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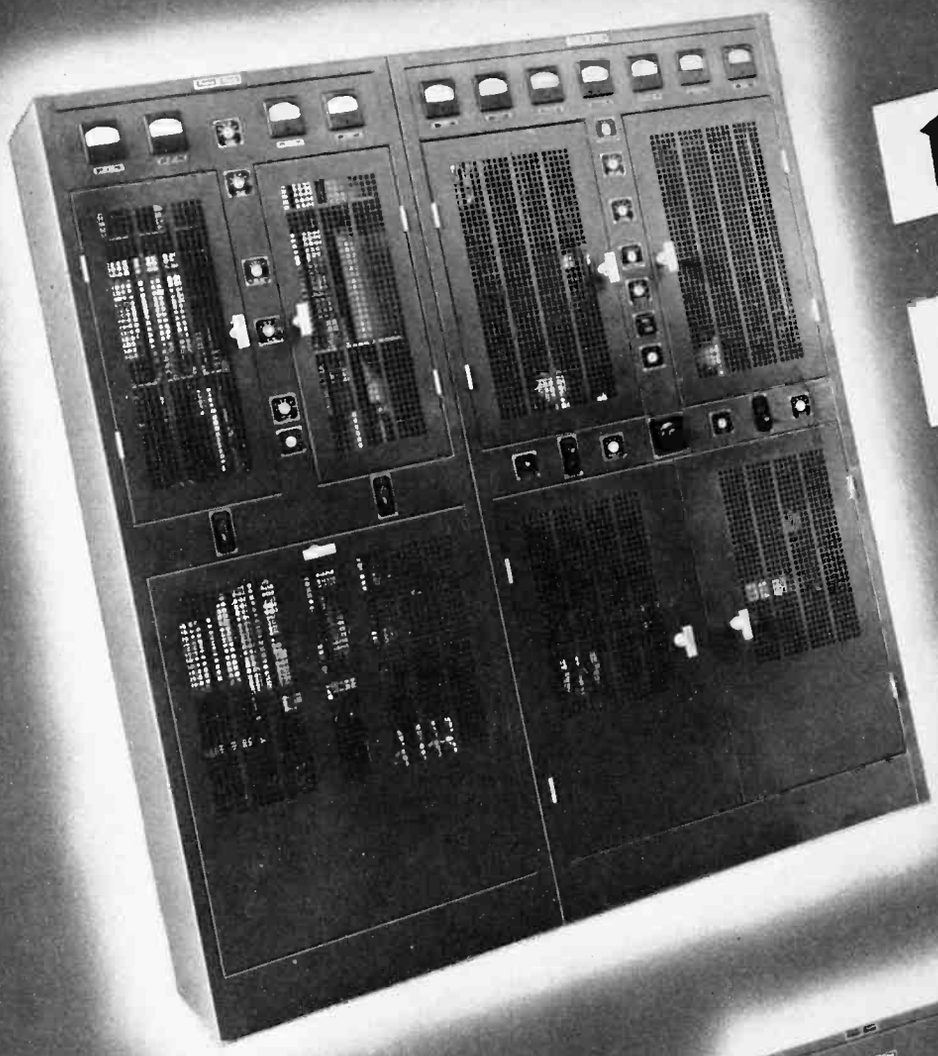
4

Western Electric

TRANSMITTERS

POLICE-AVIATION-MARIN



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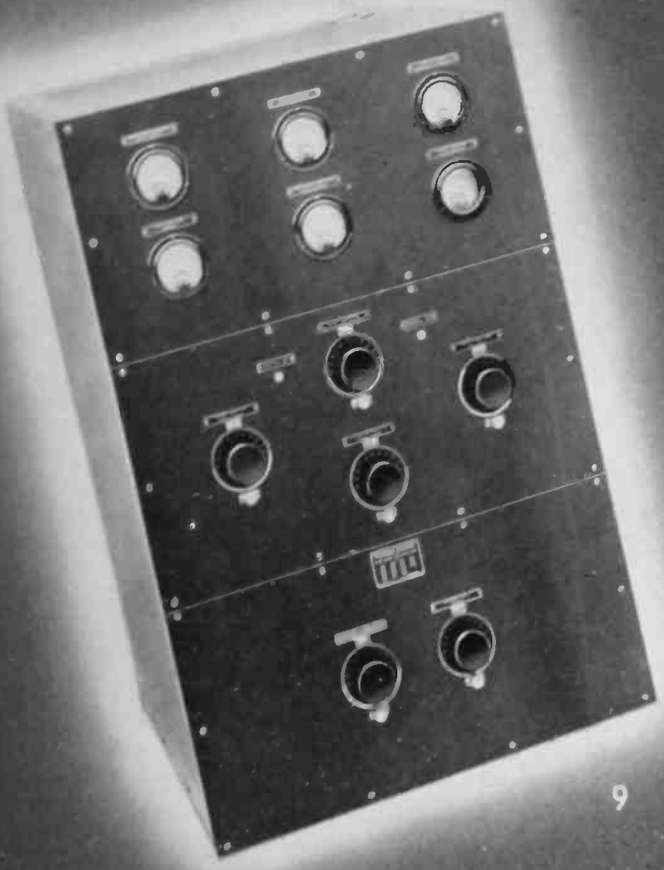

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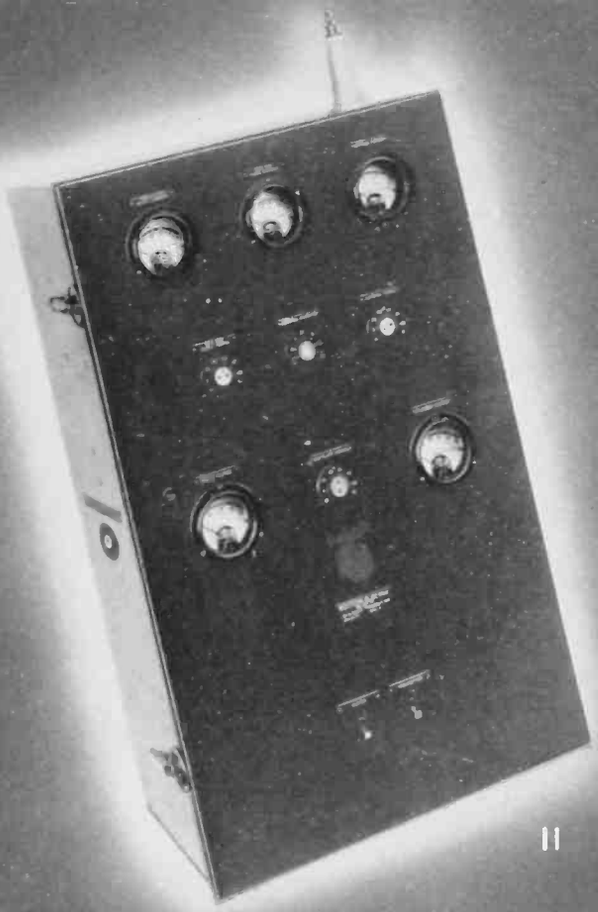

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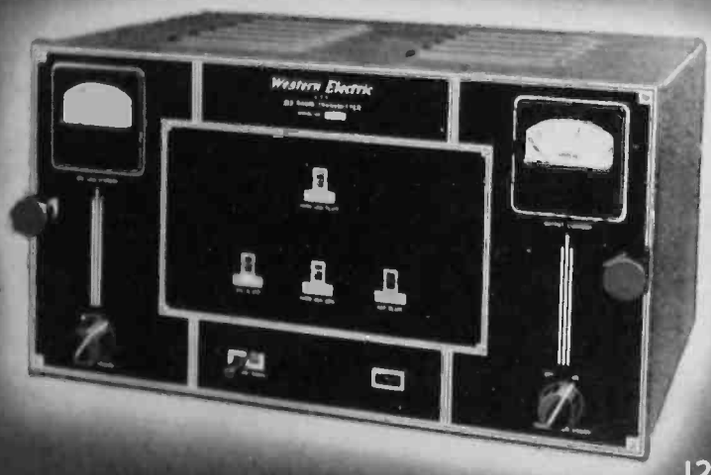

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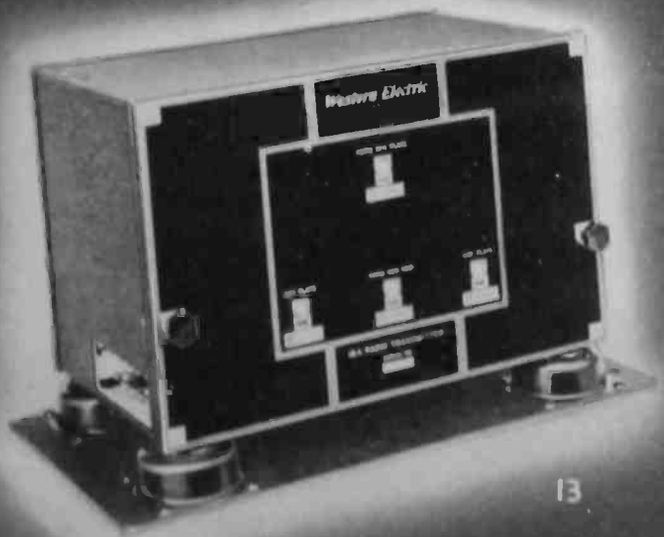

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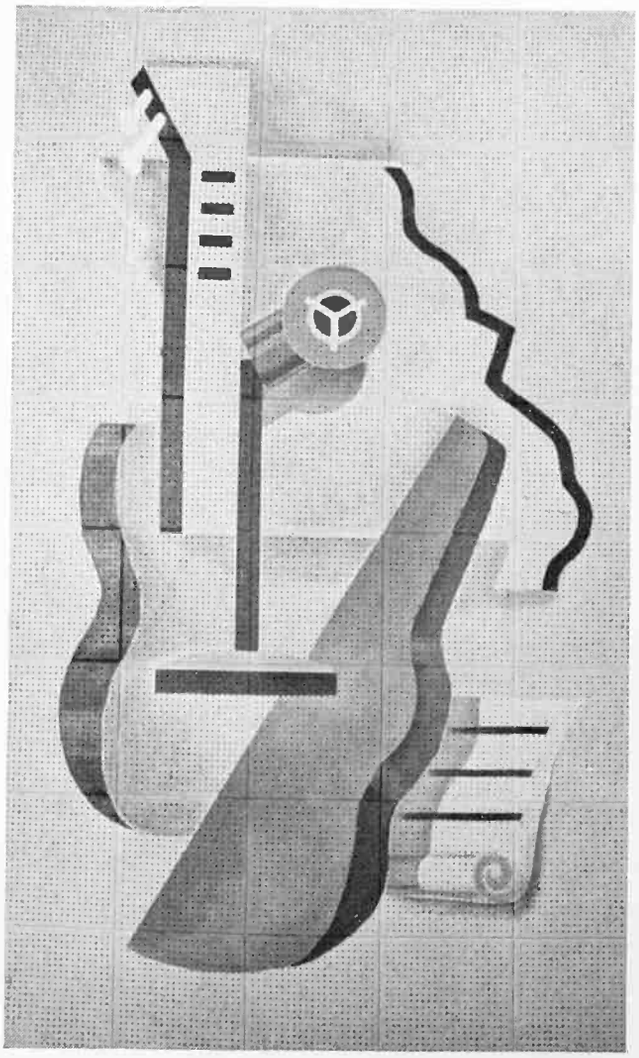
You Need a Microscope to Make This Microphone

From the Hawthorne Works of the Western Electric Company in Chicago, where for over half a century fine craftsmanship has been a tradition, comes another product, one that brings to the low price field high standards of precision and quality, the 633A "Salt Shaker" microphone.

Made by the men, and the women too, whose keen eyes and practiced hands are responsible for the thousands and thousands of items used by the communications industries, this microphone is a marvel of simplicity and precision. Beneath its smooth outer jacket, whose cylindrical shape and perforated top are the reasons for its nickname, is an unusual example of combined engineering skill and manufacturing efficiency.

Although this microphone was designed for the greatest possible simplicity so that it could be produced in quantity at low cost, the utmost care must be taken in the manufacture and assembly of the various parts in order to attain the desired high quality in the finished instrument.



A mike becomes a mural in the studio of KFRU, Columbia, Mo. — take a second look and you'll see the Salt Shaker.

The diaphragm, as delicate as a rose petal, is typical of the many parts that must be made to exacting tolerances. The thin film of insulation which isolates this fragile wafer from passing electrical currents is painted on with a fine camel's hair artist's brush, under the scrutiny of a microscope.

In several of the precise assembly operations the parts are so fragile that they cannot be picked up in the fingers, but must be lifted and placed in position by a small suction hose. This is done in placing the voice coil, eight-thousandths of an inch thick, into a gap twenty-thousandths of an inch wide. Extreme care must be exercised lest the coil touch the sides of this air-gap, as this would result in scratching noises while the microphone is in use.

Many of the assembly operations are carried on in an air-filtered and conditioned room, where, to further protect them against dust, the individual parts are stored under dust-proof covers very much like the usual bell-jar of the watchmaker. Despite all precautions an occasional chip or bit of dust will find its way into some crevice whence it must be removed by a special magnetized tool, moistened so that non-metallic particles also adhere to it. This operation, as delicate as removing a speck from the eye, is performed with the aid of a high-powered microscope.

An interesting test is made on the specially prepared silk screen that can be seen through the Salt Shaker's perforations. The ability of this screen to admit only a specified amount of air is thoroughly checked on an instrument closely resembling those used for testing blood pressure.

The completed microphone is well protected against hard usage. The three fins in Y formation are used mainly to protect the delicate mechanism from sudden increases in air pressure which might result if a speaker placed his hand directly on the perforations. For additional protection the tiny voice coil is cemented directly to the diaphragm and the diaphragm itself fastened directly to the magnet—neither one touching any other part of the microphone. Hence if the magnet should shift slightly in the case due to a severe physical shock, the critical adjustment of the diaphragm and coil would not be impaired.

Tested and checked at every step of the way, the finished "salt shaker" emerges as another Western Electric quality product of which the Hawthorne artisans can well feel proud.

Rugged enough to operate perfectly under the most unfavorable conditions, yet with quality that previously had been limited to studio broadcasting, the "salt shaker" has found favor with every user. With it, remote pick-ups come in with studio quality, and in control room or transmitting station, for spot broadcasts or announcements, it's a "natural."

MAKING A MIKE

Unusual skill, pin-point precision and meticulous manufacturing methods are required to make a high quality microphone. These scenes, showing details in the manufacture of the "Salt Shaker" microphone, were taken at the Hawthorne, Chicago, plant of Western Electric.

This lovely worker shows how the "Salt Shaker" got its name.

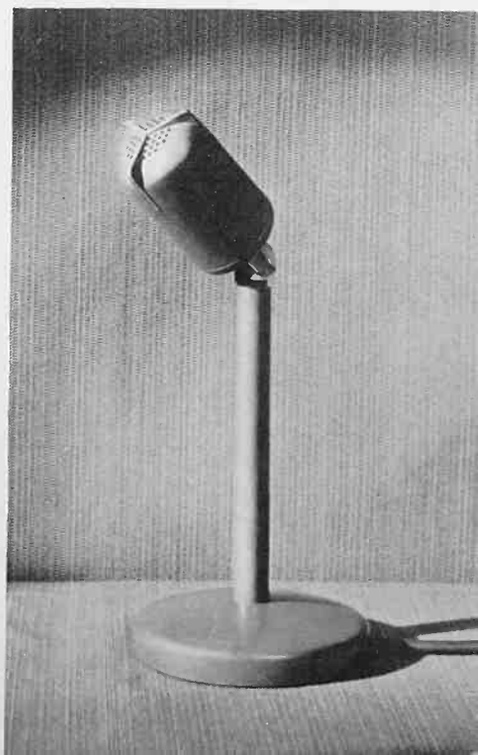
Like writing on a pinhead—this industrial artist deftly insulates the rim of the tissue-like diaphragm.

Centering the voice coil in the air gap. Parts are so delicate they must be picked up by "air fingers."

Checking air leakage. Just so much air—no more, no less—may filter through this silk-screen before it is accepted.

More fragile than spun glass, delicate diaphragms, formed by air pressure, are checked for pin holes over a brilliant light.

The finished "Salt Shaker," ready to do a quality job for broadcasting.



It Takes Science, Skill to Make Crystal Oscillators

(*Continued from Page 10*)

maintain and the type number of the transmitter it will control.

Two methods for testing the blanks are used—audible and visual. The audible method, you learn, matches the frequency beat note of the crystal against a standard beat note. This test is performed in a standard transmitter. When the crystal is oscillating correctly there is no sound. To accomplish this the crystal is gradually ground down by hand until zero beat is reached.

For the visual method the cathode ray oscillograph is used.

The operator who assumes guardianship of the blank when it leaves the lapping room hops back and forth from the calibrating circuits and the oscillograph to the lapping plates nearby. This is a finger-tip operation and an extremely delicate one as the crystals are nearing the desired thickness and only the smallest fraction of the surfaces or edges must be polished off at a time. Grinding the surfaces brings the frequency up to the specified frequency. Gently the operator presses the tiny crystal square round and round over the plate for by now it has been reduced to such fragile proportions that it can easily be crushed to a thousand splinters. Yet, they tell you, nothing can shatter it in a Western Electric transmitter except too high a voltage. Toward the end the polishing process becomes so precise that fine emery powder is used in place of carborundum.

The word "precise" is actually meaningless in describing this hand lapping process. There is no mechanical means of measuring such small increments, since the thickness of quartz lapped off at this stage is of the magnitude of a wave-length of light. To attain such accuracies electrical methods of measurements are resorted to which permit a direct measurement of the quantity which is to be controlled and at an accuracy of about one part in a million.

When crystals are being calibrated, they must be tested in circuits which are exact duplicates of the transmitters in which they are to be used, otherwise they may not have the frequency characteristic required. At the Laboratories the actual transmitter is used in checking the new crystal being made for it, or an exact duplicate oscillator circuit is set up. This is done in the manufacture of every crystal turned out by the Laboratories.

When the frequency, tested in a standard transmitter, and the stability and output, measured in the oscillograph, check correctly the crystal is put through a heat run. This, you observe, means placing the blank in an icebox, then an oven where it runs the gamut of temperatures from minus 10 to plus 60 degrees centigrade. Crystals must be immune to the temperature fluctuations they are likely to encounter on their future travels. After the heat-run the crystal is rechecked for frequency and output.

Now the last stage of the long journey through the Laboratories has been reached and the crystals are ready for shipment to all parts of the globe. Some will spend the coming years in broadcasting stations. Others will lead a more adventurous existence flying the airways, spanning oceans or speeding through city streets and along highways in radio police motor patrol cars.

Perhaps the most impressive part of the whole business of crystal making at Bell Telephone Laboratories is the precision, the skilled workmanship, the rigid tests and the detailed histories kept of these minute bits of quartz. A complete record of each crystal is filed away for future reference after it has emerged as a full-fledged oscillator. These show how the crystal performed in the final tests — the curves charted in the standard circuits — the temperature coefficient—who made the tests and just how much time was spent in the calibrating.

Before the crystal leaves the shop it is given a serial number and assigned to a particular type of transmitter. Rarely is one returned for misbehaving. Occasionally crystals which are used in the ultra-high frequency bands find their way back to the shop for a check-up. According to the records about one-half of one per cent of the mobile oscillators return. This is considered a remarkably low percentage when it is realized that over 7,000 of these Western Electric crystals are continually on the job in all parts of the world and that approximately 50 leave the quartz shop every week.

Such a record is understandable, for Bell Telephone Laboratories' engineers are pioneers in the art of crystal making for radio telephone purposes. It was back in the early twenties that the utility of quartz crystal oscillators for radio transmission was definitely established. The first one sold for commercial broadcasting went into a Western Electric transmitter at Station WLW, Cincinnati. With broadcasting stations springing up like magic in all sections of the country, with aviation, police and marine radio booming ahead, the demand for this new type of frequency control became urgent. By this time the United States government had taken over the responsibility of regulating the air channels and the Laboratories had settled down to an intensive study of the methods for making and applying quartz crystals. As time went on they were able to overcome many of the difficulties found in the early types and consequently could manufacture them in greater quantities.

Today in the research department the Laboratories' engineers are still delving into the mysteries of quartz and are continuing to improve upon these bits of crystal which have become the midget masters of broadcasting channels.

NOTE: Since this story was written the Quartz Crystal Shop has moved to the Kearny, N. J., plant of Western Electric.

Ole M. Hovgaard

Just after the turn of the century American youngsters discovered a new and fascinating subject, radio. From oatmeal boxes, wire, and other odds and ends they made up their receivers and listened to the dots and dashes of commerce, even hearing at times a little speech and music. Europe too was growing its radio fans, among whom was a lad named O. M. Hovgaard. Born in Copenhagen, Denmark, on October 27, 1899, he began at the age of ten to experiment with the early crystal receivers.

O. M. Hovgaard

By 1914, when Hovgaard came to the United States, his interest in radio had increased so much he determined to turn his hobby into a career. Before he was 18 years old, he had secured both an amateur operator's license and a commercial operator's license, first grade. After one year at the Massachusetts Institute of Technology he gained invaluable commercial experience by spending four years as radio operator and chief operator on various boats sailing between the United States and foreign countries.

In April, 1923, he returned to M.I.T., and, upon graduating, in June, 1926, with the degree of B. S. in Electrical Engineering, he joined the Acme Apparatus Company, radio manufacturers at Cambridge, Massachusetts, as an engineer assisting in laboratory investigations of new designs and in production control. Later, he joined the Briggs and Stratton Corp., Milwaukee, Wisconsin, as a consultant for the purchase of radio supplies.

In January, 1928, Hovgaard became a member of the Technical Staff of Bell Telephone Laboratories, joining a group engaged in the development of radio facilities for broadcast and aircraft application. He specialized in antenna design.

Eighteen months later, he was made supervisor of a group of men responsible for the development and commercial manufacture of quartz plates for radio transmitters and superheterodyne receivers. Since 1930, he has also supervised development and electrical design of antennas for broadcast transmitters.

One of the jobs for which Hovgaard was responsible during this period was the design of the antenna system for station WOR which cut out the unproductive areas and reached the rich markets to the north and south.

Outside of radio, Hovgaard's hobby is photography. As proof that he does as well in this, he won first prize in the 1936 Leica Show.

Robert E. Poole

Whenever Robert E. Poole, broadcast development engineer of Bell Telephone Laboratories, visits any of his associates on the upper floors of the Laboratories headquarters' building he can look across the Hudson River and see that portion of Jersey in which he was born, reared and educated.

Robert E. Poole

Born, in January, 1899, in that section of Union City formerly known as West Hoboken, Poole, at the age of 18, after attending Stevens Preparatory School for three years, became a student at the Stevens Institute of Technology in Hoboken, from which he was graduated four years later with the degree of Mechanical Engineer. During the next three years he occupied the position of instructor in the electrical engineering department at Stevens, working under that well-known radio inventor, L. A. Hazeltine, consultant engineer at the Institute. In addition to his duties as instructor, he was also employed by Hazeltine as an assistant, and under his guidance conducted experimental work in the design of receivers, vacuum tubes, and other radio apparatus.

On June 1, 1924, Poole left Stevens Institute to cross the river and join the Technical Staff of Bell Telephone Laboratories where he put into practice his experience in development and design. In 1927 he was placed in charge of the newly established radio research laboratory at Whippany, N. J., where in 1928 he developed the 50 kilowatt and 5 kilowatt radio apparatus for the American Telephone and Telegraph Company's radio television demonstration. From 1929 to 1933 Poole was engaged in supervising the design and construction of an experimental model of a 300 kilowatt long-wave transmitter for use in the transatlantic telephone system.

Transferred back to headquarters in New York City in 1935, Poole was placed in charge of the Broadcasting and Transoceanic Division of the Apparatus Development Department, and in November 1936 was appointed to his present position as Broadcast Development Engineer. The design and experimental work on the new Western Electric 5, 50, and 500 KW radio broadcasting equipments has occupied his time for the past two years.

Mr. Poole is a member of the I.R.E. and the A.I.E.E. His home is in Morristown, N. J., where he has quite a reputation as an amateur gardener. His flower garden is the envy of all his neighbors. He is married and the father of two children, Diana, six, and Robert, eleven.

An Inland Empire in the Making — so some describe the Grand Coulee Dam Project.

Sculptured by lava, ice and water flow over thousands of centuries, Grand Coulee is being remodelled by man in the space of a few short years. Once the age-old Coulee carried the mighty Columbia when the river's natural course was blocked by glacier deposits. As the glacier retreated the fickle river returned to its original bed leaving the Coulee an arid waste. Now the greatest engineering brains in the country have conceived a way to return the waters of the Columbia to the thirsty Coulee and transform it and the Columbia Basin below into a vast tract of fertile acres.

Even as late as 1933 the Coulee stretched alone among its shadows while the Columbia at the base of its steep banks rushed on unheeded. With Federal funds made available, the Coulee came to life. As though preparing for a great spectacular pageant the stage was set for carrying out one of the largest power development projects ever undertaken.

Trains, trucks, tractors and automobiles carrying cargoes of men, machinery, and materials began winding their way to the Coulee. As the work progressed the Dam became a center of attraction for tourists from all sections of the country. During the fall and summer of 1936 over 200,000 visitors came to see the powerful Columbia being harnessed and put to work. As many as 4,500 people have visited the dam in a single day.

When automobiles or buses approach the parking area at West Vista House, visitors hear a voice inviting them to the grandstand to see the "big show" being enacted and, through the facilities of a program sound system, to hear the story of Coulee Dam. The announcer's voice has been heard distinctly in Mason City a point across the river, one mile northeast of West Vista House.

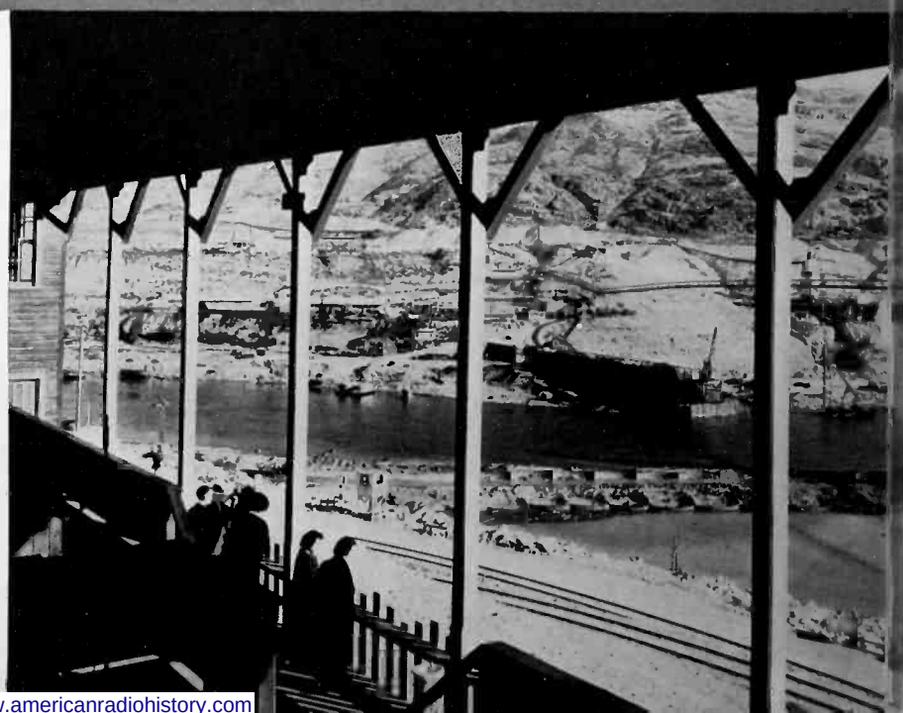
Every word the announcer utters over the Eight-Ball Mike is heard distinctly despite the terrific clamor reverberating over the Dam

PUBLIC ADDRESS CARRIES STORY OF GRAN

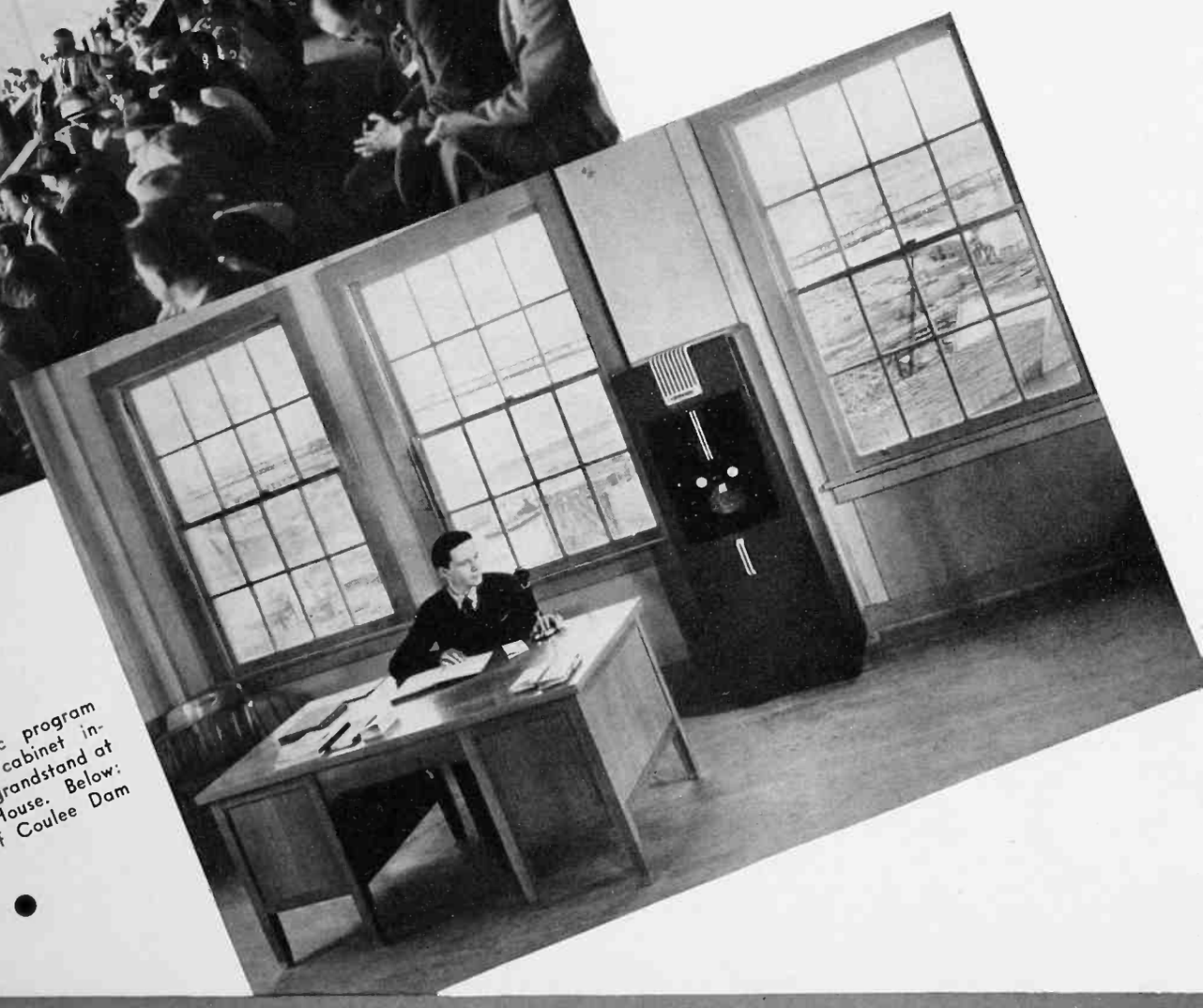
This cordial long-distance invitation comes from a horn, the mouth of which projects through a hole in the attic wall of the Vista House. The cabinet of the sound system is installed on the second floor of the little two-story Vista building. From this room the announcer on duty has an uninterrupted view of the parking space below. When he sees visitors approaching he issues his invitation.

The system contains two channels so that one person can invite the visitors while a second talks to those already seated in the grandstand. On days when only one man is on duty he may invite the visitors in the parking area while giving his talk in the stand. To do this he throws a switch near him and makes the announcement into the microphone he has been using for his descriptive talk. Throwing the switch connects the six-foot horn into the circuit and

(*Continued on Page 36*)



Through the medium of loud-speakers mounted on the ceiling, grandstand spectators hear the dramatic story of this colossal engineering project



Western Electric program sound system cabinet installed above grandstand at West Vista House. Below: Panorama of Coulee Dam

COULEE DAM TO RINGSIDE SPECTATORS

During the recent Institute of Radio Engineers' convention in New York, Station WOR played host to members and took them on a tour of inspection of its transmitter building and Western Electric 50 KW transmitter at Carteret, New Jersey. From the many smiles in the picture, it must have been a pleasant occasion.

Coulee Dam Public Address

(*Continued from Page 34*)

disconnects the loudspeakers in the grandstand. Thus the audience there does not have to listen to an announcement which does not interest them.

Once inside the grandstand the stirring pageant of Grand Coulee Dam moves majestically on. You sit spellbound by its grandeur. As the announcer explains the colossal engineering job being carried on before your eyes you marvel at man's ingenuity. Pioneer towns have sprung to life as though conjured up by Hollywood's master magicians. In the far distance on the east side of the river is Mason City, the contractor's electrified camp. On the west side is located the permanent government city, Coulee Dam. Children are going to school in a new schoolhouse. Past their windows, station wagons carrying shifts of engineers jog steadily toward the dam site followed by lumbering trucks hauling machinery. A seemingly endless flow of sand and gravel moves in snakelike fashion on a conveyor belt across the suspension bridge. Over a railroad trestle engines travel back and forth, their cars transporting buckets of concrete from the mixing plant. Men dangling in midair piloting strips of steel into place remind you of trapeze performers ready to swing out over a huge arena.

Grand Coulee Dam will be the second highest in the world, you are told, Boulder Dam being the highest. Its cost including power plant and irrigation system is estimated at $376,631,000. Approximately 11,250,000 cubic yards of concrete masonry are being used in the dam, power plant and appurtenant works. To better visualize this enormous amount the announcer informs you that this quantity of concrete would build a standard paved highway 16 feet wide two times from coast to coast in the United States. Seventy-five million pounds of reinforcing steel will be used in the development.

The project includes construction of the dam, power plant and pumping plant on the Columbia River; a reservoir in the Grand Coulee; main irrigation canals and water distribution system on the project lands.

Ultimately the deep gorge of Grand Coulee itself will be used as a storage reservoir. The dam will raise the waters of the Columbia so that they can be pumped into this reservoir to flow over the parched acres of the Columbia Basin territory. It will in addition back up the river to create the longest artificial lake in the world, to extend 151 miles to the Canadian border and beyond.

Sound effects for this mammoth "moving picture" are the clang of giant shovels, the rumble of pouring cement and gravel, the roars and puffs and growls of machinery, all reverberating over the Coulee. But the speaker before the eight-ball microphone on the grandstand talks on in modulated conversational tones. Thanks to a very different type of engineering job his audience can hear each word distinctly despite the clamor.

The Western Electric program sound system which makes this possible is known as the 14A, an all-purpose system, distributing sound from microphones, radio and phonograph records. It was described in full in the February 1936 issue of PICK-UPS. When the system installed at West Vista House proved so successful a duplicate installation was made in East Vista House. Both installations have five twelve-inch permanent magnet loudspeakers mounted on plywood baffles in the grandstands. Four 630A microphones are used—one in each of the grandstands and one in each of the offices where the cabinets are installed. The announcing horns in the attic walls are driven by Western Electric 555 receivers.

If the present rate of progress is maintained the dam and power plant will be completed in 1941. When this time comes some of the spectacular sights of the Coulee will be hidden. If you want to see and hear the story of this "Inland Empire" in the making you'd better go West.—*C. A. Marten.*

J. O. Maland, WHO

(*Continued from Page 5*)

great jubilation when the last mortgage on transmitter and station was cancelled and burned with ceremony.

Such in brief has been the personal history of J. O. Maland, but it does not explain his success or the success of WHO. The explanation, however, comes when you talk with him.

I met him in Des Moines on a bright, sunny, spring day, but it had rained the night before. Almost every automobile in the city was splashed with mud. This does not mean that Des Moines has muddy streets. But it does mean that its citizens and the citizens of the great Corn Belt serviced by WHO come in contact with Mother Earth. Their feet may be accustomed to city streets, but their hearts, their minds and their business reach back into the soil.

Remembering this fact, and being constantly guided by it, is the explanation behind the success of Joe Maland and WHO.

Maland's background is ideal for his job. He is a graduate of the University of Minnesota and later had advertising experience in a Minneapolis agency. But you can't run a general merchandise store in a small town; serve in almost every official capacity in a community's life; work on farm papers; operate a 240-acre Iowa farm and do countless other things connected with rural activities, without acquiring a shrewd insight into the lives, ambitions, ideals, customs, desires and feelings of a people. Today he still keeps in close contact with his listeners.

He keeps a close check on the popularity of the station by constantly talking with a cross section of the station's listeners. Some stations might capitalize upon this and call it, perhaps, The Institute of Public Opinion. Maland has no name for it, but it amounts to that. Regularly he discusses WHO's progress with farmers, doctors, lawyers, scrub women in the studio, taxi-drivers, educators, housewives. Their criticisms and suggestions help to set the policies of the station.

"A radio station must have its own individuality. It must have a distinct and very definite personality if it is to be a success," says Maland. "The most successful newspapers and magazines are those which have individual editorial policies and give their readers what they want. Exactly the same principle exists in broadcasting.

"Stations should not rely upon chain broadcasts for the majority of their programs. A star or a program may be a hit in New York, but that does not mean it will be popular in Iowa or some other part of the country. We try to balance our programs so that there is never more than 50 per cent chain material going out over WHO. I know the trend is toward chain domination but I am not in favor of it. Perhaps the smaller stations have to rely upon the chains for the majority of their programs due to the expense involved in originating their own, but it is a mistake for a station like ours. The more you use a crutch, the weaker you become. The more you use outside program material, the more you lose the ability to build your own."

Newscasts, according to Maland, are the best means of holding an audience. WHO broadcasts news six times daily. One of the station's most popular programs is the Farm News broadcast each morning at six thirty. This newscast is prepared by a man who devotes his entire time to this one fifteen-minute daily program. He spends most of his time in the field, visiting farmers, attending farm meetings, and taking part in many rural activities.

It is significant that the most successful stations today are those which from their very beginning have regarded radio as a public service. WHO is in the front rank of stations operated for the benefit of the listener. Last year 14.2 per cent of WHO's time was given to public service organizations.

Such institutions often abuse their privileges. "When an organization is on the air regularly," says Maland, "it begins to feel that it owns that time forever. Often this attitude results in poor programs, of interest and value to neither the group nor the listener. If the time is taken away from the organization, hard feelings and misunderstandings may result. We have eliminated such trouble by making it a hard and fast policy to promise no organization more than four broadcasts. As a result, the four programs are carefully planned and presented in the best possible way. No more time is expected, and everyone is pleased. If the four programs are successful, then we can easily extend the time."

One of WHO's most successful public service programs has been its "Veterans' Forum," a 15-minute evening broadcast each week eagerly looked forward to by thousands of disabled soldiers. In the past three years more than 80,000 men have received individual help through WHO in obtaining federal aid.

There is one program, however, which is synonymous with WHO. It draws an estimated weekly audience of a million and half people. From two to four thousand people travel from miles around to Des Moines to see it each week. It is the Iowa Barn Dance Frolic. Traveling units of the Frolic have played at least three times in practically every town in Iowa. No one can adequately explain its tremendous appeal. Maland has gone to famous psychologists for the answer. Perhaps his own is best. "I suppose it brings back memories of childhood to people raised on farms and in small towns," he says.

Reasons, however, are not as important as results. WHO gives its listeners what they want. The Corn Belt looks to its radio for news of the world. It gets it through WHO. Farmers and small town merchants depend upon weather reports in the conduct of their work. Right now WHO is waging a campaign to better this service.

KTSA, Hearst Station at San Antonio, Gets 5 KW

KTSA, San Antonio, Texas, one of the latest links forged in the Hearst chain of broadcasting stations, is on the air with a new Western Electric 5000 watt transmitter. Texas now has three of the ten Hearst-owned stations scattered from coast to coast. Western Electric takes credit for eight of the ten transmitters. KTSA claims that the improved quality of transmission brings listeners right in, figuratively speaking, to the station's studios.

W. G. Egerton, Chief Engineer

KTSA is one of broadcasting's first born stations. The license under which it operates was the second issued in the Lone Star State. It was back in 1922 under the call letters WCAR that the little pioneer toddled on the air with the aid of a 100 watt transmitter. For two hours, three times a week, its strident voice could be heard in a nondescript assortment of programs.

By 1926 the power had been jumped to 1000 watts and programs were going out over the air waves six nights a week. Two years later WCAR became KTSA. In May, 1936, Hearst Radio, Inc., took over the organization. Plans were immediately drawn up for expanding broadcasting facilities.

The new transmitting equipment which went into operation late last year is housed in a modern building on the Seguin Highway, an advantageous site overlooking the greater part of San Antonio. In the ground system surrounding the building there are 12 miles of copper wire buried 15 inches deep and separated in rows three feet apart. The twin antenna towers, 400 feet apart are located at the north and south ends of the property. Peering 200 feet in the air these towers are placed on insulators designed to carry 75,000 pounds.

The five room transmitter building is of Spanish design with tinted stucco exterior and red Spanish tile roof. There are separate rooms for control mechanism, transmitter panels, rectifier equipment and the cooling system. KTSA's ultra-modern high fidelity transmitter is one of the first to make use of the new stabilized feedback principle which was introduced by Bell Telephone Laboratories last year. This was described in the July 1936 issue of *Pick-Ups*.

According to station officials the increased coverage made possible by this new equipment brings KTSA programs to many more listeners than ever before—listeners far beyond the former distance range of the station. Moreover, the improved quality of transmission has considerably increased KTSA's popularity within the area previously covered.

Studios are located atop the Plaza Hotel in metropolitan downtown San Antonio. These comprise a main orchestral studio and small ensemble studio with adjoining control and reception rooms. Offices and audition room are located on the floor below and carry out the Spanish motif which is so typical of historical San Antonio.

Packard Official Flies with Western Electric Radio

The Packard Motor Car Company asks you to "Ask the Man Who Owns One." Borrowing their slogan *Pick-Ups* asked the man who owns one of those two-way Western Electric aviation radio sets what he thought of this communication system for private flyers. The man was Mr. J. G. Vincent, vice-president of the Packard Motor Car Company.

Mr. Vincent did not seem to mind in the least having his own slogan turned back at him. He spoke enthusiastically of the radio, described how he uses it and discussed many interesting phases of private flying.

"Having become acquainted with the value of two-way radio I would not think of attempting to fly in and out of a busy air terminal without such equipment," he says.

Most of Mr. Vincent's flying is cross-country. Before leaving on any trip he makes it a practice to work out his flight plans and submit them to the control tower. Naturally he is in touch with the various stations as the trip progresses. If he finds it necessary to alter his plans he reports the change and secures approval. In brief, he lives up to the same rules and regulations that govern scheduled transport flights.

"As I see the use of two-way radio by a private flyer," Mr. Vincent explains, "it is chiefly valuable as a means of keeping out of dangerous situations. When I am flying around an airport I want them to know where I am and I want to know what the traffic conditions are. When I am flying along an airway I want the transport pilots to know my flight plans and feel that I will cooperate with them to the limit."

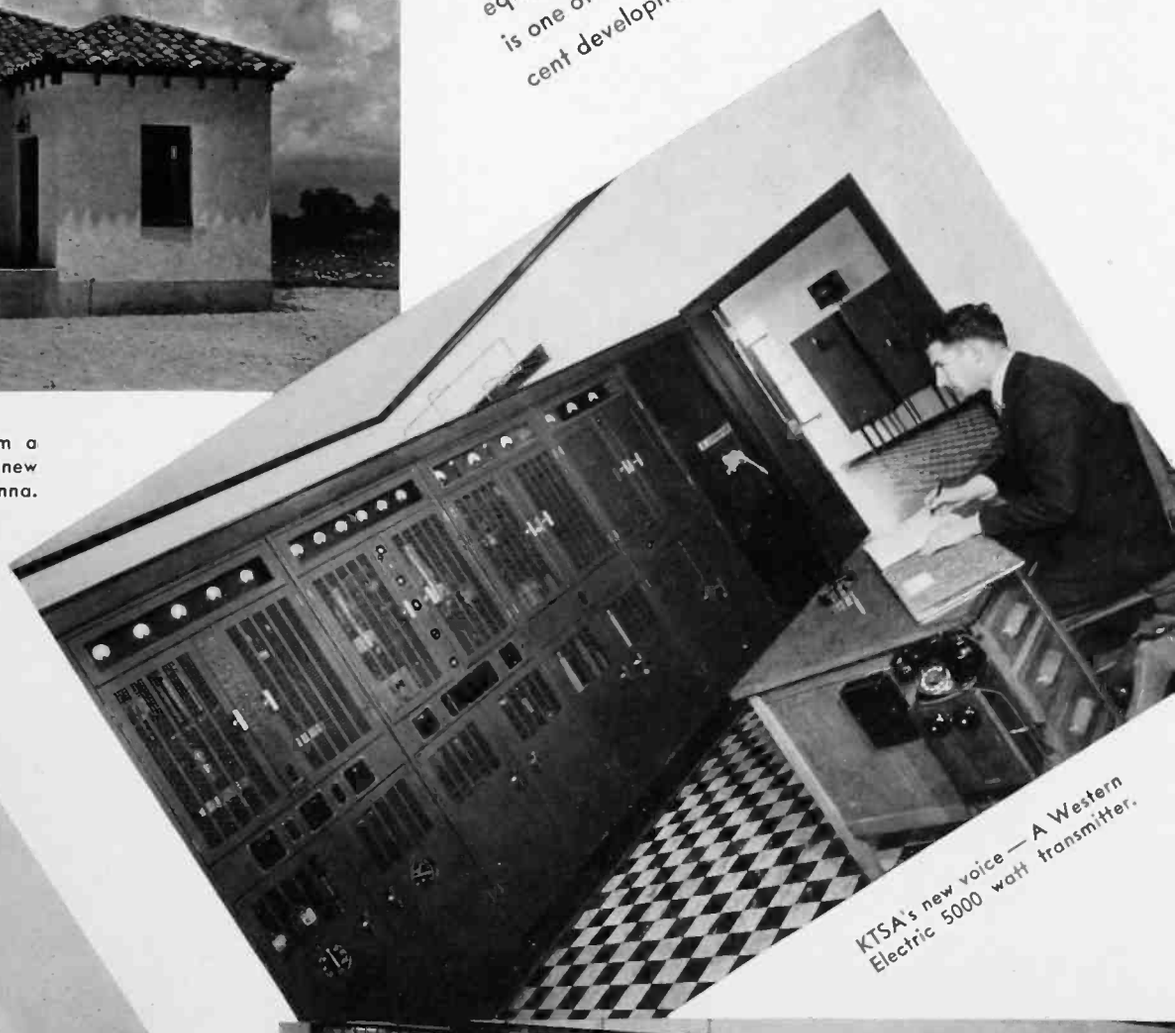
In addition to his radio apparatus, Mr. Vincent's plane is equipped with all the instruments necessary for blind flying. Should an emergency arise which would require instrument flying he is fully prepared to meet it.

The Western Electric radio set which Mr. Vincent selected when he purchased his new plane includes a 19A transmitter and a 20B receiver.

KTSA
SAN ANTONIO

During 15 years of operation, this Texas station has changed its name once and its transmitting equipment twice. The new 5000 watt transmitter is one of the first to use stabilized feedback, a recent development of Bell Telephone Laboratories.

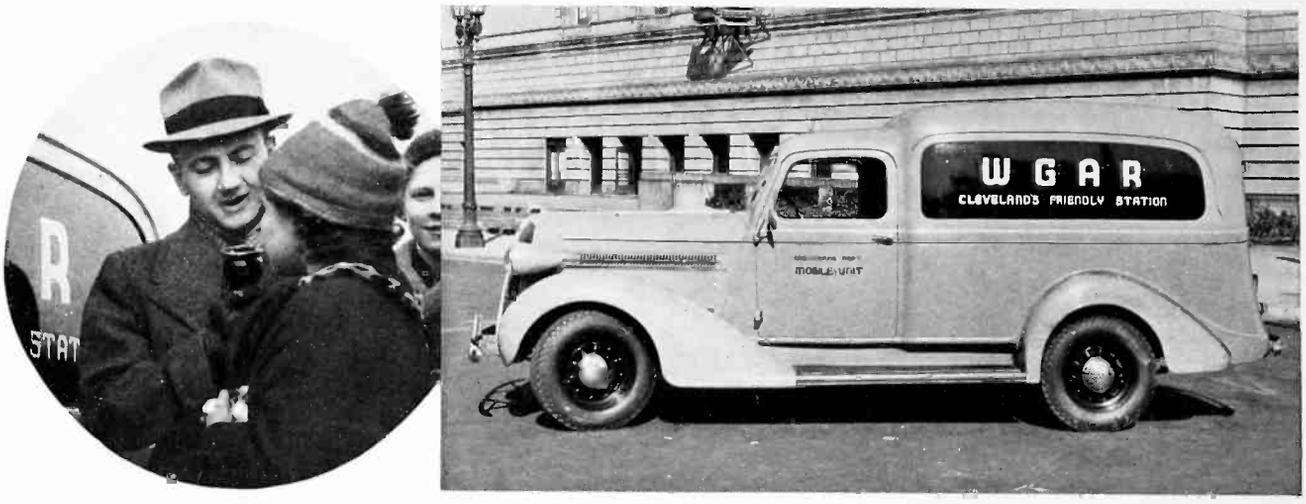
San Antonio's famous clouds form a colorful background for the new transmitting station and antenna.



KTSA's new voice — A Western Electric 5000 watt transmitter.

Western Electric frequency monitor and associated equipment

Rear view of transmitter showing rectifiers and water-cooling system for vacuum tubes.



WGAR announcer Carl George, eight-ball mike in hand, interviewing Cleveland children for "Vox Pop Junior," humorous daily feature. This mobile unit, equipped with a 100 watt short wave transmitter, and operated for WGAR's special events broadcasts, was used by the Red Cross during the flood of Cincinnati for intra-city communication. Of the eight-ball microphone, WGAR Chief Engineer R. Morris Pierce says: "The eight-ball is admirably adapted for any broadcasting purpose requiring a light and durable microphone. After trying other microphones, Western Electric was decided upon."

110A Program Amplifier

(*Continued from Page 4*)

pressed more than the predetermined 5 db and adjustments in level should be made.

Specifications are as follows:

1. Terminating impedances 600 ohms.
2. Input level —35 to +5 db.
3. Output level up to +20 db.
4. Transmission characteristic flat within 1 db from 30 to 10,000 cycles.
5. Distortion contribution less than 1 percent under normal operating conditions.
6. Relay rack mounting. Approximately 19¼ inches of a standard relay rack panel.
7. Front of panel controls.
8. Self-contained power supply completely A. C. operated from 110 volt supply 50-60 cycles. Power consumption less than 100 watts.
9. Nine vacuum tubes are employed. These are: two 6J7G; three 6C5G; one 6F6G; one 6M6G; one 5V4G; one 885.

It is evident then, that the Program Amplifier offers a number of major benefits to the broadcaster. It provides not less than 3 db improvement in average signal level. It compresses the excessive peaks of modulation. It furnishes protection against overmodulation in the case of accidental changes in program level. Freedom from extra band radiation is afforded by the prevention of overmodulation. Also, by means of the flashing light, it provides a continuous indication of the correctness of operating levels.

New Book on Police Radio

A new book written by Jo Ranson, Radio Editor of the Brooklyn Daily Eagle, dealing with the various phases of police radio and teletype, has just been published by the Eagle Library, Inc., Eagle Building, Brooklyn, N. Y. It is a most comprehensive treatise on modern communication methods for combating crime, comparing one-way and two-way radio systems, English methods and American methods—with authentic quotations from records. It is written in non-technical style.

This work has been favorably reviewed by Edward L. Block, Attorney and Author of the "Criminal Law Quizzer"; M. J. Delahanty, Director, Delahanty School for Police Entrance and Promotion Examinations, and Gabriel Heatter, radio's nationally known news commentator.

Radio Fleet Reports 6,101 Arrests

Police radio patrolmen of Newark, New Jersey, have made 6,101 arrests since the police radio system went into operation on October 3, 1934.

According to a recent report compiled by Michael P. Duffy, director of public safety, and issued by the Police Radio Division, the radio fleet has chalked up the following record:

Police alarms answered (without missing one)	135,203
Fire alarms answered	7,257
Arrests	6,101
Stolen automobiles recovered	1,655
Value of automobiles recovered	$396,150
Miles patrolled	2,404,544
Fires extinguished, no alarm sounded	207
Fires extinguished before arrival of fire dept.	72

In his report Mr. Duffy urges Newark citizens to cooperate in enhancing the success of the radio patrol fleet by using it when the occasion arises. He says, "Should you need the services of a policeman or see anything that requires police service in Newark, dial the operator and say, 'I want a policeman.' You will be connected with police headquarters. Explain the difficulty and a radio car will immediately be dispatched to the scene. The police radio system was installed for your protection and should the necessity arise you are urged to make use of it."

Newark was the first city in the country to install Western Electric ultra-high police radio equipment.

Low-Power Stations

(*Continued from Page 12*)

Augustine, Florida, the romantic story of the Spanish explorer and the famed spring is sent far and wide through the medium of white man's 20th Century magic—radio broadcasting.

Could those stalwart warriors steal away from their Happy Hunting Ground and look in on station WFOY, located in the "Fountain of Youth" park, they might indeed believe that the sparkling spring waters had endowed white man with miraculous powers.

The quaint structure which houses WFOY, built of "tabby," in the early Spanish motif, has been made exceptionally striking with a log and moss roof and oyster shelled walls. Floors of the various rooms are laid with old, used Spanish tile, especially imported for this purpose. Studio walls are treated with alternate panels of Celotex and worm-eaten cypress boards in their natural state.

The building contains offices, two large studios, reception room and control room. Engineers and radio men who have visited this unusual station edifice have been loud in their praise of its unique design and efficient layout.

The transmitting equipment consists of a Western Electric 310A transmitter, 22A and 23A speech input equipment and eight-ball microphones, with and without baffles. A vertical radiator, 204 feet in height and erected on salt water marsh, is located 200 feet east of the transmitter building. The ground system, built on rock nine feet below low tide, is covered by the ocean tide 20 hours out of the 24.

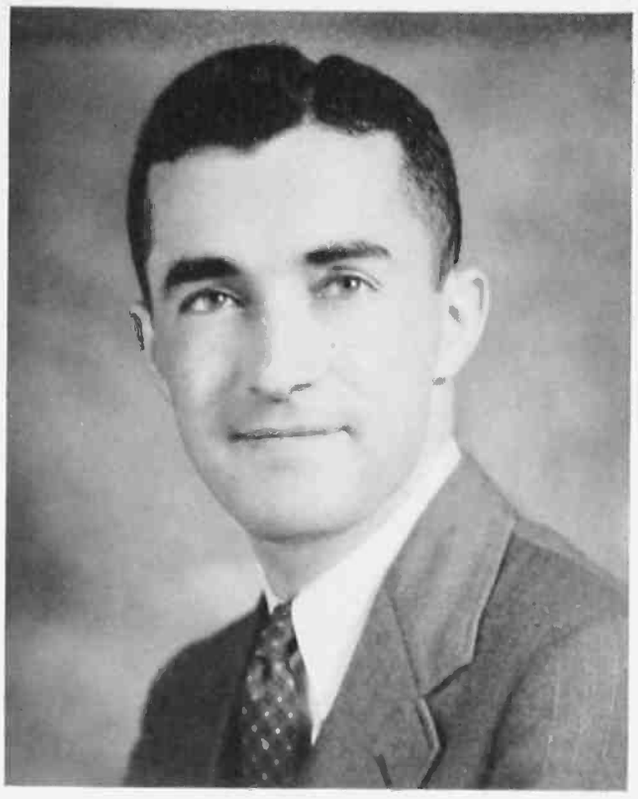
Not far from the building is the renowned spring over which has been erected a structure of old coquina blocks copied from a Spanish mission. Throughout the beautiful park the owners have preserved and restored that which belonged to the vivid past of the "Fountain of Youth." Old records and documents displayed in the museum on the grounds tell the story of the adventurous Ponce de Leon and how, lured by the legend of the youth-giving waters, he discovered Florida.

The spring, which is unique in that region because it has no odor of sulphur, has become renowned as the "Fountain of Youth."

The park covers 20 acres, bordering on Matanzas Bay. Within its walls, in addition to the broadcasting station and the famed spring, are the old Spanish shrine, Indian burial ground and many other points of interest.

WEXL—Royal Oak, Mich.

Unheralded by the usual dedicatory services, fanfares or even formal announcement, WEXL, Royal Oak, Michigan, recently went on the air with a Western Electric 310A transmitter. Evidently listeners immediately sensed a change, for reports and letters of appreciation praising the improved quality of reception began flowing in to station officials.



William H. Doherty of Bell Telephone Laboratories was awarded the Morris Liebman Memorial prize by the Institute of Radio Engineers at its recent convention. This award, given annually in recognition of an outstanding development in the field of radio, was presented to Mr. Doherty for his improvement in the efficiency of radio power amplifiers.

The new equipment is modified to operate at 50 watts output and does a splendid job of covering Detroit and suburban towns. This 310A is the second transmitter to be purchased by this station from the Western Electric Company within four and a half years. It replaces an oscillator-amplifier installed in 1932.

WEXL's antenna system consists of a flat top T, supported between two steel towers 130 feet high, and operates in conjunction with a fan type counterpoise near the ground. The transmitter building is located almost directly beneath the "flat top" permitting the antenna coupling units to be located within the transmitter room.

This gives the station one of the shortest concentric transmission lines in the country—nine feet to be exact. The set-up is unique in that the coupling units consist of a Western Electric 1000 watt coupler modified with the addition of an extra unit capable of adapting the output network to the antenna counterpoise system.

WEXL operates 24 hours a day with five newscasts daily, a weekly police safety talk and many devotional and educational programs on its schedule.

Paul A. Loyet, WHO

Things electrical and mechanical have an unusual fascination for Paul A. Loyet, Technical Director of the Central Broadcasting Company, Des Moines, Iowa. It is a pleasure to watch him examine a new car for instance. Nothing escapes his eyes, and they glow with appreciation when he sees something that is well designed and constructed. Perhaps this is one reason why he is rated as one of the country's top-notch broadcast engineers.

Paul A. Loyet

Perhaps, also, that explains why, when a neighbor's boy in 1919 showed him an amateur radio set in Davenport, Iowa, he fell in love with radio, built his own station, and has been in the game ever since. Through high school, Loyet entered St. Ambrose College in Davenport and during his two years there conducted a course in radio. Station WOC is in Davenport and it was only natural that Loyet should find that the most interesting spot in town. Before long he was one of its operators.

Leaving WOC to complete his education, Loyet graduated from the University of Iowa in 1927 with an engineering degree, returning immediately to WOC as chief engineer. In the reallocation of 1928 WOC and WHO in Des Moines were put on 1000 KC on a split-time basis. Under Loyet's supervision, a great deal of experimental work was carried out and as a result, the two stations were synchronized and operated simultaneously on one frequency by the newly organized Central Broadcasting Company. In 1932 the synchronized operation was discontinued in favor of a single 50 KW station near Des Moines using the single call WHO. WOC was reestablished in 1935 as a 100-250 watt local station in Davenport. In 1933 Loyet was made technical director of the company.

Loyet designs most of the test equipment used by the two stations. Recently, he engineered WOC's new antenna which is of the grounded radio type, developed by Bell Telephone Laboratories. The job was more than usually complicated because the antenna was erected upon the top of a large building, and the building itself became part of the radiating structure.

Loyet's hobbies are golf and tennis, but radio is his love, first, last, and always. He has been a stockholder in the Central Broadcasting Company since its inception in 1930 and has been a director of the company since 1933.

New Police Radio Systems

An ever-increasing demand for Western Electric police radio systems is evidenced by the list of sales which Graybar reports for the first six months of 1937. During this period six cities and one county in the United States have purchased new equipment.

The order placed recently by Waukesha, Wis., calls for a Western Electric installation combining intermediate and ultra-high frequency operation. Included in the contract is a 100 watt intermediate frequency headquarters transmitter and five ultra-high frequency car transmitters. Affording two-way operation, the five motor patrol cars will receive transmission from the headquarters' medium frequency transmitter and transmit to headquarters on the ultra-high frequency police band.

Milwaukee, Wis., will shortly transmit its police calls through the medium of a new Western Electric 1000 watt high fidelity transmitter which is similar to the seven transmitters now operating throughout Illinois in connection with the state-wide police radio network there.

Aurora, Ill., is installing a complete new Western Electric ultra-high frequency two-way police radio system. The equipment includes a 16B 50 watt headquarters' transmitter, a 19A headquarters' receiver and four two-way car transmitting and receiving sets.

The police radio system, formerly used in Rome, Ga., has been replaced by modern Western Electric equipment employing a 16B 50 watt ultra-high frequency headquarters' transmitter and two car receivers. Mount Vernon, N. Y., is operating a complete new Western Electric system which includes a 16B 50 watt ultra-high frequency headquarters' transmitter, a 19A receiver and 25 car receivers.

Fitchburg and Lowell, Mass., at present equipped with Western Electric one-way systems, are adding Western Electric equipment to the cars to become two-way. Both cities have ordered 19A receivers. Two of the motor patrol cars in Fitchburg will be equipped with transmitting apparatus. Lowell's new contract calls for six car transmitters and a 100 type loud speaker set as well.

Nassau County, which has been using a Western Electric one-way intermediate frequency system for the past few years, is changing over to two-way by installing 18A ultra-high frequency car transmitters and additional 19A receivers spotted throughout the county. Since Nassau covers an unusually large area, all car transmitters cannot reach headquarters from every location. Consequently receivers are spotted at strategic points so that a car is always within range of one of them. The receivers are connected by telephone lines to the headquarters control point at Mineola. Thus the dispatcher at headquarters has complete control of the entire network.

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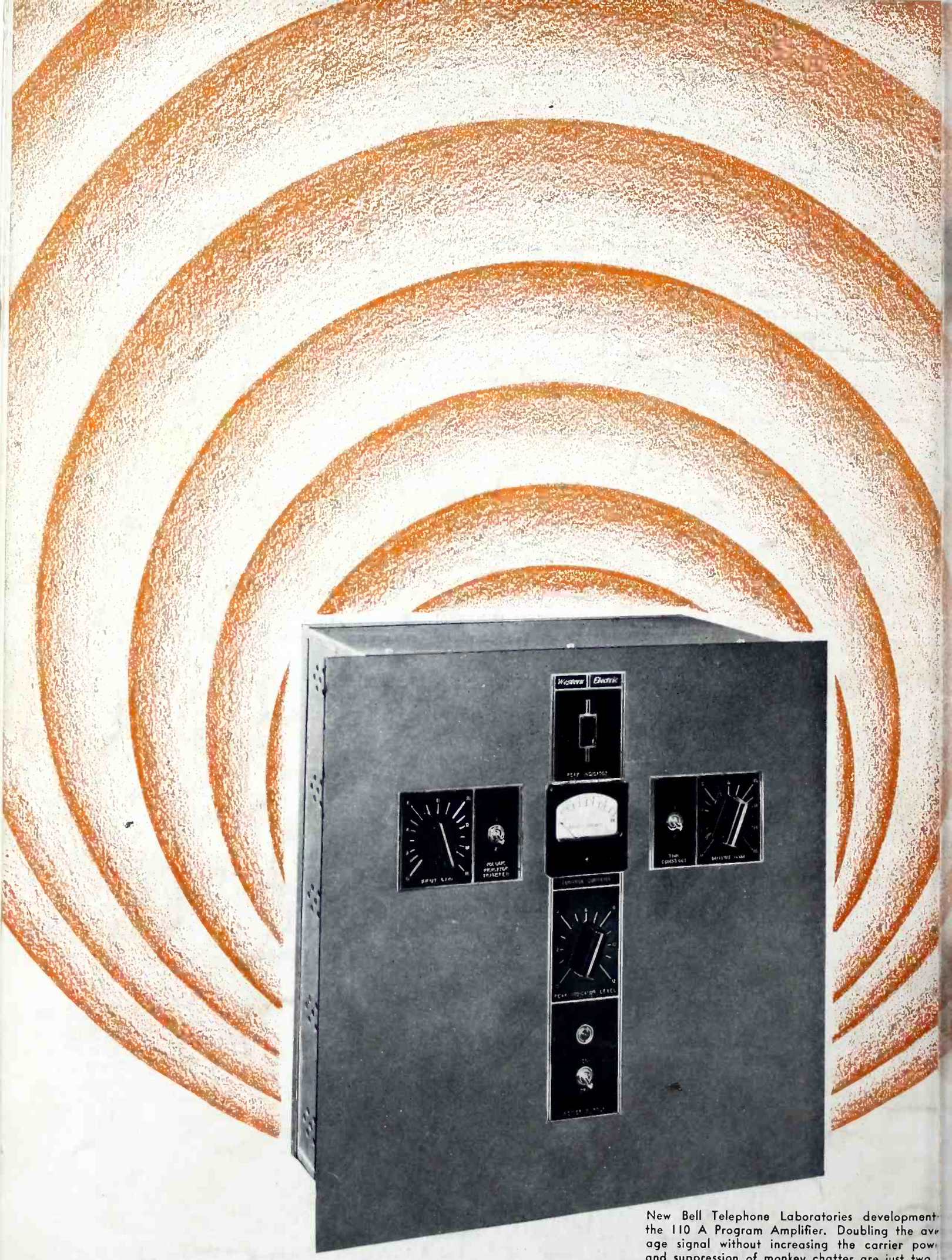

New Bell Telephone Laboratories development the 110 A Program Amplifier. Doubling the ave age signal without increasing the carrier pow and suppression of monkey chatter are just two its many features. Story on page 3.

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