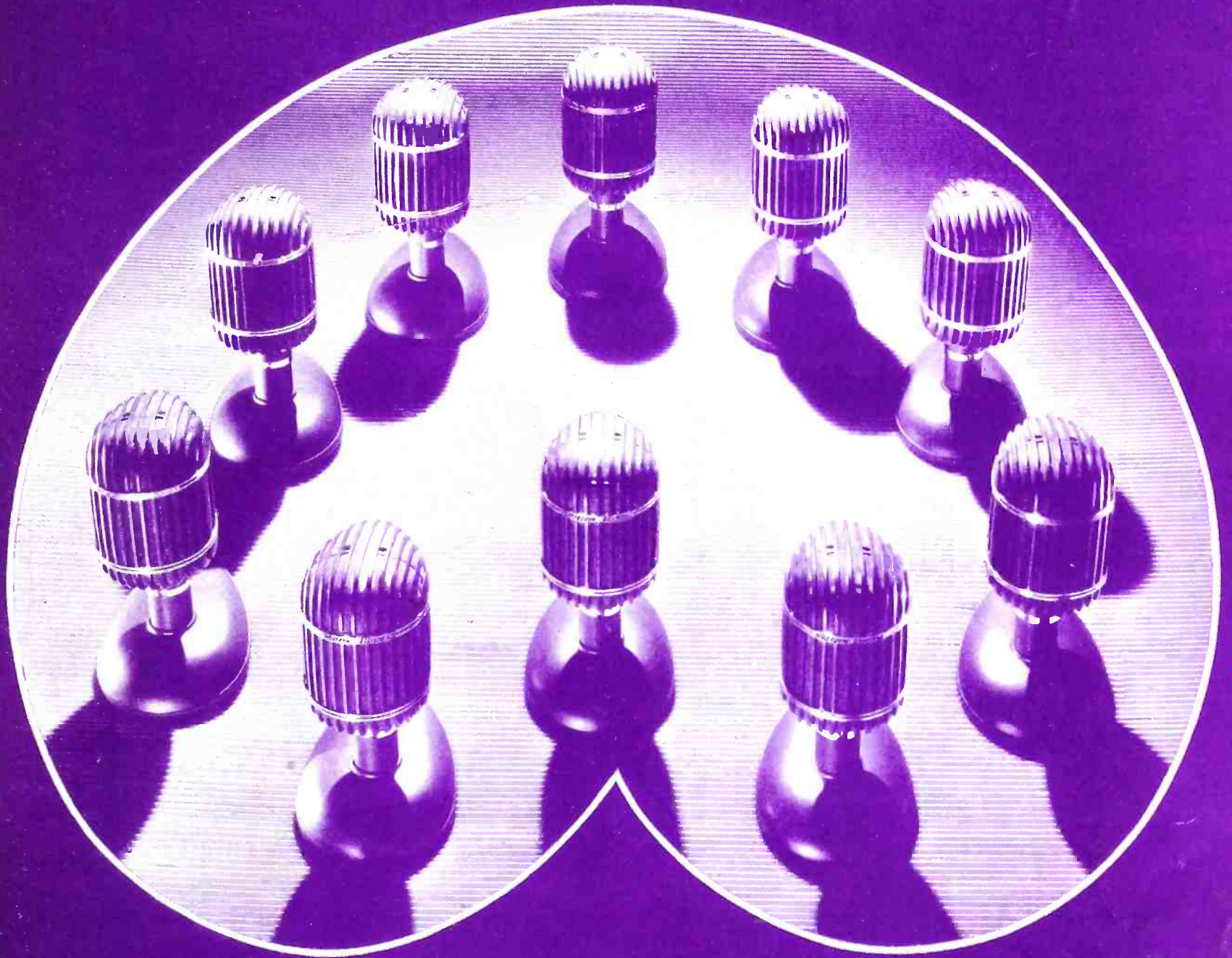


PICK-UPS

APRIL 1939



WRVA Steps Up to 50 KW
New Equipment for Directive Antennas
50 Watts at 200 MC.—the 356A
Radio Fun—Lore

LESTER C. FROKE

SINCE the first days of radio, research organizations along with manufacturers of equipment have been engaged in an eternal dog race with commercial broadcasters. The former, like the mechanical rabbit, have always managed to keep a few paces ahead of broadcasters and their needs. With the demand for more and more stations, the frequency spectrum became more and more crowded and something had to be done. Along came Bell Telephone Laboratories with the directive antenna array, one of the first applications of which was at WOR. Today, directive antenna arrays have become imperative. The laboratories and manufacturers are ready for them. *Pick-Ups*, on pages 4 and 5, describes two new equipments for this type of service, the 2A Phase Monitor, and the 33A Antenna Control Equipment.

More Power to WRVA

"Down where the South begins" in Richmond, Virginia, station WRVA is now pumping out a more powerful signal with a new Western Electric 50 KW transmitter. The station site is hallowed by the memories of famous men and women who lived upon its acres. What would Pocahontas, who resided there, think of those twin 170-foot towers? Were she alive today, she would be no stranger to this station's microphone, because it is the kind that broadcasts everything in the public interest. *Pick-Ups* tells you about WRVA on page 3, and pictures it on pages 14, 15.

PICK-UPS

APRIL, 1939

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

Western Electric

C O M P A N Y

195 Broadway : New York, N. Y.

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Pick-Ups does not accept responsibility for quoted statements appearing in the magazine. Such statements reflect only the opinions of the person quoted.

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Headaches and Laughter

Do engineers have a sense of humor? Decidedly, yes! If you don't think so, just turn to page 8. Scores of engineers have told *Pick-Ups* their funniest experiences. Most of those experiences, when they happened, were headaches, but time has a way of mellowing even the worst of trouble. Maybe that's a thought worth remembering. Today's headache becomes tomorrow's laugh, so it can't be so bad, even while it hurts.

Old Timer

Think of the technical changes and advances made in radio in the last 13 years and then marvel that a 13-year-old transmitter is still going strong today. It's the transmitter at WNEW, operating on a 24-hour-a-day schedule. *Pick-Ups* had a chat with the old timer. Its story is on pages 16 and 17.

Wanted — New Name

Isn't it about high time we stopped calling vacuum tubes, vacuum tubes? They still have vacuums but they aren't tubes. Some of them look more like fancy door knobs. If you don't think so, just look at the picture of Western Electric's new tube on page 12. It's a honey, too, as the full set of characteristics will show.

Ho Hum

There were flowers blooming in the neighbor's yard this morning and the sun is warm and friendly. Spring is definitely here, and so is Spring Fever. We're lucky that we got this issue out just in time.

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WRVA

Richmond, Virginia

Public Service Station Steps Up to 50 KW.

By WILL WHITMORE

In 1775 at St. John's Church, Richmond, Virginia, Patrick Henry became immortal by delivering his famous "Give me Liberty or give me death" speech. Had he delivered it any time after November 2, 1925, before him undoubtedly would have been the microphone of WRVA.

On that date WRVA began its broadcasting career, and since then it has never failed to broadcast every event which its managers considered in the interest of city, state or nation. To its casual friends it is known as "The Edgeworth Tobacco Station," but to those more intimate friends who have followed its growth, it is known as "The Public Service Station."

The first words spoken over the station were a prayer which outlined clearly the future policy and aim of the station. Because it so beautifully and fully expresses the achievements of American broadcasting in general, it is fitting to record it here, in part:

"May it (the radio station) be an instrument of blessing to countless thousands throughout our land," spoke the Reverend W. Taliaferro Thompson. "May it bring cheer to many a lonely soul far from the crowded ways of life. May it wile away many a weary hour for the sick tossing through the night watches. May it broaden the outlook of many whose lives have been cramped from childhood, and fill them with a determined purpose to achieve in a larger sphere, and make them content to be faithful where they are. May its message ever be one of hope and courage and faith and good will so that those who hear in our noisy, hurrying cities, as well as in our quiet country districts, may have their hearts calmed and warmed with a larger love for their fellows, their wills nerved to finer endeavors, their lives enlarged and made more satisfying."

Because radio has achieved those ends so splendidly is perhaps the reason for its rapid growth and success. Undoubtedly it accounts for the growth of WRVA which began in 1925 as a 1 KW station, in-



Virginia State House as seen from WRVA's studio windows, symbolic of the station's long record of service to the state. For pictures of the new transmitter and personnel turn to pages 14, 15.

creased its power to 5 KW in 1929 and now, 10 years later, boosts that power tenfold.

WRVA was founded by the late William T. Reed, president of Larus and Brother Company, as a civic contribution committed to the development of the resources of the state. For the first two years of operation WRVA refused to accept any commercial programs. It was only because of the tremendous growth of radio that this policy was changed. By 1927 operating a radio station had become big and costly business. WRVA was being operated at a mounting loss. It was confronted with either closing down or accepting commercial programs in order to keep up with the rapid progress of the art. It naturally chose the latter solution. Commercial programs, however, have never stood in the way of the founder's original aim. Today they are cancelled without hesitation if there is the least possibility of broadcasting an event of greater interest and importance to the people.

As Virginia's leading station WRVA is ideally located both geographically and historically to serve the state. With its new Western Electric 50 KW transmitter it easily covers most of the Tidewater section and its night-time voice reaches out to the far corners of the commonwealth.

Richmond, the capital of Virginia, has always been the hub about which the social, cultural, and economic life of the state revolves. About it are countless reminders and concrete evidence of the traditions and achievements of its people. Look out of the studio windows of WRVA and you see the stately, architecturally pure lines of the State House designed by Thomas Jefferson in 1775. The new transmitter building, itself an outstanding example of Colonial architecture, sits upon the banks of the historic James River. A few feet from the front door of the building are the earthen embankments thrown up by Federal troops during the war between the States.

During the 14 years that WRVA has
(Continued on page 24)

33A Antenna Control

By P. H. SMITH

Commercial Products Development
Bell Telephone Laboratories

Directional broadcasting, while not new in its conception, has only within the last half decade become of general interest and application. The ability to control the distribution of radio wave energy through the use of directive antennas makes it possible for broadcasting stations to increase power without causing a corresponding increase in interference with other stations which may be operated on the same or adjacent channels. More power reaches more listeners, especially when this power can be directed towards thickly populated areas, and generally rates more revenue from the program sponsors. Radio wave energy which is often wasted over the ocean or over sparsely populated areas may in this way be conserved and directed where it will do the most good.

The most typical radiation "pattern" is probably the "hour-glass" used by Stations WOR, WRVA, WPRO, WJAR, and others, although a number of stations use a "cardioid," "clover leaf" or "pear" shaped pattern. The apparent power may be effectively increased 2 or 3 times along the direction of maximum radiation by using relatively simple directional arrays of two or three radiating elements. In the directions where protection is desired the apparent power may be held to a small fraction of the total actual power radiated.

Radio waves emanating from two or more separate antennas fed from a single transmitter are intensified in certain chosen directions by starting them off at a definite time relation (phase) so that

DIRECTIVE

Call for New Control,

they reinforce each other in these directions. Conversely they are weakened in certain other directions when they are timed so that they cancel each other in these directions. Controlling this timing or phasing of the radio waves is conveniently accomplished by simply adjusting the phase relation of the two or more antenna currents. Antenna *currents* are the source of radio wave energy and any adjustments which influence either their phase or magnitude have a directly proportional effect upon the wave amplitude and phase.

The shape of a radiated pattern is not determined entirely by the antenna current characteristics, but also by the antenna element spacing, and to some extent (chiefly in the vertical plane) by the antenna height. With a given antenna configuration it is possible to adjust the antenna currents so as to produce any one of a given family of radiation "patterns." It is therefore necessary to employ antenna configurations which will permit the pattern shape desired as well as to employ equipment which is capable of adjusting the relative current amplitude and phase to the desired value.

This equipment has generally comprised more or less fixed networks. In order to provide means for more accurately maintaining the adjustment of a directional array under operating conditions and to make available means for conveniently obtaining different radiation "patterns" for day and night operation, the Western Electric 33A Antenna Control
(Continued on page 19)

Fig. 1—Front view of the 33A Antenna Control Equipment.

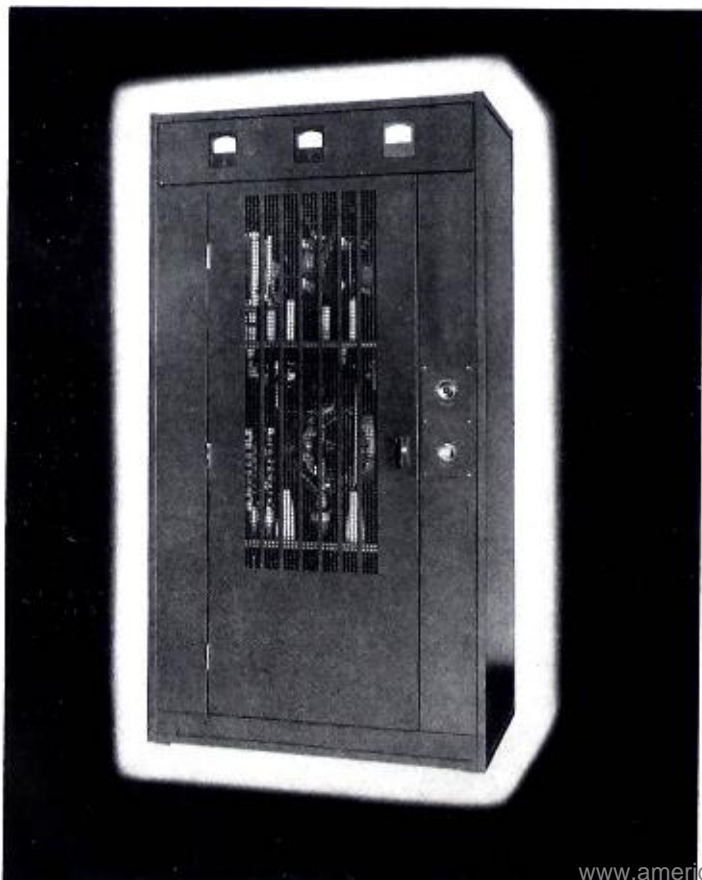
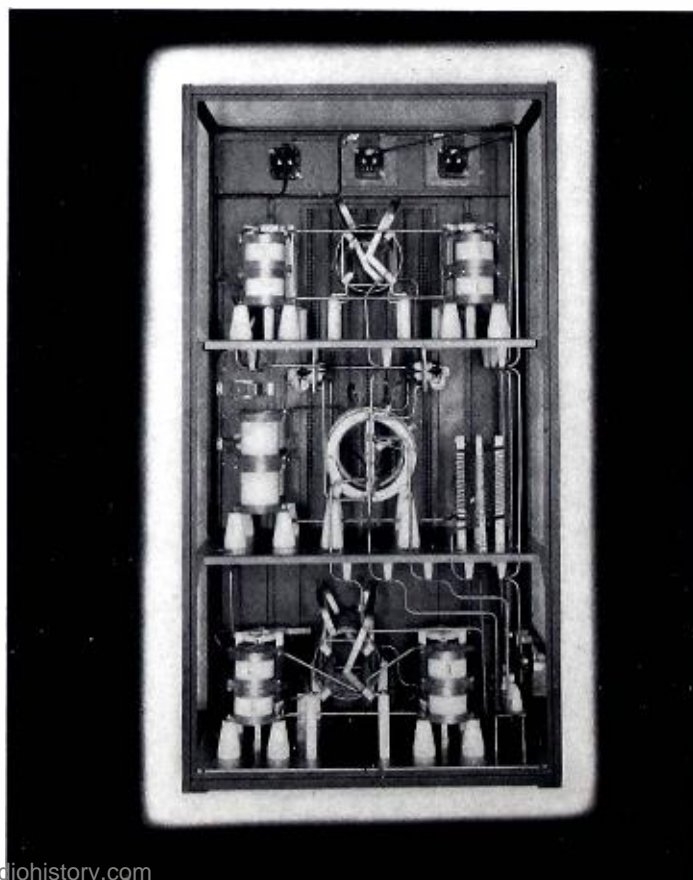


Fig. 2—Rear view with covers removed, showing internal components and wiring.



ANTENNAS

Measuring Equipment

A single antenna, since it tends to radiate in all directions, often distributes energy over the surrounding country in a manner quite inconsistent with the needs of the listeners. Considerable engineering effort has been expended during the history of broadcasting to devise methods of distributing this radiated energy in a manner to serve the listener best and at the same time create the least interference with other users of the same or adjacent frequencies.

Among the means used to improve the coverage of broadcast stations have been careful selection of the station site, vertical radiators properly proportioned to the wave-length of the station and working in conjunction with adequate ground systems, synchronized "booster" stations and directive antenna arrays. Directive antenna arrays have proved particularly useful for reducing interference with other stations and have provided a means for increasing signal strength in densely populated areas where high noise conditions generally prevail.

The adjustment of the electrical circuits of these antenna systems is difficult because of the many factors which must be considered. Heretofore the initial adjustment of the directional system has required a prolonged and expensive series of field intensity measurements which had to be repeated frequently as adjustment progressed.

Realization of this fundamental difficulty with directive antenna systems led John F. Morrison* of Bell Telephone Laboratories to devise a simple means of measuring the phase and current relations in the elements. His method, adapted to meet the special requirements of a monitoring device, is embodied in the Western Electric 2A Phase Monitor. It is now possible by the use of this instrument to adjust directive antenna systems quickly and accurately without extensive field intensity measurements and to check the permanence of these adjustments from time to time, from dial readings.

A station operating with one pattern at night and another during the day to suit particular transmission or interference requirements may, after the correct adjustments for the two patterns have once

* "Simple Method for Observing Current Amplitude and Phase Relations in Antenna Arrays"—Proc. IRE Vol. 25, P. 1310, Oct. 1937.

** Insulated towers have the loops attached with stand-off insulators.

2A Phase Monitor

By N. C. YOUNGSTROM

Commercial Products Development
Bell Telephone Laboratories

been determined, check by the use of the phase monitor the accuracy of transfer from one operating pattern to the other without interrupting service.

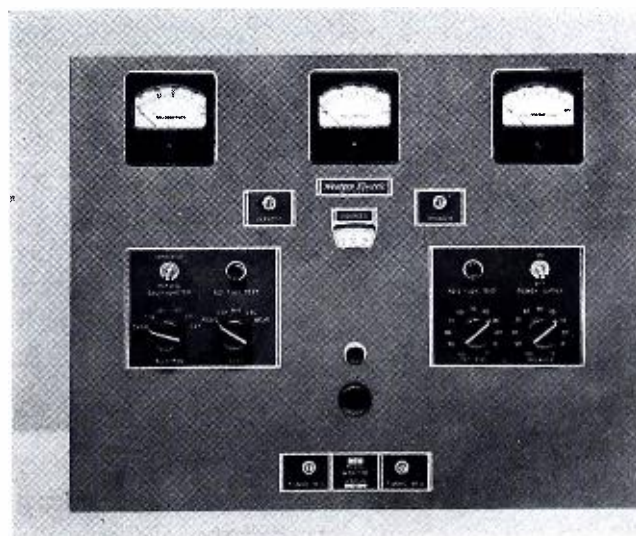
The Western Electric 2A Phase Monitor provides a means of determining the ratios and relative phase angles of the currents in the towers of a directional antenna array. Measurements are made upon true samples of actual tower currents derived from fixed and rigid loops securely attached to the towers.** The measurements are therefore independent of tuning adjustments within the transmitter and are made directly upon those quantities which determine the pattern of the distributed energy.

The principle of operation is briefly as follows: One of two samples is passed through a phase shifter and an amplifier with adjustable gain to a detector. The other is directly connected to the detector. By adjusting the phase and magnitude of the first sample it may be made to oppose, exactly and completely, the second sample. When this condition is obtained a sharp null or minimum is observed on a galvanometer associated with a detector in the instrument. The phase angle is then read directly and without mental computation from a 360° dial. Ambiguity is impossible since the dial is calibrated with red figures for leading currents and black for lagging currents.

The relative magnitudes of the two samples are read from two radio frequency milliammeters mounted adjacent to each other. By interchanging these two meters and their associated circuits by means of a single control on the front of the panel, the operator may not only check the accuracy of the meters,

(Continued on page 17)

Western Electric 2A Phase Monitor.



KTUL Serves 36 Rich Counties with New Western Electric 5 KW

By NATHAN WILCOX
Chief Engineer, KTUL

Topping five years of rapid progress in the art of broadcasting, KTUL, Tulsa, Oklahoma, recently went on the air with the first of the new Western Electric 5 KW transmitters incorporating the Doherty Circuit.

Making its bow to a radio audience early in 1934 as a 500 watter, KTUL has celebrated four power increases, each approximately 18 months apart. Due to the management's foresight in specifying Western Electric equipment for the original installation, it was not necessary to install new equipment for the first three increases. However, because of the rapid growth of Tulsa and since a directional antenna was needed for night operation, the fourth increase in power necessitated a change to a location where a complete new antenna and ground system could be installed.

After careful surveys, a site five and one half miles northeast of Tulsa's business district was selected. Here a plot of 20 acres was purchased by the Tulsa Broadcasting Company for KTUL's new home. The attractive transmitter building, of semi-modernistic design, is completely fire-proof and constructed entirely of a new type of cement building block and cement beams. Since Tulsa has the lowest gas rate of any city of its size in the country, a gas heating plant was installed. This has provision for air conditioning the entire structure during the summer months.

Due to the compact and efficient design of the new transmitter the building is much smaller than one would ordinarily associate with a 5 KW installation. The transmitter proper requires only 10 by 11 feet of space. This enclosure includes voltage regulator, plate transformer, plate retard and high voltage rectifier as well as the filter bank and power distribution equipment.

As to the performance, the usual high Western Electric standards have been attained easily. The comments, both lay and professional, have been most gratifying. Not only the engineers but the entire personnel as well as the station's listening family are more than pleased with KTUL's new voice.

The two-element directional antenna is located just north of the building. It consists of two 220 foot self supported towers with 6 foot, 6 inch base spreads. The towers are laid out on a true north and south line and are spaced 175 feet or one quarter wave-length apart. The associated ground system comprises approximately 75,000 feet of No. 6 copper wire. In wheel-like formation 120 radials 300 feet long reach out from the base of each tower. Where the

radials intersect between towers they are soldered to a common lateral buss.

As proof of the antenna's efficiency the RMS field at a mile is 207 MV/m. This is considered exceptionally good for this part of the country since the average soil conductivity is rather poor. The antenna was so designed and engineered that the field toward Indianapolis and Ogden, Utah, is held to 105 MV/m. These directions are northeast and northwest respectively. Toward the city proper the unattenuated field at a mile measures 315 MV/m on 1 KW. This arrangement gives a signal of better than 25 MV/m over the entire city of Tulsa.

Approximately three quarters of KTUL's listening audience is rural. Included in the station's primary area are 36 rich counties — 27 in Oklahoma, four in Kansas, two in Missouri and three in Arkansas with a total population of 1,295,900. It has been estimated that very nearly 50 per cent of the inhabitants of Oklahoma reside in the 27 counties served by KTUL. Tulsa is listed as the 58th city in population but 28th in per capita income. Last year 707 new homes at an average of a little over \$5,000 each were built. When it is realized that 546 oil companies and operators make their headquarters in Tulsa, it is readily understood why the city is called "The Oil Capital of the World."

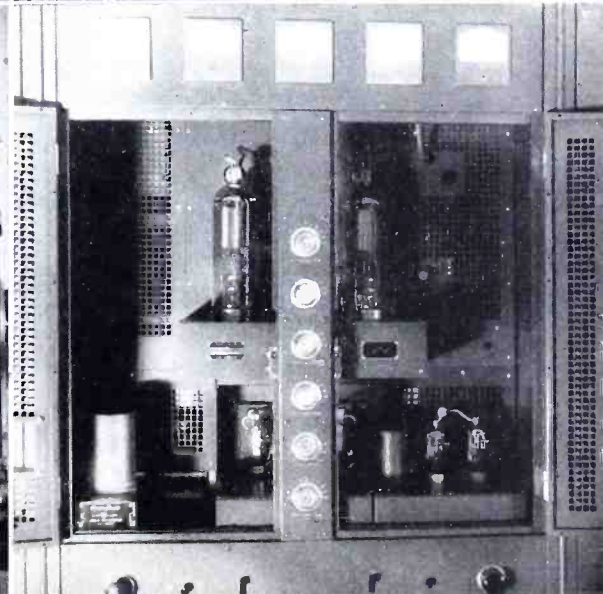
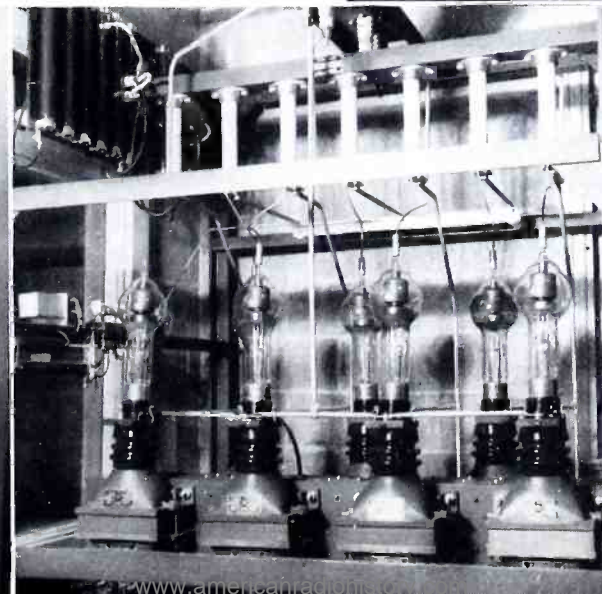
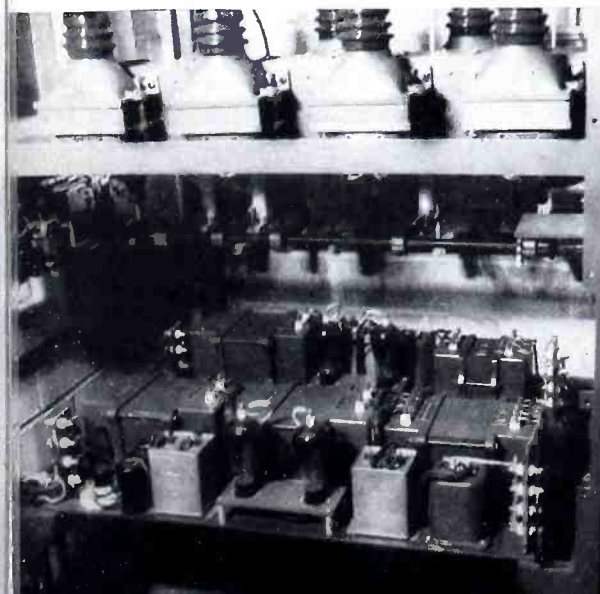
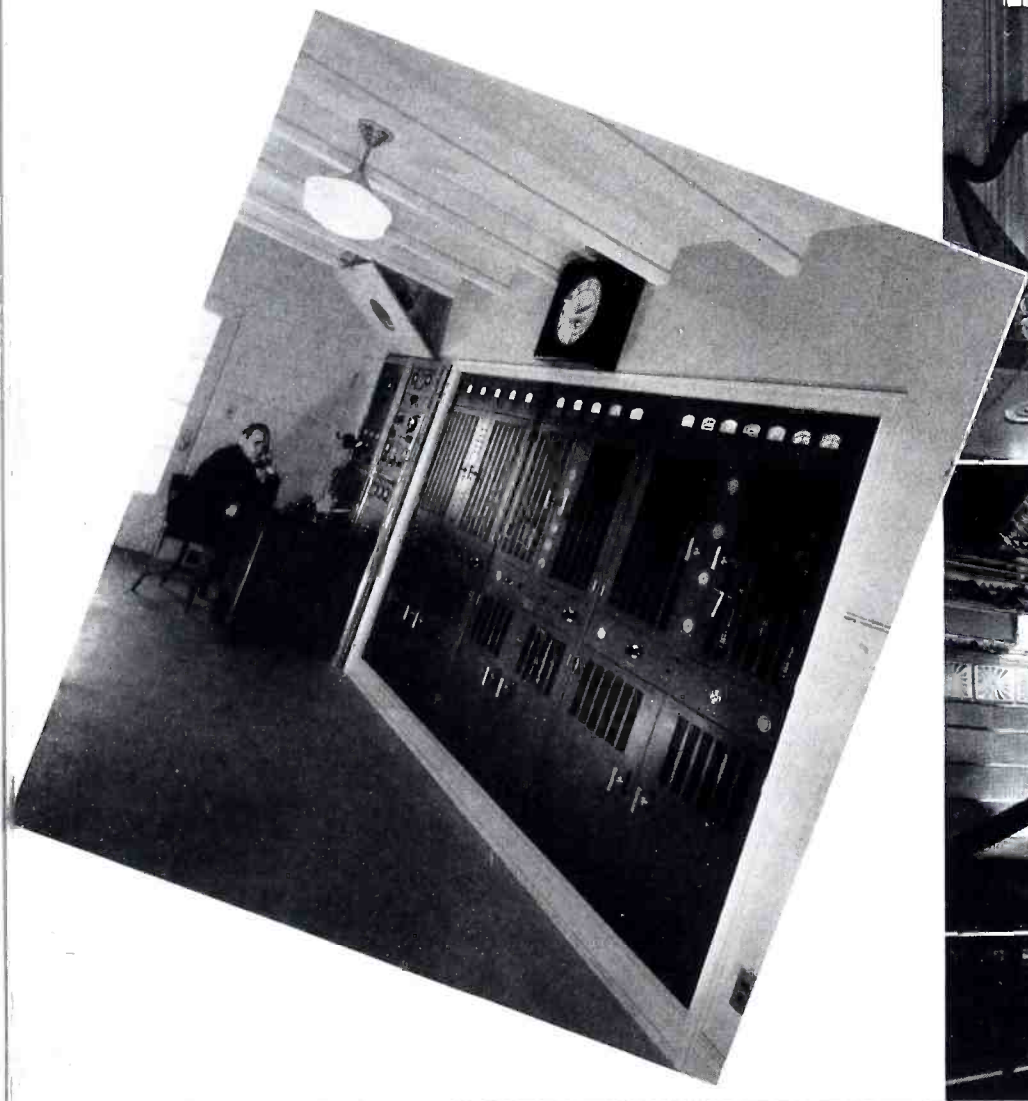
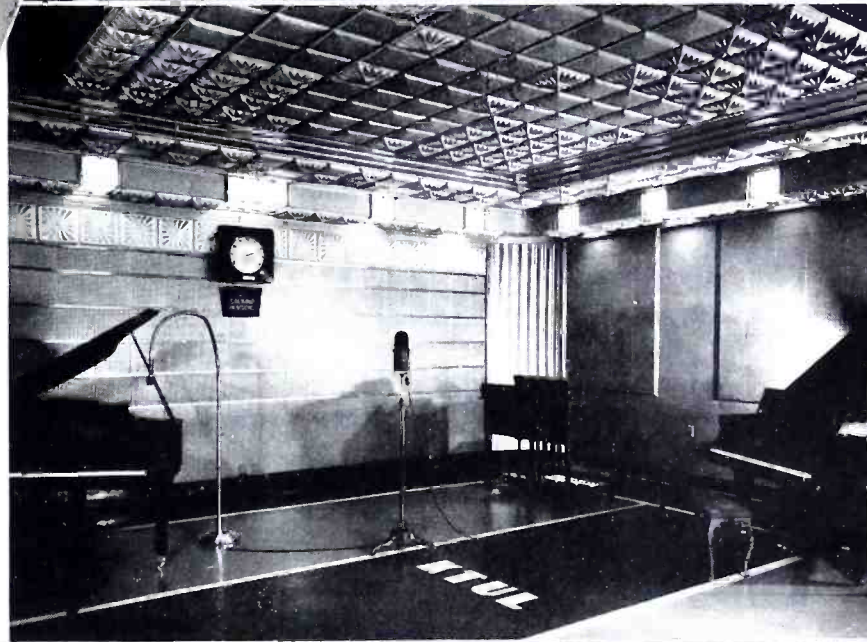
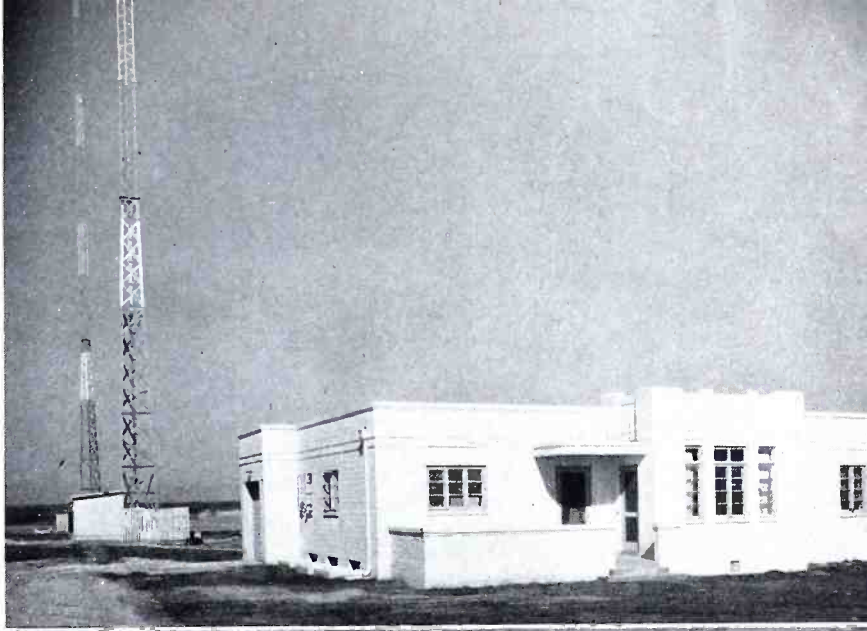
The station is owned by J. T. Griffin, Oklahoma grocery wholesaler, and operated by William C. Gillespie, vice-president and general manager. Others on the executive staff are Lawson Taylor, sales manager; John Esau, promotion manager; Vic Rugh, program director and Ray Sollars, continuity chief. Installation of the new 5 KW transmitter and associate equipment was planned and supervised by the writer.

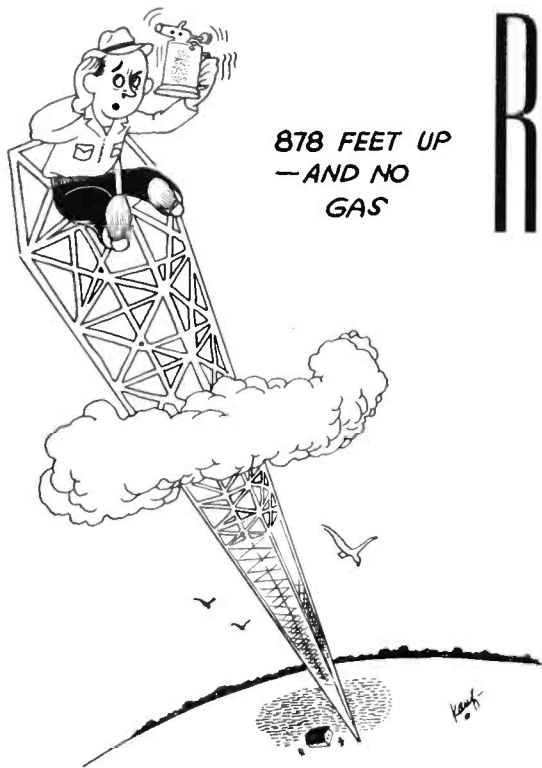
WOR Buys 16 Cardioid Microphones

Station WOR will shortly put into service 16 of the new Western Electric cardioid directional microphones. In a recent news release, WOR announced that the purchase of this unusually large number of microphones was more than justified by the results of the exhaustive trials given the new 639A. The enthusiasm expressed by WOR music director Alfred Walenstein, after tests at his Robin Hood Dell concerts, contributed in a large measure to the decision.

KTUL, Tulsa, Okla.

"The new Western Electric 5 KW transmitter (below) is so compactly designed that it requires only 10 by 11 feet of space," says Nate Wilcox, chief engineer, who is seen at his desk in the transmitter room. The photographic panel at right shows the semi-modernistic transmitter building and two of the attractive studios. Bordering the bottom of the page are the final amplifier bias rectifiers, high voltage rectifier and part of the oscillator-amplifier unit.





RADIO FUN-LORE

Yesterday's Headaches Become Today's Laughs For Chief Engineers

Electricity is a fickle mistress. Sometimes she kicks up her heels, and refuses to submit to the engineer and also apparently, to the law that says her voltage is equal to the product of her current and resistance. That means a job for the engineer to find out why. In the hours that pass while he frets and fumes at trouble shooting, nerves become frayed and the mind grows tired. Then comes humor, that fragile, intangible, invaluable something—touching him and his men lightly. Nerves relax, the mind is freshened and the mistress, become vixen is wooed back to her accustomed complacency.

Engineers like to tell of funny things—the Funniest things that ever happened to them. Many of them have told *Pick-Ups* the most humorous incidents in their careers. Perhaps on paper they all don't seem so very funny as you read them and perhaps, too, they didn't seem funny to the persons to whom the things happened, but imagine the settings where they occurred and you'll see the humor. Or can't you picture several engineers having a cup of steaming black coffee from a battered old tin pot as they pause for a moment in a night filled with work? They talk of this and that and then one says: "Wonder whatever became of old Gus . . . remember the time he . . ." That's how engineers' lore is made and that's when stories produce their deepest chuckles. So, pour me some more of that Java, pal, and listen.

"The most humorous incident I ever

saw," says Jack DeWitt of WSM, "was the time one of our engineers climbed to the top of our 878 foot tower to do some soldering only to discover when he reached the top that his blow torch was out of gas."

The practical joker is no stranger to the transmitter building. Here's one of his niftiest tricks: "One of our operators," recounts Theodore A. Giles of WMBD, "had his pet pipe filled with rubber bands by another operator. When he fired up his pipe he dashed from one part of the building to the other looking for burning insulation." Then there was the behavior of the rookie operator when an ignition bomb, which another operator had placed in the transmitter, went off as the rookie put the transmitter on the air. "I was the rookie operator," says Glenn G. Boundy of WWVA.

Consider the state of affairs reported by John Scales of KARM when the maestro slipped the moorings on the concert master's trousers during a long solo violin passage before the microphone. "The results were remarkable," states John simply.

Comedy flirts dangerously with tragedy, around the station when engineers work with high voltages, providing a common form of humor so long as the results are harmless. "Two engineers were working on the transmitter," reports Neal McNaughten, KRGV, "and the air suddenly grew blue with profanity when one of them got a touch of 110 AC. A few moments later the other engineer in some unknown way received the full discharge from a bank of filter



condensers, throwing him with great force against a brick wall. The only word he uttered was 'gracious.'"

Removing an employee from the clutches of a high voltage power supply, Norris E. Grover, WKAR, proceeded to give the careless worker a lecture on the fact that he should have been more careful, "because you know that pack has 500 volts." Still nervous, the man shouted, "FIVE HUNDRED AND FIFTY, FIVE HUNDRED AND FIFTY." "Thereby making a liar of me for a measly 50 volts," says Grover.

It happened some time ago and Nathan Wilcox, KTUL, now thinks it was funny when he sat on a corona shield of an antenna lead-in insulator only to have some one turn on the transmitter—a transmitter that was supposed to be securely locked up.

Don't ever try to put out a fire in an antenna series inductance at the height of an electrical storm without removing the carrier. Scott Helt of WIS saw a 200 pound operator try it. The antenna was receiving hits in rapid succession and the operator would mount a chair and blow on the fire between hits. He miscalculated just once and was knocked off the chair and back against a very, very hard brick wall.

There's no telling what people will do when lightning begins to pop. Walter M. Ely of KGFW tells of the operator who was talking over a phone when lightning struck. He yanked the phone off and ran across the room with it. Five people were so frightened in the midst of a card game in the transmitter building when the horn gap discharged, they dashed outside of the building, according to Earl F. Downey, WAIR, who saw it happen.

A common source of trouble and fun are animals around the transmitter. There was the time John C. Bell, WBRC, saw an operator uninten-



tionally grab a four foot black snake entwined in the mesh door of the transmitter. The snake had come in through the drain hole of the building to get warm. Trying to remove a family of baby mice from a transmitter without going off the air was fun to George F. Gautney of WICA. And Robert A. Starr of WRGA let his emotions run from laughter to pity to irritation when a mouse got his tail between the plate supply and ground, throwing the transmitter off the air twice in 30 minutes. But this tale of a tail has a happy ending, except for the mouse's. He lived but his ending didn't. Tails make tales, it seems. There's the case related by J. G. Leitch, WCAU, of the pack of fox hounds which ran under a temporary counterpoise being used in conjunction with field strength measurements and whose height was just right to touch the tails of the dogs.

Every engineer has nightmares that his station is off the air, and occasionally dreams turn into reality. That's when hairs turn gray. As a rule the cause of trouble is minor, sometimes even the result of a bonehead stunt. There was the case, for instance, of the engineer who called in Myron Kluge, KFSG-KRKD, to help get a transmitter back on the air when the only trouble was that he was repeatedly putting in undersize fuses without looking at their ratings.

Gene Rider, WQAM, had a new operator who put the transmitter on the dummy antenna and wondered why he wasn't getting out. Who hasn't had the experience of J. C. Haynes, Jr., KWOS, who spent an hour trying to find the source of hum, only to discover that he had forgotten to reconnect the filters after working on the power equipment.

Consider the tragic comedy reported by J. P. Veach, KFEL, of the station engineering staff that worked a week trying to tune the transmitter only to find that the manufacturer had supplied an amateur

(Continued on page 21)





Announcer Paul Oliphant at the desk presenting a program from Studio C.



From the specially designed control room engineers direct all broadcasts.

WLAC

Nashville, Tenn.



Chief Engineer F. D. Binns (right) says repairing the boss' radio is his hobby. On his staff are Raymond C. Lowry (upper left) who toys with photography — Charles Dorris (upper right) known as expert wood worker.



Miller Watkins (upper left) devoted to bird dogs, caviar and "chewing the fat" — Felix D. Riley (upper right) farmer, hunter, fisherman, and Allen Dunkerley (left) who lists football, aviation as his pastimes.



Two of WLAC's luxurious offices — the lower photograph shows J. Truman Ward, owner, conferring with an associate.



Main studio where all programs using large units originate. Below: Manager F. C. Sowell directing station activities.



Elaborate New Studios Mark Rapid Growth of WLAC, Nashville

Southern broadcasting took a conspicuous step forward when WLAC, Nashville, opened its elaborate suite of new studios and offices atop the Third National Bank building a few months ago. Planned and approved by the Columbia Broadcasting System, they represent the last word in technical utility and beauty of design. Introducing a unique quirk in switching from old to new, WLAC planned the transmission to take place in the middle of a sentence during a regularly scheduled news-cast. Except for the change in voices, the news story flowed smoothly on without so much as a momentary pause, as the announcer at the new studios took over the broadcast.

Covering 11,000 square feet of floor space, every inch of which is utilized, WLAC's new home includes nine offices, three reception rooms, audition room, news room, library and three major studios. Western Electric equipment has been used for the entire installation. All studios are constructed with sound-lock entrances and the most modern acoustical material and devices have been employed. The main studio is mounted on springs and "floats" inside another room. Each studio is equipped for individual control with 23A speech input consoles. Seated at a circular desk, with all control panels before him, the operator has a clear vision of broadcasts originating in any one of the three studios.

One of the first objects to catch the visitor's eye is the imposing new four manual Kilgen organ especially built for broadcasting and installed in the main studio. More than 300 artists and craftsmen participated in the building of this instrument and wood from many great forests scattered over the globe has gone into its construction. WLAC claims that there are only four other such organs in existence.

The story of WLAC is in reality the story of the ability, sound judgment and foresight of its present owner J. Truman Ward who has guided its destiny since the station first took to the air in 1926. It has been Mr. Ward's aim to provide types of broadcasts which will meet with the approval of every listener. He is fully in accord with the viewpoint that the standards of radio broadcasting must be continually improved. But this, he contends, must be a gradual process since the average listener cannot suddenly learn to appreciate and assimilate all the finer things radio has to offer. In this way broadcasting will continue to hold the interests of its vast audience and at the same time create an increasing demand for programs of a higher type. WLAC strives to bring the listeners themselves into the programs whenever possible, impressing them always with the idea that this

is their station.

That these policies have reaped a rich reward is indicated by the fact that commercial programs carried over the station have increased more than 110 per cent during the past three years while the staff has expanded to more than 30 members and the listening audience has swelled at the same extraordinary pace. Advertising carried during the past year topped that of 1937 by approximately 15 per cent.

At the beginning of 1939 WLAC found itself completely sold out from eight in the morning until one in the afternoon with the exception of one 15 minute spot. Virtually all evening spots were under contract and a generous sprinkling of afternoon commercials was shown on the schedule. Now, happily settled in its splendidly equipped new home, WLAC feels that the outlook for the future is exceedingly bright.

Remote Temperature Indicator at WNAX



Clifton Todd, Chief Engineer, WNAX, showing his automatic temperature indicator.

In keeping with its policy of public service, WNAX, Yankton, S. D., has just installed a remote control temperature indicator for the purpose of supplying its radio audience with accurate temperature reports. Formerly the temperature reading was phoned in to the control booth at the studios from the transmitter, several miles out of Yankton. The new system, devised by Clifton Todd, chief engineer, is almost entirely automatic. The temperature reading is now taken by one of the engineers at the transmitter; he pushes a button on a control panel, and immediately an automatic relay operates an indicator in the announcer's booth, showing the present temperature.



50 Watts at 200 MC. The 356A

Stemless construction contributes to small size of new tube, reduces losses at ultra-high frequencies.

By C. E. FAY

Vacuum Tube Development
Bell Telephone Laboratories

A new ultra-high-frequency vacuum tube, designed for operation in the range from 30 to 300 megacycles, has just been introduced by Western Electric. This tube, the 356A, utilizes the stemless type of construction pioneered in the 316A vacuum tube (Pick-Ups, Feb. 1937). Taking full advantage of this most recent development in vacuum tube design, Bell Telephone Laboratories engineers were able to reduce radically the height that would have been necessary for this tube if the conventional base and stem had been used. This reduced size means a reduction in the length of leads both inside and outside of the tube, an extremely important advantage in the operation of ultra-high-frequency circuits.

The 356A is a filamentary, air-cooled, high mu triode. As a radio frequency oscillator it may be used at full rating at frequencies up to 100 megacycles and at reduced rating up to 250 and even 300 megacycles. It is also suitable for use at audio frequencies, particularly in Class B audio amplifiers or modulators, where it may be used without grid bias at plate potentials as high as 1,000 volts.

As can be seen from the photograph, all of the tube elements of the 356A are supported by the leads, which are themselves supported solely by the glass envelope. No solid dielectric whatsoever is used inside the envelope, reducing to a minimum the dielectric losses which, especially at high frequencies, ordinarily impair tube efficiency.

The plate terminal at the top of the tube is connected to its lead by a welded connection, an important improvement over the conventional soldered

(Continued on page 22)

Complete Characteristics of the 356A Vacuum Tube

Filament voltage 5.0 volts, a.c. or d.c.
Nominal filament current 5.0 amperes
Average thermionic emission 1.0 ampere

Average Characteristics with a plate current of 100 ma.
Amplification factor 50
Grid to plate transconductance 3800 micromhos
Plate resistance 13000 ohms

Average Direct Interelectrode Capacitances
Plate to grid 2.75 mmf
Plate to filament 1.0 mmf
Grid to filament 2.25 mmf

Maximum Ratings
Max. direct plate voltage 1500 volts
Max. direct plate current 120 ma.
Max. plate dissipation 50 watts
Max. r-f grid current 6 amperes
Max. direct grid current 35 ma.
Max. frequency for above ratings 100 megacycles
Max. plate voltage for upper frequency limit of 250 mc. 1000 volts

Class B Audio Amplifier or Modulator for Balanced 2 Tube Circuit

Direct plate voltage	1500	1250	1000	750 volts
Grid bias	-17	-10	0	0 volts
Direct plate current per tube				
No drive	30	35	50	35 ma.
Maximum drive	100	120	120	120 ma.
Load resistance per tube	4100	2750	2100	1450 ohms
Load resistance plate to plate	16400	11000	8400	5800 ohms
Power output depends on distortion requirements				
Approximate maximum output (per pair of tubes)	200	200	150	100 watts
Recommended power for driving stage	10	10	10	10 watts

Class B Radio-Frequency Amplifier

Direct plate voltage	1500	1250	1000	750 volts
Grid bias	-17	-8	0	0 volts
Direct plate current for carrier conditions	50	60	60	60 ma.
Approximate carrier watts for use with 100% modulation	25	25	20	15 watts

Class C Radio-Frequency Oscillator or Power Amplifier— Unmodulated

Direct plate voltage	1500	1250	1000 volts
Direct plate current	100	120	120 ma.
Grid bias	-40 to -80	-35 to -75	-30 to -60 volts
Nominal power output	100	100	80 watts

Class C Radio-Frequency Oscillator or Amplifier— Plate Modulated

Direct plate voltage	1250 max.	1000	750 volts
Grid bias	-100	-95	-90 volts
Direct plate current	100	100	100 ma.
Max. direct grid cur.	35	35	35 ma.
Nominal carrier power output for use with 100% modulation	85	65	50 watts

Ultra-High-Frequency Operation

For frequencies above 100 megacycles, the maximum plate voltage must be reduced as follows:

Frequency	100	150	200	250 mc.
Plate voltage:				
Class B or Class C Unmodulated	1500	1400	1250	1000 volts
Class C Plate Modulated	1250	1175	1050	800 volts

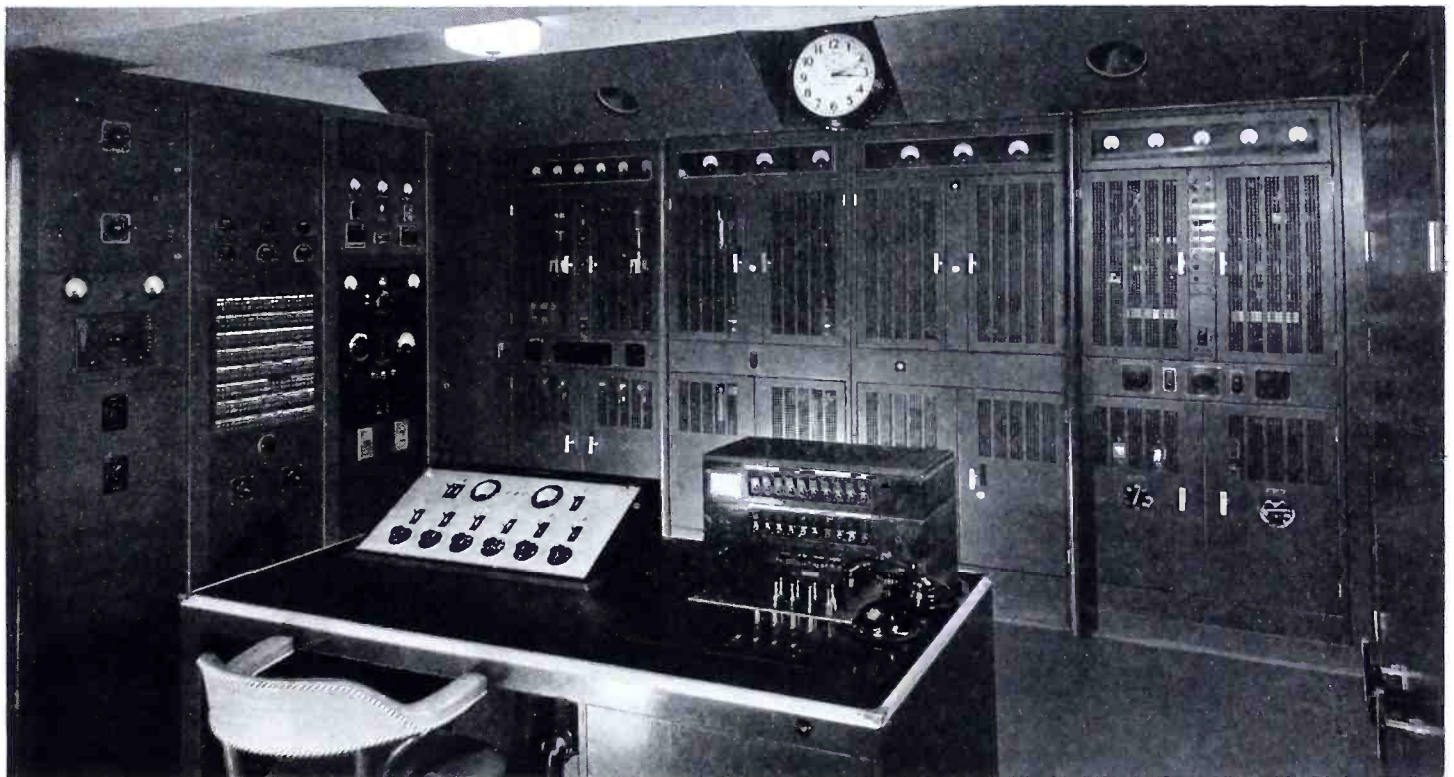
The plate dissipation should not be allowed to exceed 50 watts.

WKRC

Cincinnati, Ohio



In the past 14 years WKRC, Columbia's outlet in Cincinnati, has grown from a 500 watt station to its present power of 5,000 watts. Above: Two views of the reception room—notice novel clock and monitor loud speaker combination in left picture.



Above: The Western Electric 5,000 watt transmitter and speech input equipment which were installed in March 1937 in a penthouse on the roof of the Hotel Alms.

Below: Western Electric studio speech input equipment controlling largest studio. WKRC's suite of attractive offices and studios occupy one entire wing of the hotel.

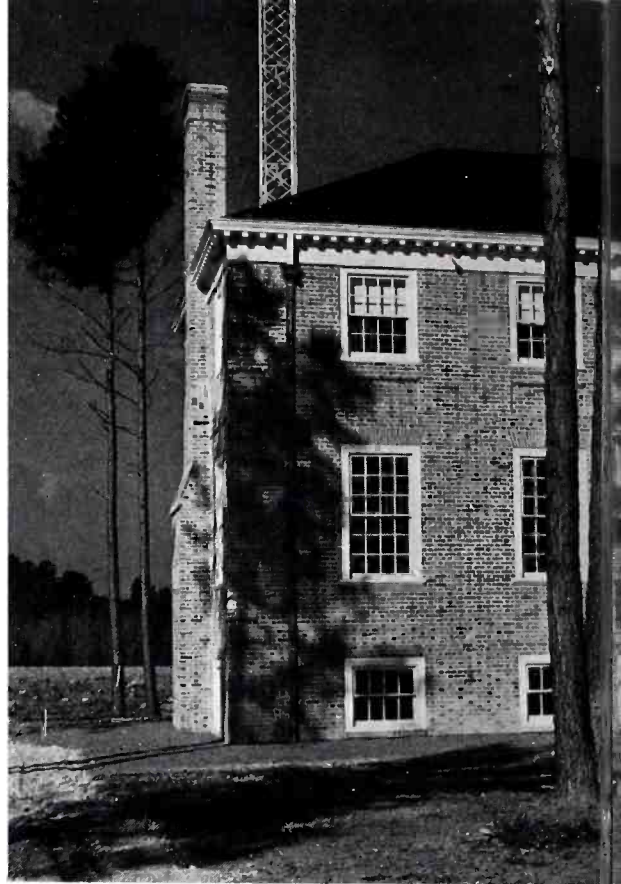


William A. Schudt, Jr., manager (left) came from WBT, Charlotte, N. C., just a year ago. Previously he was associated with the Columbia Broadcasting System in New York. John Tiffany, who heads the engineering staff, formerly worked at WABC, N. Y.



WRVA

Richmond



Overlooking the historic James River, 12 miles from Richmond, Virginia, this building houses WRVA's new Western Electric 50 KW transmitter.



Looking up a supporting guy to one of the two 470 foot towers which appear in lower center picture.



Barron Howard,
Commercial Manager

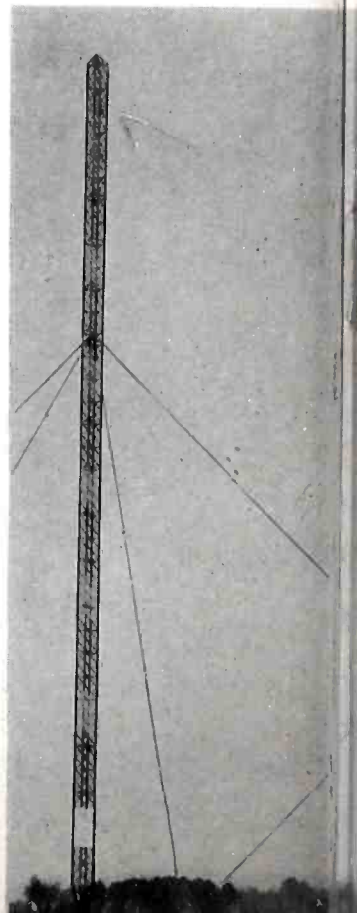
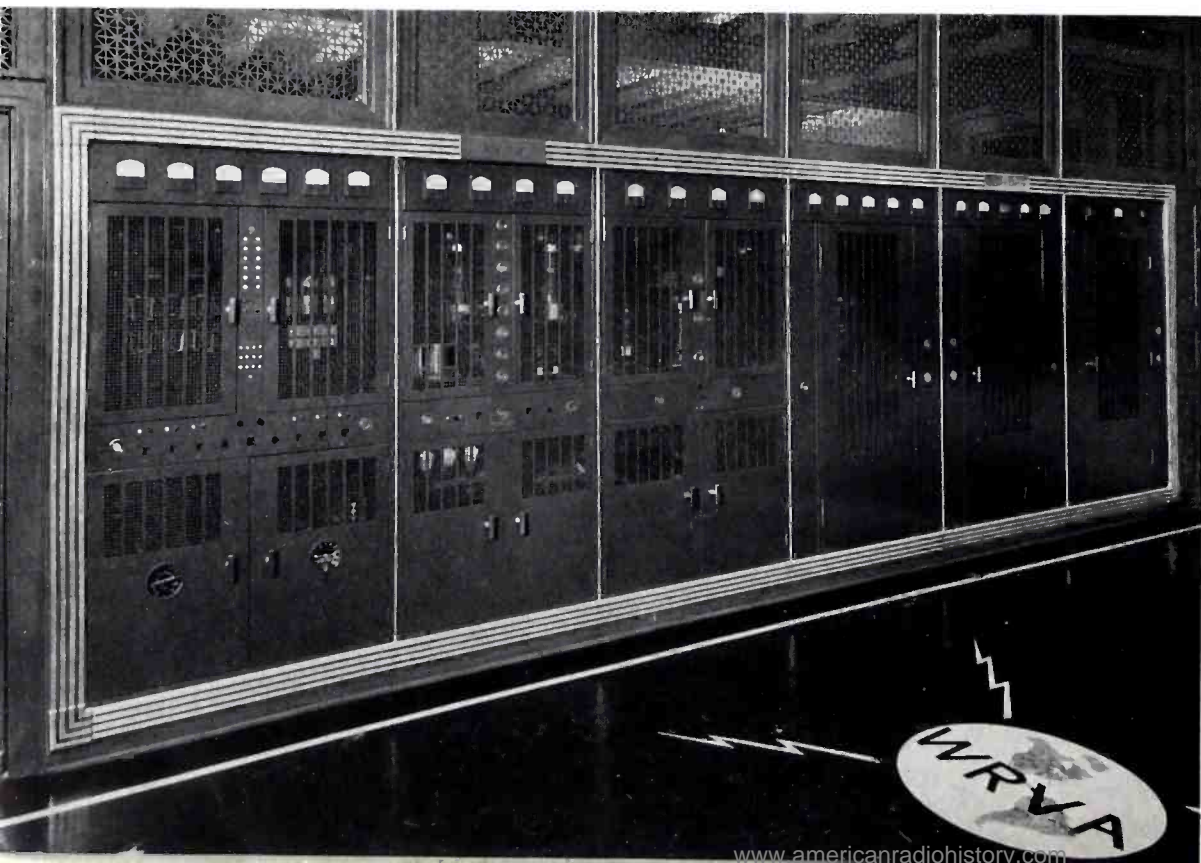


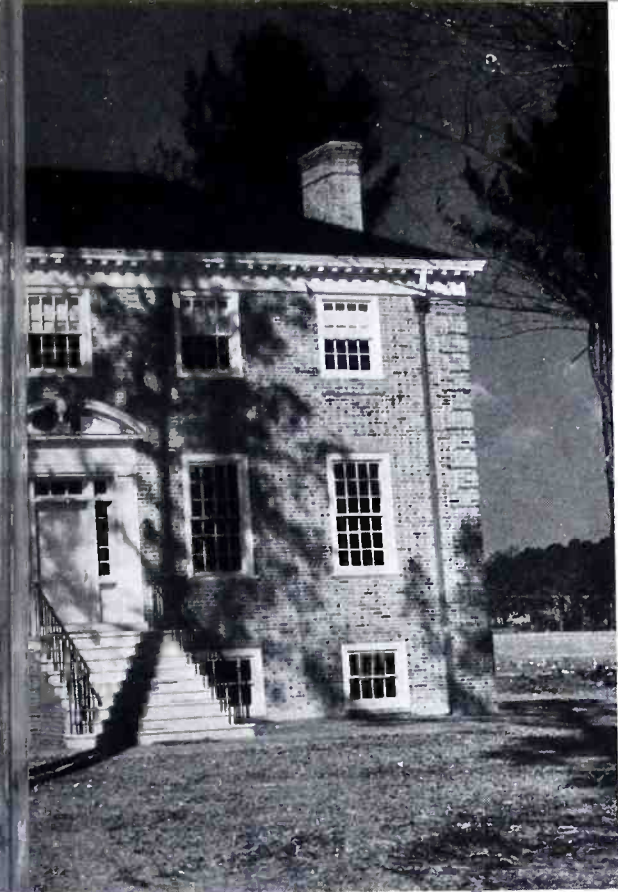
Walter R. Bishop, Director
of Public Relations



General Manager

Front view of WRVA's powerful new voice — the Western Electric 50 KW transmitter which employs the Doherty Circuit. The last cabinet in the line-up houses the 33B antenna control equipment.





Richmond, Virginia, this stately colonial building
 which went on the air on St. Patrick's day.

50KW

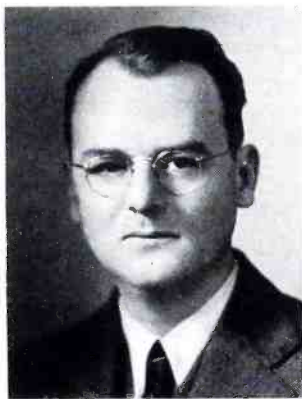
Virginia



Multi-conductor antenna coupling equipment show-
 ing the unusual counterweight anchorage system.



Lucy,
 Manager

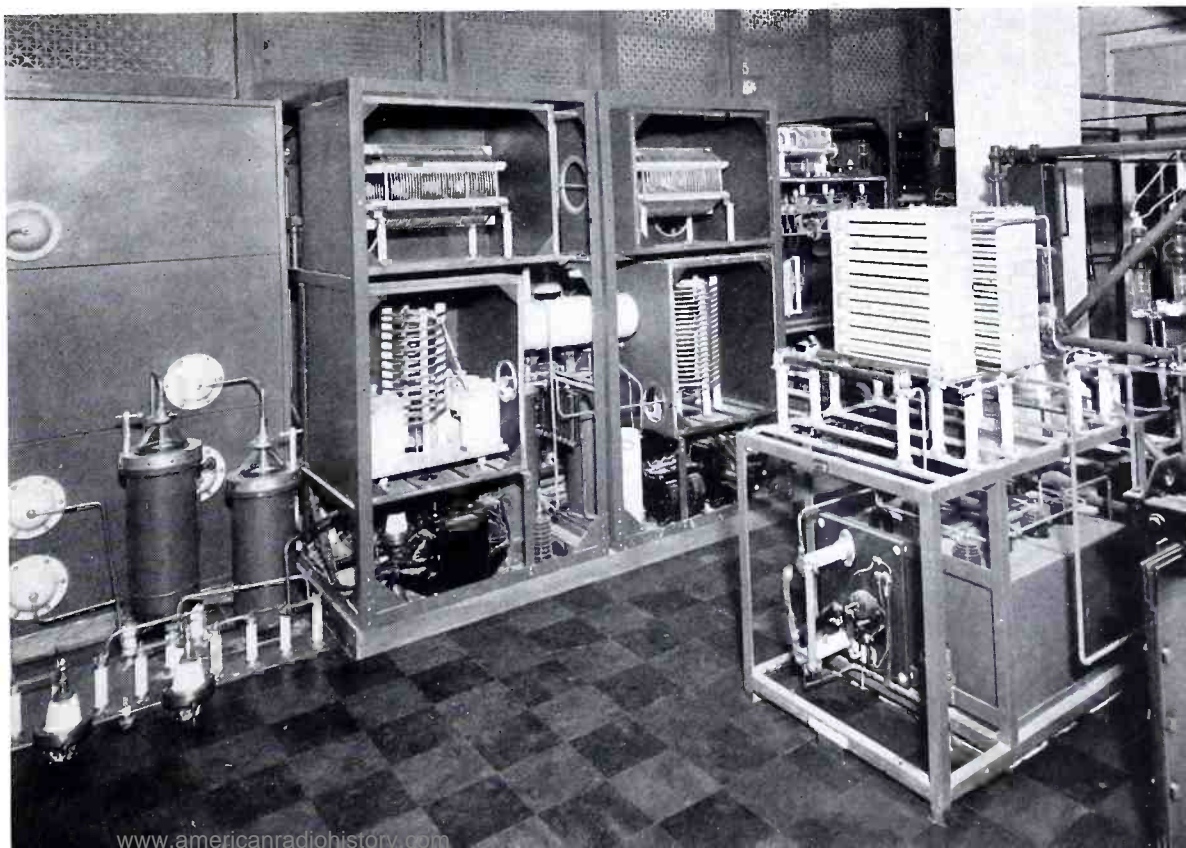
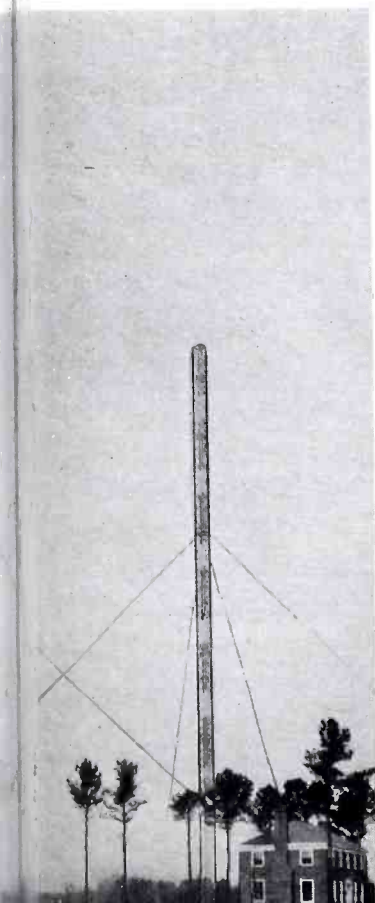


David C. Woods,
 Chief Engineer



Irvin G. Abeloff, Program
 Service Manager

Rear view of the new 50 KW transmitter—note the nitrogen gas condensers (at the left) used
 for the antenna control equipment. This transmitter occupies less space than any other 50 KW.



AUTOBIOGRAPHY

Of Old Timer Western Electric 5KW at WNEW

Heh, Heh! Way back in 1931 they stored me away to catch dust and die. Yep, they said I was just an obsolete 5 KW transmitter too old and out of date to do a good day's work, but listen, you young fellows! Take a look and a listen to me now. Here I am at WNEW doing more work than any of you. And thanks to modifications, I put out as pretty a signal as any of you new fangled guys, and boy how the old RF pounds through my coils and condensers.



Max J. Weiner
Chief Engineer, WNEW

Yes, sir, look at the record. Since 1935 I have been on the air 24 hours a day at WNEW with only 12 hours rest on Sundays and Mondays, but there I go bragging again. Guess maybe I'd better begin at the beginning and give you the story straight. I was conceived by Bell Telephone Laboratories and Western Electric back in 1926 and christened 5B, and I was the first of this series. What a transmitter I was for those days. They called me the last word. I went in service for A. H. Grebe with the handle of WAHG, operating from Richmond Hill, Long Island. Those were the days. Grebe operated me about 7,500 hours during two and half years and then along came a new outfit which called itself the Atlantic Broadcasting Company,

Twenty-four hours daily after more than 65,000 hours on the air is the amazing record of this 13-year old Western Electric transmitter, now operated by WNEW.

forerunner of Columbia Broadcasting System. They moved me over to Cross Bay Boulevard and life began anew for me under the call of WABC. Ray Newby was my chief engineer and life went merrily on under my new operators until 1931, when, after operating another 20,000 hours, disaster suddenly befell me.

Well, sir, it was terrible. Seems like those restless boys at Bell Telephone Laboratories and Western Electric had been up to their old tricks again, and the art of broadcasting had been zipping along too. They said I was old and obsolete, and my power was too feeble. WABC bought a spanking new Western Electric 50 KW transmitter and I was shoved over in a corner. No more life-giving AC pulsed through my transformers. No more hot RF tingled in my tank. No listeners twirled dials to hear my vibrant voice. There I sat for two years, forlorn and forgotten, except when somebody needed a relay, condenser, or resistor. Then I felt the searing scorch of the soldering iron, and another vital part was yanked from my innards. It looked like a slow, silent, and lingering death, and then Day of Days! WNEW was formed in 1933.

The first I knew was when a young fellow, Max J. Weiner, came in to look me over. He had the appearance of an engineer. How I longed for a tail to wag at him! But they bought me, and moved me over to the Jersey salt flats at Carlstad. Some job Weiner had fixing me up, but in a few weeks I was on the air again, (February 15, 1934). Oh, boy, ON THE AIR with people listening to me, wanting to hear my voice. Can you wonder that I was determined to do my best!

And I have, ever since. Right now it's Spring, 1939, and this old frame of mine has seen 38,018 hours of broadcasting for WNEW with a total time on the air of 65,518 hours which amounts to more than seven and a half years of continuous time.

What changes I've seen. How the art and science of broadcasting have changed in these 13 years of service. Would you believe that I started out in the world innocent of even crystal control. WABC modified me for that with Western Electric conversion parts. Then they opened me up again and gave me a new voice with 100 per cent modulation. In 1934, 700A oscillators were added, making the frequency stable to one cycle.

In 1936 Weiner revamped me for stabilized feedback, and what a job that was when I was on the air 24 hours daily except Sunday and Monday.



Then he put in a new switching circuit to permit me to hop back and forth from two and a half KW to one between day and night. Then I got a new water cooling job. Who knows, maybe one of these fine days Weiner will come in, and wire me for higher efficiency with the Doherty circuit I hear so much about these days. Oh, yes, I'm operating at my full power of 5 KW daytime now.

Between you and me I'm just as proud of these so-called modifications inside me as an old dame who gets her face lifted. Speaks pretty highly for my designers that a 13-year-old war horse like me could still take every scientific advance in its stride. Guess you'd call it designing, foresight or something. Whatever it is, it certainly has kept me on the air. I'll have you know my voice is high-fidelity, and all my other requirements are well within the FCC regulations.

Of course, I have had good attention, too! Weiner and his crew look me over regularly each week and keep me in perfect condition. Guess the boys are getting rather fond of me because I hear them bragging now and then. Just the other day Weiner was saying something about it being amazing how an old timer like me keeps on going without any station interruptions. Maybe I'm mistaken but I thought I heard him refer to me as the Gehrig of Broadcasting. My parts last pretty long, too. My thyratrons have about 27,000 hours on them. My 222A tubes have given about 10 to 12 thousand hours service, and the 220B amplifiers run 8 to 10 thousand hours.

My audience is growing daily and I do a swell job of covering a territory that includes parts of New York, New Jersey, Pennsylvania, and Connecticut. I have made a couple of guys famous. Ever hear of Stan Shaw? He's the guy who keeps me going all night with his "Milkman Matinee." Stories have been written about him in Ken, the New Yorker, and several other slick magazines. Why, he's received more than 26,000 paid telegrams in one year. Then there's Martin Block and his "Make Believe Ballroom." He draws as many as 1,300 telegrams from one announce-

WNEW transmitter building housing the 5 KW Western Electric transmitter which operates 24 hours daily, affording music and the patter of Stan Shaw to thousands of night-owls.



WNEW transmitter site at Carlstad, N. J. With tidal water lapping its antenna base, an almost perfect ground is obtained.

ment. He has received as high as 31,000 letters in one month. My old voice has done pretty well by our sponsors, too. I have brought them so much business, many of them have expanded beyond their fondest dreams. Reckon I'm doing all right for an old timer who thought he was finished way back in 1931.

2A Phase Monitor

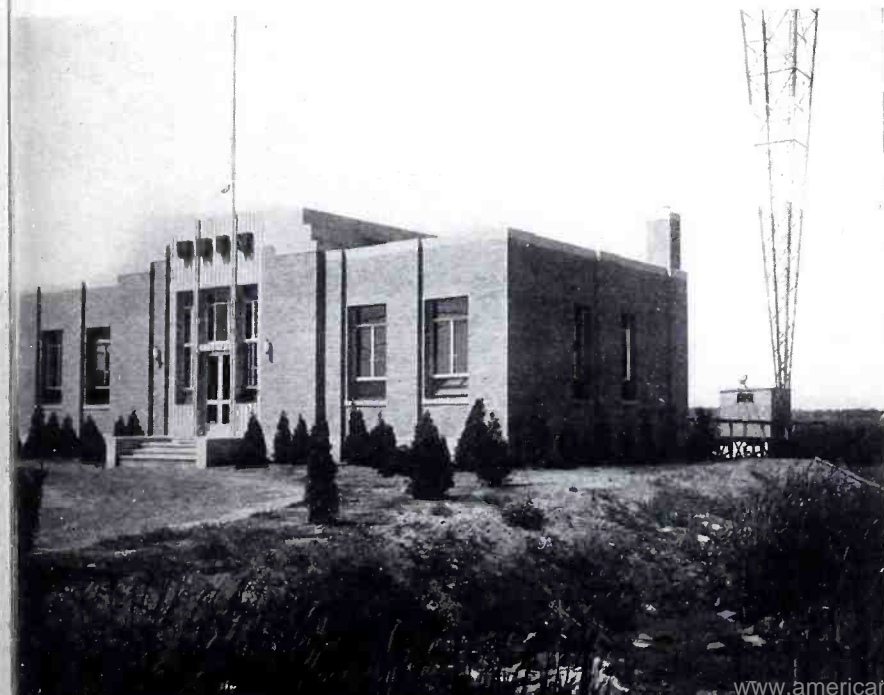
(Continued from page 5)

but may repeat the phase measurement using the adjacent quadrant of the phase shifter. This feature makes the device self-checking and gives the operator assurance of its accuracy.

In general, the unpredictable mutual effects of the individual radiators make it impossible, from merely theoretical computation of phase angle and current ratio, to arrive at adjustments which will produce the desired pattern from a given directive antenna with the accuracy usually required. However, the use of the phase monitor reduces to a minimum the tedious process of making repeated corrections to tentative adjustments, each checked with field intensity measurements. With this new tool the required number of tentative adjustments are few and check field intensity measurements are simplified as well as reduced in number.

The phase measuring element in the monitor is a unique "multiple sinusoidal" condenser devised by L. A. Meacham of Bell Telephone Laboratories. Used in a suitable circuit it produces phase shifts equal to the angular displacement of the rotor,

(Continued on page 21)



Police Radio Best Weapon, Says White Plains Chief

When any municipality installs a police radio system, two things inevitably happen which prove the efficiency of this law enforcement weapon, the most hated and feared among criminals. They are: the decrease in crime; the increase in arrests.



William Miller,
Police Chief,
White Plains, N. Y.

When the City of White Plains, Westchester County, New York, recently installed a Western Electric Police Radio System, it didn't have to wait for monthly and yearly statistics to demonstrate the wisdom of the move. One dramatic, fast moving incident gave quicker proof than whole columns of figures could have done.

One night, shortly after the installation had been completed, there came a call to Police Headquarters. The caller reported hearing the sounds of a fight in an apartment building. Out went a radio call to the prowl car in the district. The car arrived at the scene seconds later and the officers apprehended a man just as he was leaving the building. Inside, they found a man dying of a gun wound. The man picked up by the police had fired the shot. "That man would without doubt be at large today, had it not been for our police radio system," says Chief of Police William Miller.

To cover the ten and one-half square miles of rolling, highly urbanized White Plains, the city chose a Western Electric 22A 25 watt ultra-high frequency headquarters transmitter, and equipped eight cars with Western Electric two-way car transmitters and receivers. One remote receiver installed in a public school building is used as a booster in receiving the signals from the cars. Four of the cars are used as prowls, also one by a captain, one by a sergeant and one by detectives. The prowl cars work 24 hours daily with officers working in eight hour shifts.

White Plains could have installed a



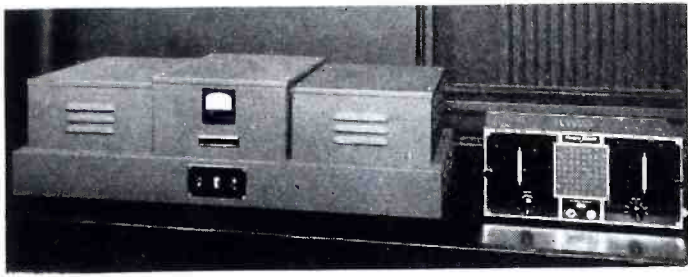
White Plains police headquarters where the heart of the Western Electric two-way police radio system is located. Because the coaxial type antenna is used, an unusually strong signal is obtained. Bottom panel: Radio equipped motor patrol fleet ready for action.

one-way system long before this but it choose to wait until it was possible to purchase the two-way equipment. "Our system after only a few months use has already demonstrated the need for and the increased efficiency of two-way communication," Chief Miller states. "We keep a perfect check on our prowl cars at all times, and we can learn in an instant their exact locations in their districts. When an alarm comes in from some remote section of the city and a car is dispatched to the scene, headquarters never is in the dark for a moment. It knows the prowl car has received the information and is on its way because the officer in the car immediately reports back to headquarters.

"The ability of the prowl car to report instantly to headquarters is an asset of inestimable value. An officer can call for additional help instantly and without leaving the scene. In the event of a chase he can help direct the movements of other cars. Even in cases where no criminal act has been committed, such as traffic accidents, the two-way feature is important. It enables the officer to summon an ambulance, call for help, and carry on his other duties without once leaving the scene.

"Today we can reach the location of any disturbance in a matter of seconds, and that often makes the difference between an argument and an act





Western Electric 22A radio transmitter (left) and the 19A radio receiver installed in a small closet at Headquarters.

of violence. Now, our men are able to get there before the crime happens. The appearance of an officer ends the disturbance.”

An average of from 20 to 30 alarms come to headquarters each night from frightened citizens. They are put on the air and answered so quickly by patrol cars that the person making the report is often still at his telephone when the officers arrive. The great majority of these calls are false alarms, but they spell safety and protection to citizens, and where there is trouble, arrests and crime prevention follow.

“Our police radio system,” says Chief Miller, “is the best weapon on the force. We wonder now how we ever got along without it.”

33A Antenna Control

(Continued from page 4)

Unit has been developed; see figures 1 and 2. The unit contains variable branching and phasing networks capable of initial adjustment to any operating requirement. Equipped with magnetic switches a complete change of pattern may be established automatically using a single control on the operator's desk.

Figure 3 shows a simplified schematic of the circuit. L3Z-L4Z is the branching transformer, the primary of which is connected to the radio transmitter. This transformer is arranged to permit adjustment of the current division between the two branches without materially affecting the phase relation. The input impedance of the branching transformer remains practically constant as the ratio of currents is changed over a wide range. Adjustable stops, provided on the secondary winding, prevent a maladjustment at the extreme ends which might produce an impedance outside of tolerable limits, thus preventing any detuning of transmitter or mis-termination of the transmission line.

A phase shifter is provided in each of the two branch circuits, one of which is variable over a small range under power. Two phase shifters permit a greater degree of flexibility to meet varying installation requirements and minimize the losses normally encountered in a single phase shifter which may be required to shift the phase through large angles.

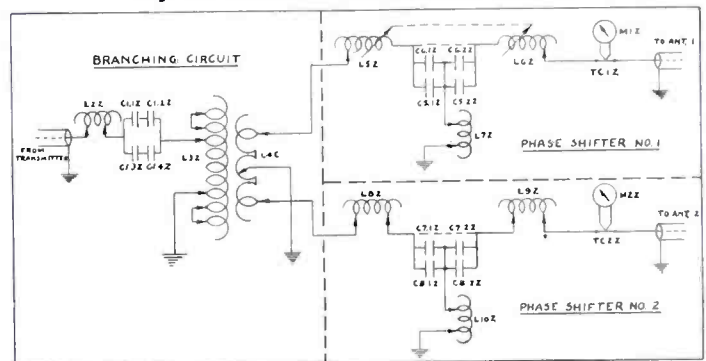
The correct adjustment of the phase shifter circuits will be determined by a number of variable items which include the following: (1) Difference

in the electrical heights of the antennas; (2) Difference in adjustments of the coupling circuits to the antennas due to differences in antenna impedance; and (3) Difference in the electrical lengths of the branch transmission lines. None of these will be the same in different installations, furthermore the unsymmetrical mutual effect of two antennas on each other resulting from the not unusual requirement of unequal antenna currents at an odd phase relationship becomes a particularly serious consideration when the antenna elements are spaced less than $\frac{1}{4}$ wave length. A theoretical calculation of the combined effects of the several factors influencing the required phase shifter adjustment becomes so unreliable, on account of the number of approximations involved, that experimental determinations at the time of installation is considered more practical. The Western Electric 2A Phase Monitor may be used to measure directly the net relative phase of the tower currents and indicate the required adjustment of the phase shifter circuits which form a part of the antenna control unit.

When it is desired to switch the radiated pattern, as for example attending a day and night time change in power, the 33A Antenna Control Unit may be equipped with any one of a variety of combinations of magnetic switches which serve to select different tap points on the coils and thereby to change the adjustment of antenna current amplitude, phase, or both. Additional relay circuits have been devised for use in this unit which may be interconnected with the transmitter control circuits to remove the carrier power, switch the pattern and restore the carrier to either full or reduced power automatically in a time interval of about one second.

The apparatus is mounted in an aluminum gray cabinet, 78 inches high, to match the appearance of the 405A-1 Radio Transmitting Equipment. It is intended to accommodate from 1 to 5 kilowatts power output from any broadcasting transmitter which is capable of working into a concentric type of transmission line. Two controls appear on the front panel, one providing adjustment of the relative tower currents, the other an adjustment of the antenna current phase relations. Two radio frequency ammeters indicate the current in each branch transmission line and a galvanometer may be connected with the 2A Phase Monitor to indicate proper adjustment of antenna phase relations.

Fig. 3—Circuit of 33A Antenna Control.



WPIC

Sharon, Pa.

The story of WPIC, a newcomer on the air, is in reality the story of three young hams who envisioned a broadcasting station for Sharon, Pennsylvania, more than 20 years ago. John Fahnlne, Jr., toyed with the idea as he tapped out wireless code messages in a little shed at the back of his home. Not many miles away two brothers, G. E. and A. E. Heiges, echoed Fahnlne's thought while tinkering with a home made crystal set. Years later the three men got together and laid plans for the station. During the five-year effort to obtain a permit the Sharon Herald Company became interested in the project. Thus the Sharon Broadcasting Company came into being with John Fahnlne, president; A. W. McDowell, vice-president; George E. Heiges, secretary and treasurer and A. E. Heiges, consultant engineer.

Known as the "Friendly Voice of Shenango Valley," WPIC speaks to its audience through the medium of a Western Electric 310B transmitter which is installed in an attractive brick structure on Pine Hollow Boulevard extension. Included in the associate equipment are the 110A amplifier, 23B speech input console and salt-shaker mikes. The transmitter building also houses the offices and two studios. One studio is used for transcriptions and speakers and the other for groups and musical broadcasts. The larger studio is equipped for operating four microphones at the same time. With an eye to the future, space has been allotted for expanding broadcasting facilities.

WPIC speaks to its audience through the medium of a 310B transmitter (below). The transmitter building (at right) situated on Pine Hollow Boulevard, also houses the studios.

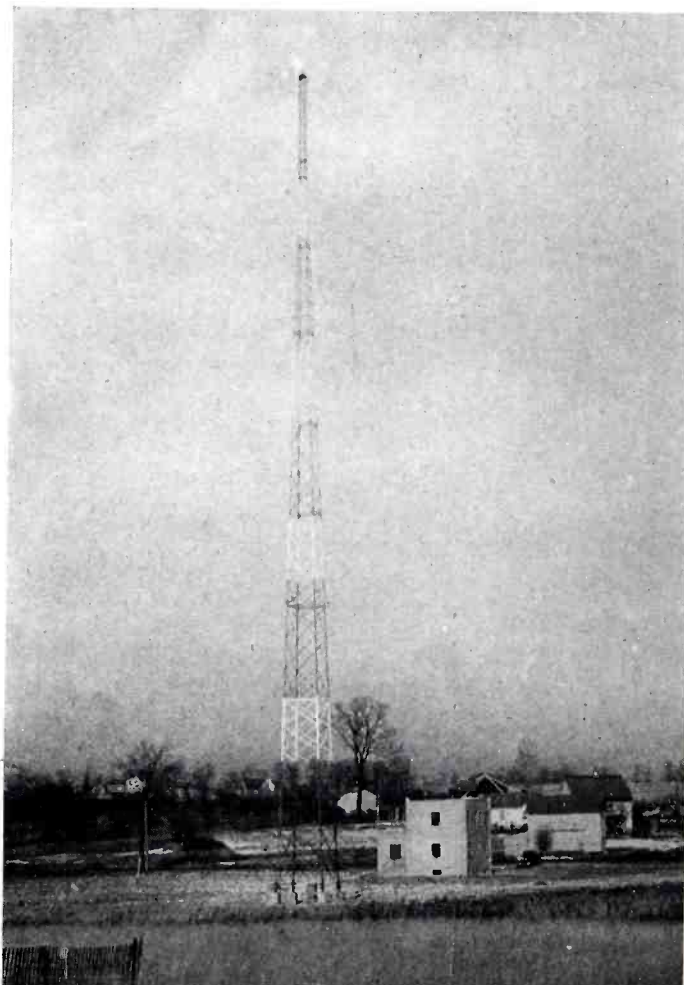
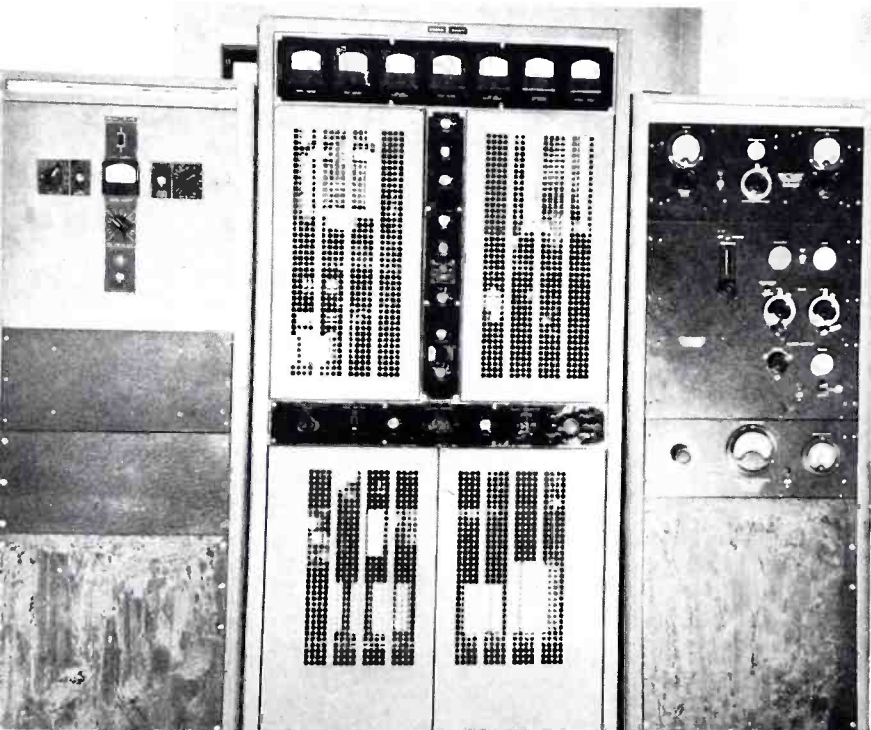


A. C. Heck, chief engineer, seems to enjoy operating the 23B speech input console. Salt-shaker mikes are also used.

Instead of following the usual method of burying the concentric transmission line WPIC engineers laid the line along the top of a row of posts inside a continuous iron conduit. The line rests in the topmost pipe of a group of three. Of the other two, one pipe carries power to the tower to operate the aircraft warning lights while in the other is a line used to observe remotely the antenna current.

Heading the engineering staff is A. C. Heck who has been interested in radio since he was a youngster. Prior to joining WPIC, Heck held the position of chief engineer at station WMMN, Fairmont, West Virginia, for five years. He previously worked on wire transmission for Pennsylvania and West Virginia oil pipe line companies, for the Bell Telephone Company and as an engineer in Pittsburgh assigned to relaying NBC and Columbia network programs.

In addition to its service to the community at large, WPIC is doing much to encourage and develop the talents of local artists, many of whom are appearing regularly on its programs.



Radio Fun-Lore

(Continued from page 9)

band crystal. Or that of the excited operator, reported by John Nazak, WMFF, who thought he was off the air only to find that his monitor speaker was turned down!

Charlie Chaplin never invented a funnier, screwball situation than that of an engineer, who, bragging about his rifle marksmanship, shot over his shoulder at a tin can and hit the concentric transmission line. James Ebel, WILL, witnessed that one. Sometimes its worse to be on the air than off, at least when you don't know you're on. Robert R. Cross-thwaite, KWYO, reports the hilarious happening during a program of Christmas greetings from staff members of the station. The operator on duty at the transmitter came in on his cue with: "One, two, three, test, woof, one, two, three," and then, "excuse me folks. I didn't know this junk was working."

Apparently C. B. Persons of WEBC takes his job rather seriously because he states that "nothing is funny about this business." The chances are he would have changed his mind had he been with Leonard Carlson, WKBB, when a priest sprinkled holy water on an amplifier by mistake, making it, the amplifier, go up in smoke. Or could he have kept a dead pan when a bull chased an engineer with a pack transmitter through a pasture. The engineer, according to Asa W. Adkins, WJIM, won by the thickness of a condenser plate.

Ralph H. Carpenter, WBCM, also takes life seriously and asks, "Does anything humorous ever

happen?" Well Frank B. Ridgeway, WTOL, thought it was funny when the band leader in a prominent hotel opened his mouth to correct one of the vocalists and his false teeth fell out and bounced on the floor in front of about 200 people at dinner. "Needless to say," says Frank, "it broke down the entire band."

"The most humorous thing I ever saw," says R. M. Myers, WHIP-WWAE, "was my former boss' reaction when I used a 16 gauge shotgun to remove offending ice from the hot end of an L antenna. Them war the days, Podner," adds Myers.

Today as well as in the old days when a 1 KW was super-ultra-high power humor plays its part. That serious chap with a slide rule in his vest pocket known as the chief engineer also has a funny bone. On his job anything can happen and it usually does. If humor comes along to make the job easier, he'll welcome it with open arms, and store it away in his memory for an occasional reminiscent chuckle.

2A Phase Monitor

(Continued from page 17)

therefore the dial attached may be engraved in degrees which accurately measure the electrical phase angle. It consists of four sets of stator plates, each at the same radio frequency potential above ground but mutually exactly 90 electrical degrees apart. A specially shaped rotor meshing with the stator plates derives sufficient potential from each of the four stator plates to produce a voltage of constant magnitude but with a phase displacement dependent upon its angular position. This condenser is believed to be the most nearly accurate device now known to the art for measuring the phase of high frequency current, and its use in the 2A phase monitor insures a high degree of overall accuracy.

The network which produces the 90° relationship upon the four sets of stator plates is a series resonant circuit which may be accurately adjusted for any broadcasting frequency using only a convenient source of the frequency to be measured and equipment within the device.

Measurements of angles may be relied upon to within 3° in 360° of absolute accuracy. However, if it is necessary to move a pattern through a small angle this may be done with an accuracy of 1°. The pattern of an array which has had its tuning disturbed may be reestablished to within 1°. The station operator can readily make accurate measurements since the precision of the instrument requires no more than his usual care in reading meters and making dial adjustments.

The meters for reading the magnitude of the tower currents are of the newly developed expanded scale type having a nearly linear scale from 50 to 250 milliamperes. The open scale greatly facilitates accurate determination of ratios as high as 5 to 1.

A power supply of less than 50 watts, 40 to 60 cycles, 105 to 125 volts, provides all poten-



tials required by a complement of four vacuum tubes. These tubes have no special requirements and may be used in this circuit longer than in most applications. They may be tested at any time without removing them from their sockets.

The radio frequency power required is from 1/6 to 4 watts per tower. This is believed to be the smallest amount which under field conditions and with simple apparatus can be made to be a true sample of the tower currents.

The use of the 2A Phase Monitor should improve the performance of directive arrays, reduce the cost of installation and maintenance of their electrical adjustments and make the advantage of selective coverage more generally available.

750A Loud Speaker

Another aid to high quality monitoring, in the form of a loudspeaker of unusual compactness, has recently been made available to sound engineers by the Western Electric Company. So faithfully is sound reproduced by the new speaker that, in effect, the control operator is ushered into the actual presence of the performers and gains an entirely new conception of program balance. As a result, such abstractions as "definition," "brilliance," and "presence," terms well understood by sound men, should assume real significance in the form of higher quality both in production and reproduction.

Although when properly housed the new unit is no larger than the average wall mounted speaker, where only moderate sound levels are required, its performance within a 30 degree projection angle closely approaches that of the more elaborate two-way sound radiators commonly employed in talking-picture and large public-address systems.

When used in conjunction with a properly designed amplifier, such as the Western Electric 94 type which has a normal output of 12 watts, the speaker will produce adequate volume in a monitoring booth, a studio, or a moderate sized public room. If greater sound level is desired, amplifier-output up to 20 watts may be used safely. When mounted in a housing with the specified size characteristics, the frequency response is substantially flat over a range from 60 to 10,000 cycles per second.

Because of its small size, high quality, and low price, the speaker is ideally suited for use with speech input equipment in broadcasting systems but many applications will be found in schools, hotels, restaurants, and similar locations demanding faithful music reproduction and speech reinforcement over limited areas.

The speaker element is of the moving coil type and the field is supplied by a permanent mag-

net of special alloy. "Hang-over," a form of distortion resulting from mechanical resonance in diaphragm assemblies, is absent in the new speaker's reproduction because its specially shaped metal diaphragm is designed with the proper amount of mechanical damping. The unit is designed primarily for use in a closed cabinet. The speaker matches that of the best direct radiator type of similar size and weight. Because of the wider and more uniform frequency response range, however, it will be found that a satisfactory rendition is obtained at somewhat lower input levels than would be required for loud speakers commonly employed.

The unit, which is known as the 750A loudspeaking telephone, is available with or without a cabinet. When the cabinet is supplied, the complete assembly is known as the 751A loudspeaking telephone, and measures approximately 24" high by 18" wide and 13" deep.

50 Watts at 200 Mc.

(Continued from page 12)

connection which had a tendency to soften or melt at high temperatures. To avoid softening at the high operating temperatures, the tube envelope is made of Nonex glass.

The leads at the base of the tube are connected externally to a special four-prong, wafer type base made of low loss ceramic and designed for use in a special socket. Some types of standard four-prong sockets, however, may be easily altered for use with this tube. Elimination of the conventional stem permits the reduction to a minimum of the overall dimensions, resulting in a maximum length of five inches and a maximum diameter of two and five-sixteenth inches.



In recognition of the perfect record of no sponsored time lost during 1938, KSFO Chief Engineer Royal V. Howard presented the transmitter staff with an inscribed gold cup (inset). Shown at the presentation are (left to right) John L. Middlebrooks, CBS liaison engineer; Alfred Towne, transmitter supervisor; Chief Engineer Howard, and Frank McIntosh of Graybar.



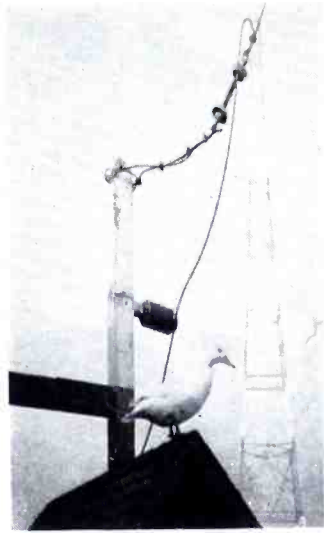
FACES

the camera

CAUGHT



The Machine Gun Mike goes nautical—so does KHJ, Los Angeles, as Announcer Sam Pierce and Chief Engineer Frank Kennedy broadcast from the U.S.S. Indianapolis.



Donald, protege of Win Crawford and Garo Ray (WICC, Bridgeport) is the latest addition to the engineering staff.



Wilton E. Cobb snaps George P. Rankin, Jr., vice president and James Caldwell, assistant engineer, as they install an audition speaker at WMAZ, Macon, Georgia.



KTUL's rapid progress is in a great measure due to its vice-president, William C. Gillespie — story page 6.



"Swanky" we call 'em—these nifty winter togs modelled by Bob Clover, chief engineer, and Manager Harry De Lasoux (KVCV, Redding, Cal.) They're out to check a tower after a storm.



"Come on now — how many calls?" says Waymond Ramsey, new KOMA manager, to a salesman during a staff meeting.

Signs of Spring at WOW (Omaha) picnic. Bungstarter Engineer Anderson gets set while Assistant News Editor Munkhof, Operator Griffin and Chief Engineer Kotera patiently await the flowing of the Lager. Did the Bungstarter bungle? Well, anyway it flows—Kotera dashes to the rescue, Anderson calls for help while Engineer Mark McGowan calmly shoots the works with his candid camera.



WRVA, Richmond, Virginia

(Continued from page 3)

been broadcasting, this country has gone through its greatest changes. Someone has said that the past is preface to the future. During this era of governmental, economic and cultural flux the country needed a knowledge of this preface to understand and evaluate the pulling forces of the present for guidance in the future. Probably no one can fully appreciate broadcasting's great contribution in joining the past with the present and future. WRVA's role in this respect has been particularly outstanding.

"Our microphones rove the entire state for events which picture the achievements and contributions of the people and their communities, past or present," says C. T. Lucy, general manager. "Each year we broadcast the ceremonies of the Shenandoah Apple Blossom Festival at Winchester, and the South Boston Tobacco Festival. One day each term the Legislature holds a regular session in the old House of Burgesses at Williamsburgh. Its proceedings are invariably broadcast by WRVA. Such broadcasts serve to acquaint the people with the customs and traditions, the resources and opportunities of every section of the state."

Politics just naturally fit into the scheme of things at WRVA. Southerners in general love politics next to religion and Virginians take it even more seriously. Walter R. Bishop, director of Public Relations is the station's political expert. He hails from southwest Virginia where everyone, according to him, is either a politician or a would-be politician. Bishop's presence at WRVA alone could account for the fact that there is always a WRVA microphone in the foreground when anything of a political nature is happening. The State House fairly bristles with microphones and they are always ready for the governor or any other prominent figure.

"WRVA has made citizens conscious of governmental problems as no other medium could," says Lucy. "Young people, in particular are showing a growing interest in government activities. We are particularly proud of the part played by the station during the administration of Governor Harry Flood Byrd. Byrd set out to make sweeping changes in Virginia's governmental structure. To put them over he had to reach the voters and win their intelligent support. The microphones of WRVA were always open to him, and this medium played a major part in the success of his efforts."

In recent years, the eyes of the educational world have been centered upon Virginia's drive to improve its educational institutions. Perhaps no state has launched a more ambitious program. Cooperation to the fullest is given by WRVA. The station sends out a weekly schedule of educational programs to every educational institution in the state, including the principals of all public schools. The station has pro-

moted the use of radio in schools and has cooperated in drives to place radio receivers in the school rooms of many communities.

Many programs of an educational nature originate in the studios of the station. In fact, it is claimed that one of its weekly programs, "Discussions in Print," is the outgrowth of the oldest educational program on the air, the Peter Quince Book Review, presented by the University of Virginia Extension Division.

The station's oldest program, while not educational in the strictest sense, had been of inestimable value to rural communities, and has done much to improve farming and living conditions throughout the state. It is the Virginia Farm and Home Hour, an outgrowth of the Market Reports given by the station since its inception. It is under the direction of "The Farmer's Friend," H. C. Cline, Division of Markets, Virginia Department of Agriculture.

Another feature, comparatively new, is the "Virginia Weekly on the Air," a 15-minute résumé of items taken from more than 70 Virginia weekly newspapers. News that is of general state-wide interest, human interest stories and editorials make up the program, with occasional comments offered by the Virginia Weekly editor, W. L. Willis, Jr. Incidentally, since this program was started, news about WRVA has increased in Virginia papers.

When application was made for the increase to 50 KW, the real popularity of the station and an indication of its many services to the people were dramatically shown. Appearing at FCC hearings were Governor Peery and representatives of the State Departments of Education, Agriculture, Health, Conservation, Highway and others, each testifying to the value of the station.

Virginians have always looked upon WRVA as their station. With its new and greater voice they will be even more proud of it, and will receive even greater value from its broadcasts. Inside its hour-glass-shaped primary coverage area live 1,625,955 people, and included in it are the cities and towns of Richmond, Williamsburgh, Charlottesville, Petersburg, Hopewell, Newport News, Hampton, Norfolk, Elizabeth City, Fredericksburg, Portsmouth and Suffolk. Hundreds of smaller communities which before tried in vain to receive the station regularly will now obtain full enjoyment and benefit from WRVA, "The Public Service Station."

Graybar Specialists Attend Annual Conference

Everything from decibels to telephone bells came in for a searching discussion last month when the delegates to the annual Graybar-Western Electric-Bell Telephone Laboratories Sales Conference went into action. Six busy days were spent at this meeting of sales, manufacturing and research experts, during which old, new and proposed equipment was discussed from every possible angle.

5 KW
RADIO TRANSMITTING EQUIPMENT

Western Electric

Western Electric

Multi-Frequency Midget Transmitter

Western Electric

Western Electric

Cardioid Directional Microphone

639 A

Western Electric

106A LINE AMPLIFIER

Western Electric

FOR GREATER POWER

Western Electric

Western Electric

105A PROGRAM AMPLIFIER

Western Electric

Western Electric

AMPLIFIER

92B

Western Electric

Western Electric

RADIO RECEIVER

20 TYPE FOR AIRCRAFT

Western Electric

27A Aviation Radio Receiver

Western Electric

Western Electric

MARINE RADIO TELEPHONE EQUIPMENT

SPECIALLY DESIGNED AND PRICED FOR USE ON SMALL COMMERCIAL AND PRIVATE BOATS

Western Electric

Western Electric

104B PRE-MIXING AMPLIFIER AND 15A RECIFIER

Western Electric

Western Electric

Portable Speech Input Equipments

22B and 22C

Western Electric

SPEECH INPUT BAY

705 A

FOR BROADCAST TRANSMITTER STATION INSTALLATION

Western Electric

AMPLIFIER

118A

Western Electric

Western Electric

RADIO RECEIVER

25A

Western Electric

Speech Input Equipment

23 Type

Western Electric

Western Electric

Marine Radio Telephone Equipment

774A-774B

Western Electric

Bulletins

Recently Issued

Western Electric

MARINE RADIO TELEPHONE EQUIPMENT

774A-774B

Western Electric

BETTER QUALITY WIDER DISTRIBUTION

Western Electric

- 5 KW Radio Transmitting Equipment
- Multi-Frequency Midget Transmitter
- Cardioid Directional Microphone
- 106A Line Amplifier
- 29A Horn — 707B Receiver
- 105A Program Amplifier
- 92B Amplifier
- 20 Type Radio Receiver for Aircraft
- 27A Aviation Radio Receiver
- 26A High Quality Horn

- Marine Radio Telephone Equipment
- 104B Pre-Mixing Amplifier
- Portable Speech Input Equipments
- 705A Speech Input Bay
- 118A Amplifier
- 25A Radio Receiver for Airplanes
- 23 Type Speech Input Equipment
- 224A Marine Radio Telephone Equipment
- 226A Marine Radio Telephone Equipment
- 750A-751A Loud Speakers

PICK-UPS

Twenty-five

AD CAMPAIGN

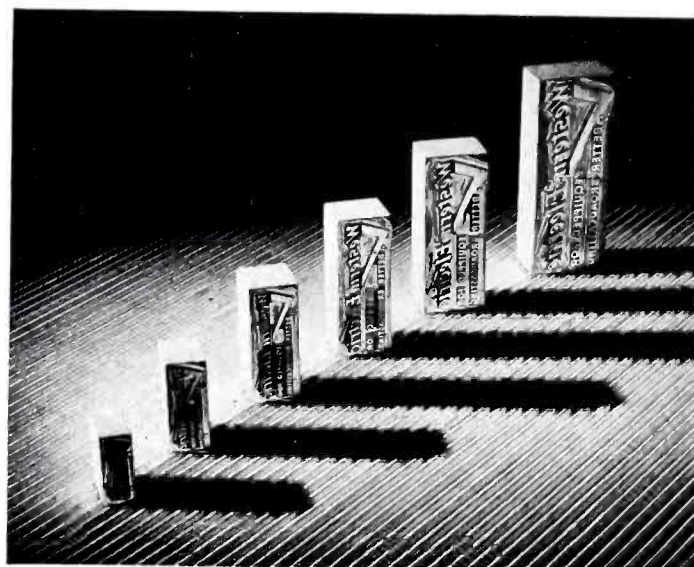
Boosts Western Electric Equipped Stations

There may have been a day when sponsors and radio advertising agencies were not too much interested in the quality of your signal, but that day has passed.

They still are giving thought to coverage, market data, listening habits and all the rest, BUT today they are also definitely considering the quality of your signal. They want to know if that station of yours is putting out the kind of signal which makes listeners tune-in and stay tuned-in.

Western Electric equipped stations have something to talk about to the men who buy time on the air. With the best signal on the air you have a real commodity to sell. And here's news. Western Electric is helping you to sell it. Throughout this year a series of advertisements is being run in *Broadcasting Magazine*, and *Radio Daily* emphasizing the quality of your signal to the sponsor and the radio advertising agency. In each ad a complete list of Western Electric equipped stations is carried. Each ad stresses the fact that your Western Electric equipped station offers the advertiser the PLUS of highest quality.

A special insignia has been designed and is carried in each advertisement. It reads: "Western Electric equipped for Better Broadcasting." As a Western Electric Equipped Station you can cash in on this advertising campaign. You can identify your station with *Better Broadcasting* by advertising the fact



These electros ranging in size from one to three inches are furnished all Western Electric equipped stations free of charge. The electros read: Western Electric Equipped for Better Broadcasting. Ask your Graybar representative for them.

that you are giving listeners and sponsors the best possible break by affording them the best signal on the air.

Western Electric has reproduced this insignia in copper electros in a variety of sizes ranging from one to three inches in length. You can use them in your advertising and sales literature. Graybar will furnish them to you free of charge in any quantity you need. Just write to your nearest Graybar house, and they'll be shipped to you by return mail. They're waiting for you, now!

Western Electric
EQUIPPED FOR
BETTER BROADCASTING

These six words convincingly testify to a station's ability to provide the finest technical facilities for the job of broadcasting.

DISTRICTS: Greater Falls Co., Greater Reading, New York, in Canada and Newfoundland, Western Electric Co., Ltd. In other countries, Western Electric Radio Co.

This two-page spread testifying to the superiority of Western Electric equipped stations appeared in the April 1st issue of *Broadcasting Magazine*.

N. W. Ayer & Son Install New Audition System

As an example of the increasing interest of advertising agencies in high quality broadcasting, N. W. Ayer & Son, Inc., have installed audition facilities which duplicate in every detail the most modern equipment found in leading broadcasting stations.

The new equipment, with which Ayer can simulate actual broadcasting conditions, consists of standard Western Electric speech input apparatus, amplifiers and turntables, together with various controls, mixers, microphones and power apparatus. A total of eight sound sources, including microphones, turntables and remote lines, can be mixed simultaneously. Electrical Research Products Inc. installed the system.

Western Electric
**BETTER EQUIPPED FOR
BROADCASTING**

See Page 26, 27