
# The "new look" at KTBS

## SHREVEPORT STATION BOASTS NEW STUDIOS, NEW TRANSMITTER, NEW FREQUENCY AND NEW HIGHER POWER

After almost a year's construction activity, involving the building of new studios and a complete new transmitting plant, Station KTBS, Shreveport, Louisiana NBC outlet, has recently begun operation on 710 kilocycles with 10,000 watts power, daytime, and 5,000 watts at night. The station's former power was 1,000 watts on a frequency of 1480.

In order to obtain a true picture of KTBS's new far-reaching signal, it is only necessary to make a comparison with measurements of signal intensity formerly put forth by the station. Under its former operation, KTBS's half-millivolt contour included an area of 2,120 square miles, whereas the same contour under its new power of 10,000 watts on 710 kilocycles embraces an area of 23,200 square miles or more than ten times the former area. Based on population, the station is now able to reach five and one-half times the number of listeners served before. This new coverage includes 31 counties and parishes in Arkansas, Louisiana and Texas, as compared with only four Louisiana parishes it formerly served.

The entire expansion and reorganization program which KTBS has undergone during the past two years has been made under the supervision of C. K. Beaver who took over the station's management in August, 1946.

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FIG. 1 (opposite page). This modernistic two-story building, with almost 7000 square feet of floor space (plans on page 43), houses the new studios and the offices of KTBS. Distinctive note is given to the building by the large free-standing letters and microphone, and the glass-face clock which is lighted from the inside.

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FIG. 2 (right). Polycylindrical diffusers made of birch plywood are used for acoustical control in all of the KTBS studios. An interesting touch is the fact that the absorption elements (which are intermixed with the smooth-surface acoustical panels) have the same curvature as the polycylindrical diffusers—as do also the curved glass control room windows. By this means the walls are given more symmetry than is usual in this type of construction. Studios were designed by Mr. Lester C. Haas, Shreveport architect who is shown here explaining the construction to Mrs. Gifford of the KTBS staff.

### KTBS's New Studios

Work on the studio building, which also houses the station's management and personnel, was completed early last fall and broadcast operations, under the old frequency and power, continued from there prior to the completion of the station's new transmitting facilities. The building, designed by Lester C. Haas, Shreveport architect, represents one of the most modern, scientifically-designed radio centers in the south. Interior acoustical design of the studios was handled by Dr. C. P. Boner of the University of Texas, one of the nation's outstanding authorities on studio acoustics. Dr. Boner was one of the pioneers in the use of polycylindrical diffusers, a treatment carried out in all KTBS studios.

The building which houses the new studios of KTBS is two stories in height and was constructed at a cost of $300,000. One entire side of the building is made up of offices, occupied by the station's management, personnel and its various departments, while the opposite side is devoted to studios and control rooms. The two main studios are two stories in height. The largest of these, Studio A, provides approximately 2000 square feet of floor space, and will accommodate an audience of 75 persons or more. Studio B has approximately 500 square feet of floor space and serves as origination point for shows which do not require or permit studio audiences. A smaller "announcer's studio" is located between Studios A and B. Also located between the studios are the twin

CECIL K. BEAVER, KTBS' General Manager—one of the pioneers of broadcasting in the southwest—planned and supervised the construction of the new KTBS.

**FIG. 3 (left). This is a view of the lobby and reception desk in the modernistic new KTBS studios. Glass entrance doors are just out of view to the right. The three windows at the back look into Studio A (see floor plan, opposite page).**

control rooms which sit atop each other. This arrangement permits independent operation of both of the larger studios simultaneously.

Studio A is intended for audience participation shows, is designed acoustically for organ, orchestra, chorus and other large musical presentations. Studio B is designed acoustically for forum discussions, small vocal and instrument presentations. The announcer's studio is especially designed for high quality voice reception. The audition room (on 2nd floor overlooking Studio B) is designed for good quality reception and is isolated to provide facilities for broadcasting by dignitaries and special guests, not requiring highest fidelity sound treatment.

The AM control room is on the main floor, with full vision of all three of the studios, and within easy access to the music library. The FM control room, directly above, has full view of the main studios and partial view of the audition room and the clients' viewing room. Both control rooms are designed to permit announcing, if required.

The studio and control portion of the building can be separated from the administration portion of the building by closing the sliding door at the reception area and the hinged door at the foot of the stairs, thereby leaving these areas accessible to the public after normal working hours.

Polycylindrical diffusers are used for the acoustic treatment of the walls and ceilings of the main studios, and similarly designed diffusing panels for the walls and ceilings of the announcers' studio. The cylinders were made at the site. Although designed for 8 foot lengths of plywood, it was found that the only available lengths of 1/8 inch birch three-ply plywood were 5 feet, which accounts for the abundance of joints in the cylinders; this is more noticeable in the photographs than to the eye. Absorption elements were made by perforating plywood on the job; on the ceiling and in the announcers' studio the absorption elements were covered with monks cloth. This is the first instance where curved glass has been used for the interior glazing of the triple-glazed viewing windows. The curves coincide with the curvatures of the plywood panels and by using these curved windows larger glass areas than are usually tolerated were incorporated in the design. The floor pattern of standard asphalt tile in two group C colors (grey and green) was designed to tie together the several parts of the building to create a continuous flow of interest through the necessarily isolated passages. The NBC background is red sheet rubber to cushion foot-fall at the live area.

Distinguishing characteristics on the exterior of the building are the glass clock, illuminated from the interior, the free standing letters and the "microphone" which is equipped with a speaker for broadcasting the NBC chimes on the hour, half hour, or quarter hour, and which may also be used for special messages or programs.

**FIG. 4 (right). Marvin L. Perry, Chief Studio Control Operator, at the console in the AM control booth. Equipment—all RCA—includes a 76-C Consolette, a BCS-1A Master Switching Console, 70-D Turntable and LC-1A Speakers. The FM control room, directly above, is similarly equipped.**

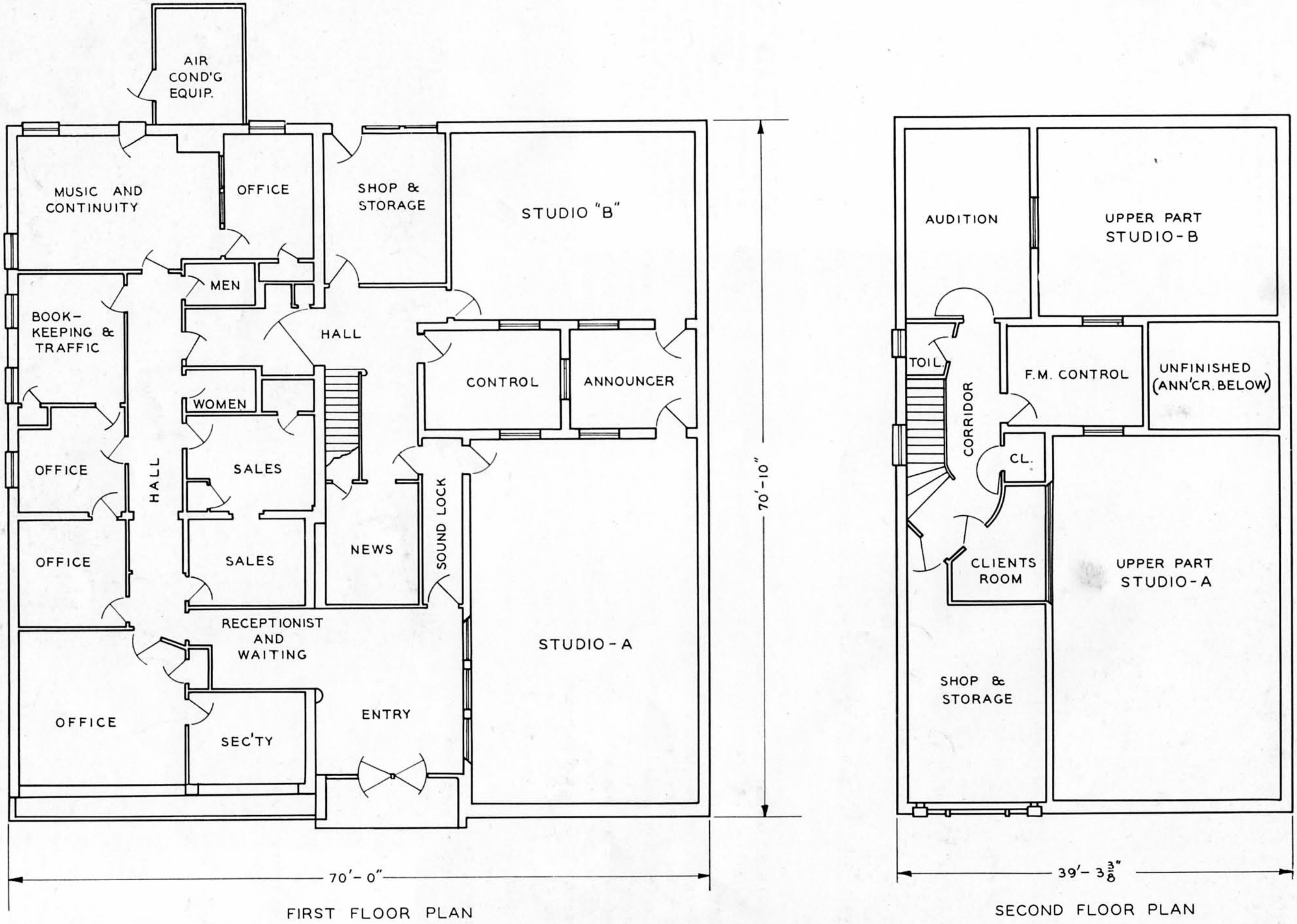



FIG. 5. Simplified plans of the first and second floors of the KTBS studio building. The two main studios are two stories in height. Between them are located two control rooms—one for AM and one for FM—which are perched on top of each other, so that both have windows looking into both of the studios. Thus either control room may be used with either studio in a completely independent manner. This makes it possible to schedule separate live programs on the two outlets—or to carry on full dress rehearsals in one studio while the other is on the air.

FIG. 8 (right). This is a corner of Studio B, a somewhat smaller studio designed for shows which do not require, or permit an audience. This studio, like Studio A, is finished on all four walls and ceiling with birchwood polycylindrical diffusers. At the left, in this view, may be seen the windows of the twin control rooms which sit atop each other and look into both of the main studios (so that either control room may be used with either studio). The window at top right is in the "audition room" which also serves as a "clients' booth."

FIG. 9 (below). Located on the second floor of the new KTBS studio building is this luxuriously furnished "Audition Room." Overlooking one of the main studios, its occupants may see as well as hear programs in progress through a specially-constructed "observation" glass partition.

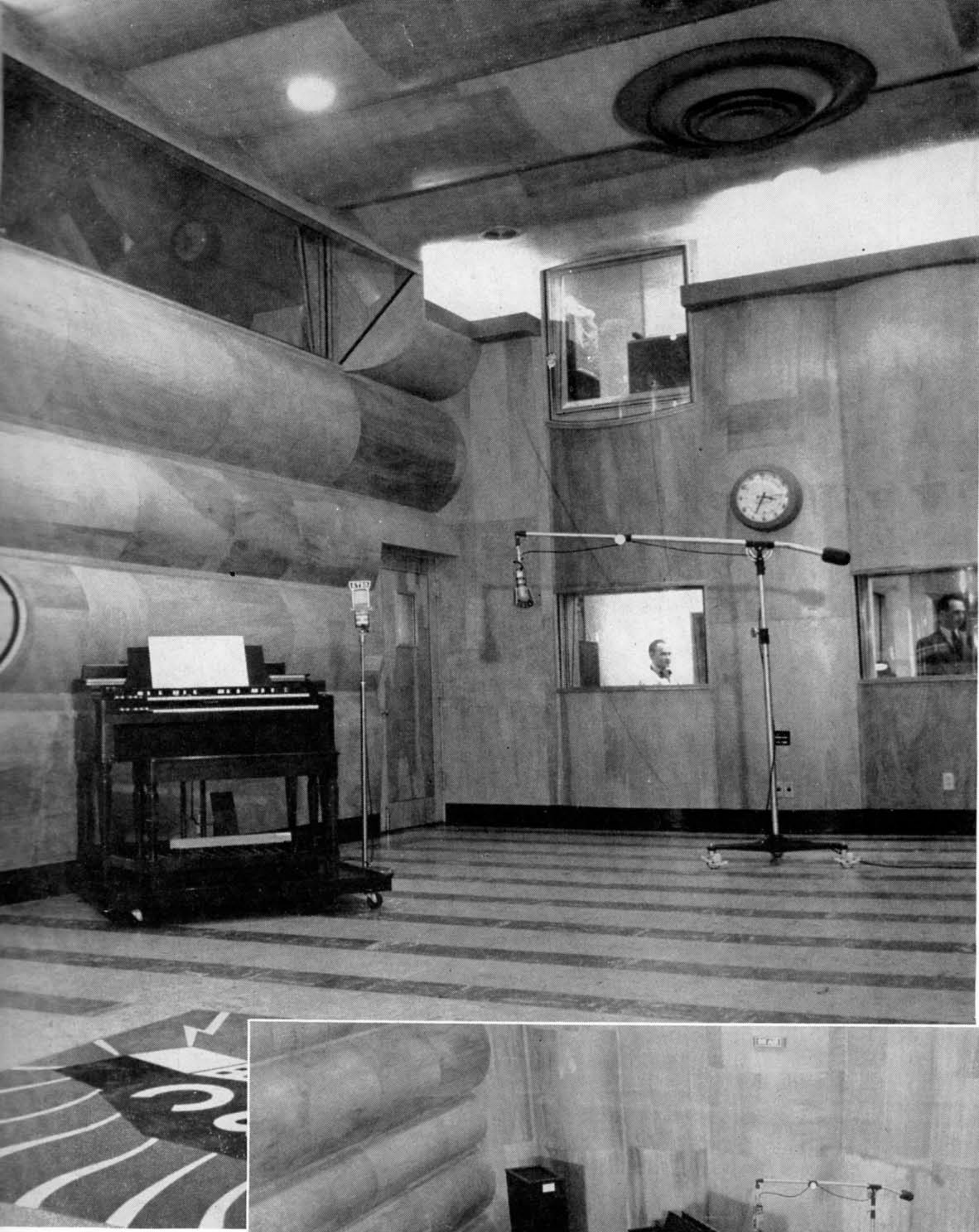


FIG. 6 (left). Interior of Studio A, largest in the KTBS group. Built to accommodate programs which require large casts, as well as live audiences, the studio will seat up to 75 persons. At top left is the studio's observation booth; at center are twin control rooms which sit atop each other; while at far right a partial view of the announcer's studio is shown. RCA 44-BX and 77-D microphones are used in the studios, 88A's in the control rooms.

FIG. 7 (below). This view, showing the other end of Studio A, is from the observation booth on the second floor. The glass in the windows at right (the windows from the entry foyer) is curved to match the curvature of the polycylindrical diffusers. Control room window glass is similarly curved to match the vertically placed diffusers on the end wall of the studio.


FIG. 1 (above). KTBS' new transmitter building is located 14 miles northwest of Shreveport. Floor of the fireproof building is five feet above ground level so that equipment is safely above possible flood waters.

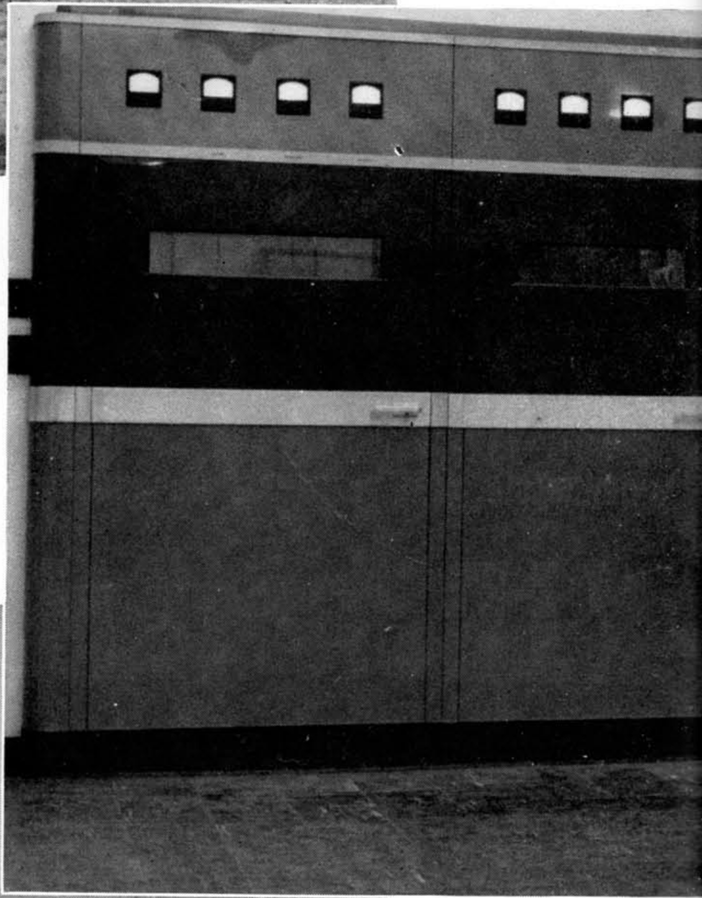
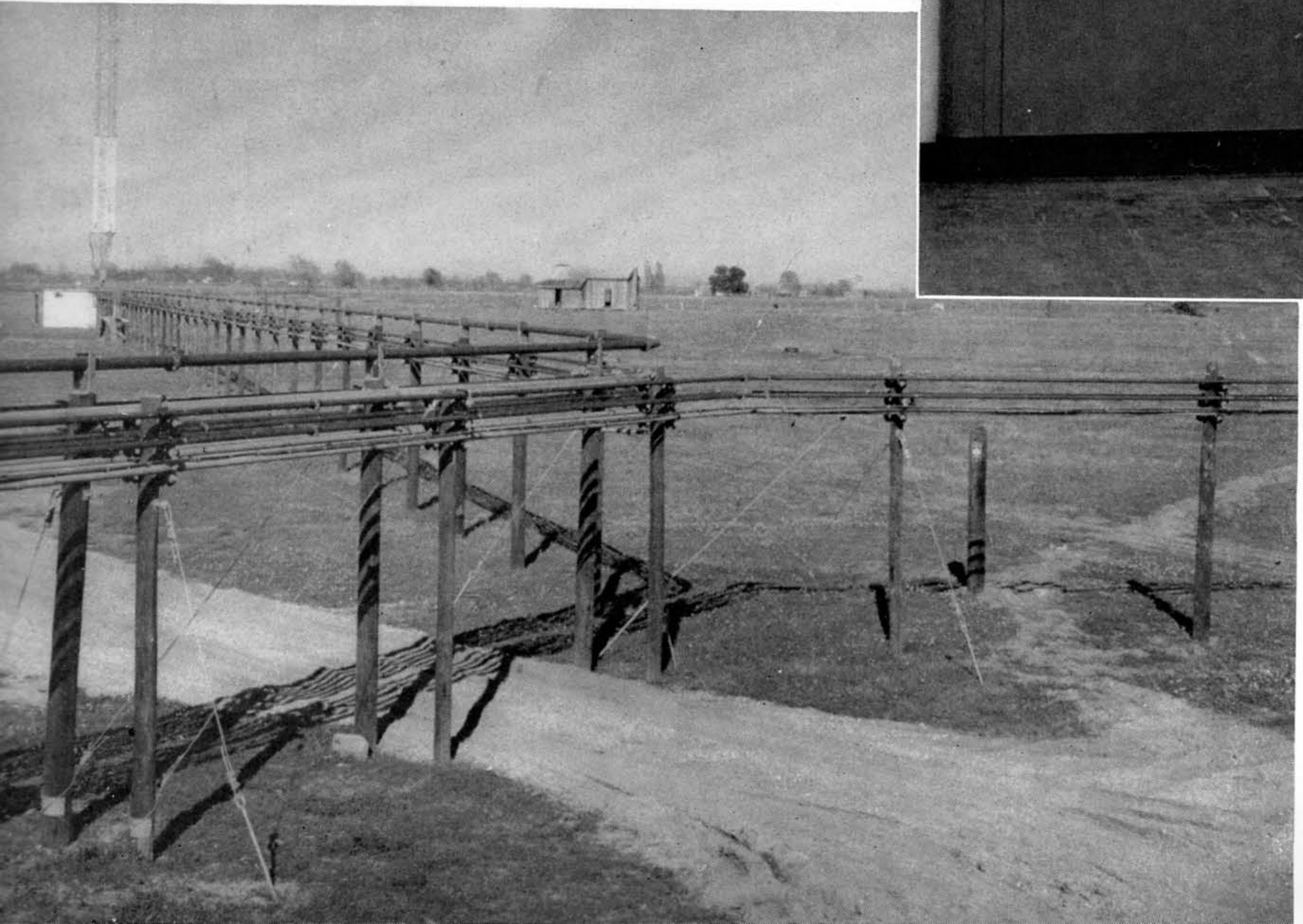


FIG. 2 (right). KTBS' transmitter is an RCA Type 10-F operated at 10,000 watts day and 5,000 watts night. Phasing equipment is located behind the panel door at the extreme left of the main transmitter assembly. Monitoring and audio equipment units are mounted in racks built into the right-hand wall of the transmitter room.

FIG. 3 (below). Transmission lines feeding the six-element directional antenna array at KTBS are of the concentric type mounted on poles high above the ground. This view shows the point where the lines from the transmitter building branch off to the two halves of the array.



# KTBS' NEW TRANSMITTER

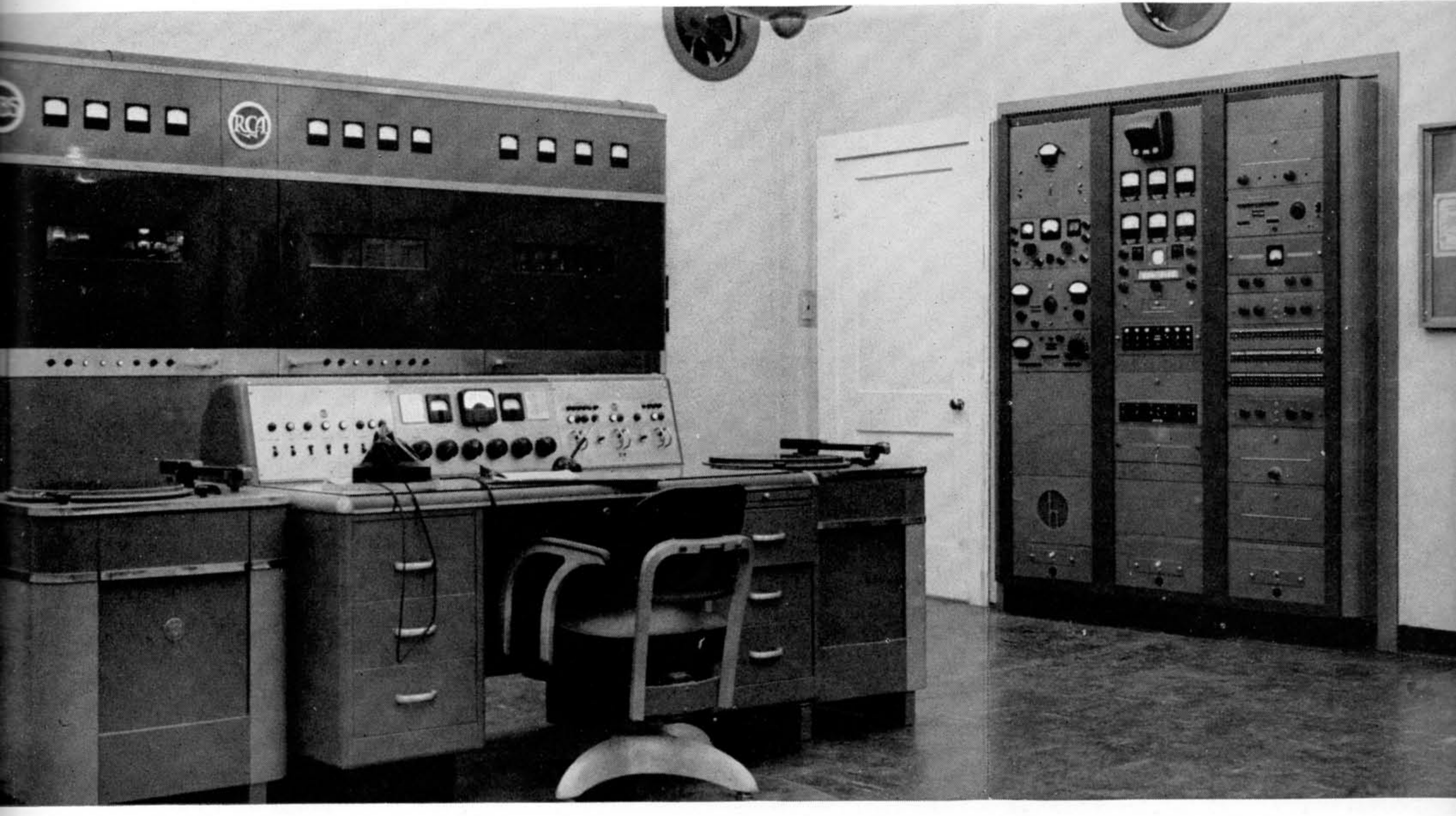
## Completely New Transmitting Plant Features a Six-Element Directional Array Designed and Constructed With Unusual Attention to Details of Feed Lines, Lightning Protection, Etc.

**by W. M. WITTY**

**Broadcast Facilities Consultant***

EDITOR'S NOTE: *The stability of a directive antenna system depends to a large degree on the care with which the antenna and ground system, the feed lines, and the phase monitoring equipment are installed. However, just being careful with ground leads, avoiding sloppy joints, etc., is not in itself sufficient. A considerable amount of know-how is required, if pitfalls are to be avoided.*

*The installation described in this article was supervised personally by Mr. Witty—a consulting engineer of many years experience (see Page 49). The result is a beautiful example of what can be done when care and know-how are combined. Every station engineer facing the near future installation of a directive antenna should study it carefully.*



On Thursday, April 14, 1949 KTBS in Shreveport began operation with a new frequency and ten times more power. The new transmitting station operates on 710 kilocycles with a daytime power of 10,000 watts and 5000 watts at night. With these improved facilities, one of the pioneer broadcasting stations of the South will be able to serve better the progressive tri-state area of which Shreveport is the center.

The new KTBS plant is located approximately fourteen miles north-northwest of Shreveport and is situated in the heart of the cotton plantation country about one and one-half miles west of the town of Dixie, Louisiana. A fireproof transmitter building houses RCA's latest model 10,000 watt transmitter with associated equipment. The six element directional antenna system is an outstanding example of moderan directional antenna engineering and construction.

Several months were required to build the new KTBS plant. In order to obtain a site that complied with the approval of the CAA and was satisfactory from the standpoint of pattern orientation, it was necessary to select a plot of land within relatively limited boundaries. As is quite often the case, the only site that was available was one not served by a main highway or any utilities. A dirt road leading to the site from a parish highway had to be covered with gravel before any

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FIG. 4 (left). KTBS' plant engineers. Left to right: C. H. Maddox, Chief Engineer, N. F. Keyes, Charles Ellis, E. W. Cook, Fred Woodruff.

FIG. 5 (opposite page). KTBS' antenna system consists of six 378-foot guyed towers arranged in a line and spaced 530 feet between towers. The upper part of the No. 3 tower (third from left) is a four-section Pylon to be used for FM transmission. Four of the towers are used for daytime transmissions and all six for nighttime. Doghouses at the bottom of each tower contain phasing and matching networks, protective circuits, etc.

FIG. 6. This is another view of the transmission line branching point. Because separate feed systems are used for day and night transmission there are two concentric lines to each tower. The large line at the top is the concentric line feeding the FM antenna at the top of No. 3 tower.

material for construction could be delivered. A branch power line was erected by the power company for supplying the necessary service. Special lines all the way out from downtown Shreveport were installed by the telephone company. Both power service and telephone lines were brought in underground for a considerable distance from the station in order to prevent their having any effect on the tuning of the directional array.

In view of the fact that the land on which the station is built has been covered by overflow water from the Red River and Caddo Lake on a few occasions during the past years, it was deemed advisable to take the necessary precautions to prevent recurrence of flood waters from damaging the station. The transmitter building was constructed with the floor five feet above ground level and all the tower foundations are eight feet high. The equipment in the tuning houses is mounted at eye level on the walls of the houses in "bread-board" style rather than in metal cabinets. In some of the tuning houses vertical panels mounted on upright steel beams located in the center of the floor supplement the wall panels. All transmission lines, lighting circuits, and interwiring between the transmitter building and towers is mounted on poles at least eight feet above the ground level.

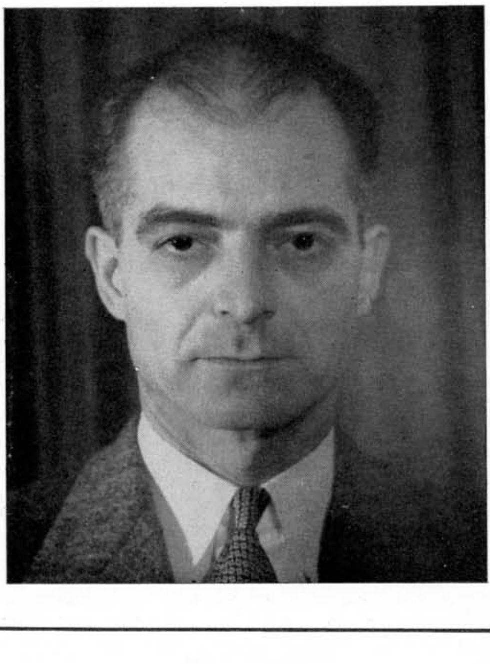
### Antenna System

The directional antenna system for the new KTBS was designed and adjusted by the consulting firm of A. Earl Cullum, Jr. of Dallas. The array (Fig. 5) is a six tower "in line" type with four of the towers used for daytime operation and all six in service at night time. The towers are 378 feet high and spaced about 530 feet which means that the end towers of the array are approximately one half mile apart. The towers were furnished by the International Derrick and Equipment Company and were erected by the Andrews Company of Ft. Worth. A four-section RCA Pylon FM antenna was mounted on top of Number 3 tower. The combined height of this Number 3 tower and Pylon is 378 feet.

Since a rather "tight" pattern was involved the array was constructed according to a very rigid specification in order to obtain the highest degree of stability possible. Every precaution was taken to insure permanence of all joints, bonds and electrical connections. Mechanically all towers and ground systems are symmetrical with the exception of the one radiator which is made up of a shortened tower plus the FM Pylon. All underground joints and all connections between heavy members above ground were made with silver solder or brazed and welded. In addition to the bond straps furnished by the tower manufacturer for "jumping" the butt joints on the towers the lighting conduits were bonded to the towers at 10-foot intervals throughout the tower lengths.

**ABOUT THE AUTHOR**

**W. M. (BILL) WITTY, the author of this article, needs no introduction to most readers of BROADCAST NEWS. For nearly twenty years he has been intimately associated with the broadcasting industry in the southwest—first as RCA's field sales engineer for the area, and more recently as a consulting engineer in his own right. Leaving the perhaps more glamorous field of allocations engineering to others, Bill has specialized in "facilities engineering"—i.e., the planning and supervision of plant installations, particularly those involving complicated and extensive antenna or equipment problems. The KTBS transmitter plant was one of these. The accompanying article—printed in Bill's own modest words—makes no attempt to glamorize this job. However, BROADCAST NEWS readers familiar with this type of installation will quickly recognize it as the work of an expert.**



## Ground System

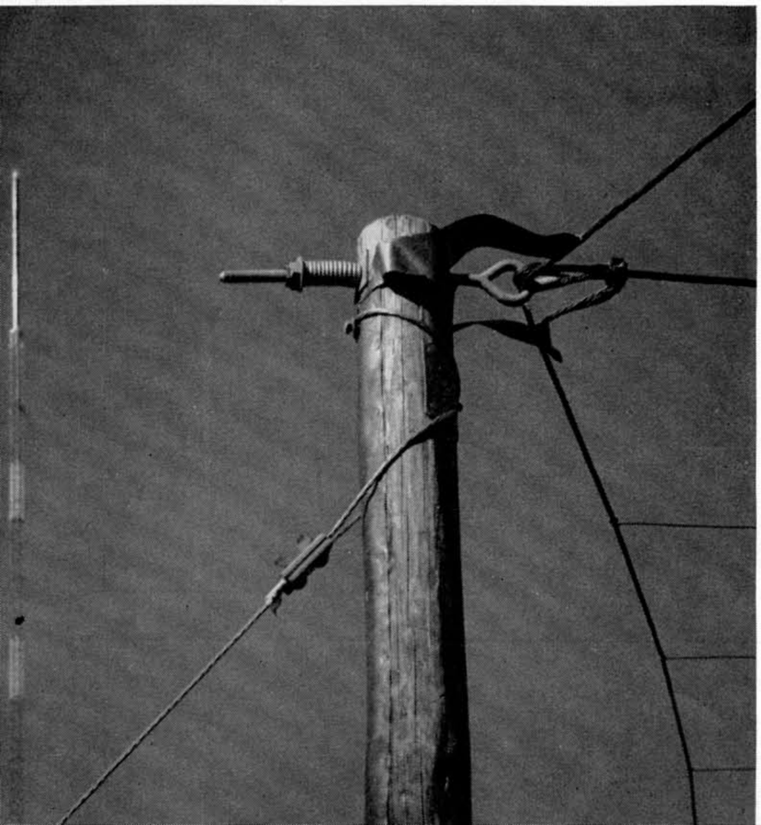
The type of ground system installed at KTBS, to some extent, departs from the conventional form of buried radial system. The KTBS ground system does have 120 buried radials 300 feet long around each tower, but these do not come all the way in to the tower base insulators. Rather, these radials terminate at an underground circular bond strap 100 feet in diameter around the edge of the overhead system. The overhead system (Fig. 7) is supported by anchored poles—12 at each tower—and is 8 feet above the ground level. It consists of 120 radials drawn tautly and soldered between a central ring (Fig. 8) mounted around the top of the tower foundation and a large copper cable supported by the twelve poles (Fig. 9) around the 100-foot circle. This outer cable is, in turn, bonded to the underground circular bond strap by means of 4-inch copper strip running down and tacked to each pole. Since the tuning houses are beneath the ground system, connections to the tuning house equipment from the ground system, as well as from the antenna, are made through the roof of the tuning houses.

This type of design insures maximum stability of antenna impedance since there can be no foreign material of changeable nature such as vegetation, water or soil within the field of the antenna at the point which is most critical and where the current is highest.

The individual tower ground systems were connected together by means of a buried 4 inch copper strip running the full length of the array. Also transverse 4-inch copper strips were placed at halfway intervals between all of the towers and any ground radials that were traversed were silver soldered to these strips. The central transverse strip extends to the transmitter

**FIG. 9 (below). Close-up view of one of the anchored poles supporting the overhead ground screen. Note compression spring which provides compensation for expansion due to temperature changes.**

**FIG. 10 (below). This is a close-up view of the central ring to which the 120 radials of the elevated ground screen are carefully braised. The ring, in turn, is connected by copper straps to the bonding about the tower base.**



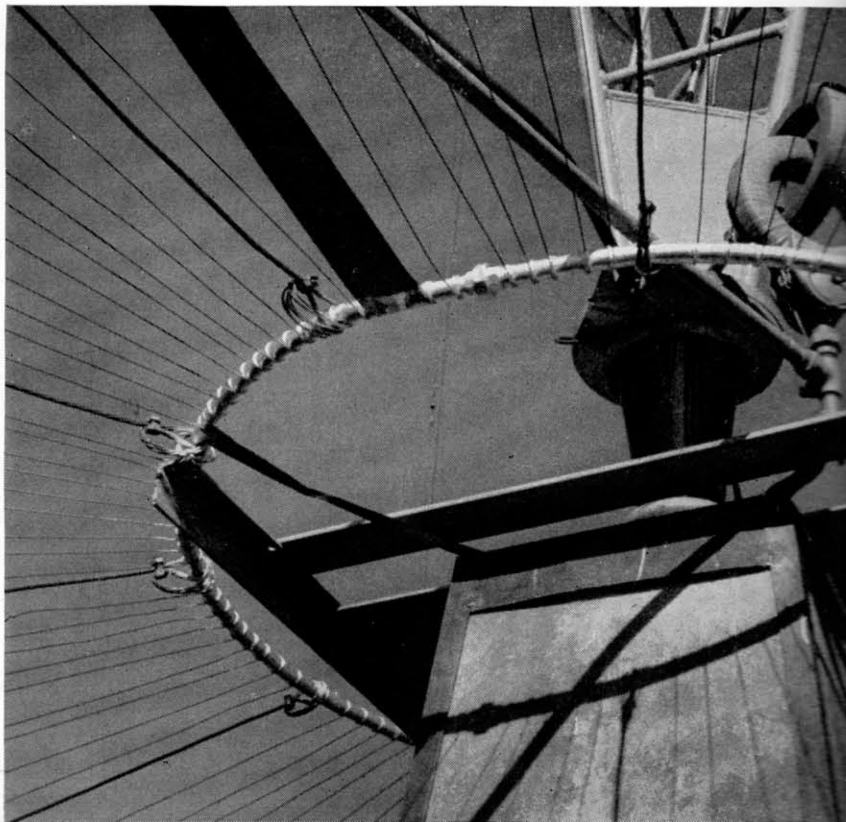


FIG. 7 (opposite page). Overall view of the elevated ground screen installed around each of the KTBS towers. This arrangement provides a stable antenna impedance because changes in vegetation or ground water in the critical area around the base are minimized.

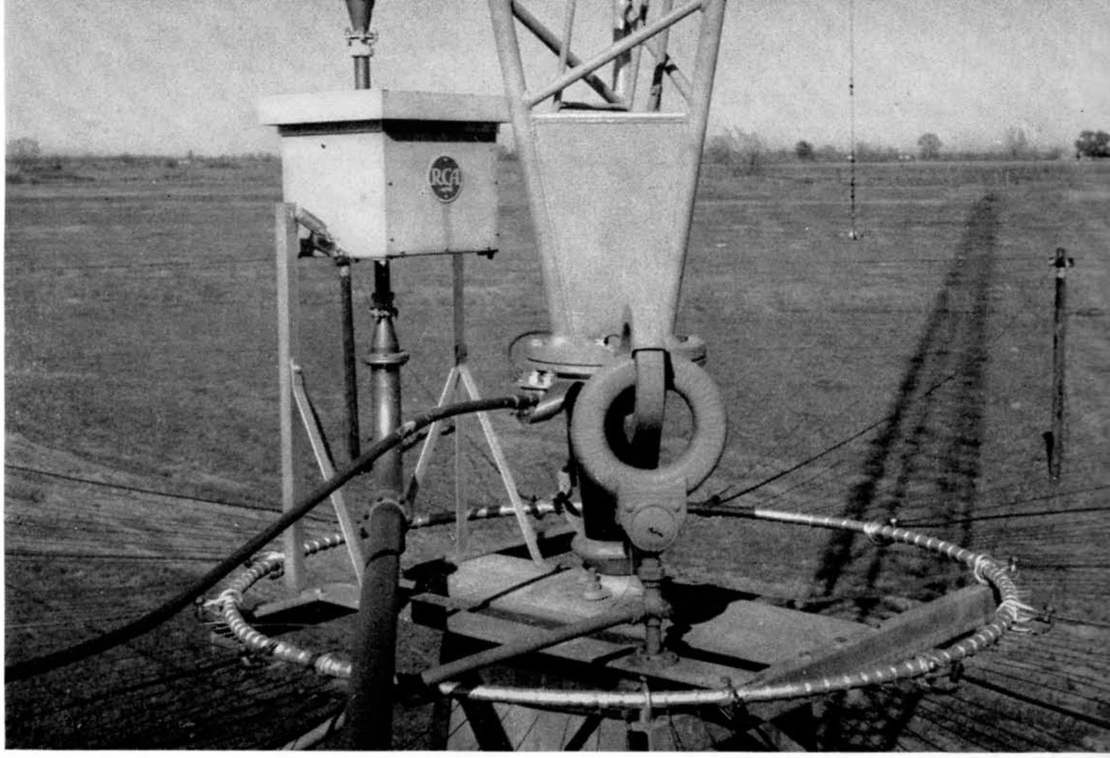


FIG. 8 (right). This close-up view of the base of one tower shows the BAF-4A FM Isolation Unit (in square box) and the Austin Transformer (large open coils) used to isolate the tower lighting circuits.

building and is connected to the ground terminals of all the transmitting equipment.

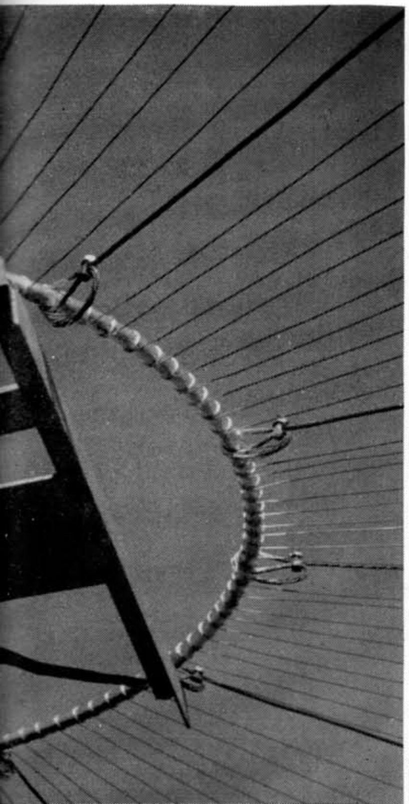
Other copper strips were buried along the line of transmission line poles between the transmitter building and towers Number 3 and Number 4. All transmission lines, conduits, and sampling lines were bonded to these buried strips at each pole, which are spaced at 10-foot intervals. Along the runs between the towers these ground connections are made at 30-foot intervals.

### Tower Lighting System

In many directional antenna systems the 1000 watt beacons mounted on each tower in accordance with CAA requirements are flashed by means of individual flashers of the non-synchronous type installed on each tower. The speed of the motor in this type flasher varies a slight amount with the result that the lights on a multi-element array occasionally get "in step". If this occurs with as many as six elements a rather heavy demand is made on the power service and the line voltage will fluctuate to the extent that it is sometimes difficult to operate measuring equipment in a station during nighttime hours.

At KTBS a central flasher was installed in the transmitter building and the three phase power service divided among the six towers in such a manner that a nearly constant lighting load is presented at all times. The flasher consists of a synchronous motor geared to rotate a cam shaft at 36 R.P.M. Six adjustable split cams are mounted on the shaft and arranged to operate individual mercury type switches that control the lighting voltage to each tower. This arrangement enables the desired lighting sequence of the towers to be obtained and the split cams permit accurate adjustment of the 2:1 light-to-darkness ratio required by the CAA.

FIG. 11 (below). This view of the tower base shows the connections between the tower and the doghouse (lower right corner). The large concentric line is the FM feed line which runs directly to the BAF-4A Isolation Unit in the square box at the top left of this picture. Note that the isolation unit is mounted on springs in order to provide for differential expansion of the FM line which runs up the tower.



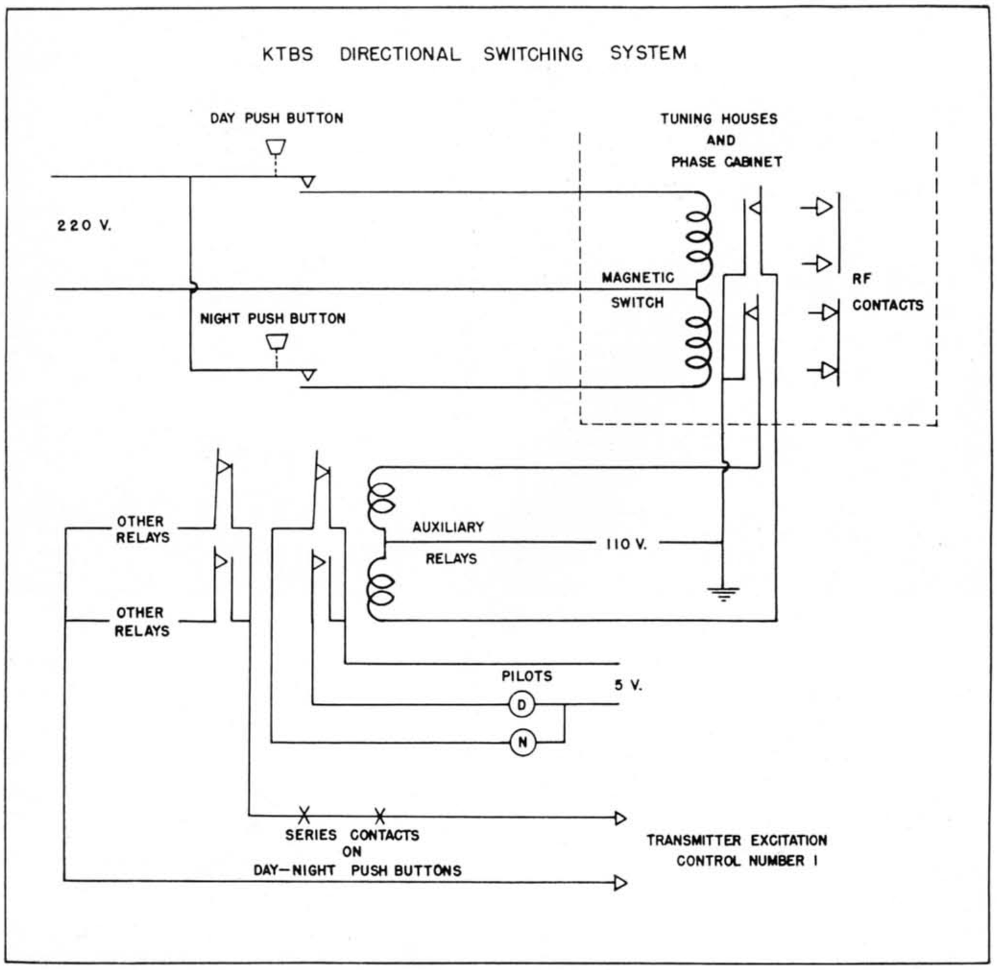



**FIG. 12 (left). Simplified schematic of the KTBS directional switching system. Push buttons on the phasing cabinet operate contactors in the phasing cabinet and in the six antenna tuning houses. Back contacts operate signal lights in the transmitter room and prevent excitation from being applied until all contactors have closed.**

## Directional Switching System

KTBS's directional system consists actually of two separate and complete systems, so far as phasing and power dividing equipments are concerned. The daytime pattern is obtained with one set of networks, transmission lines and four of the six towers. The nighttime pattern utilizes another set of networks, lines and all six of the towers. Switching between the two modes of operation twice each day is accomplished by means of solenoid type switches located in each of the tuning houses and in the phase cabinet in the transmitter building (Fig. 12). Seven of these switches are actuated from two push buttons located on the front of the phase cabinet in the transmitter building. Each of the seven switches is provided with back contacts which actuate auxiliary relays in the transmitter building that have one set of contacts to operate pilot lights and another set to close the transmitter excitation control circuit. Extra series contacts on the push buttons also break the transmitter excitation control circuit. The excitation control in this instance is the plate supply to the transmitter crystal oscillator.

With this arrangement it is virtually impossible to switch the antenna system with carrier power "on". Also if one of the remote solenoid switches fails to go over its pilot light will indicate in which tuning house the trouble is and it is not possible to put the carrier back on until this switch has properly closed. All of the switches must be in one of the two positions—that is—day position or night position before carrier power can be restored. The operator is able to manually hold off excitation until all lights are on for one position, thus indicating that the remote switches are all clear. Should he inadvertently release the push button before all of the switches have cleared the auxiliary relays will prevent excitation from being restored.

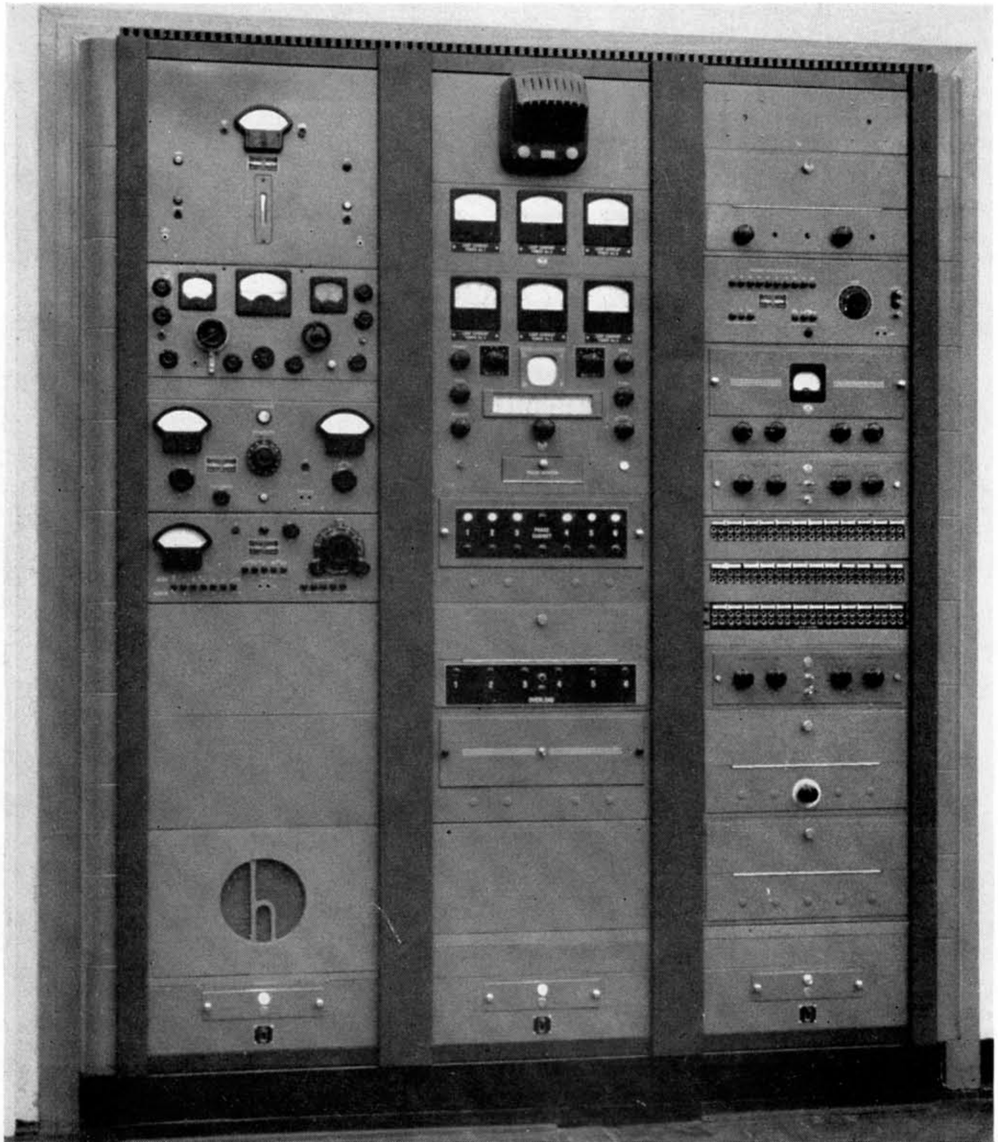


**FIG. 13 (left). These three racks are built into the right wall of the transmitter room. The left-hand rack contains frequency and modulation monitors and distortion measuring equipment; the center rack the antenna meters, the phase monitor and the contactor signal lights; the right-hand rack contains the audio input equipment.**

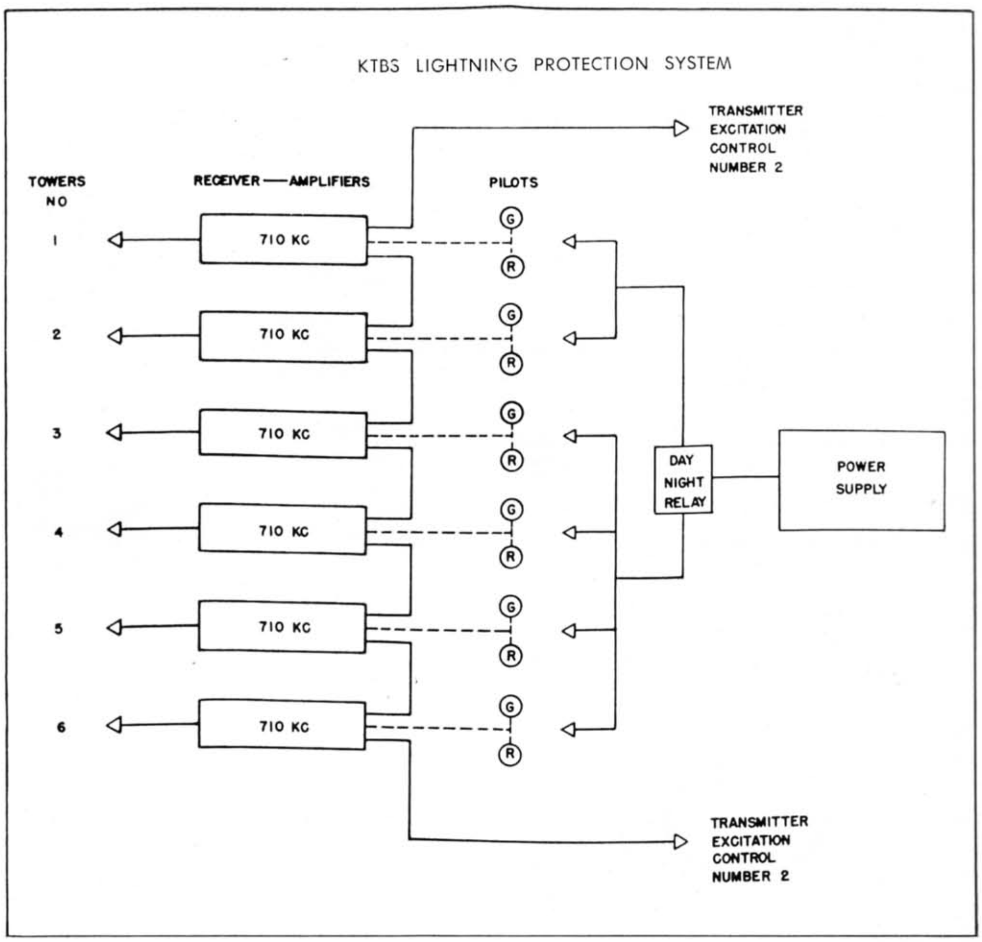



**FIG. 14 (right). Simplified schematic of the novel lightning protection system installed at KTBS. A separate receiver-amplier unit picks up radiation from each tower. In case of an arc-over on a tower, the reduction in signal picked up by the receiver-amplier coupled to that tower will operate a relay which quenches the carrier for 250 milliseconds, thereby interrupting any tendency for the arc to become self-sustaining.**

## Lightning Protection System

Since the station uses a large amount of coaxial line, it was felt that in rather long runs some protection system for eliminating possible arc overs, in the line and tuning house equipment due to lightning hits, was essential. The lengths of line together with the associated equipment are such that it might be possible for an arc to be sustained without reflecting a power overload that would trip the protective relays in the transmitter.

A lightning protection system (Fig. 14) was installed that consists of six receiver-amplifiers, a power supply and set of six relays. Each of these receiver-amplifiers is excited from the field of one of the towers and actuates one of the relays. These relays have their contacts connected in series and also in series with a transmitter excitation control circuit provided in the transmitter. Also they have contacts to operate pilot lights indicating in which tower a change in current has occurred. The excitation control in this case is in the form of a high negative charge applied to the grid of the first RF amplifier in the transmitter which quenches the carrier for about 250 milliseconds. With this arrangement, an arc over in any of the tuning houses will momentarily stop the carrier without de-energizing the high voltage plate contactors. Should the arc continue or if a component had failed which will cause one of the towers to cease normal radiation the transmitter will be shut down at the end of one second.

These receiver-amplifiers contain four tubes arranged to provide a coupling stage, one tuned stage, a diode rectifier, and a DC amplifier to actuate the relay. This combination provided sufficient gain to enable the receivers to be excited by a very high impedance connection across the 70 ohm sampling line from the tower it serves.

Also the tuning of one stage provides ample selectivity to prevent the receiver being affected by adjacent radio stations, shock excitation, etc.

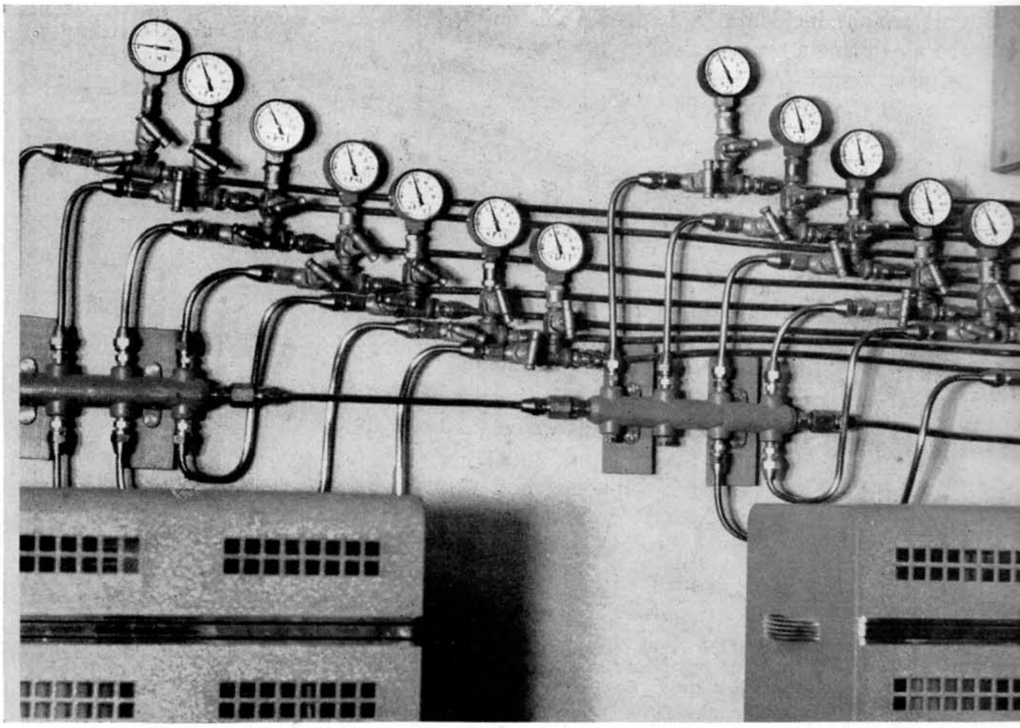


**FIG. 15 (right). A dehydrated air distribution system with individual gages and valves was installed to feed the 13 concentric transmission lines at KTBS.**