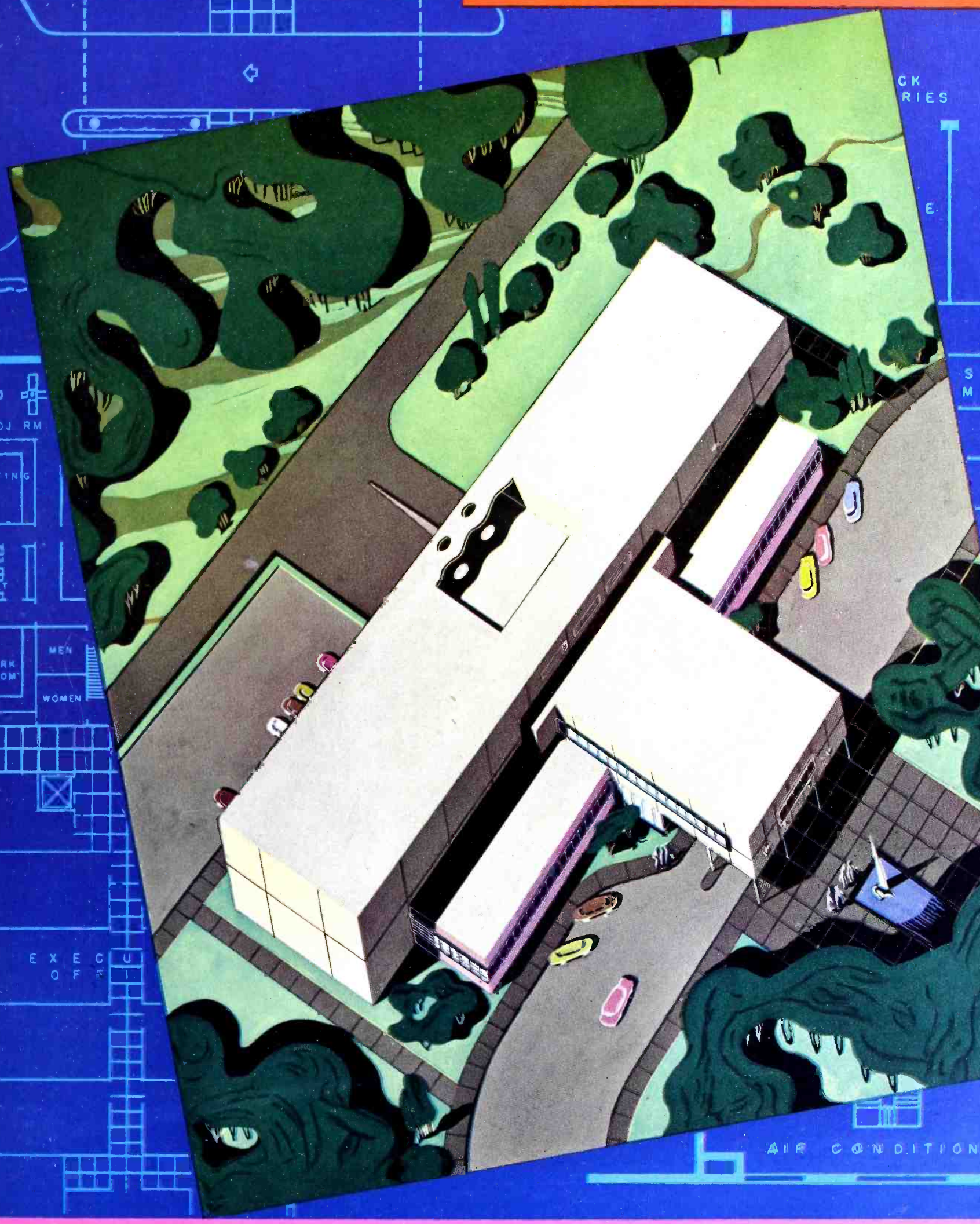
AM · FM · TELEVISION

BROADCAST NEWS



PLANS FOR TELEVISION STUDIO BUILDINGS . . . SEE PAGE 8

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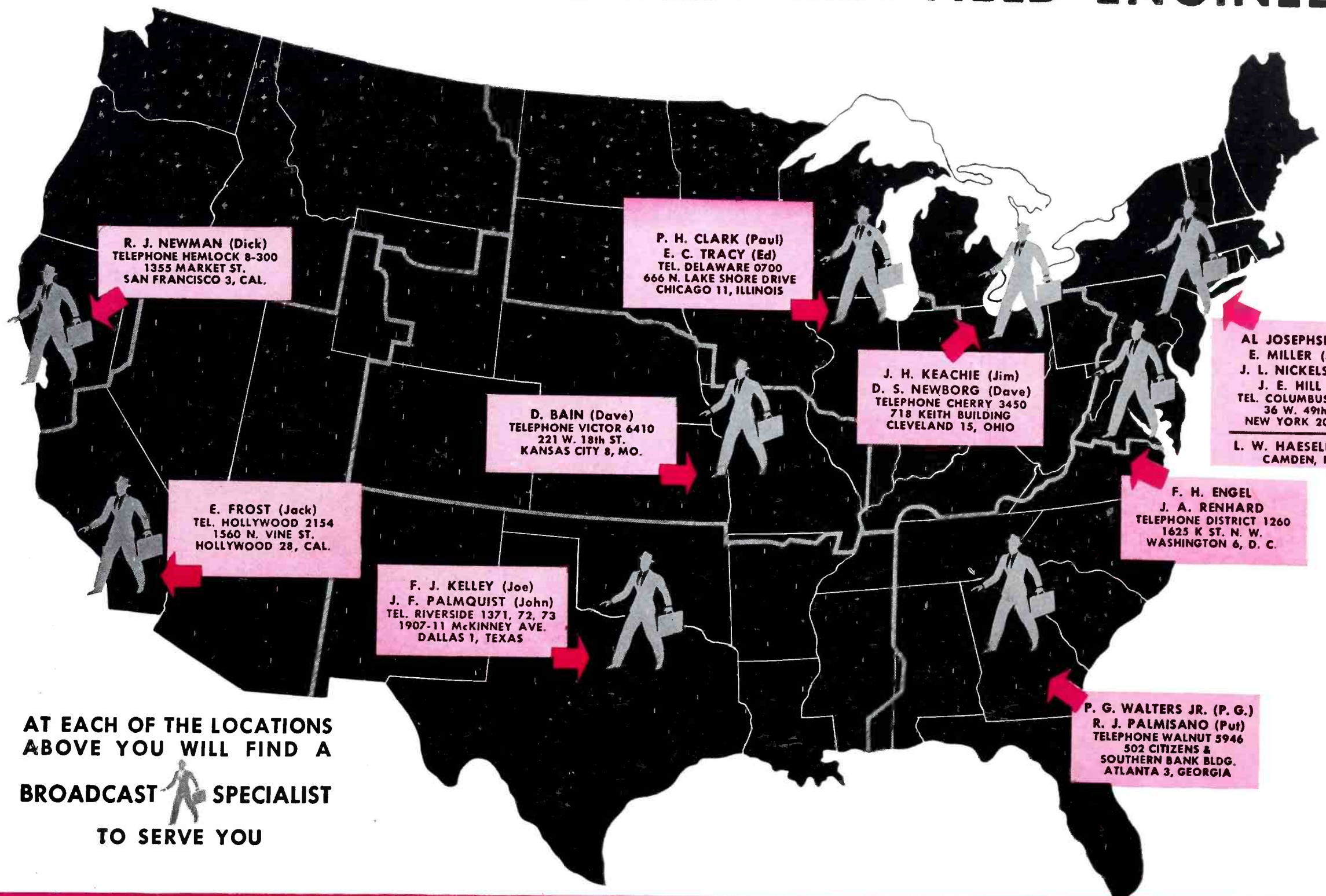

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W. O. HADLOCK, M. L. GASKILL, Associate Editors

Contents

OUR COVER for this issue features an air view (as the artist conceives it) of the big TV building described in the article by Brugnoni and Adler which begins on page 8. This building has many points of interest, as have also the other two described in this article.

Rene Brugnoni and Ben Adler worked together in the facilities engineering group at ABC, and have carried their co-operation into private practice. In talents they complement each other—experienced architect and experienced engineer. Both abilities are required in the design of successful broadcast station buildings. The TV buildings described in this issue have been carefully thought out. They contain many provisions that a station engineer working by himself might overlook. Thus, although these plans may not often fit individual requirements just as they are, they will serve, nevertheless, as a sort of visual "check list" which no TV station engineer can afford to overlook.

TOO MUCH TV is what a few readers have said about recent issues of BROADCAST NEWS. And on the face of it, they are right. However, there are a number of reasons which certainly explain, and possibly justify, our course. First of all, there is the editor's natural inclination to lean toward the most glamorous material—which the TV stuff certainly is. Second is the fact that there seems to be more material coming in on TV than anything else. Third, and by far most important, is our continuing attempt to give station engineers the material which will be of greatest usefulness to them. We feel that most station engineers are either facing now, or will face within the next two or three years, the problem of planning a TV installation. Not much practical information on the subject has been published—one reason being that the final answers on many things concerning TV station construction are not yet known. We don't know all the answers either. But, we feel that by publishing all the dope we can on how various things were done at the stations now on the air, and are being done at those stations now under construction, we will gradually build up a library of background information which will be of great value to other station engineers.

8-SECTION PYLONS are now in operation at several FM stations. This is real news because it means that "super-power" FM operation will soon be an accomplished fact. A 50 KW transmitter with an 8-section pylon will radiate 600 KW—and one now being installed will do just that. Moreover, it's on top of a mountain—so that the coverage should be phenomenal. We hope to have the complete story on it in our next issue.

Meantime, you will find on page 36 an article describing the very complete tests made on the 8-section pylon, and a description, with pictures, of the installation of an 8-section pylon at WKJG, Fort Wayne. When we first talked about building FM antennas with a gain of 12, there were some scoffers. This article is the answer. The 8-section is practical, it's economical—and the measurements prove that it works as predicted—maybe even a little better.

BILL WITTY is no longer with RCA. We report this with mingled feelings of sadness and gladness. Sadness because it hurts to lose from our midst one who has been so liked and respected by customers and company people alike. Gladness because we feel that Bill, in his newly established practice as a consultant, will have the freedom his spirit has always yearned for.

Bill has spent nearly twenty years contacting broadcast stations in the southwest. Most of this time he devoted to helping stations plan and install their equipment. He doesn't need a commercial, and wouldn't want one, but if he did, we who worked for him and with him would give it without stint. There is nothing in, about, or connected with, a broadcast station that Bill isn't an expert on. And with all, we believe him to be the most conscientious man in the business.

Bill, this is from all of us—wherever you go, and whatever you do, may God be with you and speed your work.

ABOVE. At the end of each session of the RCA TV clinic, all those attending are presented with a certificate indicating that they have completed the course. In this picture Mr. D. F. Schmidt, Vice President in charge of Engineering, RCA Victor Division, is distributing the "graduation" certificates to members of the 3rd Session.

300 BROADCASTERS COMPLETE RCA TV ENGINEERS COURSE

More than 300 broadcast engineers from leading radio networks and independent stations in virtually every section of the United States have completed the television technical training course conducted by the RCA Engineering Products Department to acquaint broadcasters with the theory, design, operation, and maintenance of the latest television broadcast equipment.

When this "course" was first given in May of 1947 (BROADCAST NEWS, No. 46, pg. 50), it was intended to be a single-time clinic in which the top television engineers of the country would gather to discuss various aspects of television engineering and television equipment. It soon became evident, however, that information on operation and use of television equipment was the prime interest of these engineers. The fact that the very RCA engineers who designed RCA's highly successful line of television equipment were available to describe all the features and best ways of using the various items of equipment soon turned the clinic into a series of instructional type lectures. The information which the visiting engineers gained from these lectures was so valuable that many of them subsequently asked that a second session be held to which they could send other engineers from their stations. Also there were many who had missed the first session who were eager to have another opportunity to attend.

As a result of continued requests a second session was scheduled and held at Camden during the last week of September, 1947 (BROADCAST NEWS, No. 47, pg. 88). Attendance was even greater than at the first session and this second meeting was no more than over before requests for additional sessions started coming in. As a result three additional sessions of what has now become known as "the course" have been held, and the end is not in sight.

3rd Session of the Clinic, Camden, April 19-23, 1948

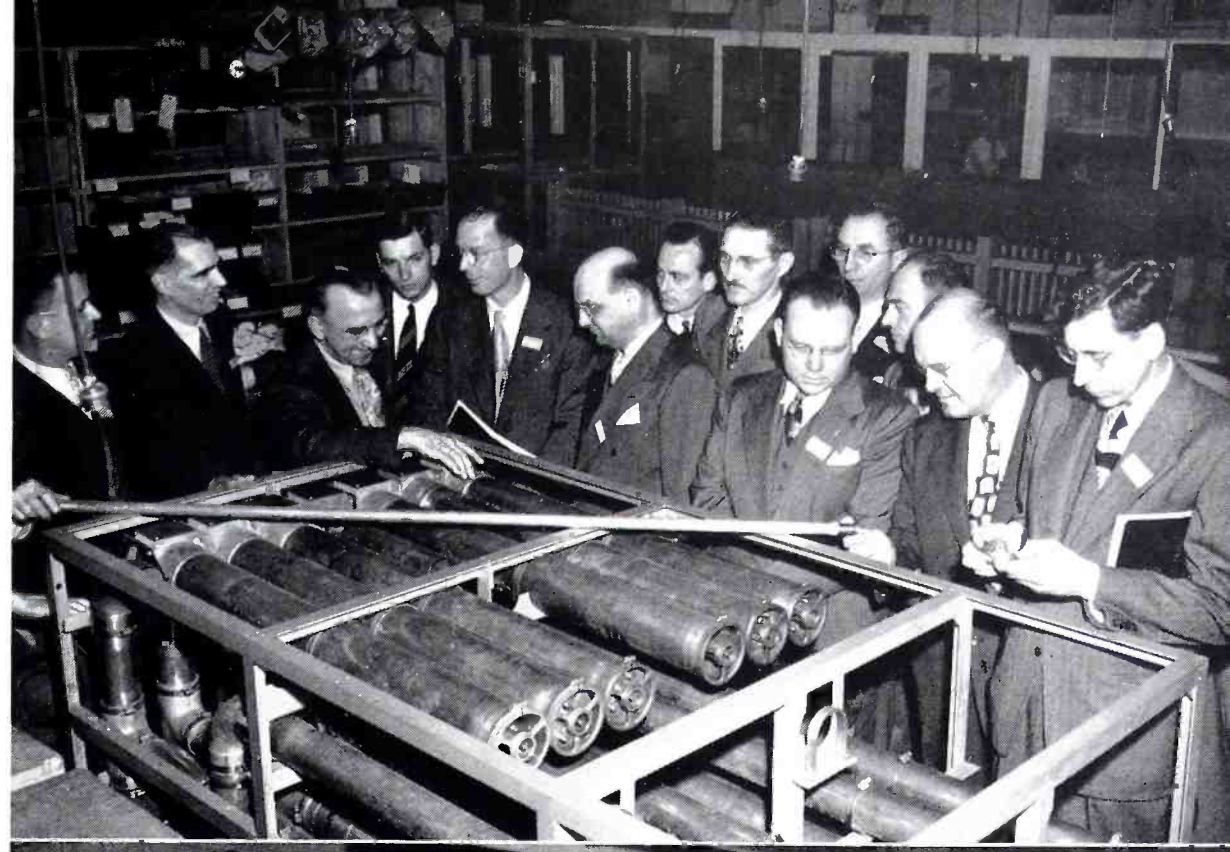
The third session of the course was held in Camden the week of April 19. As before, the technical sessions included discussions of all aspects of television technical operation, ranging from fundamental theory to layout of television studios, kinescope photography, and the use of mobile television microwave equipment in coverage of remote broadcasts. New and special emphasis was centered on the techniques of audio equipment utilization to effect sound pickup of the same high quality that now characterizes picture reproduction.

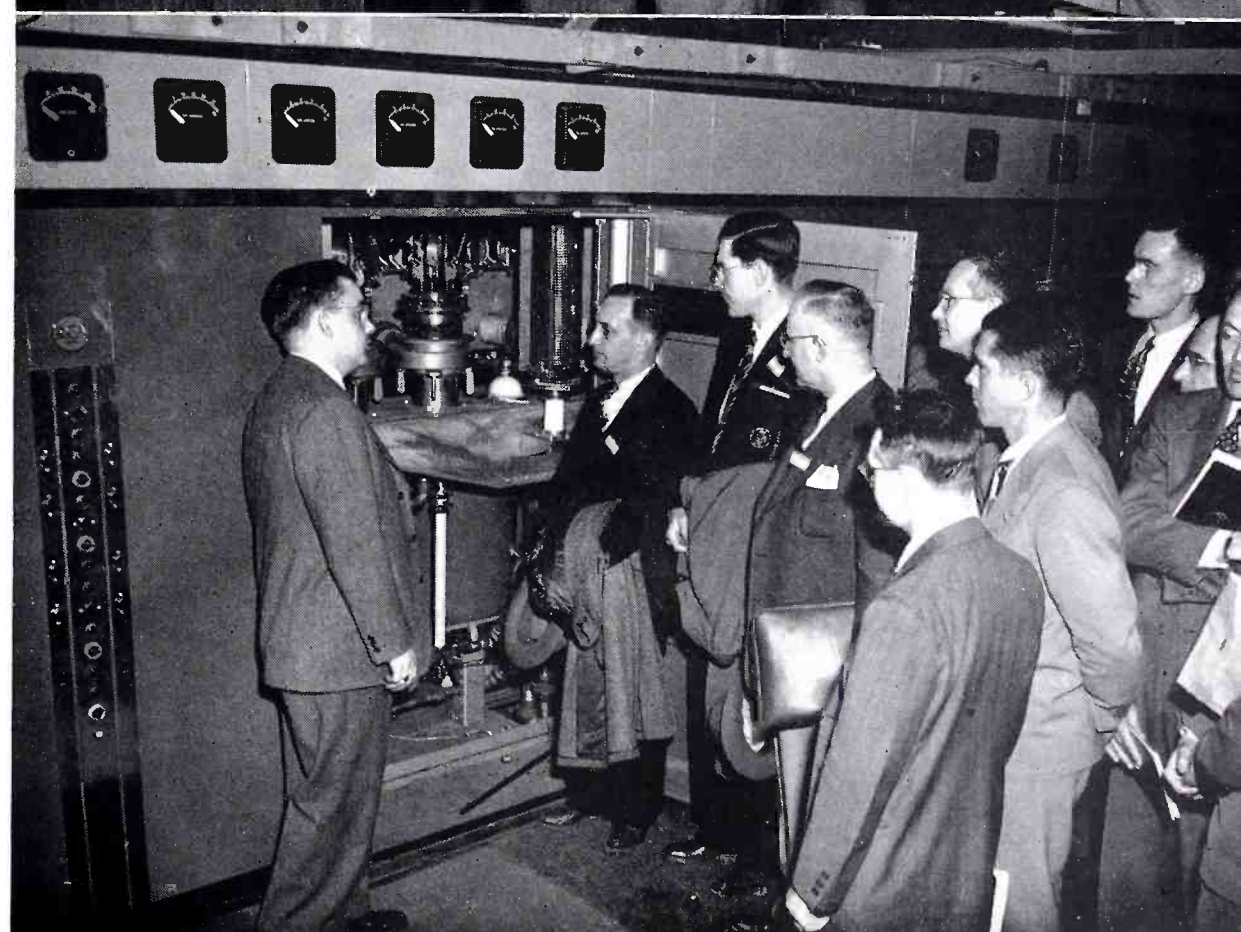
Those attending the 3rd session included: Oliver C. Beitel, KDKA, Pittsburgh; Joseph F. Novy, CBS, Chicago; Martin L. Jones, WCAO, Baltimore; Warren L. Braun, WCAM-TV, Baltimore; Jerome J. Weaver, WIOD-TV, Miami; Harvey J. Aderhold, WCON, Atlanta; W. J. Kotera, WOW, Omaha; W. G. Eber-

RIGHT (top). Practical demonstrations of equipment are an important part of the TV course. In this picture H. E. Gihring (second from left), manager of RCA's Television Transmitter Engineering Section is explaining the operation of the side-band filter to a group of interested broadcasters.

RIGHT (center). In this view Ed Tracy, one of RCA's wartime Radar experts and now broadcast sales engineer in the Chicago territory, is showing the "innards" of an RCA Image Orthicon Camera to a group in the television laboratory. Attendees at the course have an opportunity to get the feel of cameras and other television gear by actually operating them.

RIGHT (bottom). At RCA's well-known "53 Building" transmitter plant, broadcasters are shown not only production lines where television transmitters are assembled and tested, but also production and development of various types of AM and FM transmitters. In this view one group is inspecting a 150 KW standard broadcast transmitter which RCA is building for the export trade.





hart, WSBA, York; J. L. Hodgkinson, WHIO, Dayton, Ohio; M. N. Barwick, WIOD, Miami; G. F. Sprague, WIOD, Miami; E. V. Wolstenholme, Jr., WRNL, Richmond, Va.; S. T. Terry, WRVA, Richmond, Va.; J. E. Mathiot, WGAL, Lancaster; H. W. Holt, WKBW, Buffalo; A. H. Jackson, WTIC, Hartford; Wm. C. Ellsworth, WRS, INC., Philadelphia; Glenn Davis, WCPO, Cincinnati; Frank A. Dieringer, WFMJ, Youngstown; Frank R. Seitz, WFIL, Philadelphia; Paul C. Schulz, KYA-KLAC, San Francisco; Blair Thron, WFPG, Atlantic City; C. J. Auditore, WOR, New York; E. B. Stern, Miss. Valley B/Co., New Orleans, La; Reed E. Snyder, Central B/C Co., Des Moines, Iowa; Paul Arvidson, WOC, Davenport; John T. Beeston, Jr., WHO, Des Moines, Iowa; Henry R. Kaiser, WWSW, Pittsburgh, Pa.; W. J. Zehr, KWKJ, St. Louis, Mo.; Joe Herold, WOW, Omaha, Nebr.; Stan Bennett, KOMO, Seattle, Wash.; E. T. Kelly, WSB, Atlanta, Ga.; Clarence Jones, WJR, Detroit, Mich.; B. T. Wilkens, WKBN, Youngstown, Ohio; Warren P. Williamson, Jr., WKBN, Youngstown, Ohio; J. G. Carey, WBT, Charlotte; H. T. Wheeler, KPRC, Houston; E. Frase, Jr., WMC, Memphis; J. R. Whitworth, WMC, Memphis; Jos. A. Volk, WEW, St. Louis; P. K. Baldwin, WHDH, Boston; H. S. Holland, WFBM, Indianapolis; E. E. Alden, WIRE, Indianapolis; H. G. Cole, WSBT, South Bend, Ind.; Edwin L. Keim, WWVA, Wheeling, W. Va.; C. A. Runyon, WGR, Newport News; John C. Peffer, WTAR, Norfolk, Va.; Bernard C. O'Brien, WHEC, Rochester, N. Y.; M. E. Thompson, WSAV, Savannah, Ga.; Elliot Diamond, Tele. Corp. of W. Va., Wheeling, W. Va.; Thomas B. Freedman, WHK, Cleveland, Ohio; Richard H. Davis, WOR-TV, New York City; George B. Riley, WOR, New York.

ABOVE. Meetings of the 4th Session were held in the Redwood Room of the Hotel Roosevelt in Hollywood.

4th Session of the Clinic, Los Angeles, May 24-27, 1948

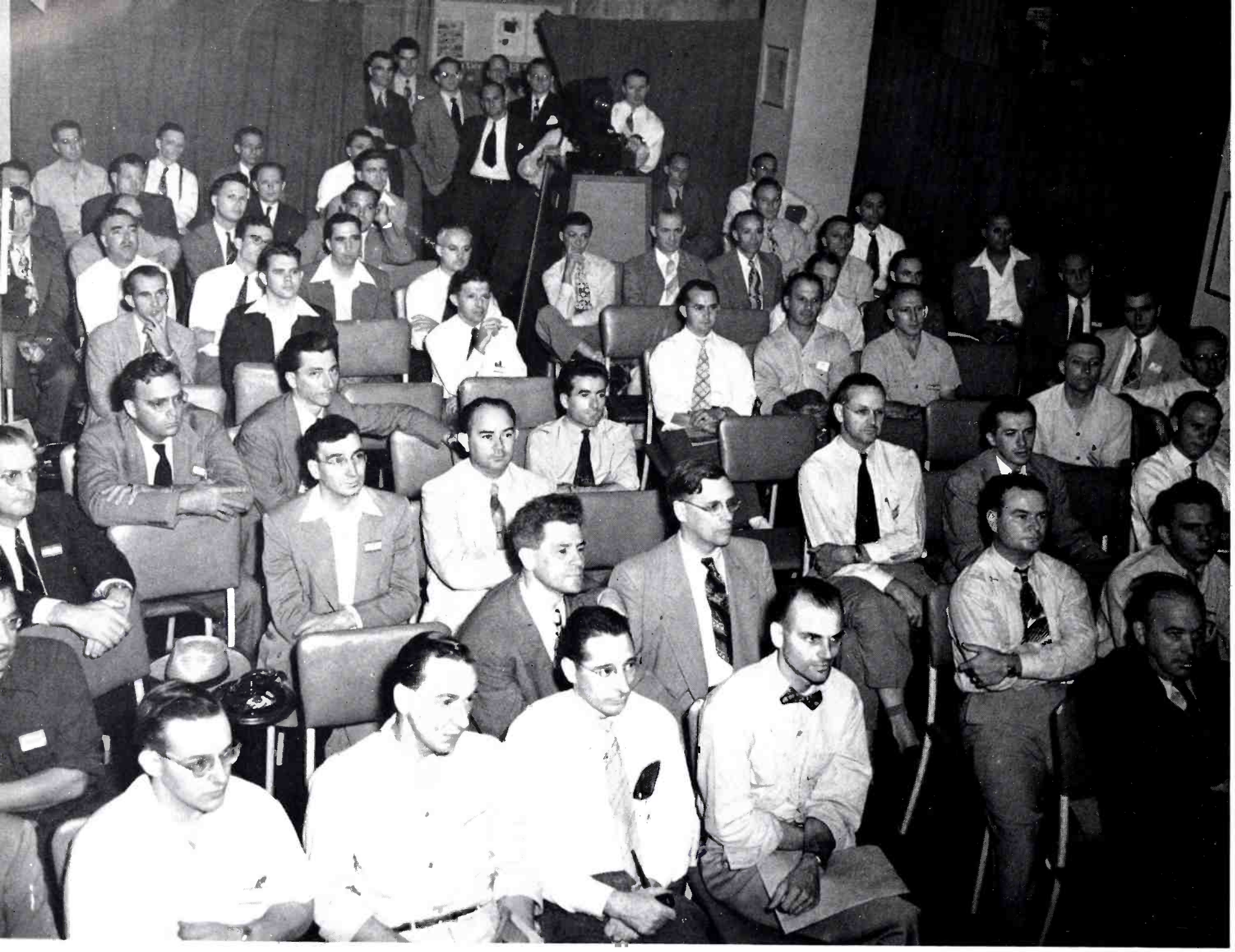
Seventy West Coast broadcasters became "graduates" of the Television Training Course when the fourth session was held in Los Angeles the week of May 24. This was the week immediately following the NAB Engineering Conference, which many of these broadcasters attended. It was also an advantageous time from our viewpoint in that a number of the RCA engineers who act as instructors in the course were also attending the NAB Conference.

Meetings of the fourth session were held at the Hotel Roosevelt. With one or two exceptions, the instructors were the same as those who give "the course" in Camden. Although the advantages of proximity to the Camden laboratories and factory were missing, this was to some degree made up for by a trip to the KFI-TV transmitter on Mt. Wilson. Here the visitors had an opportunity to inspect television transmitting and terminal equipment which was nearly ready for on-air tests.

Those attending this fourth meeting of the Television Clinic included: John Aalberg, RKO, Los Angeles; Lloyd Amoo, KIOA, Des Moines, Iowa; Warren Andresen, KGO, San Francisco: Arne Anzjon, KXLF, Butte, Montana; LeRoy Bellwood, KFSD, San Diego; E. E. Benham, KTTV, Los Angeles; J. A. Beranek, KNX-CBS, Los Angeles; Rex Bettis, ABC-KECA, Los Angeles; Max Bice, KTNT, Tacoma, Washington; L. F. Bookwalter, KOIN, Portland, Oregon; Leo W. Born, KGLO, Mason City, Iowa; L. H. Bowman, KNX-CBS, Los Angeles; F. J. Brott, KOMO, Seattle, Washington; Harold R. Brown, KFRE-KRFM, Fresno; V. E. Clayton, KSL, Salt Lake City, Utah; Bryan T. Cole, KFI, Los Angeles; Ralph Conner, Video Broadcasting, Los Angeles; R. G. Denechaud, ABC-KECA, Los Angeles; Bruce Denney, Paramount Pictures, Los Angeles; Merrill Dewitt, KSFO-KPIX, San Francisco; G. DeYoung, KERO, Bakersfield; S. E. Dunn, RKO, Los Angeles; Tom Ely, KEX, Portland; W. E. Evans, McClatchy Bdcg., Sacramento; F. W. Everett, KFI, Los Angeles; Grant Feikert, KOAC, Corvallis, Oregon; Willis O. Freitag, KRKD, Los Angeles; W. C. Gilman, Universal Recorders, Los Angeles; Albert P. Green, Warner Brothers, Burbank; Stokes Gresham, Jr., WISH, Indianapolis; L. D. Grignon, 20th Century, Los Angeles; Verne Hassett, KSRO, Santa Rosa, California; H. F. Huntsman, KLAC, Los Angeles; George Ing, KONO, San Antonio, Texas; L. P. Jarvis, KPMC, Bakersfield; Charles Jeffers, WOAI, San Antonio, Texas; E. M. Johnson, Mutual Broadcasting, New York; Seymour Johnson, KFI, Los Angeles: Vernon Kramer, Universal Pictures, Los Angeles; Paul Leake, Sacramento Broadcasters, Sacramento; Ben Leff, KHUB, Watsonville, KYOR, San Diego; Edwin B. Levinson, Warner Bros., Burbank; R. H. Lingle, KQW, San Francisco; Charles R. Long, Westinghouse, Los Angeles; George Mathiesen, KSFO, San Francisco; John C. Merino, KFSD, San Diego; Burton F. Miller, Warner Bros., Burbank; Vern Milton, KUSN, San Diego; T. G. Morrissey, KFEL, Denver, Colorado; Thomas Moulton, 20th Century, Los Angeles; M. D. Myers, KCRA, Sacramento; Ken Nielsen, KALW, San Francisco; R. E. Oakley, KFAC, Los Angeles; Carl Olson, KLAC, Los Angeles; H. P. Pangborn, KNX-CBS, Los Angeles; Harry Puccetti, KNBC, San Francisco; Farrell Quigley, KTTV, Los Angeles; Paul H. Reedy, Warner Bros., Burbank; Charles J. Sherburne, KSDJ, San Diego; L. N. Schultz, Station 2GB, Sydney, Australia; Paul C. Schultz, KYA, San Francisco; Loyd Sigmon, KMPC, Los Angeles; Ray Torian, KNOB, Long Beach; Wes Turner, Video Broadcasting, Los Angeles; W. O. Watson, Republic Studios, Los Angeles; Lawrence West, KSFO-KPIX, San Francisco; Douglas T. Winne, Columbia Studios; W. V. Wolfe, Motion Picture Research Council, Los Angeles; Omer Wright, KDON, Monterey; Lloyd Jones, Los Angeles.

ABOVE. A chance to get together socially gives station engineers an oppo-tunity to get acquainted, to swap experiences, and to discuss mutual problems to the benefit of all concerned. This picture was taken at a dinner in the Roosevelt during the 4th Session.

ABOVE. Engineers attending the 4th Session were taken by bus to the KFI-TV transmitter plant on Mt. Wilson. This gave them an opportunity to examine at first hand the most up-to-date television transmitting equipment available. KFI-TV plant at the time of this trip was testing, but not yet on the air. The picture above shows part of the group of visiting engineers. KFI-TV building and tower are in the background.



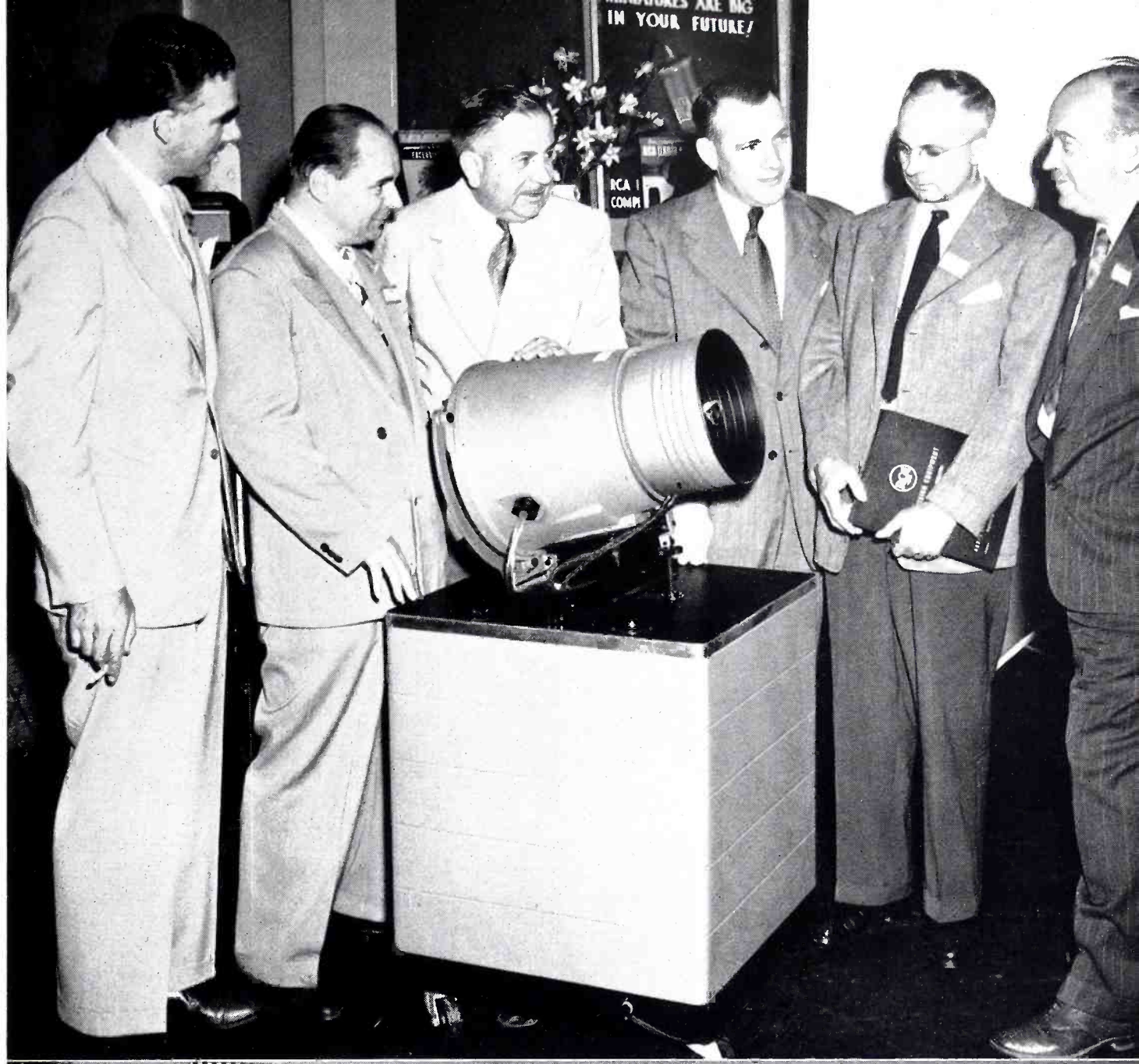
ABOVE. Part of the group assembled for the 5th Session of the TV clinic. Meetings in Camden are held in the main hall of RCA Victor's showroom.

5th Session of the Clinic, Camden, July 19-23, 1948

Fifth, and most recent, session of the clinic was held the week of July 19 in Camden. Broadcasters assembled for this session received the same basic instruction, plus lectures on some of the newer equipment developments, such as kinescope recording.

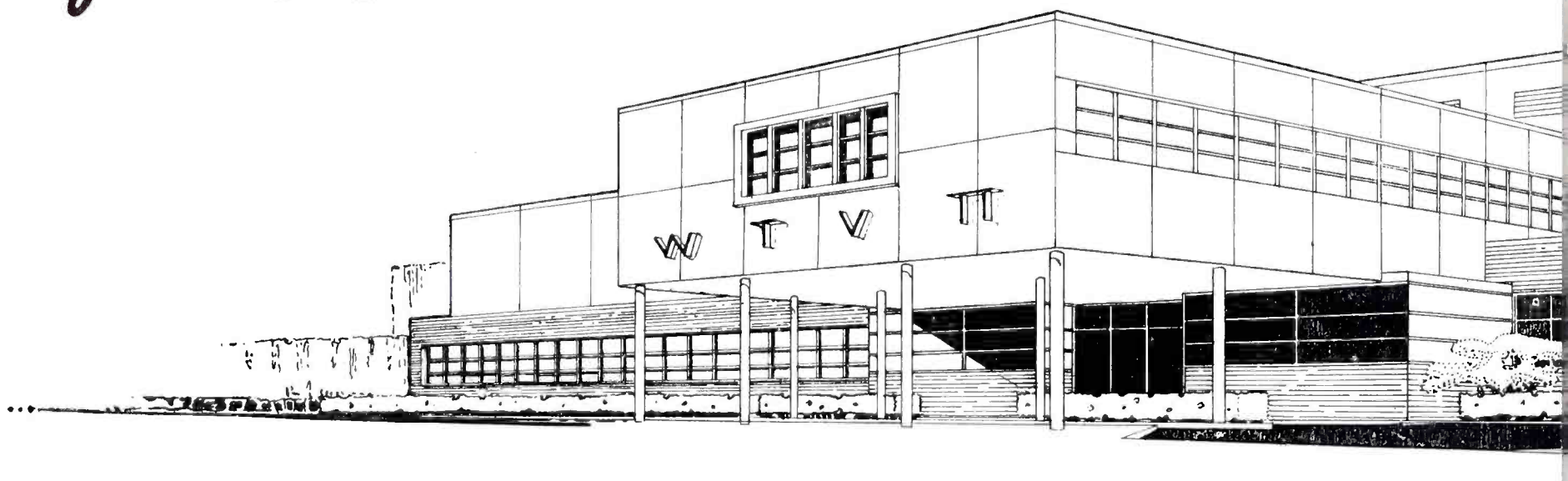
Those who attended the fifth training clinic included the following: Carl Olson, KIAC, Los Angeles; M. J. Weiner, WNEW, New York City; F. S. Howes, Consultant, Montreal; S. J. Raymond, WFMJ, Youngstown, Ohio; R. S. Emch, WARC, Rochester, N. Y.; J. J. March, WARC, Rochester, N. Y.; F. E. Bartlett, KSO, Des Moines, Iowa; R. H. Musselman, WSAN, Allentown, Pa.; A. Goldbach, WSID, Baltimore, Md.; S. W. Hagenau, WSBT, South Bend, Ind.; W. F. Kean, Andrew Corp., Chicago; F. Rich, G. U. T., Australia; R. J. Wilson, WHLD, Niagara Falls, New York; L. F. Guaragna, RCA Victor Mexicana, Mexico City; K. G. Marquardt, WIBW, Topeka, Kans.; J. A. Flaherty, WDAF, Kansas City, Missouri; H. E. Goldenberg, WHB, Kansas City; R. B. Spivey, WACA, Atlanta, Ga.; R. E. Dodson, WACA, Atlanta, Ga.; Francis Miller, KOMO, Seattle, Wash.; S. E. Sorensen, CRI, New York, N. Y.; W. Lewis Evenden, WJVB, Jacksonville Beach, Fla.; D. O. Reinert, RCA, Haddonfield, N. J.; Lou H. Stantz, WNBF, Binghamton, N. Y.; A. Boisvert, CHUM, Toronto; Charles A. Kibling, WBRY, Waterbury, Conn.; Ben Adler, Consultant, White Plains, New York; K. G. Chisholm, RCA, Toronto; M. R. Pagliarulo, RCA, Camden; George Keich, WICC, Bridgeport, Conn.; R. J. Schroeder, KMA, Shenandoah, Iowa; F. B. Ridgeway, WEBR, Buffalo, N. Y.; K. C. Shirk, WIND, Chicago, Ill.; W. B. Smith, Government of Canada; L. L. Dawkins, WPTF, Raleigh, N. C.; T. E. Campbell, WJAC, Johnstown, Pa.; E. W. Miller, RCA, Montreal, Can.; Ken Kendall, National Film Board, Ottawa Can.; Harold Schearer, WEEU, Reading, Pa.; K. D. Hewson, Kansas St. College, Manhattan, Kans.; J. L. Wildermuth, WADC, Akron, Ohio; A. W. Bock, WADC, Akron, Ohio; A. W. Varner, WJW, Cleveland, Ohio; G. C. Roberts, WJW, Cleveland, Ohio; H. F. Hutsman, KLAC, Hollywood, Calif.; J. W. Robertson, WFMD, Frederick, Md.; Wayne L. Babcock, KCRG, Cedar Rapids, Io.; Carl A. Edstrom, KSTP, St. Paul; Robert W. Cross, KROC, Rochester, Minn.; G. P. Hixenbaugh, WMT, Cedar Rapids, Io.; Lindsey Riddle, WDSU, New Orleans; John V. Leahy, RCA, Haddonfield, N. J.; S. D. Wooten, WREC, Memphis, Tenn.; Robert R. Sowers, WTOD, Toledo, Ohio; W. F. Myers, WJJD, Chicago, Ill.; Wilson Raney, WREC, Memphis, Tenn.; W. J. Blackburn, CFPL, London, Ontario; P. A. Field, CFPL, London, Ontario; Ira Kamer, Commercial Radio & Sound, New York City; Arthur Hopwood, WPTZ, Philadelphia; Scott Hagenau, WSBT, South Bend, Ind.; John R. Shearer, WFIL, Philadelphia; Wm. Clair, WFIL, Philadelphia; W. J. Thompson, RCA, Camden.

RIGHT. Among the attendees at the 5th Session was a group of prominent Canadian broadcasters. Shown here discussing the large-screen projector with RCA Victor executives are, from left to right, Walter J. Blackburn, Pres. and Gen. Mgr., CFPL and CFPL-FM, London, Ontario; Aurele Boisvert, Chief Engineer, CHUM, Toronto, Ontario; Frank M. Folsom, Executive Vice President, RCA Victor Division; W. W. Watts, Vice President in charge of the RCA Engineering Products Department; Percy A. Fields, Chief Engineer, CFPL and CFPL-FM, London; and K. G. Chisholm, RCA Victor, Ltd., Toronto.



RIGHT. Description of the operation of equipment accompanied by actucl demonstration of the equipment in operation is one of the main features of the RCA TV course. Here C. D. Kentner, supervisor of the television transmitter design group, explains the operation of the transmitter console to a group of broadcasters at the 3rd Session.

FACILITIES HOUSING *for* TV



ABOUT THE AUTHORS

Rene Brugnoni, Architect, received his training and education in this field at Columbia University, Pratt Institute and Beaux Art School of Architecture, all in New York City. He began his private practice as a registered architect in New York in 1934. This activity progressed until 1941 during which time Mr. Brugnoni designed many important commercial and industrial projects including broadcast transmitters and studios.

During the war, he was engaged in the design of several war plants in various parts of the country having been chief architect for Sanderson and Porter on these projects.

In 1944, he associated himself with the American Broadcasting Company as architect in designing and planning their post-war facilities throughout the country which included AM, FM and TV transmitters and studios, the conversion of several theatres for use as studios and the design of recording studios.

He returned to his private practice in 1947 and is now specializing in all branches of broadcasting with projects under way both in this country and abroad.

Ben Adler, Broadcast Facilities Consultant, received his E.E. degree at Brooklyn Polytechnic Institute in 1926. He has been actively engaged in field engineering for broadcast stations since 1928 when he joined the research department of RCA at Van Courtlandt Park. His work with RCA included development of broadcast station site survey equipment and methods, international broadcast reception at Riverhead, L. I., large screen television projection and synchronizing systems, television broadcasting in New York City, field engineering and sale of broadcast equipment throughout the country, and management of RCA's Test and Measuring equipment section during the war.

In 1944, he became chief facilities engineer for the American Broadcasting Company. For three years in this capacity, he played a major role in developing and improving ABC's facilities in New York and the west coast and at the same time planning their proposed TV facilities.

In 1947, he left ABC to set up his own TV service company in New York and to develop his consulting practice in the field of broadcasting with particular emphasis on TV.

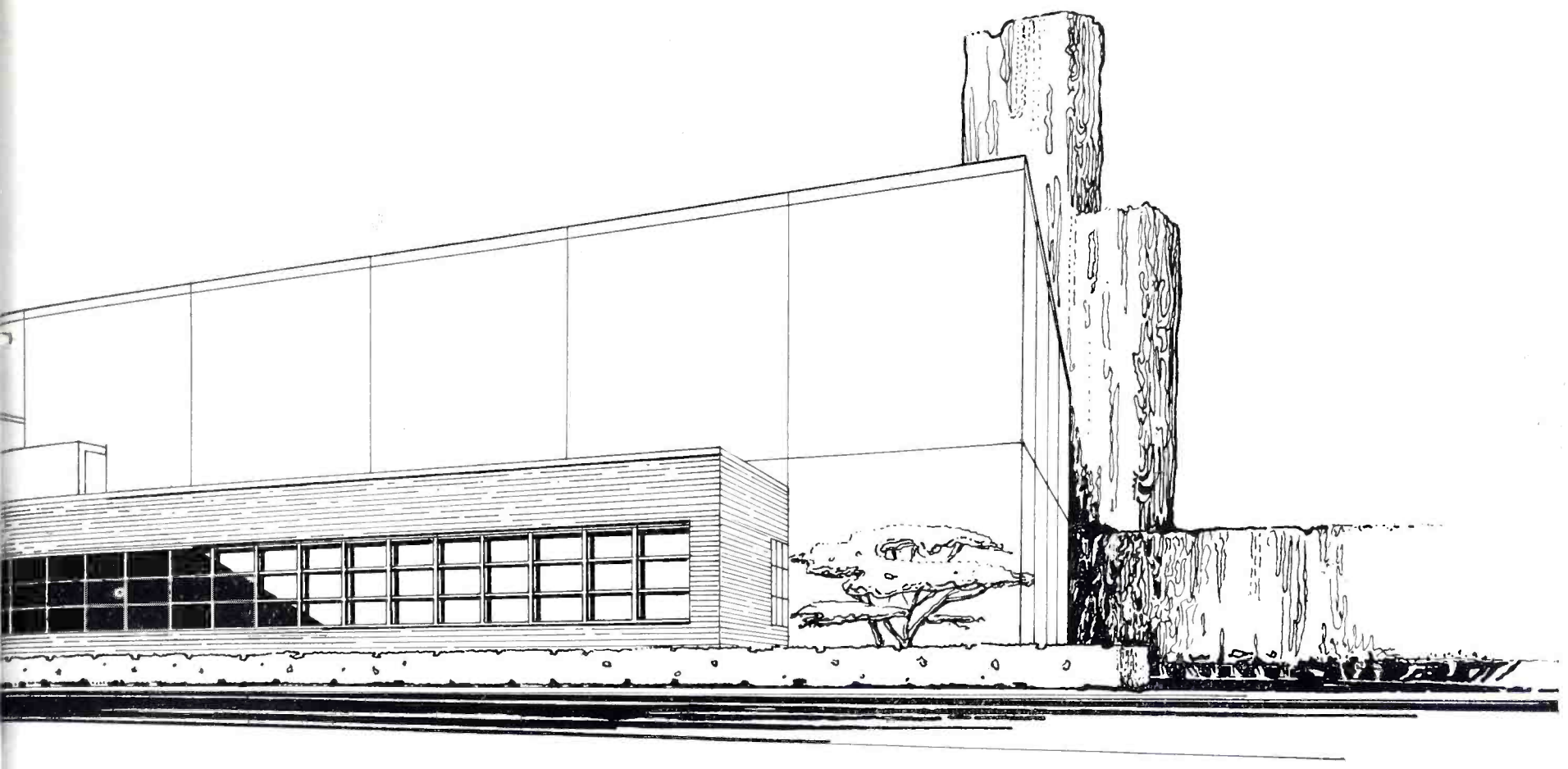


FIG. 1. Building designed to house the offices and studios of a TV station originating network programs.

PRELIMINARY PLANS FOR THREE BUILDINGS SUITABLE FOR TELEVISION STATIONS OF SEVERAL TYPES – WITH A DISCUSSION OF THE FACTORS AFFECTING THE FUNCTIONAL DESIGN OF TV BUILDINGS

by **RENE BRUGNONI*** and **BEN ADLER****

The design on the cover shows an airplane view of a proposed studio building for the master class of TV station—i.e. a station designed to produce shows and handle switching for network origination. Elevations, perspectives, and floor plans for the building as well as for two smaller TV stations are shown on following pages.

In designing these building layouts, particular attention has been given to operating and production requirements, traffic through the building during normal operating and arrangements for future expansion. Provisions for expansion are particularly important since it is well known how quickly AM facilities have become obsolete in the past because of insufficient space. The possibility of this happening in TV is even greater because of the newness of the production phase of this art, and the rapid strides that are expected to be made during the next few years. Hence, the need for extreme care in planning and adequate provisions for expansion.

Many TV studios and transmitters will, of necessity, be set up in existing buildings. In these instances, limitations will usually be imposed because of shape, size and arrangements of the space available. In such cases, the ideas contained in these designs may be used as a check list to determine whether or not all of the facilities can be made available for proper operation. Often the use of existing space for TV studios will result in many compromises especially in providing for expansion as the art develops. However, the feasibility of existing space should not be ruled out because excellent use has been made of such space, especially for interim operation. Such places as arenas, indoor tennis courts, car barns, theaters, railroad stations, and other indoor places of public gathering and of unencumbered volume can very often be adapted.

The designers of the three buildings illustrated should like to stress the fact that the layouts shown are mainly for the purpose of supplying prospective TV station owners with a check list of the approximate space required for the various functions involved in the three different types of TV operation.

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Plans for the three television buildings designed by Brugnoni and Adler appear on next eight pages.

* 515 Madison Ave., New York, N. Y.
** 15 Geney Circle, White Plains, N. Y.

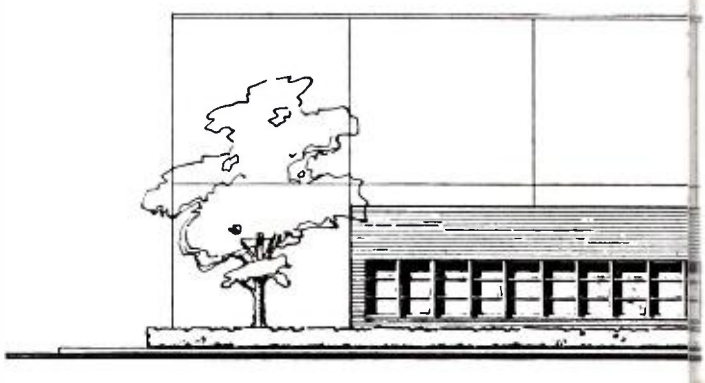


FIG. 2 (right). Elevation drawing of the large building suggested for a network originating station. This is the building of which an air view is shown on the cover and a perspective view in Fig. 1 on the preceding page. Including two large studios, an announce studio and elaborate film production facilities, this TV center is capable of simultaneously feeding one program—either live studio or film—to the network, and a second program to a local station while at the same time carrying on full dress (camera) rehearsals in either of the large studios.

No. 1 A TV BUILDING FOR A NETWORK ORIGINATION STATION

In the network origination station, adequate space for the traffic department within easy reach of master control and other operating units of the studios, is of utmost importance. This is the department that has to do with schedules, distribution of programs throughout the network and establishment of origination points.

The layout for this type of station provides for a smooth flow of people, material, costumes, scenery, props and equipment through the plant. Executives and managerial personnel enter and leave the building through the front entrance and do not interfere with operating personnel, stage and prop workers, and artists. Artists may enter and leave through the stage entrance which is one flight down at the rear. This brings them directly to costume storage, dressing rooms and rehearsal space. Up one flight of stairs brings them directly to either of the two studios for actual performances. Truck deliveries, storage for mobile unit and access to the scenery and property shop are readily provided for in proper places for desirable traffic flow.

A newsreel photographer, arriving at the studio with undeveloped hot news pictures has easy access from any entrance to the dark room where development can proceed immediately. He then has access to editing, traffic, news room for assistance in preparing copy for live commentary and to clear time on the network for the scoop. The pictures are placed on the air in the projection room and live commentary is added as the announcer views the show on his monitor either in the announce booth adjacent to the news room or in either of the studio control room announce booths, whichever fits in best with the program break.

In the studios, large access doors are provided to permit anything from a circus elephant to the pride of the local fire department to roll past the cameras. Also, in the event of major equipment failure, a mobile pickup truck may be backed into the studio to save the program.

Ceiling heights in these studios are 34' from floor to below the light hangers. This permits "flying" a complete set for quick scene changes. Following stage practice of providing cat-walks and a fly loft grid near the ceiling of each studio is highly recommended.

Overall acoustical treatment and sound isolation for each studio are considered musts. In general, TV studios with facilities for changing scenery should have wall and ceiling surfaces that are highly absorptive. The room will be quite dead

(*Continued on second following page*)

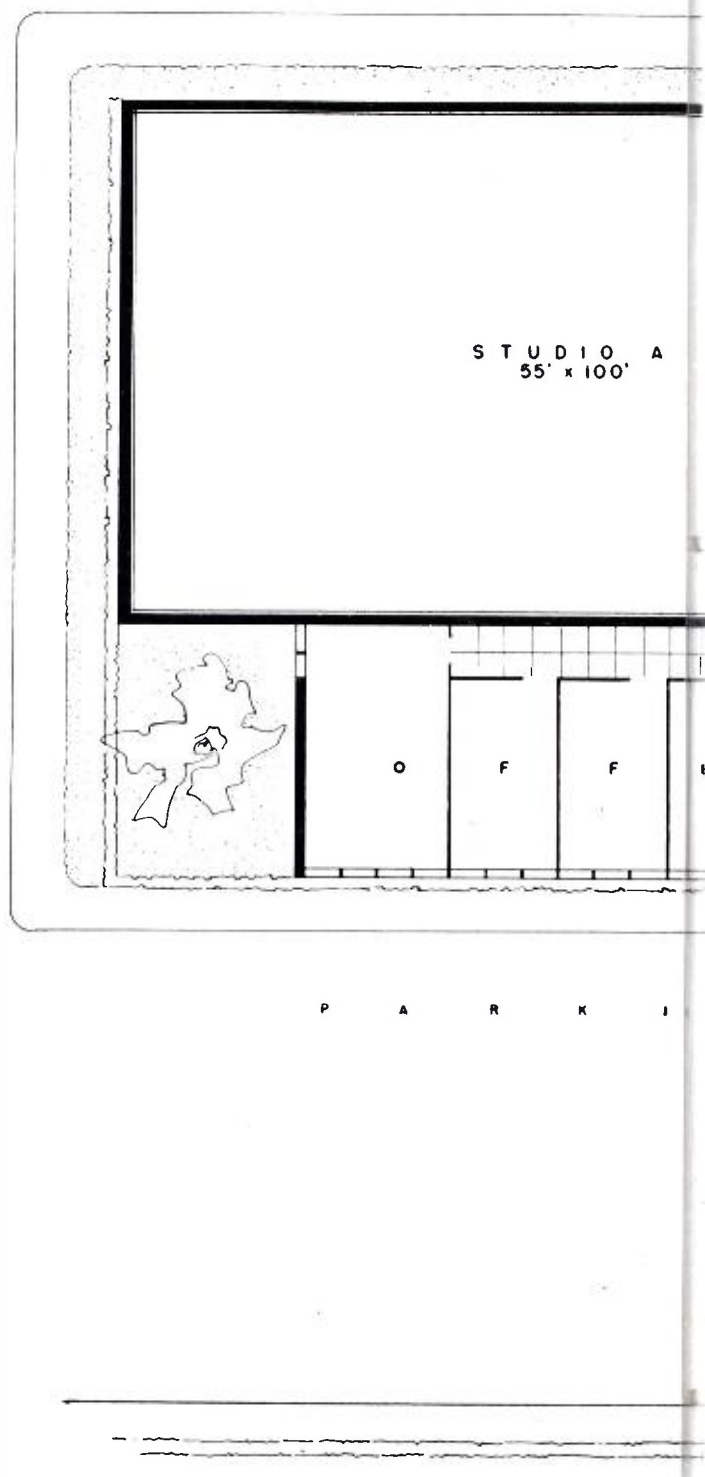
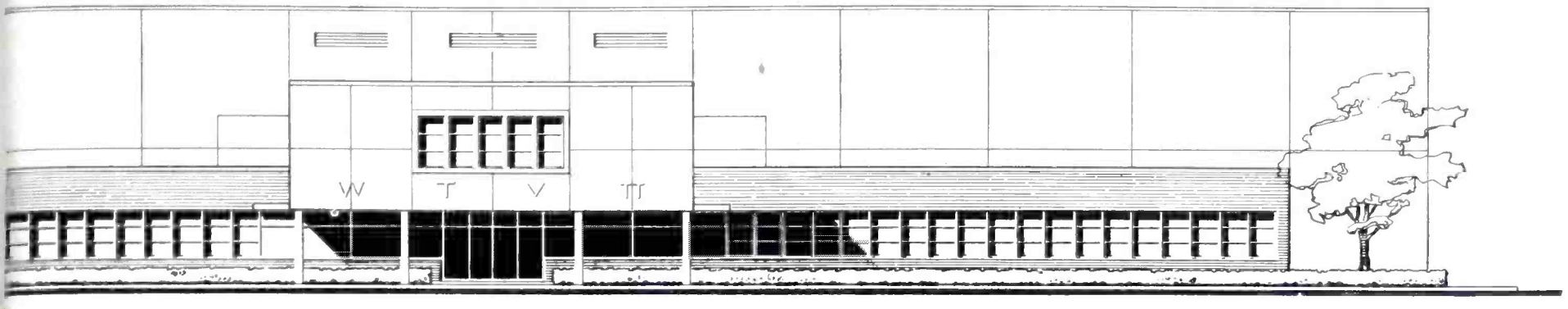
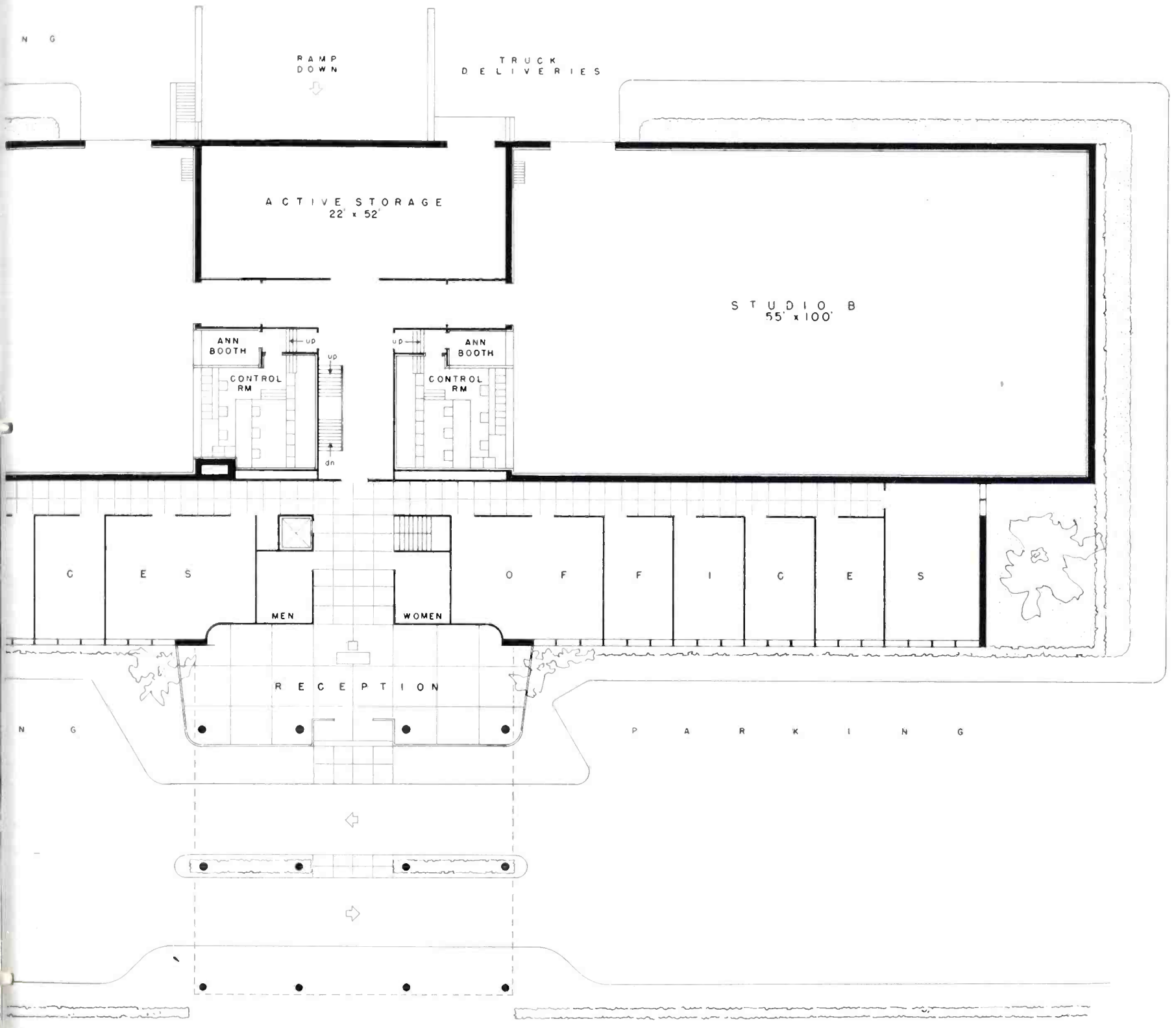


FIG. 3 (right). First floor plan for the large TV building. This "street level" floor includes the reception space, the production and sales officer, the two main studios and their associated control rooms. Placing the studios at ground level makes it possible to drive automobiles or trucks directly into the studio. Space for storage of props used from week to week is also provided. Arrangement of control rooms on same floor as studios (but raised two feet above) follows recommendations of RCA engineers.





FIRST FLOOR PLAN

10 8 6 4 2 0 10 20 30 40

No. 1 A TV BUILDING FOR A NETWORK ORIGINATION STATION

(*Continued from preceding page*)

which permits simulation of outdoor conditions. When reverberation is required to fit in with scene conditions, it can easily be added through the use of portable reflecting surfaces incorporated in the scenery or behind it.

Many other factors must be carefully planned and properly executed. Power circuits for sufficient overhead and portable lights, emergency power supply for the entire building, ventilation and air conditioning that will effectively cope with the heat developed by the studio and scene lighting are some of the more outstanding problems.

Depending upon the location of the studios with respect to the city and to the transmitter, it may be desirable to consider a tower at the studios for the mobile receiver antenna. Such tower must be carefully planned. Optimum height is of course important. The use of a platform at top to permit manipulation and orientation of the dish antennas is a desirable feature to be given consideration.

The studio control rooms have been designed to provide space for equipment and operating personnel. Two floor levels are provided. The lowest, near the window looking into the studio, seats the audio control man behind his console and turntables, and two camera control men behind their console. Directly behind and raised about two feet are the program director, his assistant and the technical director. On the same tier are the control room racks.

In network shows, the program director operates the intercom system which permits him to talk into the studio over the speaker system during rehearsal and to each camera man, dolly man, mike boom man, and lighting man, in addition to the floor director, over the headphone intercom system during the show or rehearsal. His assistant keeps time for him and follows the script along with other duties. The technical director switches and fades cameras upon order from the program director and passes instructions on to the camera control men and audio control man. The camera and line monitors are visible to the program director, his assistant and the technical director.

The announce booth adjacent to the studio control room is used for commercials, live commentary on films, interludes and other obvious purposes. For these activities the announcer must see into the studio, and into the control room in addition to having his visual monitor and aural monitor when his own mike is off.

The master control room is arranged to switch the output of the two studio control rooms and of the film control room along with remote pickups so that any of them can be fed to any combination of outgoing circuits feeding network, local station, cue transmitter and film recording room for delayed broadcasting or reference purposes. Films, remotes or incoming network may be arranged to clear through either of the studio control rooms if operational requirements indicate such setup.

FIG. 4 (above). Second floor plan for the large TV building. On this floor are executive offices, operating services (such as traffic, news, engineering) the master control room, film production facilities and the film projection room. Note that the latter has its own control room. Most of the area shown in this drawing is, of course, taken up by the upper parts of the two large studios, each of which is 34 feet high (to the light hangers).

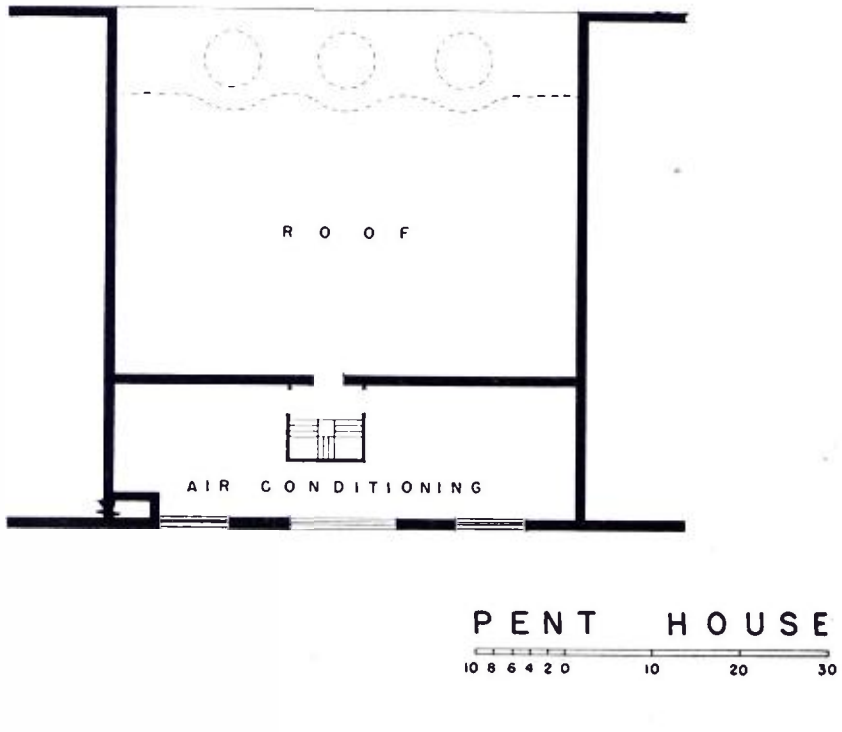
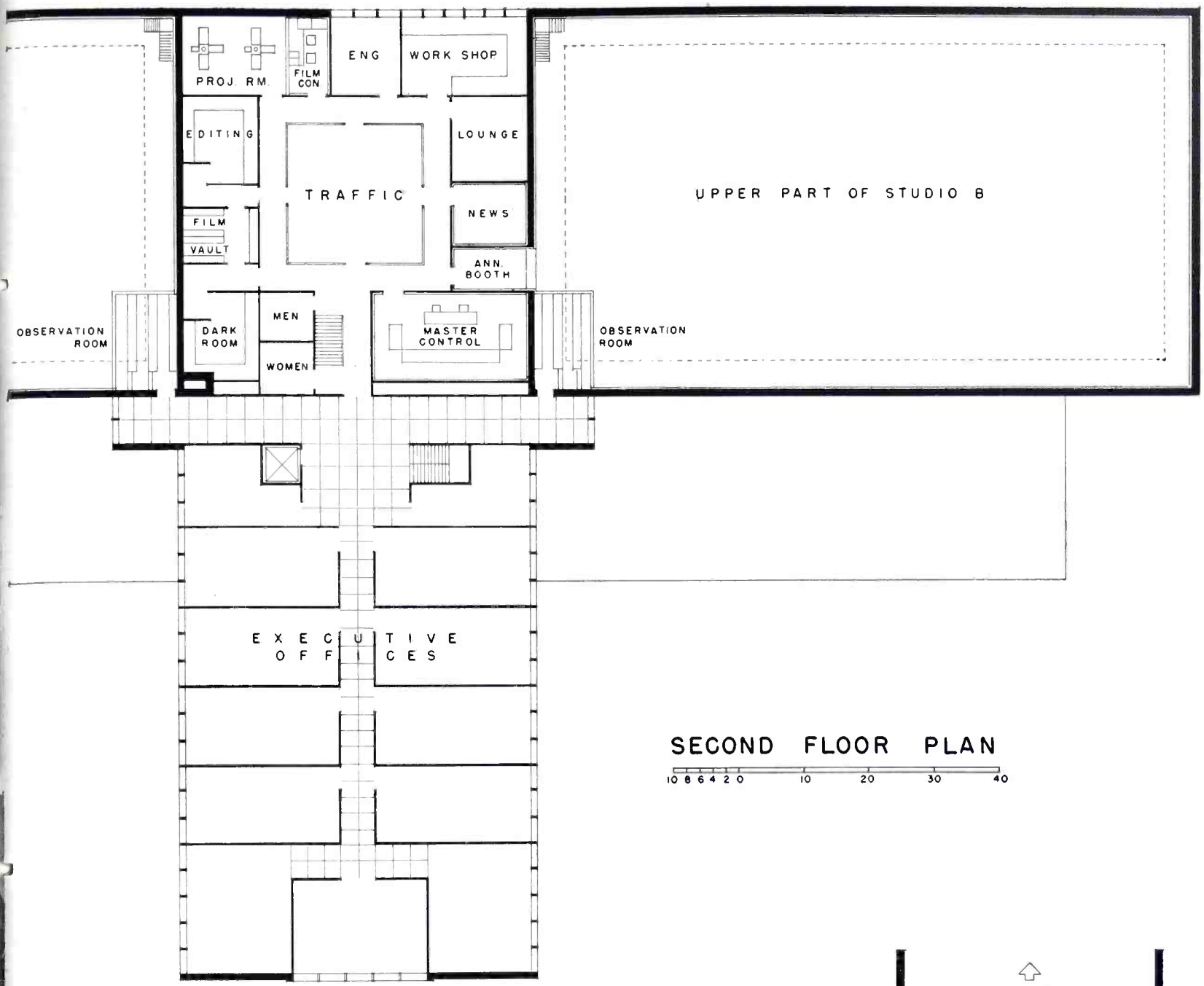


FIG. 5 (right). This is a suggested design for the "penthouse" of the large TV building. Space for air-conditioning equipment is provided in addition to certain details which are added solely for decorative effect.



SECOND FLOOR PLAN

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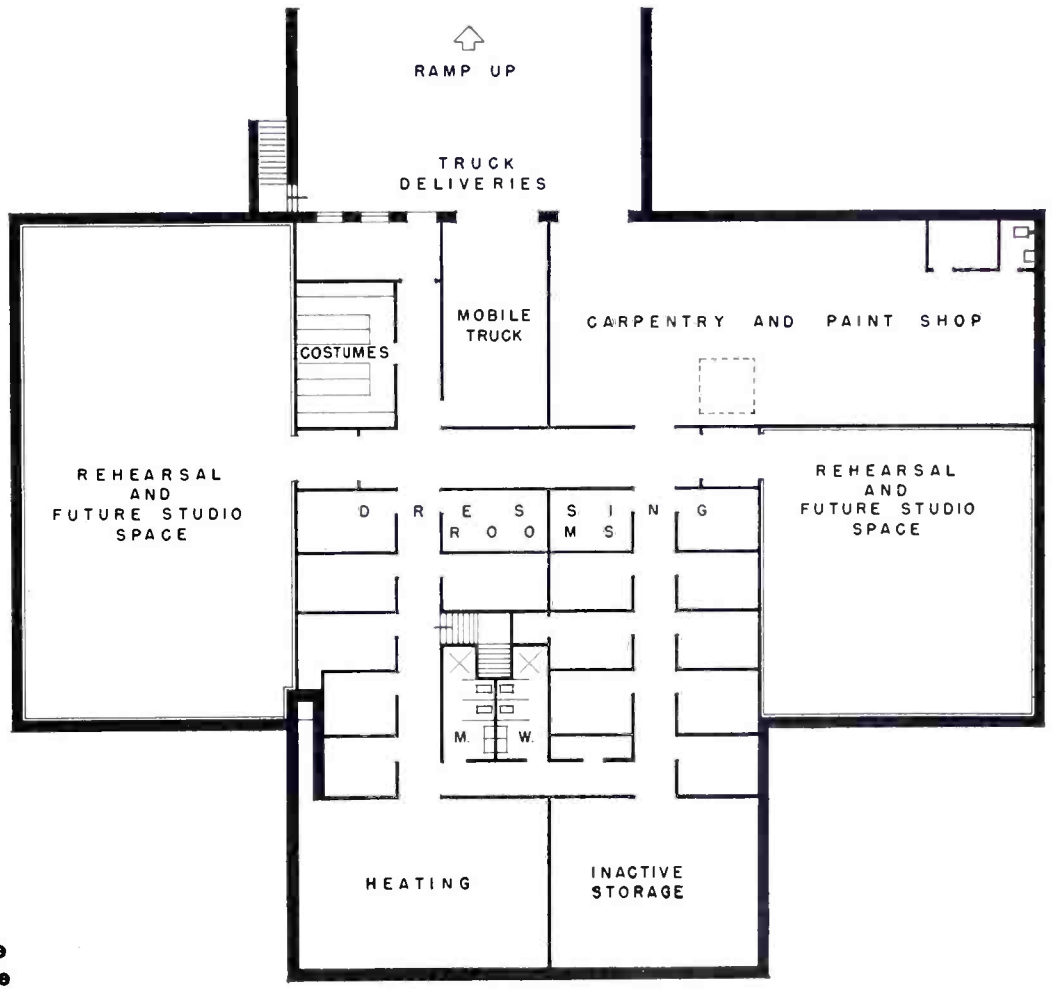

BASEMENT PLAN

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FIG. 6 (right). Dressing rooms and two large rooms suitable for "dry" rehearsals occupy most of the basement area. A garage for the mobile pickup truck, a carpentry shop, space for inactive storage and for heating equipment are also provided. Note that the stairway is placed to provide a convenient passageway from dressing rooms to studios.

FIG. 7 (above). Building designed to house the offices and studios of a television station of intermediate size.

FIG. 8 (opposite page, upper drawing). Elevation view of the intermediate building shown in Fig. 7. This is a one-story structure with the studio section rising to extra height in order to provide a ceiling of 30 feet in the studio.

No. 2 A TV BUILDING FOR AN INTERMEDIATE SIZE STATION

The intermediate studio design illustrated above incorporates many of the features of the master setup but is not considered adequate to handle continuous network origination. Only one studio is provided. Master control has been eliminated so that film and remotes must clear through the one control room. If handled properly, this should not interfere seriously with utilization of the studio and control room for rehearsals.

It should be noted that the space shown lends itself very nicely to future expansion. A good sized second studio can be located in the present dressing room space, moving that function to the basement. The present news room and toilet space can be converted into a control room, moving these functions across the hall. The announce booth would then become common to both control rooms. The master control could be located across the hall in existing office space. Offices could be added in a separate wing depending upon property availability.

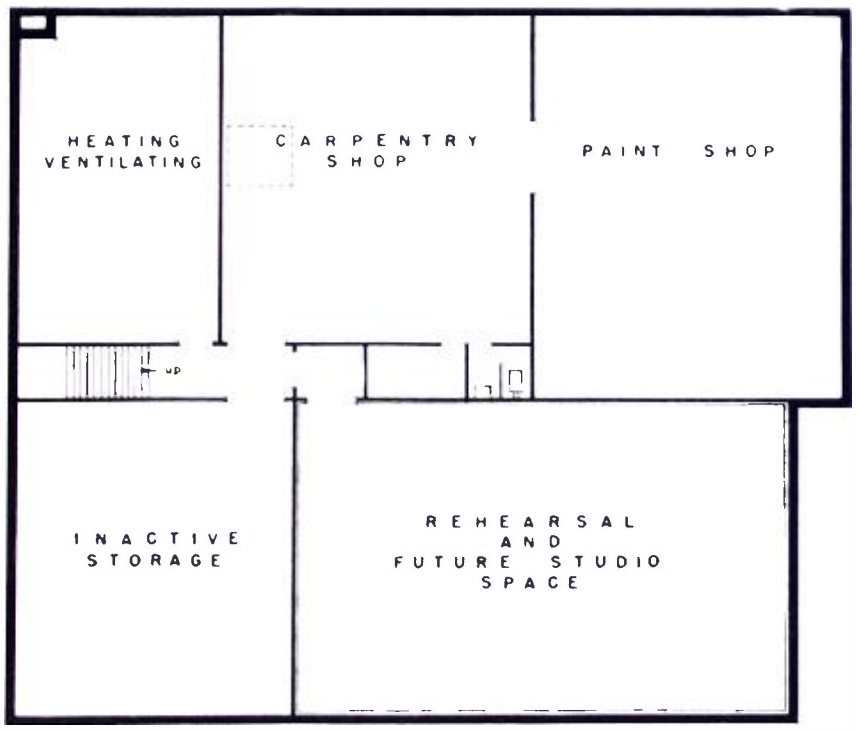
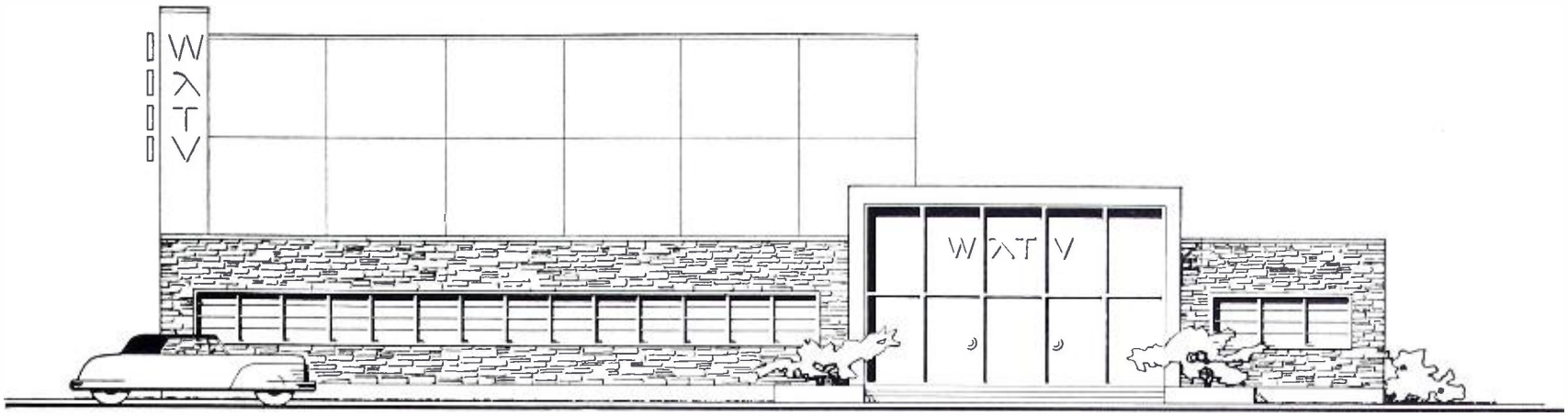
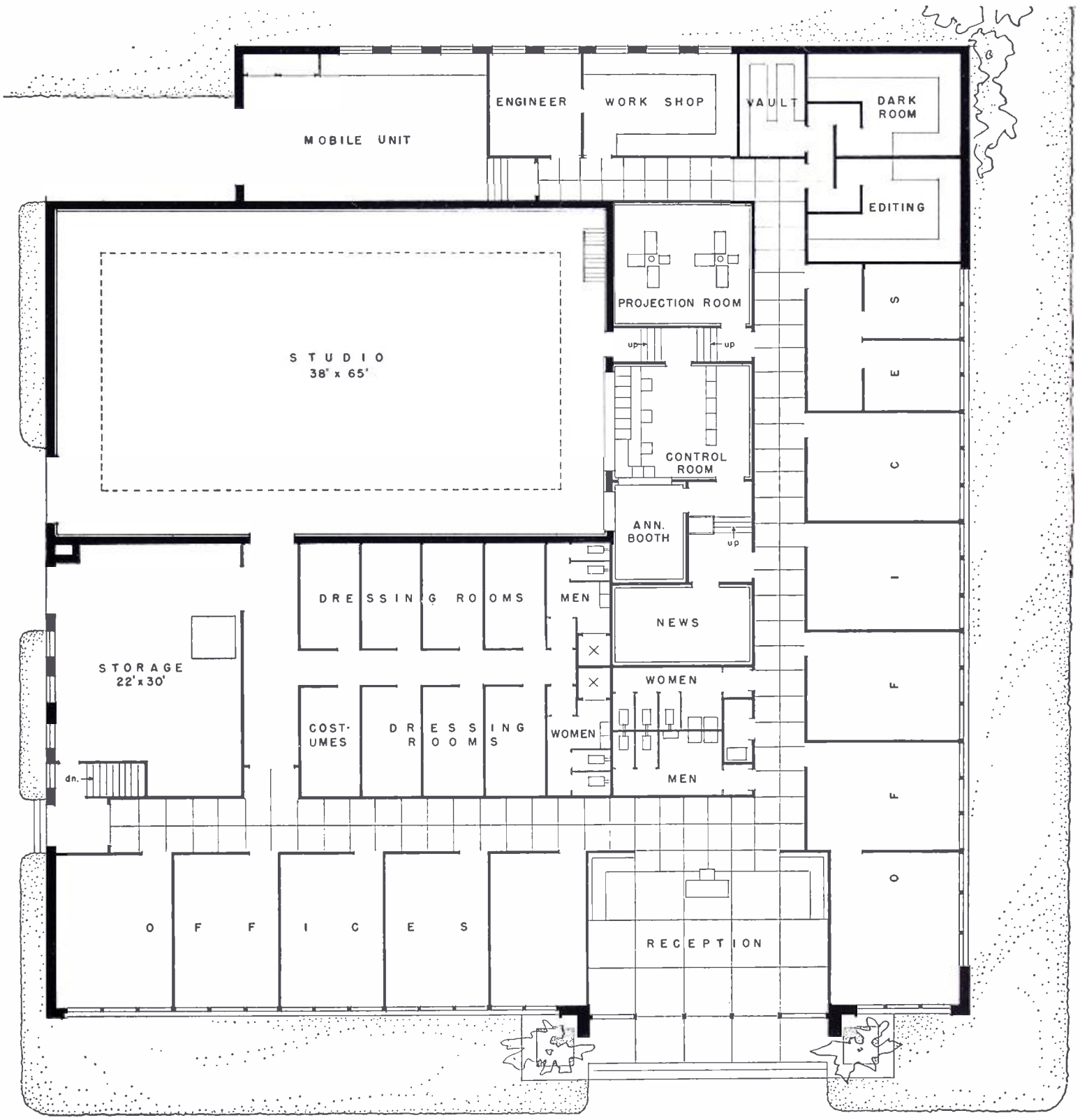


FIG. 9 (opposite page, lower drawing). Arrangement of offices, operating services, studios, control rooms, etc. For the intermediate-size TV building. A single control room handles all control functions. In it are located the film camera controls, a remote "cue" monitor and the outgoing line monitor. The camera control position in front of the studio window is raised two feet above the studio floor level. The program and technical directors sit at a position two feet higher and just behind the video operators.

FIG. 10 (left). A basement under part of this building provides space for workshops, storage and heating equipment.





FLOOR PLAN

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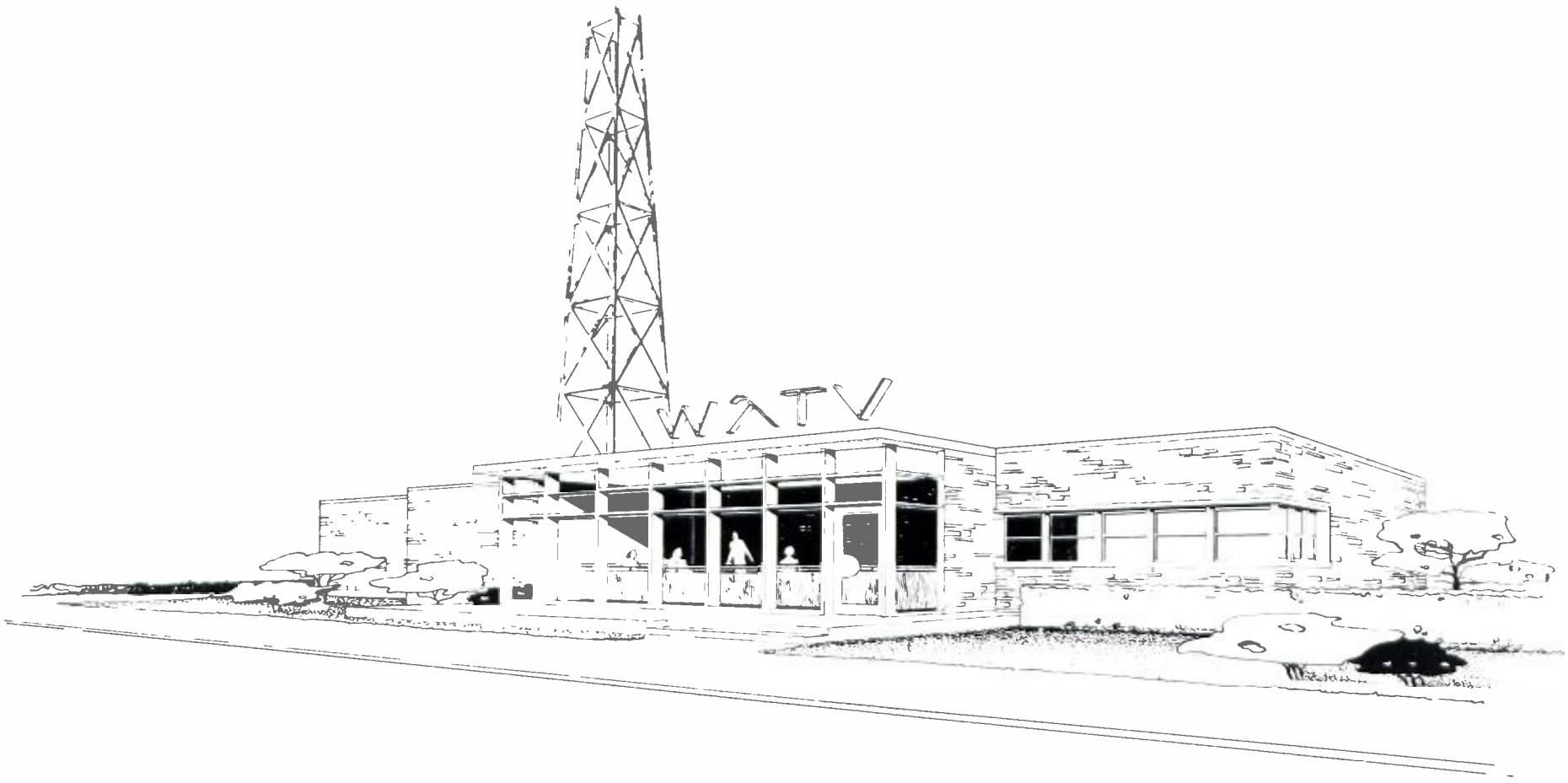


FIG. 11 (above). Building designed to house offices, studios and transmitter of a small television station.

FIG. 12 (opposite page, upper drawing). Elevation plan of the small station building illustrated in Fig. 11. This plan provides for heating antenna tower adjacent to the building (and the transmitter proper in the single control room).

No. 3 A TV BUILDING FOR A VERY SMALL STATION

The small station building illustrated here has been designed to house transmitter and studios. Since this class of station will be essentially a network, remote pickup and film station, the most simplified arrangement has been used. The small studio is included to accommodate the use of remote camera pickup equipment. Only the simplest studio shows can be handled.

The idea of operating directly out of the remote truck through a glass window has been incorporated in this design. The arrangement may have possibilities if the use of suitable interconnecting cables, plugs and receptacles is employed to eliminate the need for hauling the portable camera control gear into the studio each time live studio origination is required.

A building of this type will most likely be located at the edge of town or out on a nearby hill. Expansion may be handled by the addition of a wing or separate studios may be located in town.

Except for utilizing the remote gear in the truck for studio operation, the layout may be used in the tower of an existing building if suitable space and height can be made available.

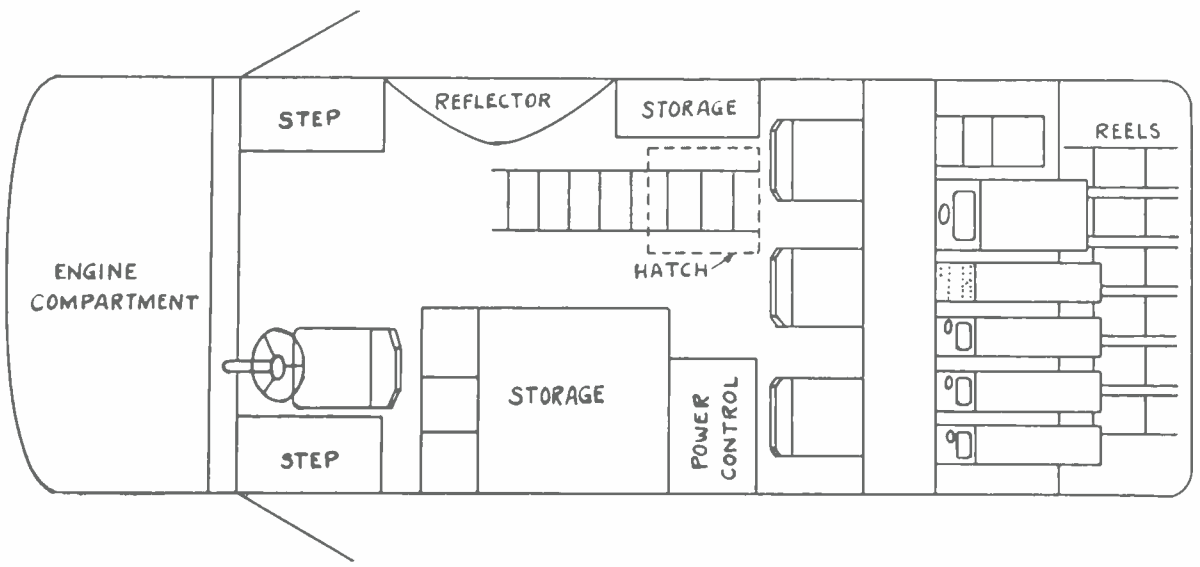
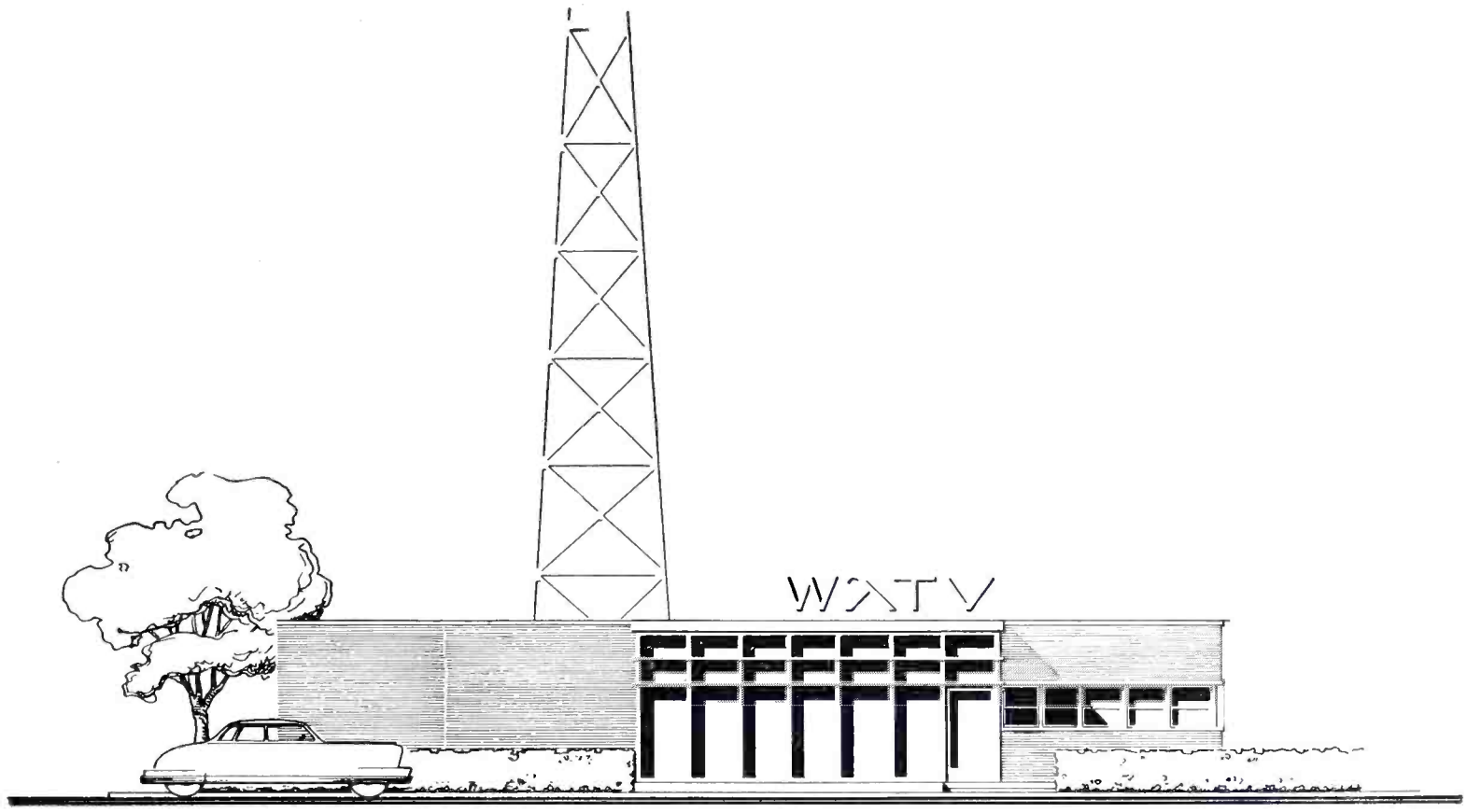


FIG. 13 (left). A novel part of this suggested plan is a provision for using the field equipment for studio pickup—without the necessity of removing it from the truck. The rear of the truck (see diagram at left) is, in effect, a glassed-in control position. When the truck is backed into the garage (see Fig. 14) this control position looks directly into the studios providing an entirely practical (although somewhat restricted) operating arrangement.



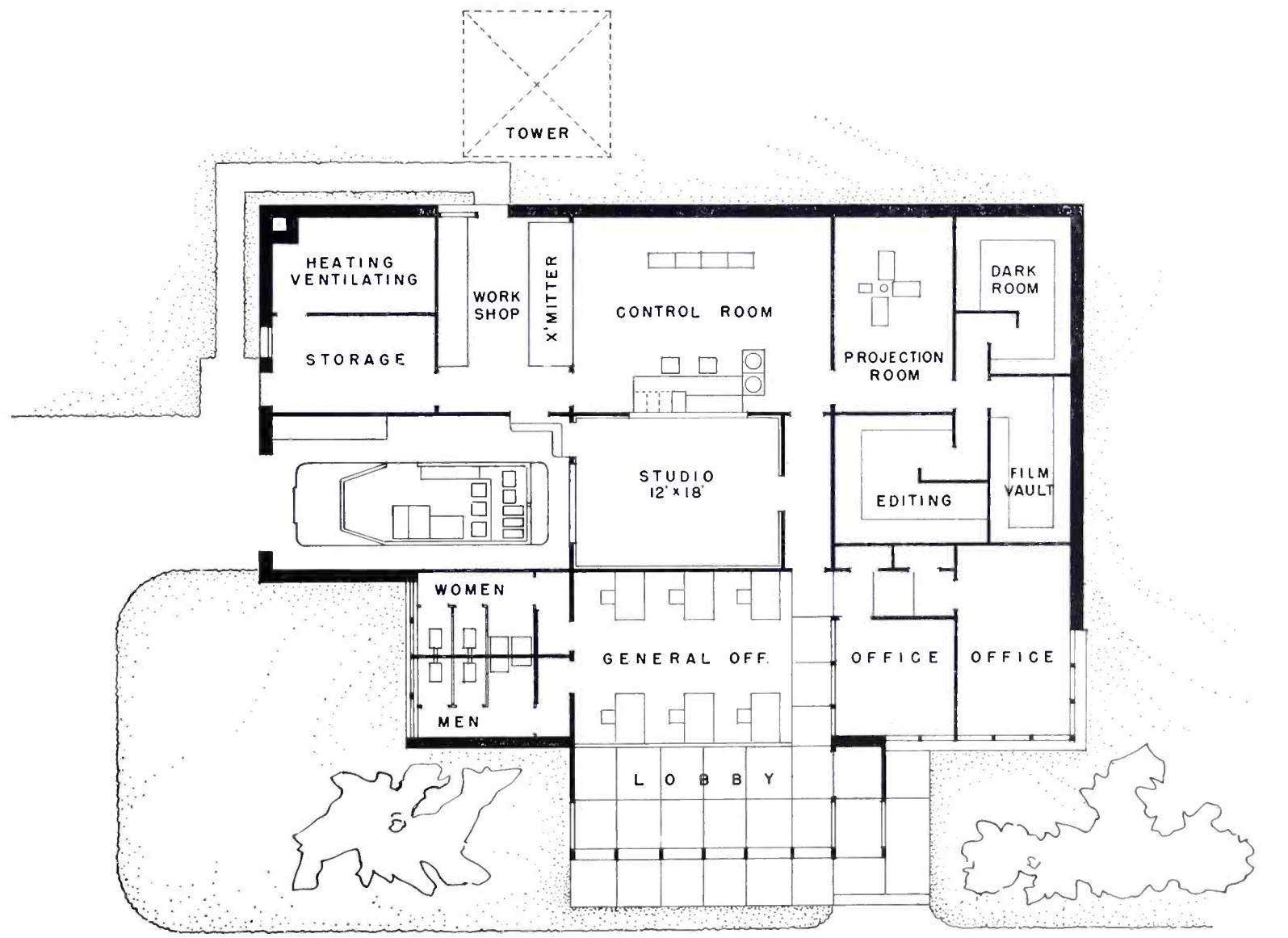


FIG. 14 (above). Floor plan of the small station building. No permanent video equipment is provided—operation of the studio for live talent shows requires use of the truck equipment.

FLOOR PLAN

10 8 6 4 2 0 10 20 30

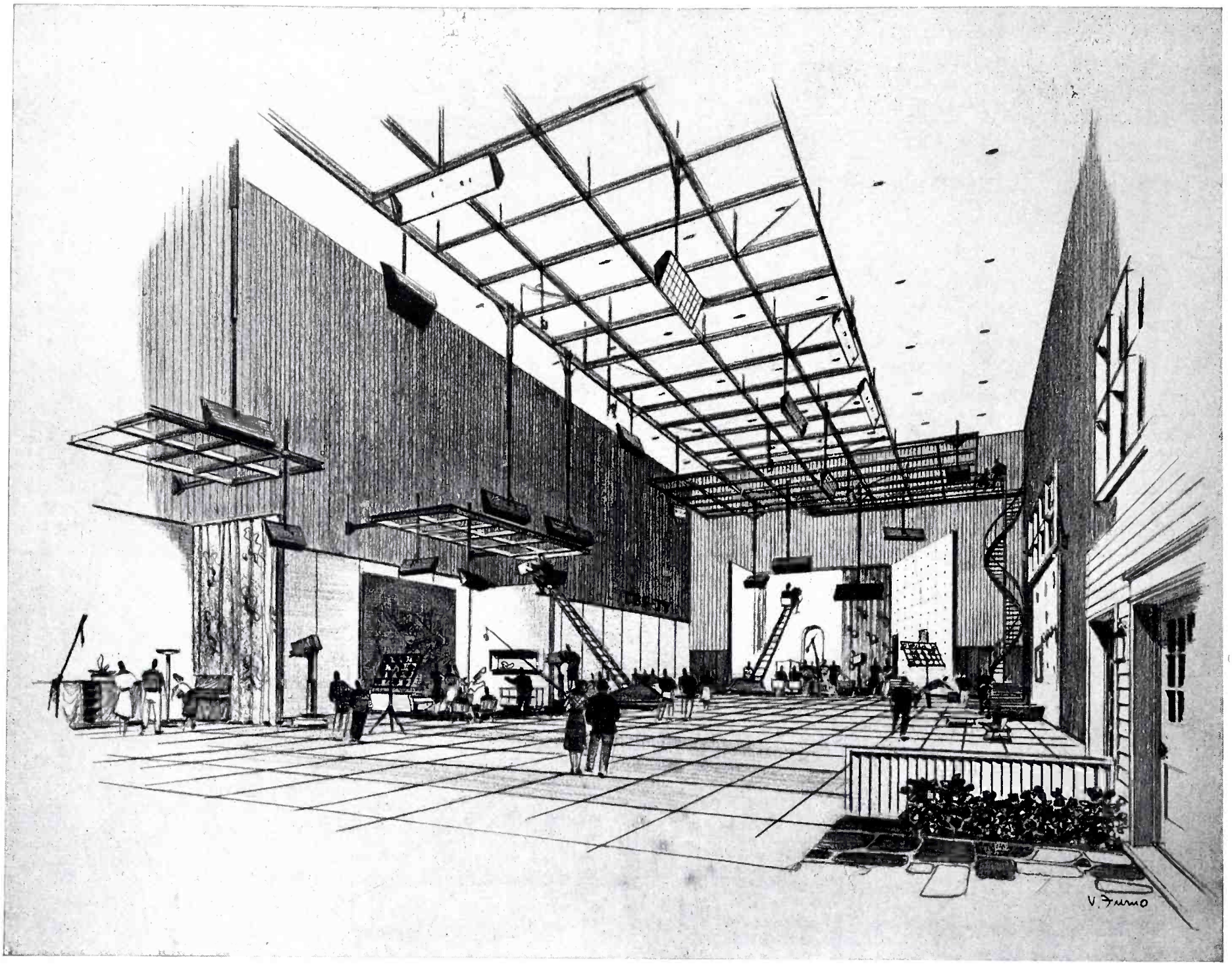


FIG. 1. The artist's idea of the appearance of one of the large studios, as viewed from the control room end of the studio.

Plans for CBS' GRAND CENTRAL

by A. B. CHAMBERLAIN
Chief Engineer
Columbia Broadcasting System

CBS now has under construction new and modern television studios at WCBS-TV, one of the pioneer television stations of the country, and the New York key station of The Columbia Television Network. Over 700,000 cubic feet in The Grand Central Terminal building are available for this large scale television operation. Adequate space, and thorough planning for operational flexibility and future expansion, are the twin keynotes of the project. Closely associated with two large live talent studios and their control rooms are a film scanning studio, master control, three announce studios; electrical, carpenter and equipment shops, scenery painting space; rooms for dressing and makeup, film editing and splicing, viewing, staff lounges, key operating personnel offices, art and sound effects, studio lighting control, primary power switching and control, storage, reception, and other related facilities.

The equipment layout is designed to furnish a high degree of flexibility and will include ample facilities for handling previews, rehearsals, programming from studios, film and slides, as well as remote and network programs, via coaxial cable or radio relay. The master control switching and distribution system for both audio and video is capable of handling any combination of twelve input circuits to six outgoing points. The switching system is a pre-set open-ended type which allows for convenient expansion or modification.

In general, the facilities consist of the following:

1. One large live-talent studio (Studio A) containing three cameras, seven

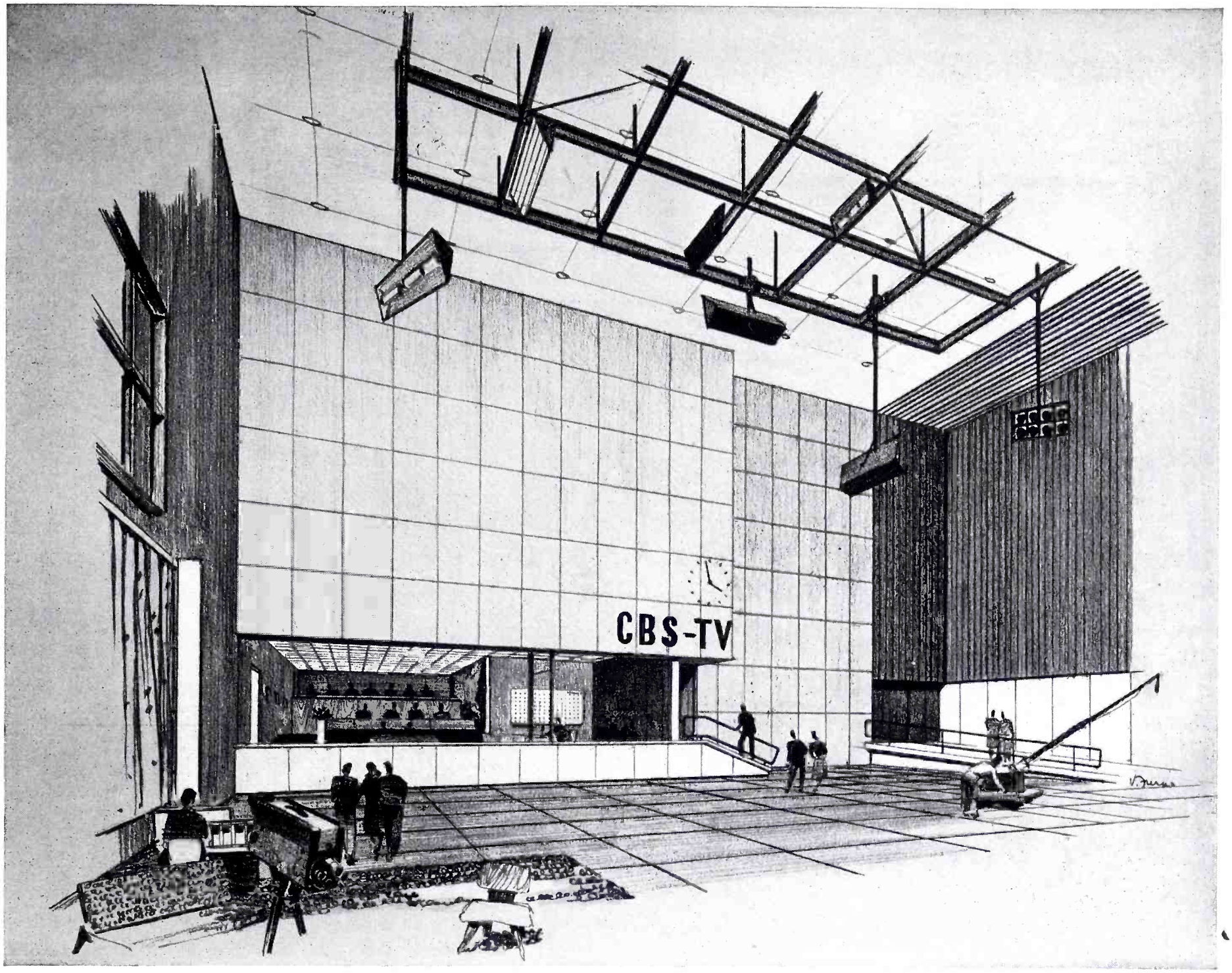


FIG. 2. An artist's sketch of the control room end of one of the two large studios included in the new CBS television setup.

TELEVISION STUDIOS ☆ ☆ ☆

or more microphones, portable video monitors and loudspeakers, talk-back loudspeakers, special communication equipment, camera dollies, microphone booms, and other necessary components.

2. A second large live-talent studio (Studio B) with two cameras and other facilities similar to those enumerated for Studio A.
3. A film projection room (Studio C) with four camera chains and eleven film and slide projectors.
4. A combined master control and film control room where synchronized switching of audio and video program material is effected as well as control of the four film camera chains. Provision is made for one or more flying spot scanners.
5. Three announce studios (Studios D, E, and F) equipped with microphones, audio and video monitoring equipment.
6. Two sound effect rooms, a viewing room, and two studio lighting control rooms, equipped with communication facilities, microphones, and audio and visual monitors.

Studios A and B and their associated control rooms are engineered for a total of four camera chains; Studio C, film scanning is arranged to accommodate three more projectors and a fifth camera chain.

The audio and video pickup, control, switching and monitoring facilities are arranged in a more flexible manner than similar facilities in the past. They are also designed for maximum ease of operation and maintenance. It will be possible, for instance, to mix with the microphone and camera outputs of any studio, action originating from the film studio, from the other live-talent studio, or from local, remote, or network points. Such multi-channel control

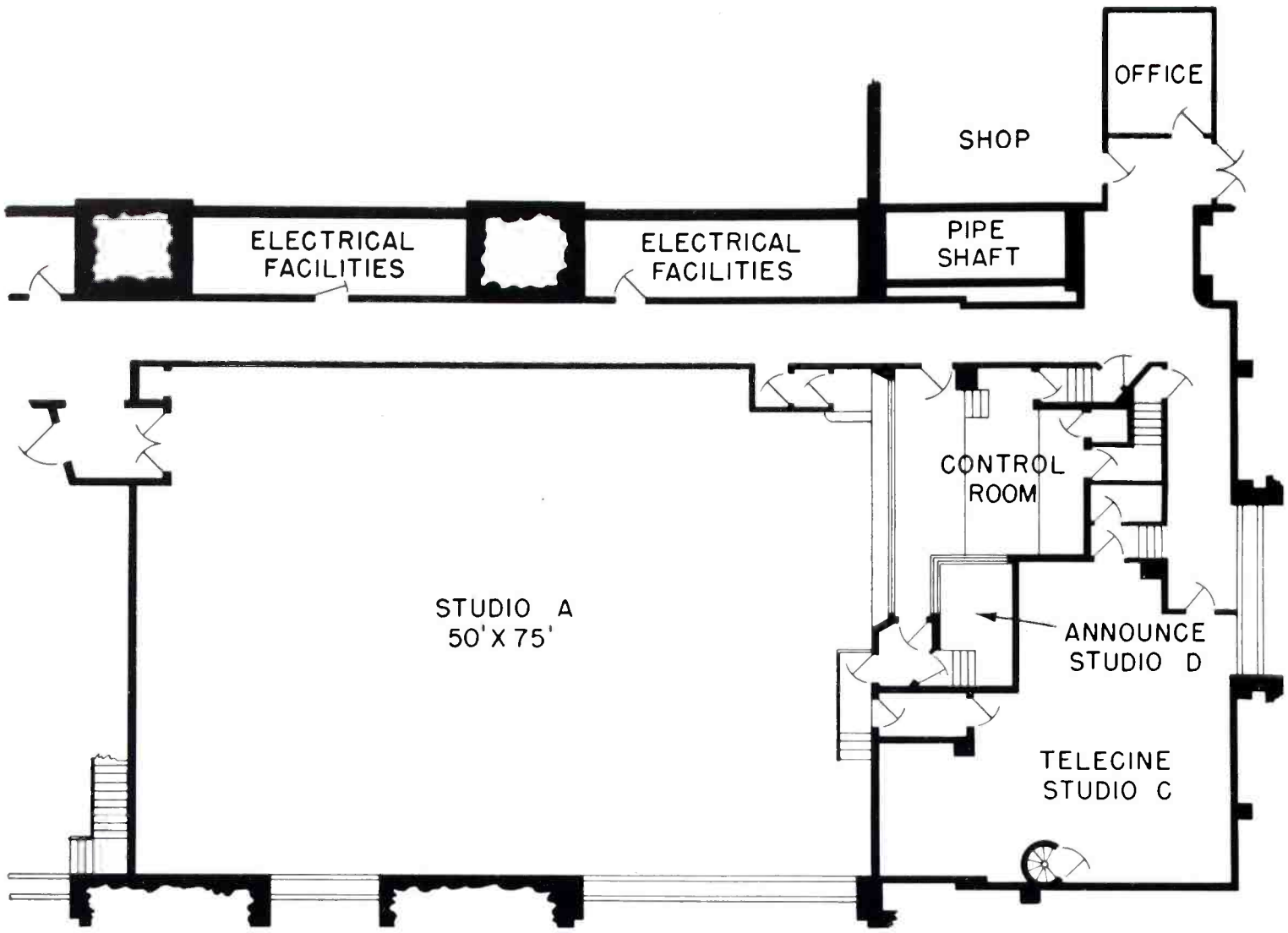


FIG. 3. Floor plan of Studio A showing relative position of Control Room A, Announce Studio D, and Telecine Studio C. Equipment in the control room is arranged on three levels in same relative manner as that of Control Room B (see Fig. 5). Arrangement of the equipment in the Telecine Studio C is shown in Fig. 9.

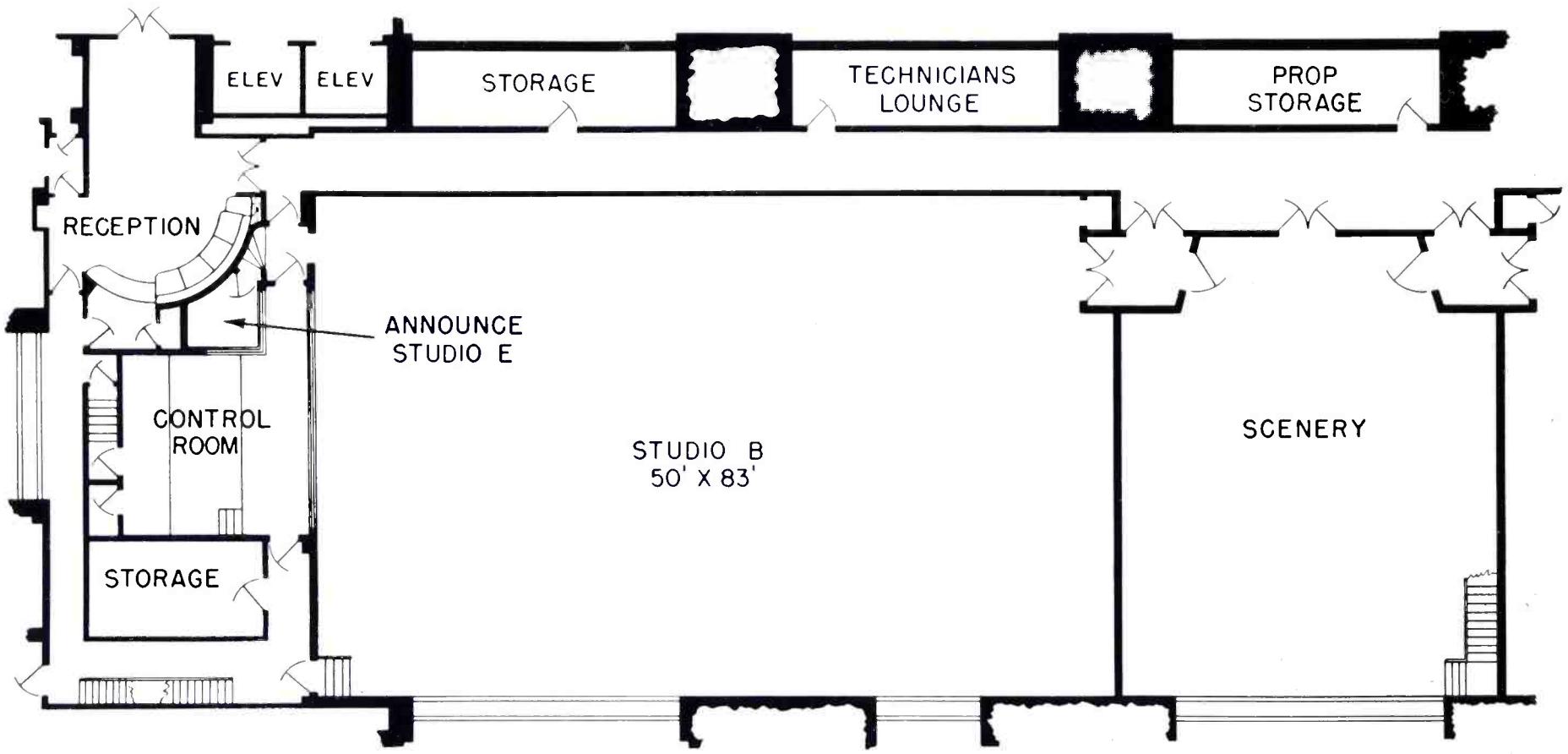


FIG. 4. Floor plan of Studio B showing position of Control Room B and Announce Studio E. Note the conveniently located areas for prop storage, scenery, etc. Arrangement of equipment in the control room and the announce studio is shown in detail in Fig. 5 (opposite page).

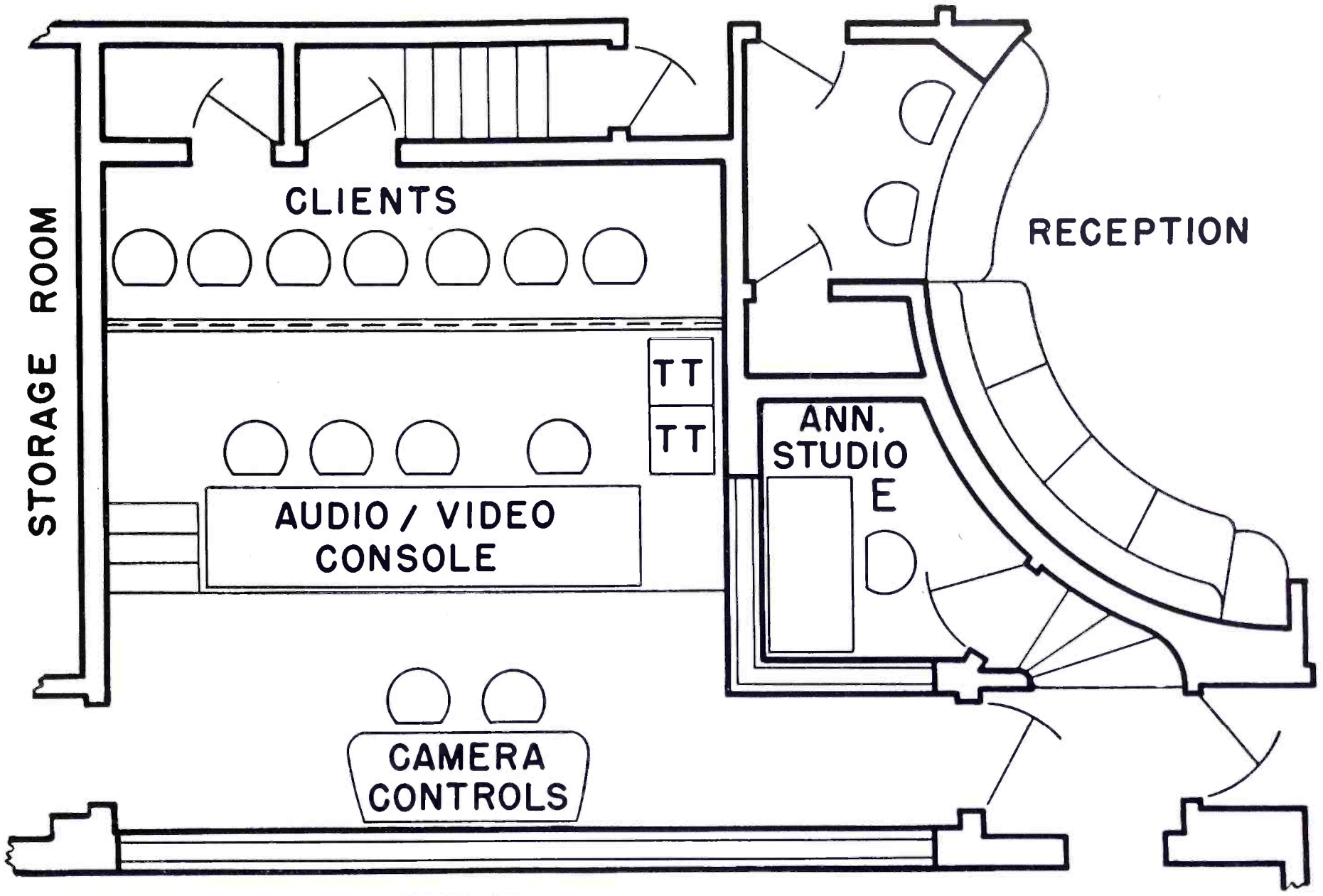


FIG. 5. Arrangement of the control room associated with Studio B (that for Studio A is similar). Video operators sit at camera controls directly in front of studio window. Just behind, and slightly above, is a console at which sit the program director, the assistant program director, a video "switcher" and the audio technician. In a third row is a space for clients or other special guests.

can be exercised in either of the two studio control rooms or in master control, where the Studio C control consoles are located, as circumstances warrant.

The systems design of the audio and video facilities together with other related facilities such as primary power supply, studio lighting, air-conditioning, sound effects, clocks, and also the physical layout of the entire space, is based upon operating specifications representing the combined viewpoints of the CBS General Engineering, Construction, Technical Operations, and TV Program Departments. This initial planning work has resulted in an approved physical layout, a basic equipment systems design, procurement of technical and other facilities, and a work schedule covering the entire project.

When planning a new station, the need for developing operating specifications which take into account projected program production planning is very important. Without such consideration the system engineering is likely to be inadequate, and may require many expensive modifications later. On the other hand, lacking such carefully established requirements, the system may become much larger than necessary, resulting in an unnecessarily large capital expenditure.

The Studios

Figs. 2 and 3 show the arrangement of Studio A which is 50′ x 75′ with a 26′ ceiling. A potential ceiling height of 45′ is available. The arrangement of this studio with its associated control room, announce Studio D, and telecine Studio C, are indicated. Although details are omitted excellent traffic and visual contact are maintained between the studio, its control room and announce Studio D. Other important facilities not shown here are the studio lighting control room located on a balcony over one side of the studio, and an arrangement in the center of the studio, probably overhead, for the passage of camera, microphone or other cables in order that they may at all times be kept at minimum length within camera working areas. This studio will accommodate several program production sets arranged around the perimeter of the studio space so as not to block entrances and exits or the visual contact between the several control points and the studio action.

Studio B and its associated facilities shown in Figs. 1 and 4 are similarly arranged. This studio is 50′ x 83′ with a 45′ ceiling. The control room and announce Studio E are similar to the facilities for Studio A. A large scenery painting area separates the two studios and acts as a sound isolation lock between them. Two sound effect rooms, one associated with each studio, and also an art room, are located on a mezzanine floor directly above the scenery painting area.

Studio acoustical properties are obtained by the use of rock wool blankets hung on the wall and ceiling areas and interspersed at random without the usual broadcast studio decorative treatment. Acoustically,

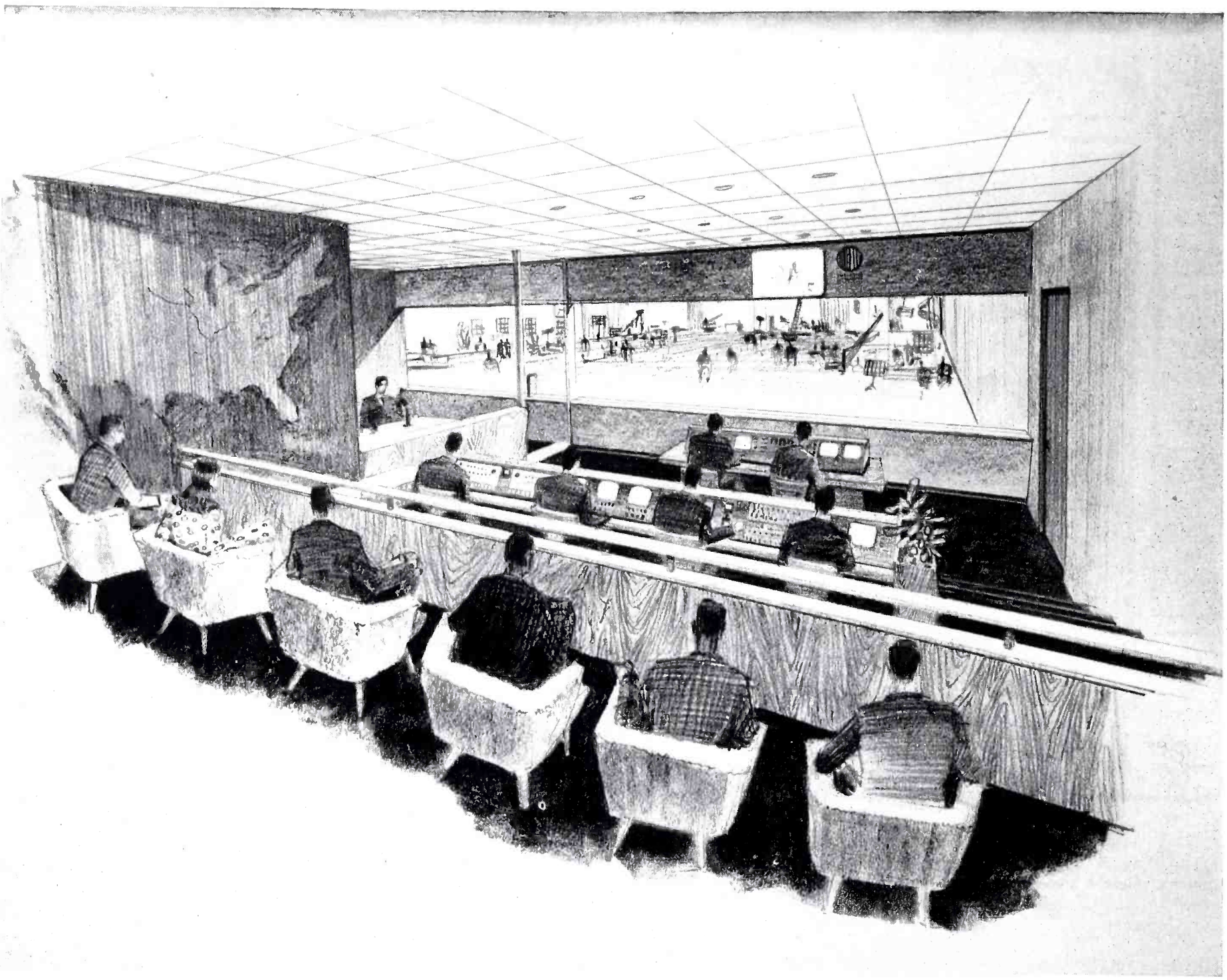


FIG. 6. Artist's sketch of one of the large-studio control rooms. Note the unobstructed view into the main studio and the announce studio (left center). An unusual feature of these control rooms is the provision of seating space for clients on an elevated platform at the rear.

each studio is slightly on the dead side of the optimum characteristic for the size of enclosure considered. Control rooms are purposely a little on the live side to represent normal acoustical conditions encountered in an average living room. The studios are made a little dead acoustically in order to reduce ambient noise and also to create less critical sound pickup; in most cases, microphones are located at a much greater distance from performers than in ordinary aural broadcasting. Additional studio reverberation can be obtained by synthetic means. Two methods are available; reverberation chamber facilities, or dialogue and audio perspective equalizers. These latter features are incorporated as a standard part of the CBS model 3C TV audio control console designed especially for this and similar applications.

Fig. 5 is a detail of the left side of Fig. 4, illustrating the arrangement of audio and video control, switching and monitoring consoles, and also the location of operating personnel in a typical studio control room. There will be three such control rooms in this plant initially, two for the live talent studios and one for handling film and slides. Normal personnel complement comprises of one or two technicians, each handling one or two control units at the camera control console. This console is located just inside the observation window which separates the studio from the control room. Several feet behind this console, and elevated slightly, are located the audio technician at the extreme left (facing studio) and adjacent to the turntables (TT), and next to him the switcher who selects camera or other video outputs and preview inputs. He also fades and lap-dissolves video signals and performs other switching and control functions as may be requested by the director who sits at his immediate right. The assistant director is seated to the right of the director. Space has been provided in the control room for clients who are located at a third and higher elevation. Here they can see the video monitors as well as hear the entire control room action. This arrangement is more clearly illustrated in Fig. 7 which shows the sight lines from each elevation to video monitors, to studio action, and to a large video monitor located above the camera control console.

The simplified video block diagram in Fig. 8 shows the arrangement of facilities associated with Studio A. Similar facilities are provided for Studios B and C, although

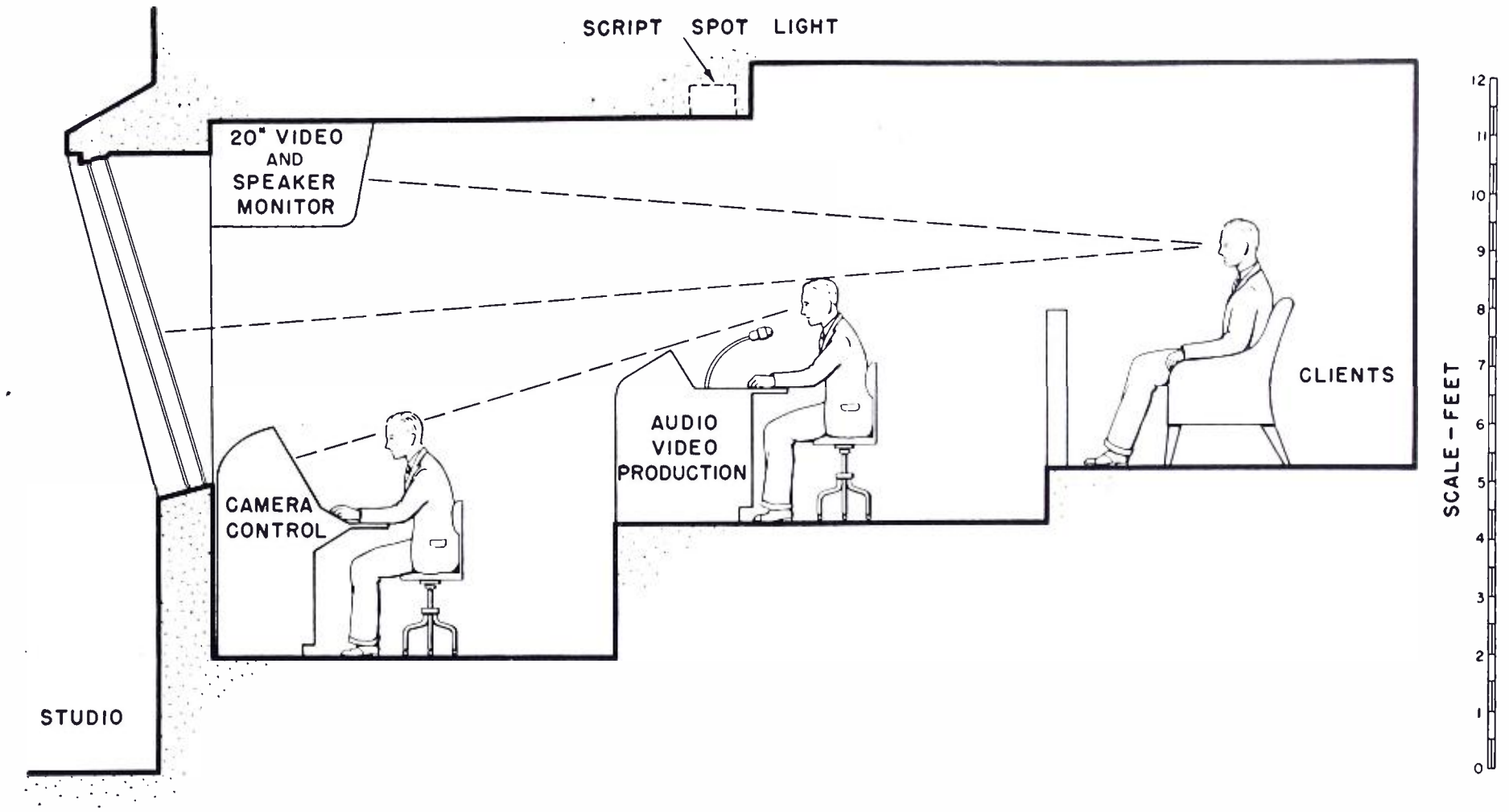


FIG. 7. Cross-section plan of the control rooms associated with Studios A and B. Video operators sit at a level slightly above the studio floor. Production director, switcher, and audio engineer on a second level, and clients at a third level. Broken lines indicate site lines.

the latter are somewhat more complex. In Studio A, three cameras, mounted on dollies or pedestals, will be provided initially, with means to accommodate a fourth camera. Each camera control unit, located in studio control, has a 10" monitor and waveform indicator. A 10" line monitor is also located in the camera control console. The switching, fading, lap-dissolving and other video controls are located on the production console. The switching system is designed to accommodate four camera circuits, four film camera outputs, three remotes, and a cue circuit, all of which appear on video jacks in master control. They are also associated with other jacks looking into the relay switching system. There are two preview monitors and one line monitor on the production console. The mixer, stabilizing and isolation amplifiers shown are located in master control.

Studios A and B will each be equipped with a minimum of seven microphones, mostly directional types. The microphones will be used on booms, or suspended from overhead. A minimum of two booms for each studio will be provided. Each of the three studio control rooms will be equipped with CBS model 3C audio control consoles. In order to accommodate the requirements peculiar to television sound pickup and production (as compared to aural broadcasting), it becomes necessary to include provisions for dialogue and perspective equalization, two disc type turntables, a modified talk-back circuit, a special studio cue circuit, the outputs of film projector sound heads, several remotes, announce studio microphones, reverberation selector and controls, and other facilities necessary in a modern audio control console of this type.

The usual mistake of taking audio facilities for granted when considering a new TV studio plant, has not been made here. The audio problem includes not only those elements common to network headquarters AM and FM requirements, but also entails a considerable number of additional engineering considerations covering the special features required by the combination of sound and pictures. To this end the model 3C television audio console has been designed to accommodate not only all of the TV studio operating requirements, but to afford the greatest flexibility yet demanded.

A suitable intercommunication system will be provided to permit the necessary liaison between program director and studio floor manager, between the director and the telecine (film projector) studio, between video switcher and camera men, between the camera control operators and the lighting operator, and between the audio technician and the studio microphone men. Both audio and radio systems of communication will be employed for this purpose.

The Film Studio

The arrangement of film and slide projection facilities with their associated cameras is shown in Fig. 9. Projection multiplexers are used in order to obtain maximum operational flexibility. Initially, two 35mm and three 16mm projectors will be installed, associated with three film camera chains. Two Baloptican projectors will be used with a fourth camera chain and the installation will be arranged so that an additional 35mm, 16mm, and slide projector unit may be used with a fifth camera chain. Accessory facilities, including a flying spot scanner, equipment racks, film splicing table and cabinet, and supply cabinet are provided as indicated. Projection controls and video monitors for each of the cameras are mounted on cabinet racks at locations consistent with best viewing. Switches for starting or stopping each of the film projectors are also remotely located on the program consoles in all three studio control rooms.

Master Control

Fig. 10 shows the master control room facilities which are located directly over

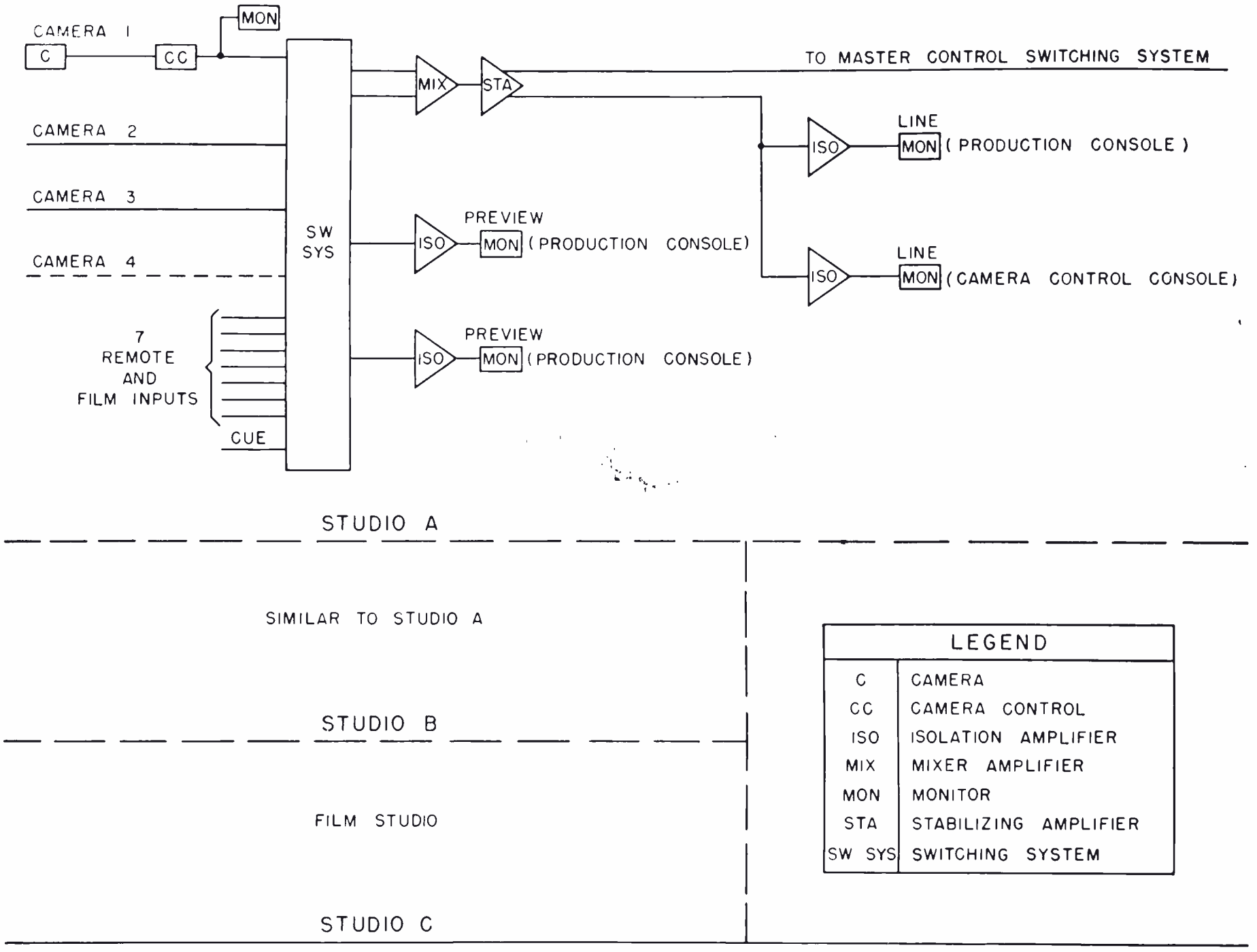


FIG. 8. Simplified block diagram of the video facilities for Studio A. Video units for Studios B and C are similar.

the Studio A control room and Studio C (telecine) areas. The arrangement of the film camera control switching and monitoring facilities are similar in plan and elevation to the facilities utilized in each of the other studio control rooms. The film control facilities are grouped at one end of master control so that if operating experience so dictates, a partition can be installed separating them from other master control audio and video operations. Initially, a curtain will probably be installed between these areas in order to segregate the general lighting and other operating features which are somewhat different from those in master control proper. The master control distribution switching console is located directly in front of twenty-one cabinet racks of audio and video equipment. The rack equipment is arranged so that those units requiring attention from the operating personnel are located on the racks closest to the control console. Fourteen cabinet racks of power equipment are located in a separate room with the panel fronts of six racks facing master control. Two types of standard power supply units for all video equipment in the plant are mounted on these racks and also a few power control and indicating panels. This equipment is segregated so that the 25 kw of heat dissipated can be removed from this space by exhaust fans. This arrangement facilitates air-conditioning the operating area within the master control room where only 10 kw power is dissipated.

The audio, video, and power equipment components on the thirty-five racks consist of two sync generators with switching panel, video monitors, video distribution, stabilizing, isolation and fader amplifiers, audio amplifiers, audio and video jack and relay panels, radio relay control units, test equipment, power supplies and their control units, and other equipment. Spare major equipment components are provided. All equipment components are carefully segregated and arranged to allow for future expansion of various parts of the system. For instance, coaxial jack panels, relays, amplifiers, and other equipment associated with the Studio A channel are not only isolated, but rack space is provided for additional units of each type used in channel A. This same design philosophy is carried out in all parts of this installation in order to make sure that it will not be outgrown, from a program production standpoint, for the next several years.

Announce Studio F is provided for sound commentary associated with film, slide, or other program material. The technical supervisor's office is located near the entrance to master control; and storage space is provided at the far end of the room for technical spare parts, test equipment and other necessary supplies.

The master control room is the real center of the system. All video switching

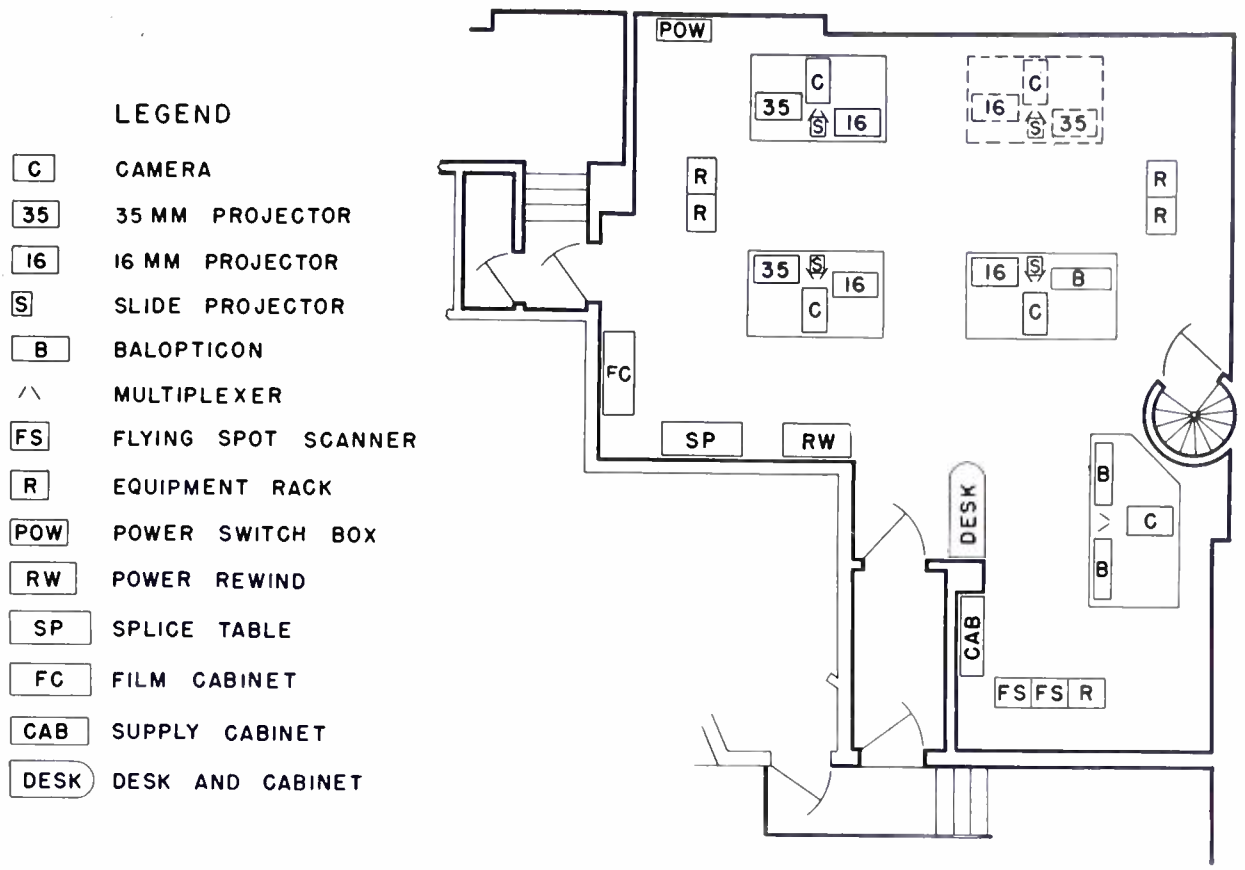


FIG. 9. Arrangement of film and slide projectors, film cameras and other equipment units in the Telecine Studio C. Four film camera chains will be installed initially. A fifth, indicated by broken lines, may be added later. This elaborate installation is provided with its own individual control setup which is located adjacent to the master control room (see Fig. 10).

is done here. The individual camera lines from each studio camera control output appear on coaxial jacks in this room. However, these lines are normally jacked into the camera switching relays of the corresponding studio. The relays are controlled from push buttons on the program consoles in the corresponding studio control rooms. Four banks of interlocked relays are used, two banks for the program switching, fading, and lap-dissolving, and two banks for switching the preview monitors in the program console to any desired input signal. Camera control unit outputs can be patched from one studio to any other control room. In this way, the video switcher at the program console in Studio A control room can switch in cameras from Studio B and from film cameras, as well as from his own local cameras. The signals can be faded, lap-dissolved, or switched instantaneously, between any two of these sources, at the one studio control console.

Remote or network signals can also be patched into any of the studio or film camera switching systems, thus making it possible to switch in remotes as part of a studio or film program if desired. It is possible to switch between local and remote signals, but no provision is made for lap-dissolves under these conditions. It is expected that this shortcoming will eventually be eliminated.

The outputs of each group of studio switching relays are mixed in a fader amplifier which is remotely controlled from the corresponding studio program console. The fader amplifier feeds a stabilizing amplifier which clamps on the blanking level and removes switching transients or surges. In addition, synchronizing is mixed in this amplifier with the local camera signals. In cases where remote composite signals are switched in through this system, the local sync mixer is automatically biased off.

The output of each studio switching system is a complete composite signal available for switching to the transmitter or elsewhere. Each of these signals passes normally through jackboard contacts to the master control switching relays. The arrangement of these and associated facilities is shown in Fig. 11, a simplified master control video block diagram.

Three stabilizing amplifiers are used for handling coaxial and telephone line remote video signals. They are required to compensate for the different sync-to-picture ratios in the various incoming signals. In addition, they are useful for removing hum and bounce that may be mixed with the incoming signals. Each of these amplifiers has two outputs available on jacks for patching either into the master control film switching system or to either of the two other studio switching systems. The controls for each stabilizing amplifier are located on the master control console, providing convenient control over the sync and picture levels while monitoring the picture.

The master control switching system is arranged so that the desired studio or other incoming signal can be selected to feed the transmitter or other points. This system consists of six banks of twelve interlocked relays each, thus providing for six outgoing circuits to be switched independently to any of twelve incoming signals. Two of these outgoing circuits are used to feed two preview monitors in the master control console. Future video monitors, if required, are indicated by broken lines of Fig. 11. The four remaining lines can be switched independently to any of the incoming circuits. One of these lines will be a network feed. By the use of additional distribution amplifiers, other lines can be fed in parallel with these circuits to take care of monitoring requirements in offices, viewing rooms, studios, and elsewhere. Contacts are available on these video switching relays for the control of simultaneous audio switching.

The master distribution switching desk also contains audio controls, waveform oscilloscopes, volume indicators, a PBX telephone switchboard, and other controls.

Two synchronizing generators are provided in the master control with a switch to select the desired generator for use. This generator feeds distribution amplifiers to supply the blanking, driving, and synchronizing signals to the various parts of the system. All synchronizing, blanking, and driving signal outputs appear on coaxial jacks. Spare outputs are also provided so that substitution can be made easily in case of failure of a distribution amplifier section.

This overall system is extremely flexible as it provides numerous combinations of camera facilities for programming and rehearsal. Cameras and remotes can be patched into any studio switching system

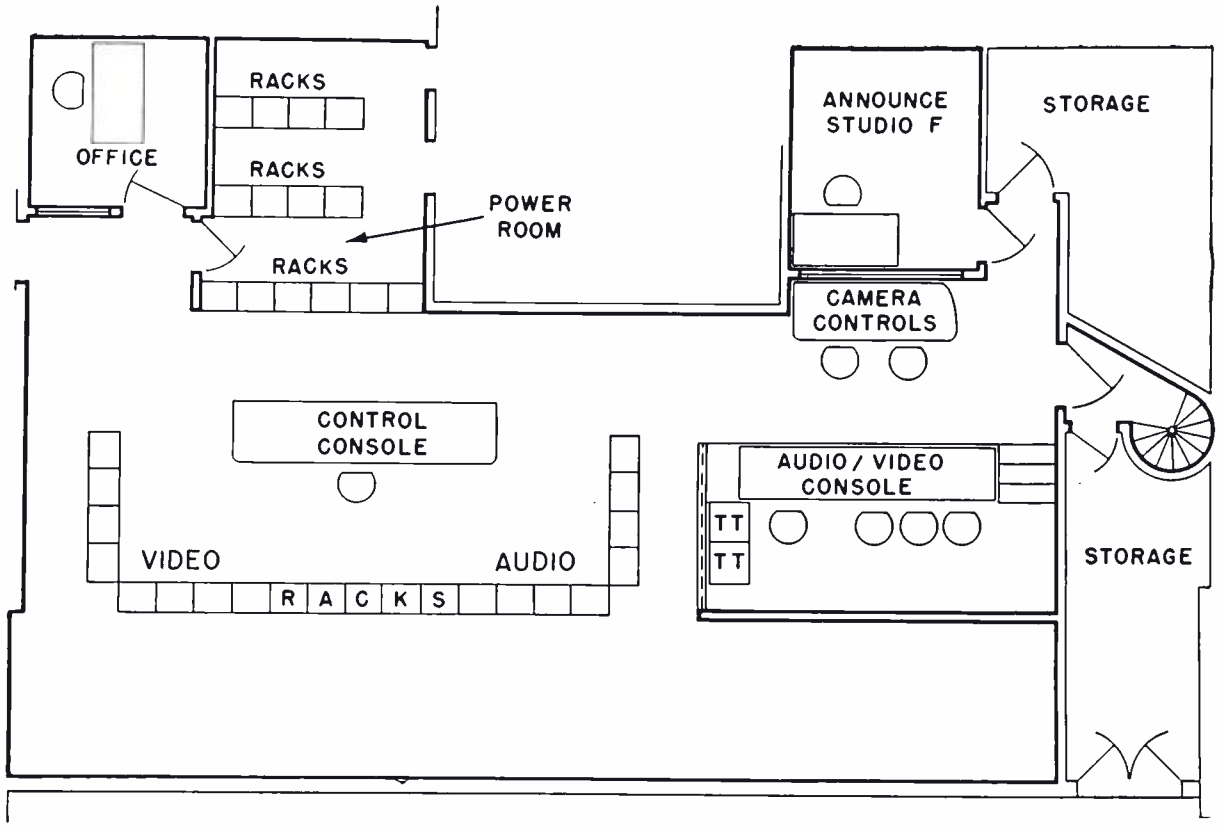


FIG. 10. Arrangement of equipment units in the master control room. The adjacent film control setup and Announce Studio F. This area is located on the second floor directly above the control room of Studio A and the Telecine Studio. This arrangement keeps the length of video cables to a minimum. Note circular stairway providing quick access to floor below.

so that the program director, at his console in a studio control room, has complete control over the switching of any studio cameras, film cameras, or remotes that he may require to make up a given program. A complete film program can be run entirely in master control if desired. Remote and network programs can also be run entirely by master control when so required. In this way the facilities of an individual studio can be used for rehearsals while another studio is put on the air. One film chain may be used for a program while another combination of facilities may be used to suit the particular requirements that may arise.

The generous use of coaxial jacks permits quick by-passing or substitution in case of failure of any part of the system. In order to obtain the high degree of operational flexibility described more than 250 coaxial type jacks and 200 video relays will be employed.

The master control room will be provided with an audio output switching system capable of handling, on a pre-set basis, the distribution of twelve sources of program to four outgoing circuits. It is complimentary to the video switching but can be divorced therefrom if necessary. In addition, ample means will be provided for the equalization of incoming remote loops, for amplification and routing of remote programs, for feeding proper cue to the various studios, and for performing the other miscellaneous functions of a master control room.

Audio and Video Test Equipment

Test and measurement equipment for properly determining and maintaining the electrical operating characteristics of all equipment in this new plant, to accord with established standards, is important.* Television test equipment, presently available is comparable to that available to AM broadcasting 15 to 20 years ago. Many of the laboratory type instruments do not lend themselves well to routine maintenance tests by personnel unable to devote full time to the use of such devices.

Test equipment, however, is being provided to enable routine measurements of the audio facilities in determining response-frequency, harmonic distortion, signal-to-noise ratio and signal level. In addition, more complex and expensive test equipment will be provided to enable measurement of video equipment and system performance. This equipment will permit measurement of such characteristics as resolving power, response-frequency, phase-frequency, transient response, transfer characteristic, signal level, signal-to-noise ratio, and sweep linearity. Means for accurately determining the timing of composite sync and blanking, and signal conformance with RMA standards, will also be available. It should be noted that only one signal source is necessary for audio performance measurements and that eight different signal sources are necessary to determine properly the performance characteristics of video equipment and systems.

Sound Effects

Two sound isolated, acoustically treated and air-conditioned rooms, approximately 15′ x 20′, each overlooking a studio, will be used for producing sound effects. Audio and video monitoring, communication, and special audio consoles including microphones and mixers, will be permanently installed here. Special power and utility circuits, variable speed turntables, and a record library will also be available. Water supply with necessary plumbing fixtures, and compressed air with necessary controls, will be furnished with which to produce special effects. Many types of physical props will be permanently installed in each room, including doors, windows, dresser drawers, gongs, bells, and buzzers. The sounds produced here will be cued in and mixed with audio from studios or elsewhere as may be required. If desirable, the sound effects may be produced in the studio proper or may be reproduced there from loudspeakers. The production of effects in the sound room will be used as much as possible in order to decrease the amount of equipment and cables on the studio floor. It is planned to give the studio floor manager and crew, especially camera and microphone men, as much freedom of operation as possible.

Other Facilities

The provision of suitable primary power supply, studio lighting, air-conditioning and other services has received careful consideration.

The primary power supply facilities include sufficient capacity, approximately 450 kw of both a-c and d-c power. The audio and video equipment requires about 60 kw of single phase a-c which is available on these premises from two sources. Direct current power is used for studio and other lighting.

Experiments in studio lighting have gone forward for many months. Although the exact lighting requirements in terms of the new studio image orthicon camera tube, type 5655, have not been fully explored, considerable information has been obtained with several different stage sets in Studio A. This studio is now being operated with live-talent pickups using portable type cameras, and both portable and fixed syn-

* Reference: "Avenues of Improvement in Present-Day Television" by Donald Fink, Editor of Electronics. Delivered before the RMA-IRE Fall Meeting and before the IRE, New York Section.

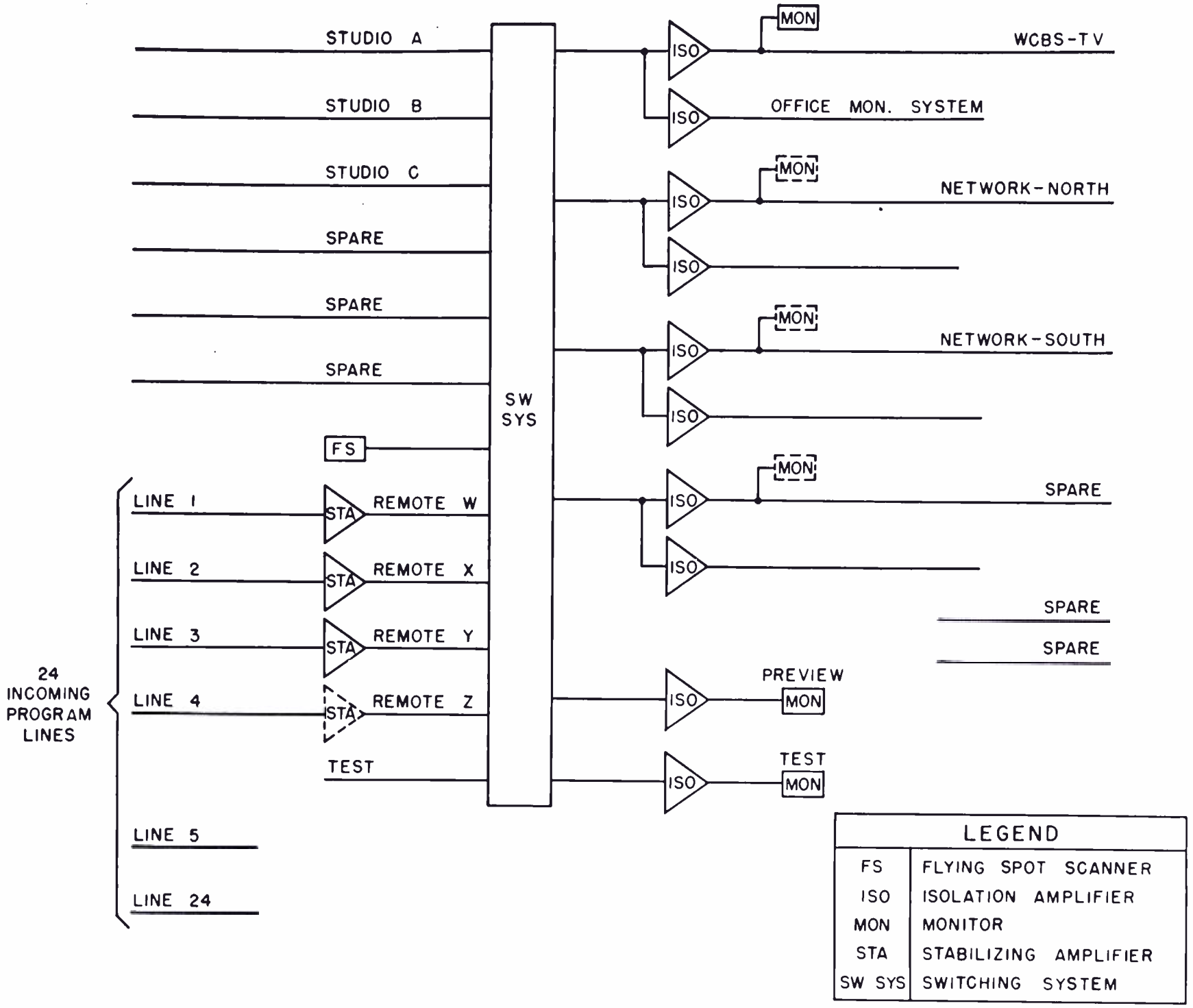


FIG. 11. Simplified block diagram of the video master switching arrangement. Provision of additional units is indicated by broken lines.

chronizing, switching, control and monitoring equipment. Best results to date have been obtained using fluorescent base lighting. About 50 to 100 foot-candles of incident light is used for the base lighting. This illumination is supplemented with incandescent flood and spotlights which are located for best modeling and highlighting of the subject or subjects being televised. This highlighting increases the incident light on the set from 200 to 300 foot-candles. On one particular experimental set, about 18 kw of lighting is used, most of the power being consumed by the incandescent flood and spots. Various types of fixtures and reflectors are used, the objective being to arrive at a standard fixture design which, with adapters, will accommodate various types and sizes of lamps. All fixtures can be elevated, tipped, or rotated by manual adjustment. Because proper set lighting plays a very important part in the quality of picture which the televiewer sees, all types of studio lighting are being investigated. A good program production will be successful or unsuccessful depending to a large extent upon the amount, kind, and arrangement of lighting used. It is planned to arrive at a system that has equal flexibility to the audio and video facilities so that the producers of television programs will have available all of the tools necessary to do a first-class job. The lighting for all studio sets will be electrically controlled from a single point. Originally, it was planned to control the physical location of the various light fixtures from a single point. Although the plan has not been abandoned it appears to be neither practical nor economically feasible. All of the lighting facilities will be arranged so that they can be serviced conveniently. Experience indicates that the amount of lighting required will be considerably less than formerly used with older type iconoscope cameras. This condition is fortunate when considering the comfort of performers and the air-conditioning problem. Studio control rooms and all other operating areas will be lighted with dimmers and spotlights wherever video monitors are located.

A television studio project of this magnitude requires a considerable amount of engineering effort. Several thousand engineering man-hours are necessary to plan and execute it efficiently. CBS intends to make this network television headquarters installation as flexible, modern, and efficient as is feasible at the present state of the art. The audio and video engineering work is being performed by the CBS Engineering Department under the direct supervision of Mr. Howard A. Chinn, Chief Audio-Video Engineer.

NAB BROADCAST ENGINEERING CONFERENCE

SECOND ANNUAL CONFERENCE A BIG SUCCESS - PLANS NOW UNDER WAY TO MAKE THIRD CONFERENCE AT CHICAGO IN APRIL EVEN BETTER

"Doc" Howard, energetic director of NAB's Engineering Department, has put us in something of a hole. Before we could get our story on the Second Annual Broadcast Engineering Conference into print, he was out making announcements about next year's Conference. According to "Doc," the Third Annual Conference is gong to be not only bigger, but better than either of the previous two. And based on the outstanding progress he's made since taking over the NAB job just a little over a year ago, we're willing to bet that it'll be just as he says.

The third conference will be held in connection with the NAB Convention at the Stevens Hotel in Chicago in April. According to present plans the Engineering Conference will have three days devoted to its technical papers, panels, and demonstrations, and will begin on April 5, 1949.

Past conferences have been held for only two days. The extra day was added to the 1949 conference by action of the NAB Board of Directors, at its Convention meeting at Los Angeles last May, after receiving recommendations from the Engineering Executive Committee.

The April 5th date, a Tuesday, is in the week preceding the Management Conference part of the NAB Conference. Thus, NAB member engineers will have three days, Tuesday, Wednesday, and Thursday for papers and conferences, and a full day, Friday, for field trips. Saturday and Sunday will be "changeover" days with station owners, managers, etc., coming into town for their meetings beginning Monday, the 11th.

Exhibits of manufacturers will be set up in the Exhibition Hall of the Stevens, which is admirably suited for the purpose. The exhibits will open on April 5th and will remain open during the full period of both the Engineering and Management Conferences.

In making detailed plans for the Third Conference, Mr Howard and Neal McNaughton, assistant NAB director of engineering, have the help of the NAB's Engineering Executive Committee, members of which are: J. H. Dewitt, WSM, Nashville; O. C. Hirsch, KFVS, Cape Girardeau; E. M. Johnson, MBS; E. K. Jett, WMAR; K. W. Pyle, KFBI; and T. A. M. Craven, WOL.

About the Second Conference

In making their plans for next year's conference the committee has the experience of this year's conference as a guide. It should also be encouraged by the feeling of optimism which the success of the 1948 program engendered in all those who were connected with the endeavor.

Nearly 400 station engineers, together with a sprinkling of station managers, consultants, and others, attended the Second Conference which was held in connection with the 1948 NAB Convention at the Biltmore Hotel, Los Angeles, May 20-21. They listened to, and discussed, some twenty-five papers on broadcast problems, participated in an FCC-Industry Roundtable, inspected MBS's new Hollywood Studios, witnessed large screen television at Warner Brothers, and visited FM and TV installations on Mt. Wilson.

The technical papers presented at the Second Conference were largely on the practical aspects of broadcast problems (as contrasted to the highly academic discussions which have occupied most of the program at recent I.R.E. meetings). The committee made strenuous and quite successful, efforts to get material which would be of immediate or very near future usefulness to a majority of the attending engineers. The high attendance at all sessions indicated that this was appreciated.

Meetings were presided over, in turn, by members of the Engineering Executive Committee. At the first days sessions nearly all of the papers presented concerned the problems presented by the emergence of television on a national scale. Subjects included comparative coverage of high and low bands, station planning, studio lighting, networking, and installation problems.

On the second day the subject of papers turned to various AM, FM and audio problems, with several papers on magnetic recording, the subject which, next to television, seemed to be most on broadcasters minds.

The trip to Mt. Wilson on Saturday was a stand-out feature. Here the engineers roamed at will amid a growing forest of FM and TV plants and antennas. KFI-TV's plant nearly ready for on-air tests received much attention and comment. New FM installations of KNX and Unity Broadcasting Corp. were also open for inspection. Just in the beginning stations stages were the TV plants of NBC and ABC. Another very interesting installation was that of the PT&T Co. which relays programs from Los Angeles to Mt. Wilson as a common carrier. All in all there were few if any broadcasters who did not feel very satisfied with the worthwhileness of this trip—and, in fact, of the whole conference. Judging from the satisfaction they openly expressed most of them will be sure to attend all future meetings.

They Planned It!

ROYAL V. HOWARD (left), Director of the NAB Department of Engineering, is the man who envisioned a bigger and better Engineering Conference, made most of the plans for it, and pushed these plans through to completion in spite of all obstacles. "Doc," as he is known to almost everyone, is one of the industry's foremost engineers. He has been a member of various industry committees, a delegate to the ITC and NARBA conferences and is a member of numerous professional societies. Before coming with NAB in 1947, Mr. Howard was Vice-President in charge of Engineering for the Associated Broadcasters, Inc.

NEAL McNAUGHTON (right), NAB Assistant Director of the Department of Engineering, acted as Doc Howard's assistant and good right arm in planning and carrying out the program of the Second Conference. Neal is a veteran of twenty years in the radio engineering profession. From 1934 to 1940 he was chief engineer of KRGV. In 1941 he joined the FCC. In 1943 he became Assistant Chief of the Treaty Section, in 1945 he was appointed Chief of the Standard Broadcast Allocations Section. He joined NAB in 1947.

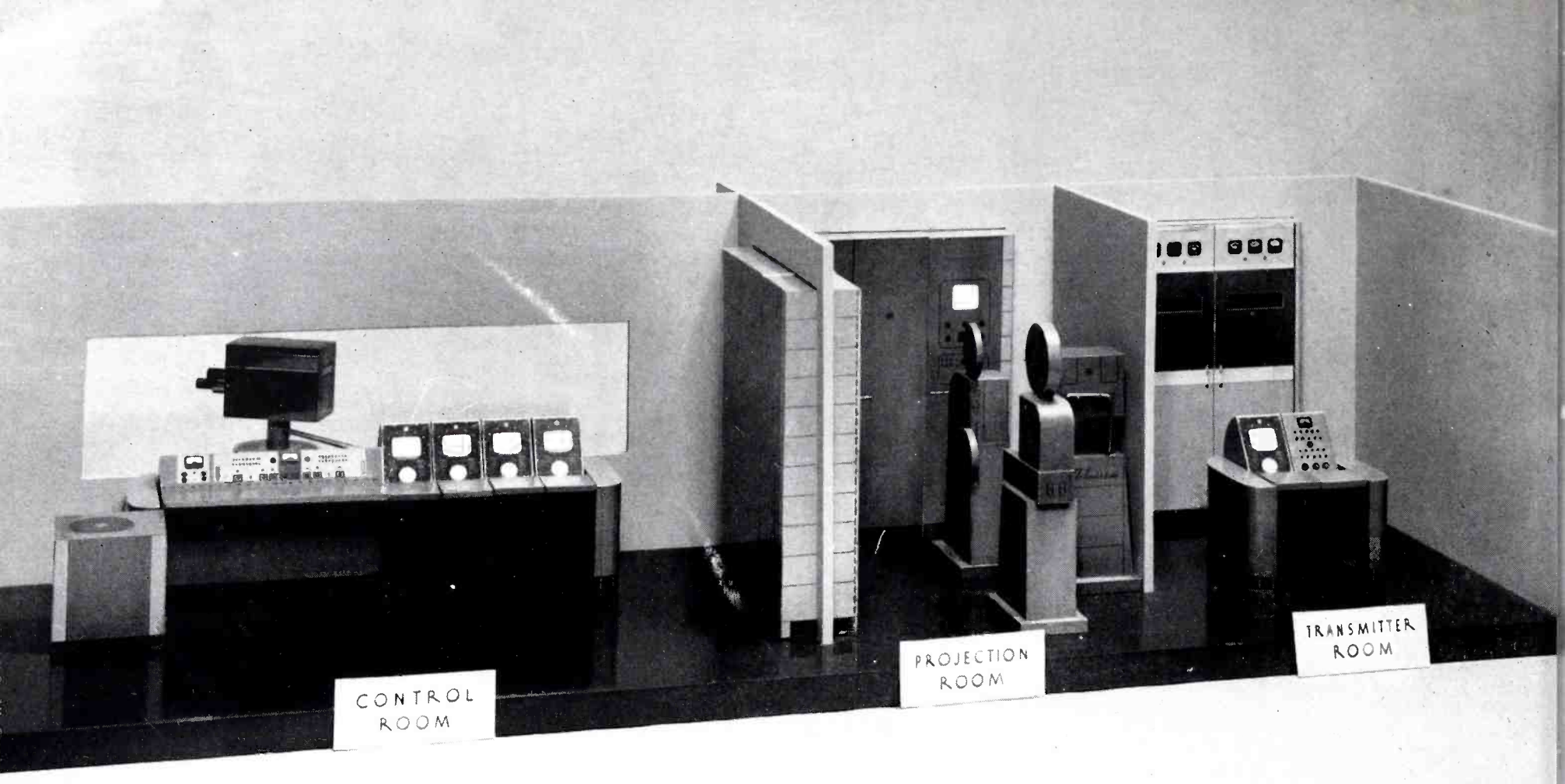


FIG. 1. This is a scale model of the "complete television station" displayed at the NAB Convention. Room at the left is a typical studio control room, room in the center is the film projection room and the room at the right, the transmitter room.

TELEVISION IN THE SPOTLIGHT AT NAB

by JOHN P. TAYLOR
Manager, Advertising and Promotion Section
Engineering Products Department

Television took the spotlight as the nation's top ranking broadcasters gathered in May, at Los Angeles, to discuss their plans for the forthcoming year. In a week of management and engineering conferences, the more than 1000 station managers and upwards of 400 station engineers who gathered for the 26th annual convention of the National Association of Broadcasters discussed important issues such as a new code for the industry, copyrights, labor relations, FCC policies, broadcasting horizons in general, but the underlying topic of conversation was the new booming industry—television. Nearly every speaker on the agenda—whatever his announced subject—eventually made some reference to television. Not a few of them, including both of the principal luncheon speakers, devoted most of their time to it. And, wherever broadcasters got together in their off-hours, the shadow of TV's imminence was inescapable. Among the exhibits, TV equipment was the center of attraction; in the upstairs entertaining suites TV receivers were omni-present at the banquet TV made it possible for an overflow crowd to "sit close" to the performers; at the studios, broadcasters saw programs like "Queen For A Day" being "simulcast" (simultaneous AM and TV); at Warner Brothers' lot they saw 16 x 24 foot television projection; and on a trip to Mt. Wilson they had an opportunity to inspect four TV stations (one on-the-air, one testing and two others in process of construction).

For most of those in the "planning stage" of TV (and that includes the great majority of present broadcasters), the RCA exhibit of television station equipment was an irresistible attraction. It was noticeable that many station men not only studied it over with great interest, but kept coming back again and again to observe it in operation.

Pleasant as this was to observe—it was not exactly a surprise. It was, in fact, planned to be that way. For this exhibit was based on the experience of our television sales force. They have found that prospective telecasters, (particularly those outside the metropolitan centers), are confused as to just what equipment they need to "get on the air". Lists of equipment are of little aid because the items themselves are largely new to AM broadcasters. Photographs of actual installations are of some help but they still lack the feeling of realism that comes from having seen the equipment itself. It is obviously desirable that prospective telecasters see for themselves a complete station setup. The NAB Convention was seized on as the opportunity to present such a setup.

In order to make it as easy as possible for the visiting broadcasters to visualize what their television station would look like, we decided to display a complete station setup, including at least one of every item that would be used by stations of small or medium size. To further heighten the effect, this equipment was arranged much as it would be in a typical station—i.e., with the equipments grouped in a studio, a studio control room, a film projection room, and a transmitter room.

FIG. 2 (right). In the "studio," where guests were served a coke and televised. The camera, first of the new TK-10A Studio Orthicon type to reach the coast, was exhibited by courtesy of KFI-TV to whom this unit, as well as much of the rest of the television equipment shown, was delivered immediately after the convention.

FIG. 3 (right). Control room of the NAB television display. A 12 ft. window looked into the "studio" where a "coke" bar provided a camera shot with continuing action. Directly in front of the window are the audio and video control consoles. Built into the wall at right are equipment racks containing the synchronizing genrator, power supplies, and distribution amplifiers.

FIG. 4 (right, lower). Operator on duty at the video console in the control room had three program sources to select from: the "studio," the film projection room, and a monitor receiver on the local television station.

These rooms were provided with a floor and three walls, the fourth wall being omitted to permit observation of the operators. Fig. 1 is a model of the actual setup.

Although space limitations made it necessary to use rooms of smaller than optimum size, the equipment, nevertheless, was arranged in an approximation of the normal manner. The studio control room was provided with a window looking into a space which was arranged to simulate a studio. This studio was equipped with one of the new TK-10A Studio Image Orthicon Cameras (the first time such a camera had been shown on the west coast).

The problem of getting a constant action scene in the "studio" was solved by setting up a "coke" bar. (Fig. 2.) Visitors were invited into the studio for a coke "with our compliments." This relatively simple scheme provided a satisfactory camera setting with a constantly changing cast of actors. Lights for this "set" were provided by the Otto K. Olsen Co. of Hollywood, designers of lighting fixtures widely used in the film industry. Varying degrees of

FIG. 5. Entrance to the RCA exhibit at the NAB Convention. RCA Pylon antennas flanking entryway had red beacons on top and red lights inside which were driven by a flasher spelling out R C A in code. On the large (30″ x 40″) screen on top of the television display was projected the picture from the television master monitor, thus allowing passersby to see the picture even when there was a crowd around the control consoles.

illumination at different points were indicated by small signs so that engineers desiring to do so could compare the pickup under various conditions.

The equipment in the control room (Fig. 3) consisted of the audio and video control consoles (in front of the window), a transcription turntable and equipment racks (in the wall at right). On the monitors of the video console appeared three pictures, these were: (a) the scene picked up by the studio camera, (b) the picture from the film camera in the projection room and (c) the picture from a receiver tuned to the local television station. Any of the three could be selected for display on the master monitor unit. (Fig. 4.) The picture so selected also appeared on a large (30″ x 40″) screen mounted high above the exhibit. The latter made it possible for passersby to see the picture even when there was a crowd around the monitor (Fig. 5).

The film projection room (Fig. 6) was equipped with a 35mm projector, a 16mm projector and a slide projector, all three being arranged around an ingenious "multiplexer" unit, so that any one of them could be used to project a picture onto the mosaic of the film camera. Also in this room was one of the new RCA rack-mounted film monitoring units.

The transmitter room contained a new RCA 500-watt television transmitter (designed specifically for smaller stations) which was shown for the first time. Also an operator's console designed especially for use with this transmitter.

Although most television stations will have more than one studio camera and probably more than one film camera, the television setup displayed was otherwise a complete equipment (other than outside pickup equipment) for a small or medium-sized station. Thus, prospective telecasters visiting the RCA display at the NAB Convention could see exactly what they are going to need in the way of equipment.

Of course, broadcasters are also still interested in RCA equipment for AM and FM, as well as audio equipment for all three services. Hence, the RCA exhibit also included large displays of various types of gear for these fields as well as TV. One of the new 10 KW FM Transmitters was set up complete, ready for operation (Fig. 7). In addition to the transmitter proper, there were a number of operating displays illustrating features of this transmitter (Fig. 8).

Shown for the first time were two new types of equipment. One, designed to facilitate broadcasts from the field, is a mobile transmitter which can be mounted in a truck or station wagon. Operating on frequencies in the 152-162 megacycle band, this transmitter can be used to send a voice program back to the studio from distances up to 25 miles. The second of these new equipments is designed for permanent installation as a studio-transmitter-link circuit, particularly in FM service where the transmitter may be located on a mountain and high-quality lines are not available.

In addition to all of this transmitting equipment, one wing of the exhibit (Fig. 9) was devoted to audio and test equipment—of which RCA has a very complete line suitable for all of the broadcasting services, AM, FM and TV.

The opportunity to view and inspect all of this equipment at first hand is one that is seldom afforded the smaller broadcaster. This was, in fact, the first time that a display of this size had ever been held on the west coast. It was eagerly accepted by the hundreds of broadcasters who crowded the RCA space during almost every hour of the convention week.

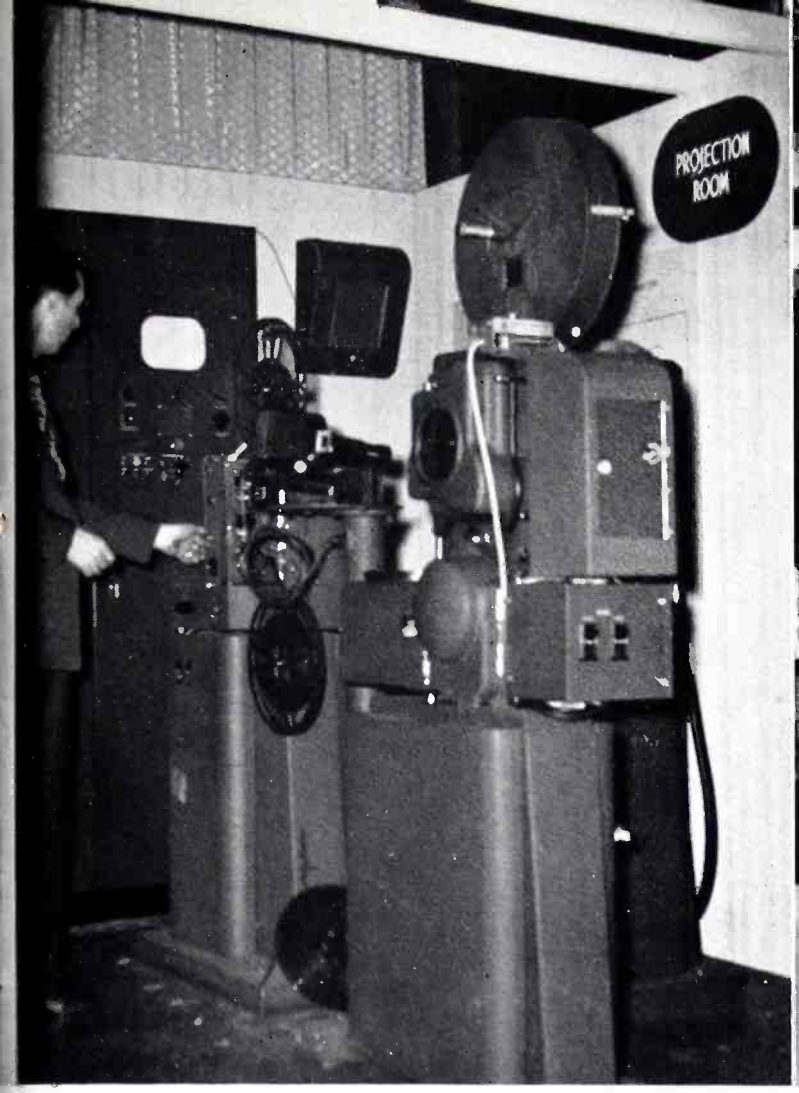


FIG. 6. The film projection room of the NAB display. In the foreground are 16mm and 35mm projectors. A multiplexer unit, between the projectors, allows the picture from either to be projected into the film camera (behind the 35mm projector in this view).

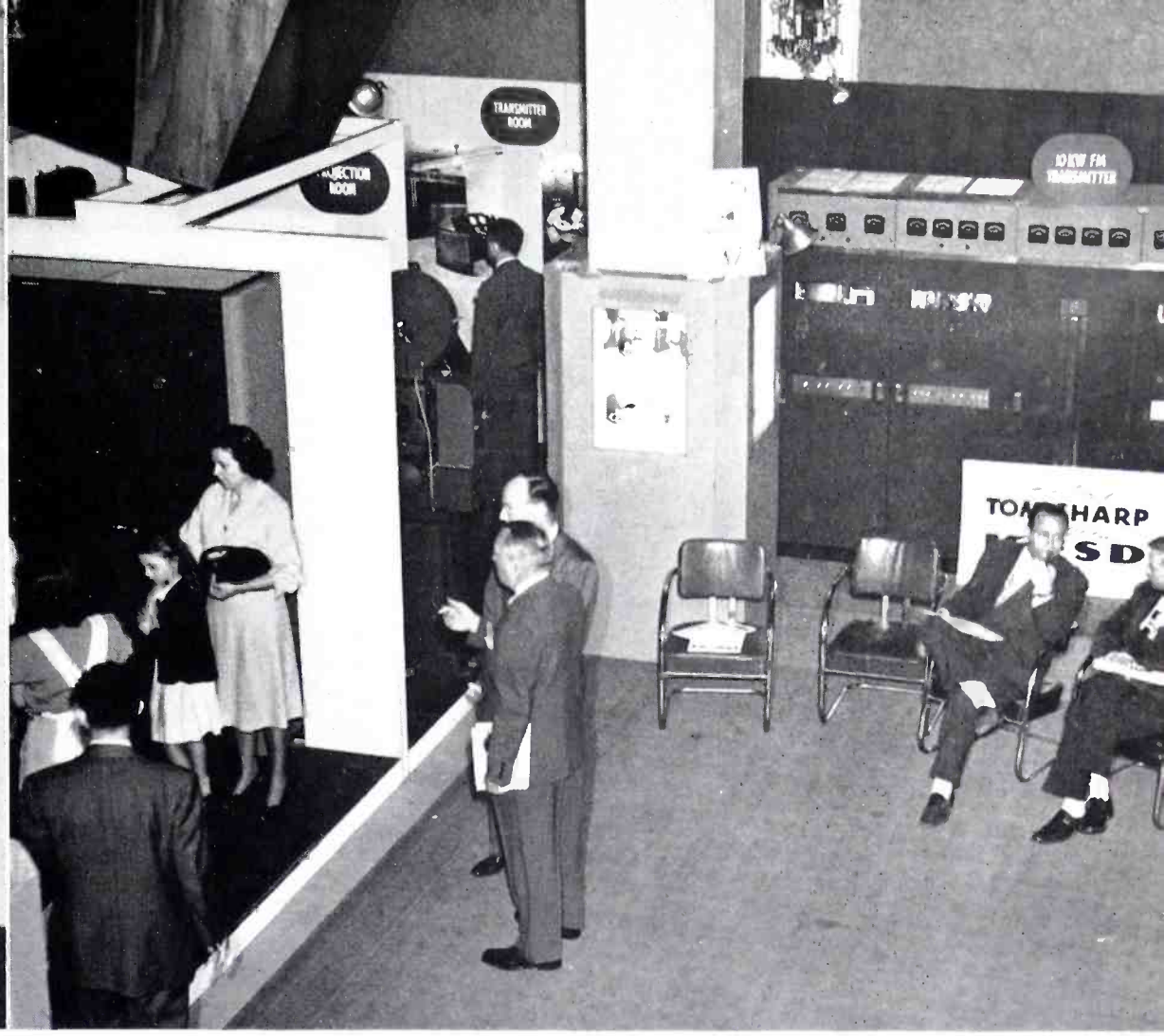


FIG. 7. Another view of the NAB display. Mounting of the 30" x 40" screen can be seen here. One of the new RCA Type TLS-86 "Life-Size" Television Projectors was used to project on this screen the picture selected by the switching unit in the "control room" console. At the right center may be seen one of the new RCA 10 KW FM Transmitters, which was shown by courtesy of KFSD, San Diego, to whom it was delivered after the show.

FIG. 8. Special transmitter displays occupied this wing of the exhibit space. Display in center illustrates operation of grounded-grid tank circuits used in RCA FM transmitters.

FIG. 9. The left wing of the exhibit space was devoted to a display of the many items of audio equipment and measuring equipment which RCA builds and which are used in all three services, AM, FM and TV. Two new field intensity meters, shown for the first time, were a center of interest for station engineers.

HIGHLIGHTS OF THE "SUPER-POWER" 8-SECTION PYLON

by O. O. FIET
Transmitter Engineering Section
Engineering Products Department

Up to 1200 KW of Effective FM Power may be Radiated by Eight-Section Pylon

Introduction

FM Broadcasters requiring very high power ("super-power") in serving wide coverage areas, particularly in rural or thinly populated sections, will find the new RCA eight-section Pylon the ideal FM Broadcast antenna. It is designed to provide the highest gain and handle the highest power of any commercially available FM Broadcast Antenna. It includes many exclusive design features which make it versatile in its applications (both present and future) for high-power FM. In design, it is a companion to the one, two- and four-section RCA Pylons installed by FM and TV Broadcasters the country over (the choice of over 200 FM Broadcasters). Throughout a period of two to three years, the RCA Pylon design has been thoroughly proved during actual operation.

The design of the RCA Pylon was evolved through the combined efforts and experience of RCA Transmitter Design and Research Engineers. The inherent strength and ruggedness of the Pylon permit the stacking of sections in order to provide unusually high gain in a single, self-supporting radiator. These features of design made possible the revolutionary "super-power", high-gain, eight-section Pylon Antenna. Several high-power FM Broadcasters have already installed the new eight-section Pylon and other installations are planned. (Figs. 6 to 14 included in this article illustrate a typical eight-section Pylon installation—through the courtesy of Radio Station WKJG, Fort Wayne, Indiana.)

The Eight-Section Pylon

The eight-section Pylon is a stacked combination consisting of two complete four-section Pylon antennas. The bottom

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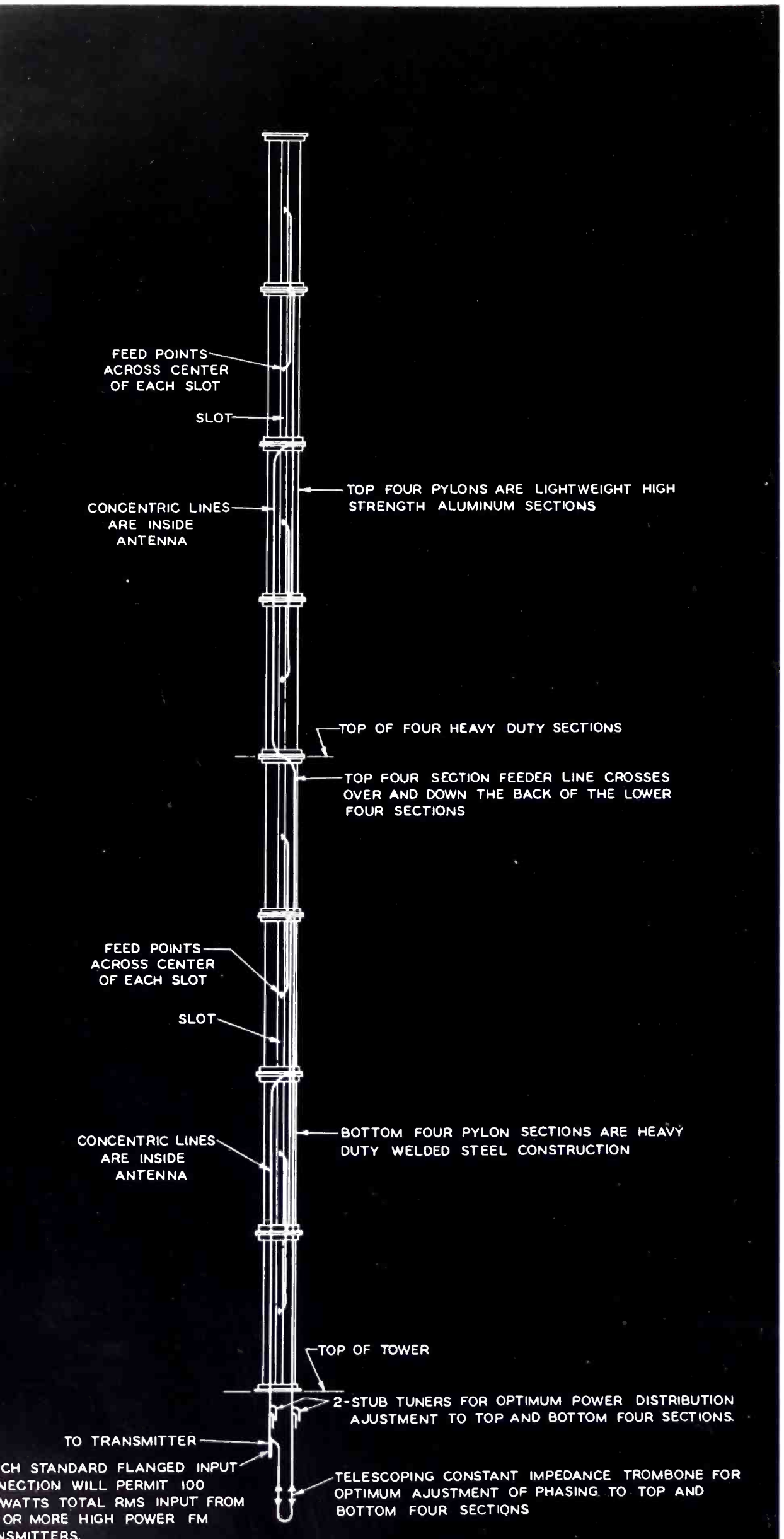
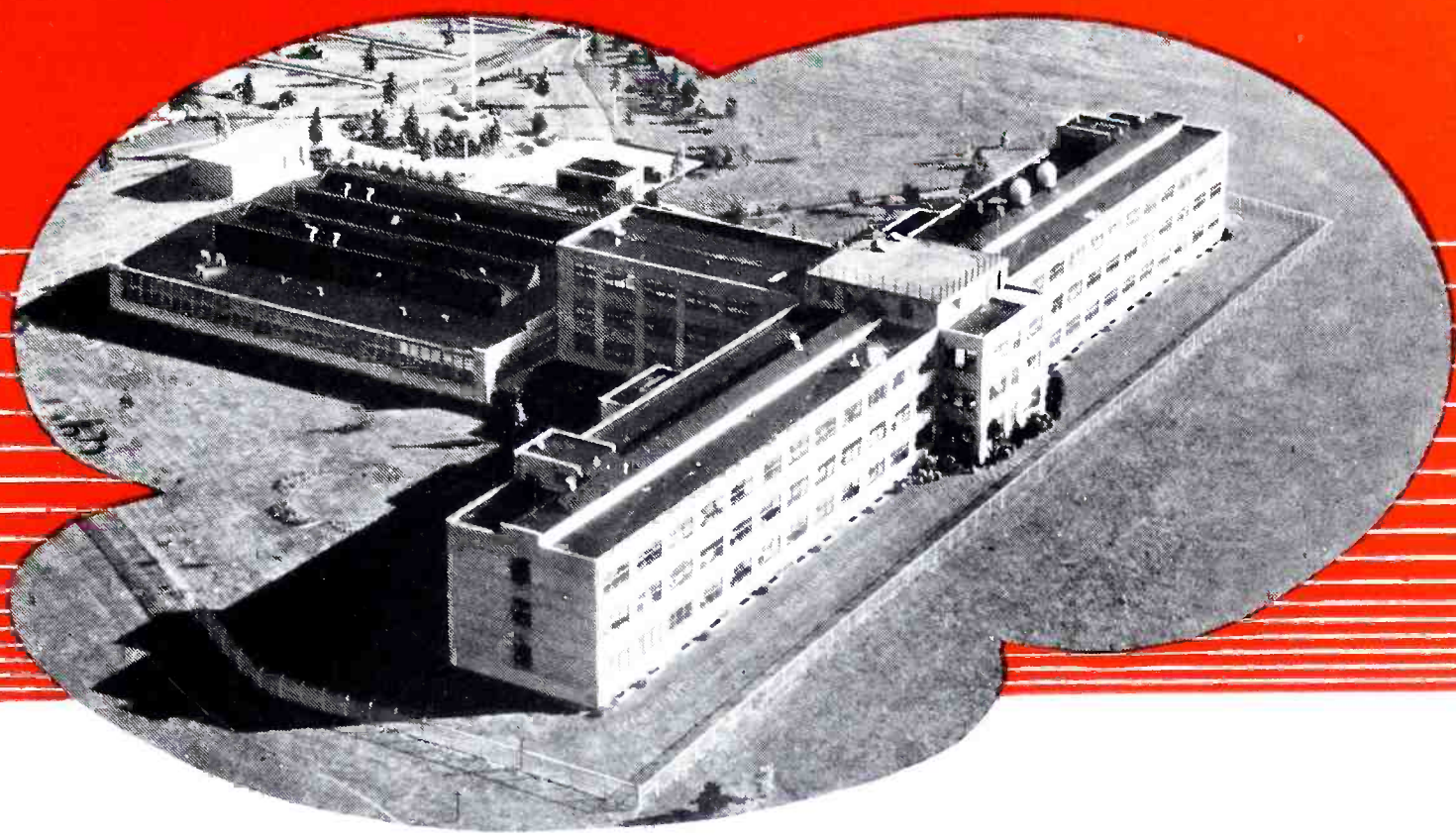


FIG. 1. Line sketch of the eight-section Pylon showing feed line harness connections. An extremely simple transmission line arrangement which requires only one feed point per section.

IN FM... RCA HAS EVERYTHING



RCA Laboratories...

America's Center of Radio and Electronic Research and Pioneering

● Basic and outstanding scientific developments, achieved at RCA Laboratories, have made the United States pre-eminent in radio and electronics . . . new industries and a new service to the public have been created.

Overlooking the rolling countryside at Princeton, N. J., the research laboratories of the Radio Corporation of America are built on land over which trails were blazed by American pioneers and across which Washington and his soldiers fought in the American Revolution. Today, on this historic site, scientists are conquering elements of nature so that the world continually may enjoy new benefits of electronics, AM and FM radio, and television.

Here, through discovery and invention, new products and new services are created for our national security and for the benefit of people everywhere.

The scientists and research men who work here are explorers of new frontiers in the invisible spectrum of space. They blaze new trails, not only in radio broadcasting but also in radiotelegraphy, radar, and many other phases of radio-electronics, for the present and the future.

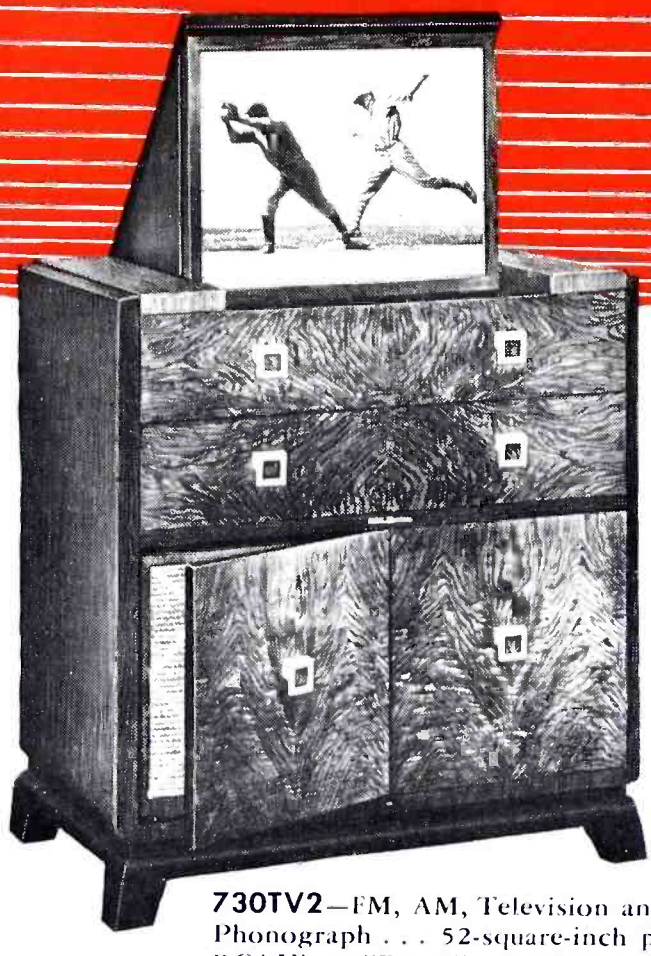
RCA scientists and engineers devote their efforts to the discovery of previously unknown principles and phenomena, to the revelation and expansion of knowledge, to the extension of man's horizons. They create and develop new and improved industrial processes and products, and provide new and expanded communication services.

The scientists of RCA believe that all additions to fundamental knowledge eventually will be worth while from the commercial as well as the scientific point of view. Therefore, RCA conducts basic research, the foundation upon which new industries are built and through which new services are made available to the public.

When in Radio City, *be sure to see the radio and electronic wonders at RCA Exhibition Hall, 36 West 49th Street. Free admission.*

RCA **RADIO CORPORATION of AMERICA**

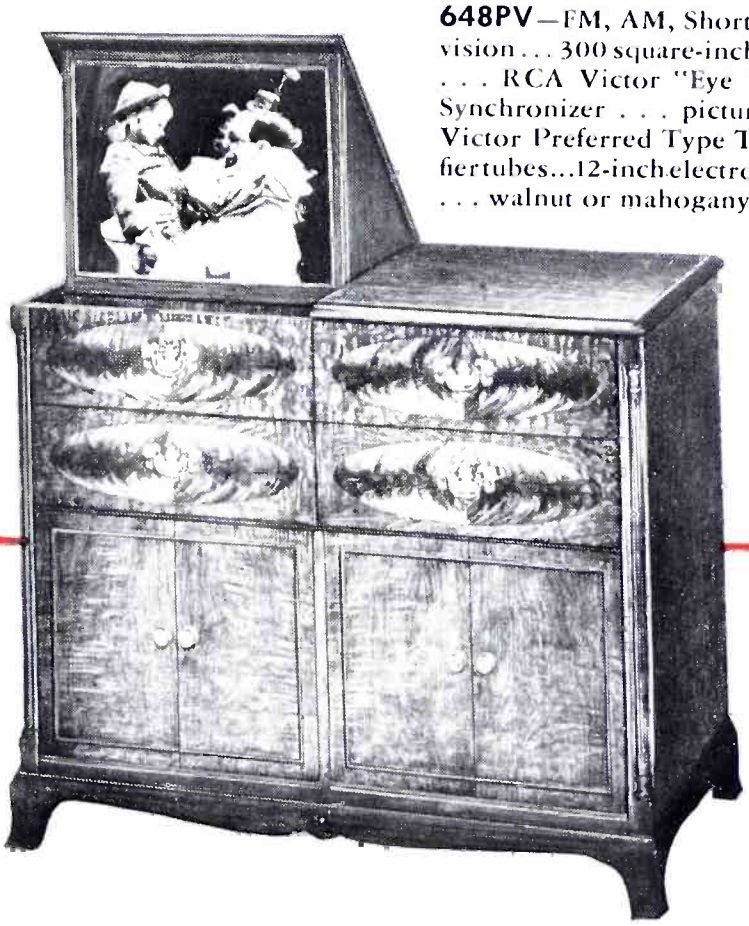
RCA FM INSTRUMENTS



730TV2—FM, AM, Television and Victrola Phonograph . . . 52-square-inch picture . . . RCA Victor "Eye-Witness" Picture Synchronizer . . . picture tube, 26 RCA Victor Preferred Type Tubes plus 3 rectifier tubes . . . walnut, mahogany and blond finishes.

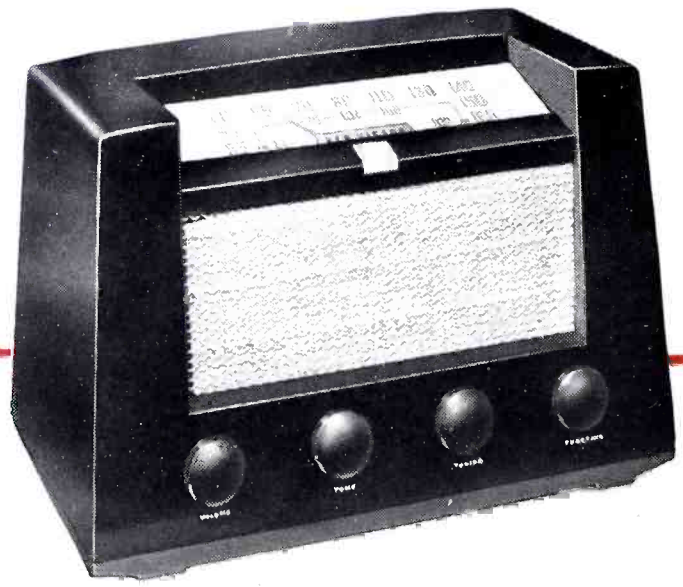
8V151—FM, AM, Short Wave and Victrola Phonograph. 14 RCA Victor Preferred Type Tubes plus 1 rectifier tube . . . 12-inch electro-dynamic speaker . . . "Crestwood" roll-out control unit . . . rich mahogany veneers.

There's an



648PV—FM, AM, Short Wave and Television . . . 300 square-inch television screen . . . RCA Victor "Eye Witness" Picture Synchronizer . . . picture tube, 40 RCA Victor Preferred Type Tubes plus 7 rectifier tubes...12-inch electro-dynamic speaker . . . walnut or mahogany finish.

8R71—FM and AM . . . Six RCA Victor Preferred Type Tubes plus one rectifier tube . . . powerful electro-dynamic speaker . . . maroon plastic case.



8V112—FM, AM, and Victrola Phonograph. 10 RCA Victor Preferred Type Tubes plus 1 rectifier tube . . . 12-inch electro-dynamic speaker . . . mahogany, walnut, or blond finish.

711V3—FM, AM, Short Wave and Victrola Phonograph. 10 RCA Victor Preferred Type Tubes plus 1 rectifier tube . . . 12-inch electro-dynamic speaker . . . roll-out record changer . . . mahogany cabinet.

RCA VICTOR FM instrument for everybody

NOW, everyone can enjoy the thrill of FM in the widest selection of RCA Victor instruments *ever.*

The great RCA Victor line has a full range of FM instruments . . . from the 8R71 table model AM-FM, to the superb 648PV AM-FM radio and TV receiver. All have the thrilling tone of the "Golden Throat" 3-way acoustical system.

Powerful RCA Victor advertising, in top-ranking national magazines, and over 163 NBC stations send people to their dealer for RCA Victor instruments with FM. Look for these hard-hitting advertisements in LIFE, COLLIER'S, SATURDAY EVENING POST and LOOK. Listen to the RCA Victor Show "The Music America Loves Best" over your favorite NBC station every Sunday afternoon.

Every day more people learn about FM and want an RCA Victor FM instrument. RCA Victor dealers have the FM instruments everybody wants . . . instruments that offer FM through the famous "Golden Throat" tone system.

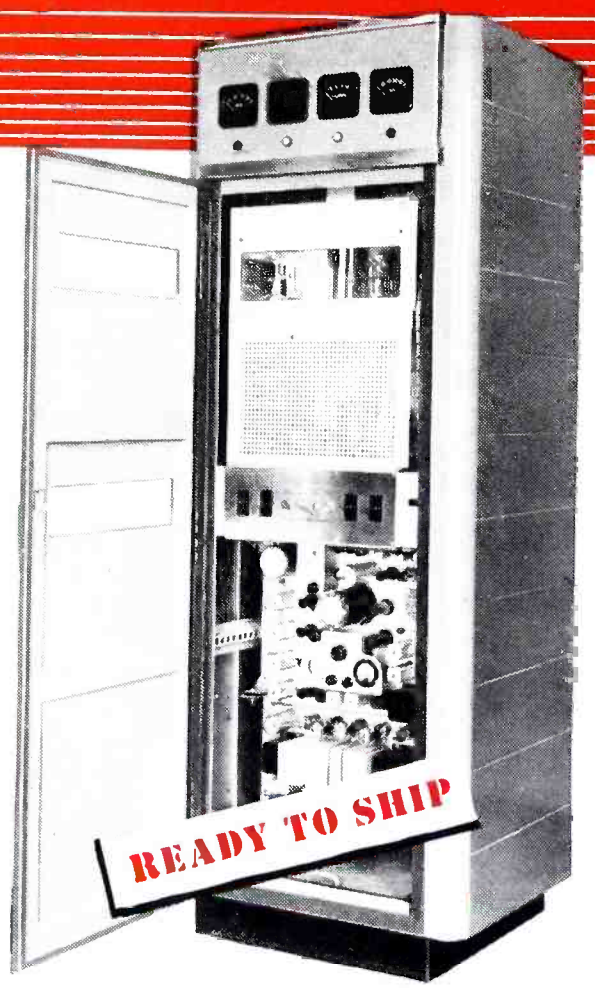
"Victrola"—T.M. Reg. U. S. Pat. Off.

RCA VICTOR

DIVISION OF RADIO CORPORATION OF AMERICA

One Equipment Source for

RCA FM BROADCAST EQUIPMENT



RCA's 250-WATT FM TRANSMITTER

Type BTF-250-A

Completely self-contained, this pace-setting 250-watt FM transmitter offers low-power stations the easy way to get on the air immediately with true FM quality. It includes RCA's "Direct FM" system using only 16 inexpensive tubes (about half the number used in many exciters)—with only 7 tubes in the r-f chain. All r-f circuits are single-ended. Multi-unit construction permits easy addition of higher power units later on. The BTF-250-A is the ideal standby for higher-power FM stations.

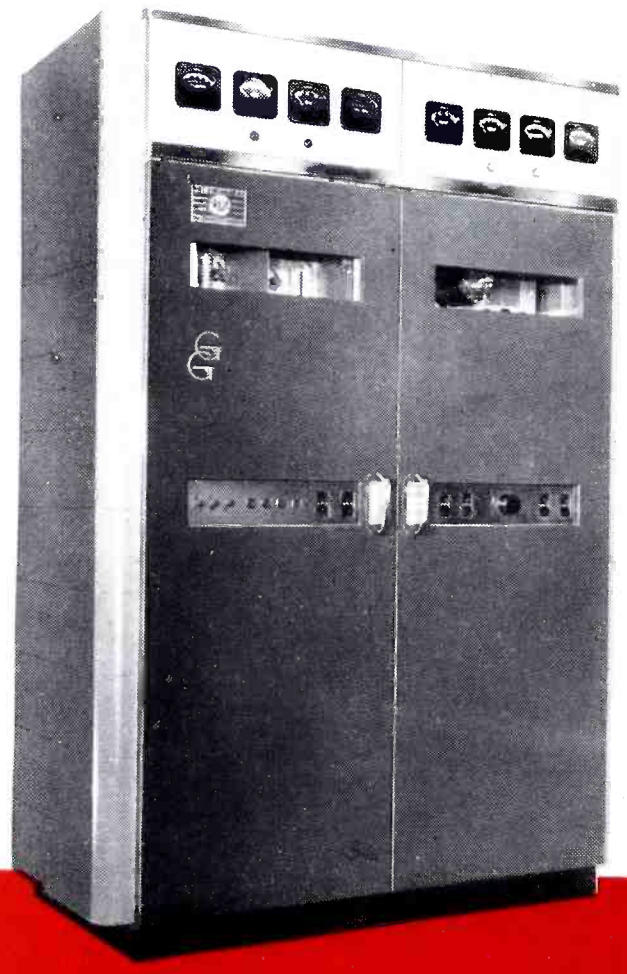
READY TO SHIP

RCA's 3-KW FM TRANSMITTER ▶

Type BTF-3B

The BTF-3B is designed and built strictly for professional transmitter engineers who know transmitters. It uses only 36 tubes (15 regulator and voltage control tubes do not contribute to outages) and employs RCA's simple, straightforward "Direct FM" type exciter. The driver and final are "Grounded-Grid" for easy tuning and maximum stability. Shielded final tank circuit reduces housing radiation and r-f pick-up in nearby a-f circuits. Single-ended output provides greater stability and easier matching. Every component is easy to reach. Unit-type design makes for easy installation and simple modification to higher power. All air-cooled and self-contained. Can be tuned by inexperienced personnel in minutes.

READY TO SHIP



RCA's 1-KW FM TRANSMITTER

Type BTF-1-C

Here is a self-contained 1-kw transmitter with a "Direct FM" exciter inherently capable of lower noise and distortion than any exciter yet developed. No fussy, complicated circuits. No trick tubes. Only 8 tubes in the r-f chain. Grounded-Grid circuits in the final amplifier provide greater stability than conventional amplifiers—require no neutralizing. The shielded tank circuit of the final amplifier provides near-perfect shielding. Output is single-ended for maximum stability. Unit-type design provides easy installation, flexibility, and simple modification for higher power. Type BTF-1-C is all air-cooled.

RCA

Everything in the FM Station ...RCA

IMMEDIATE DELIVERY FROM STOCK

● Continuing its active production of FM equipment, RCA today is manufacturing the most complete line of well-engineered FM station equipment in the industry—*and is stocking it.* Nothing in your station "specs" that RCA cannot supply. Nothing in the transmitter equipment line that RCA cannot ship promptly.

Who are RCA's best references?

The station men of the nation's leading FM stations. These are the men who like the practical engineering that goes into each piece of RCA FM equipment. They like the completeness of the RCA FM line—with one manufacturing source for everything they need in the station. They like the undivided responsibility RCA assumes for its equipment. They like the prompt delivery RCA gives them on every item on the list.

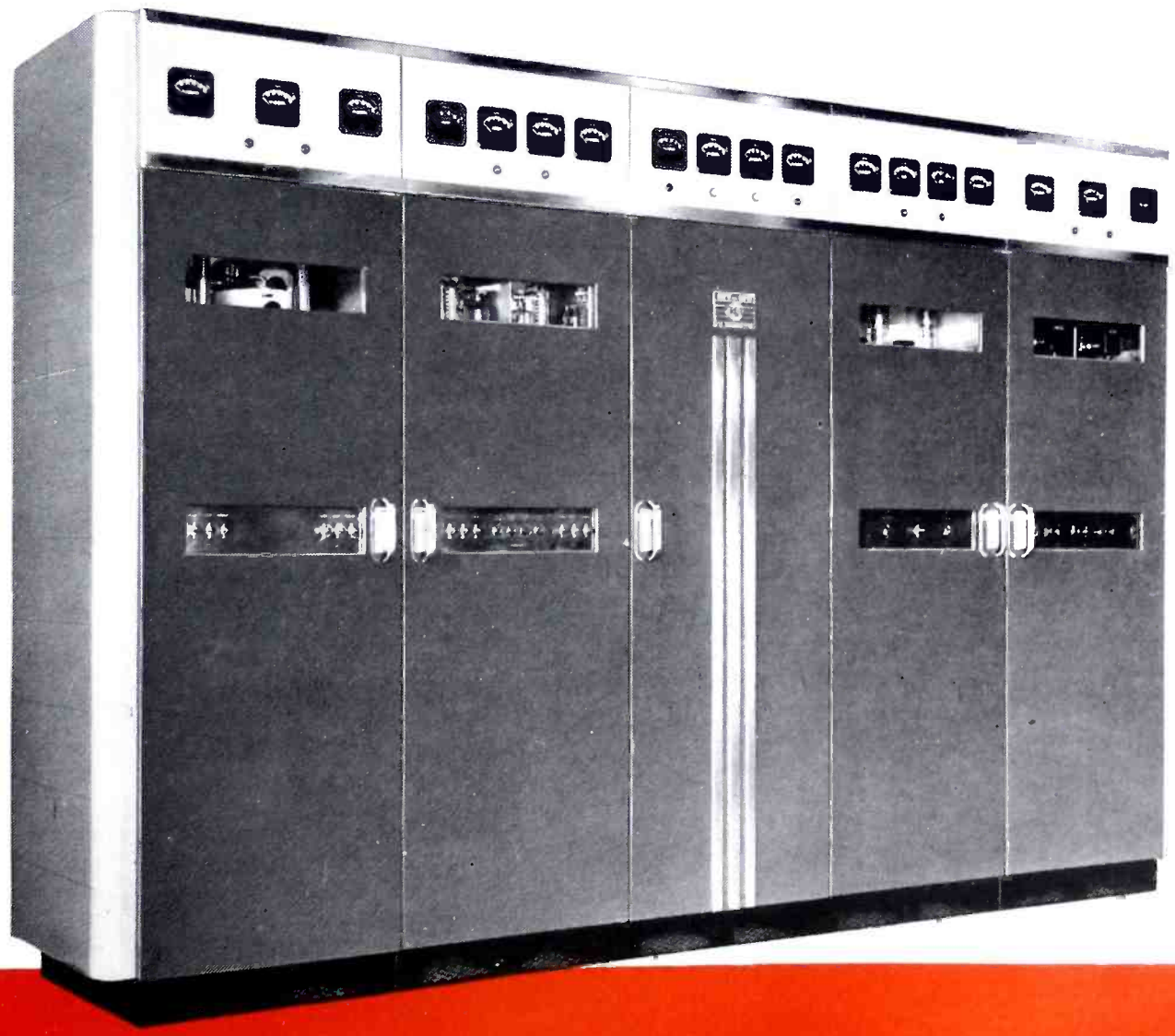
Call your RCA Broadcast Sales Engineer for information and help. He's an FM specialist. Or write Dept. 307, RCA Engineering Products, Camden, N. J.

RCA's 10-KW FM TRANSMITTER

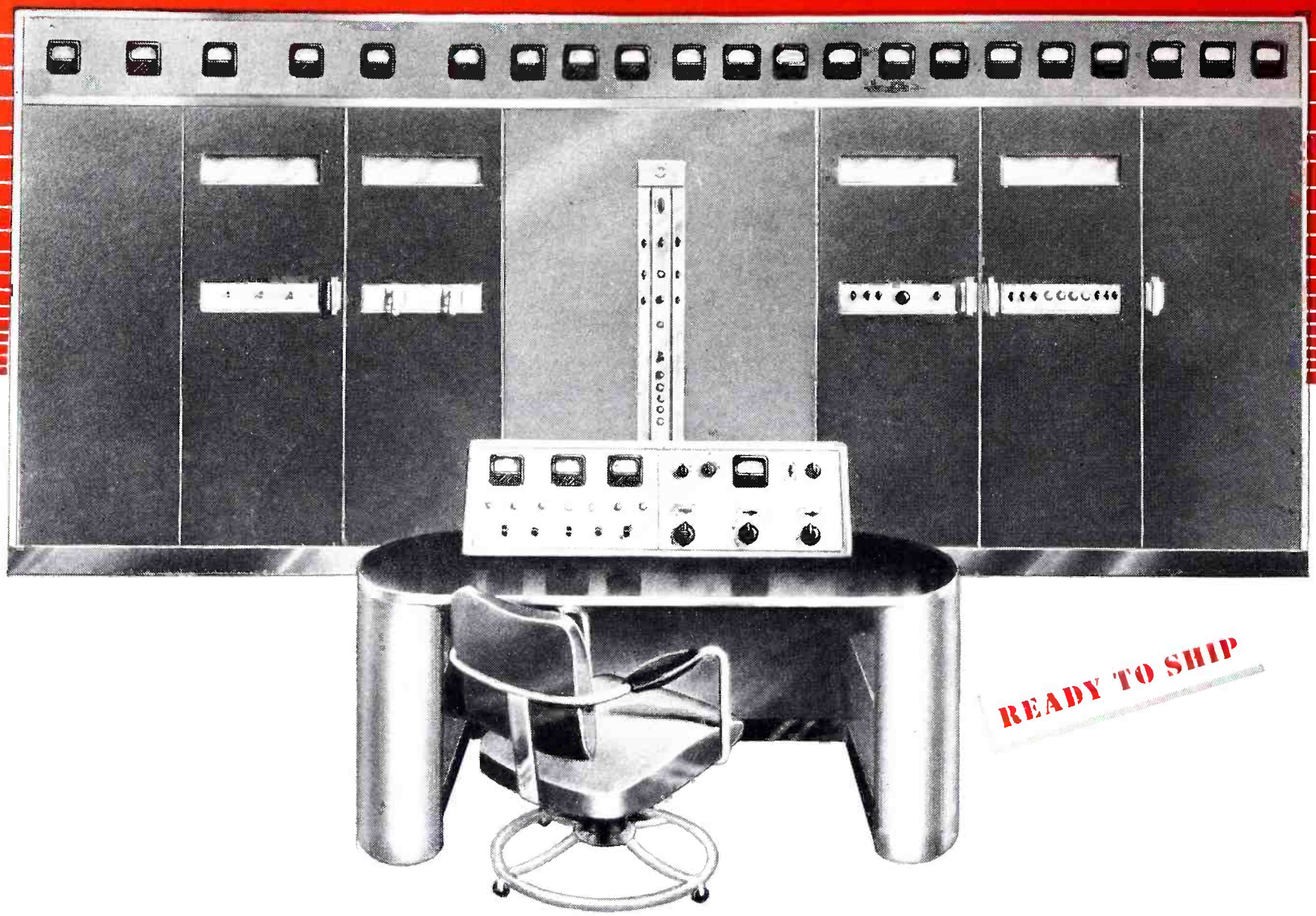
Type BTF-10B

Outstanding for its low running costs, *this 10-kw FM transmitter takes only 22.5 kw to run it.* Grounded-Grid circuits in both drivers and in the final permit the use of small power triodes (7C24's) in all three stages. RCA's "Direct FM" system is used, as in all RCA FM transmitters. All r-f stages are single-ended. High-power stages are motor-tuned. Carrier returns instantaneously after momentary power failure. Only 39 tubes, total, in the entire transmitter (only 23 of these are required for emergency operation). Only 14 different tube types to stock. All air-cooled, the entire transmitter is designed with just *one* high-voltage power supply. Possible savings in running costs of the BTF-10B *—up to $1500 a year!*

READY TO SHIP



. . . FM Transmitters, FM Antennas



READY TO SHIP

RCA's 50-KW FM TRANSMITTER

Type BTF-50A. One of the easiest-handling high-power transmitters ever designed . . . and as reliable as a powerhouse. Grounded-Grid amplifiers and simplified single-end r-f circuits (class C) insure highly stable operation and easy tuning. Direct FM produces high-fidelity frequency modulation simply and directly (less than 1% output distortion 30-15,000 cps). Total tube complement, 42 tubes. Of these, only 26 can seriously affect the carrier. *Number of different tube types, only 14. One* high-voltage power supply for the entire transmitter.

Type BTF-50A is built for true walk-in. Its unified front-panel design is functionally styled to fit any station layout—makes it economical to set up. Here is the 50-kw FM transmitter that is completely air-cooled—with two blowers operating independently to assure maximum program continuity.

READY TO SHIP

RCA STUDIO CONSOLETTE

Type 76-B5

Latest in the series of RCA Consolettes is the 76-B5. This type performs all the amplifying, monitoring, and control functions of most large and small stations—AM and FM. It has full facilities for simultaneous auditioning and broadcasting for practically any combination of studios, turntables, or remote lines.

RCA

— Station Accessories

READY TO SHIP

RCA's Duo-Cone Speaker Type LC-1A

Expressly designed for monitoring FM programs and high-fidelity recordings, this revolutionary new two-cone speaker provides true FM response throughout the range 50 to 15,000 cps! It is free from resonant peaks, harmonics, and transient distortion at all usual volume levels. Crossover response is remarkably smooth. Controlled "roll-off" is provided for 5 and 10 kc. *Room location of the LC-1A is non-critical.*

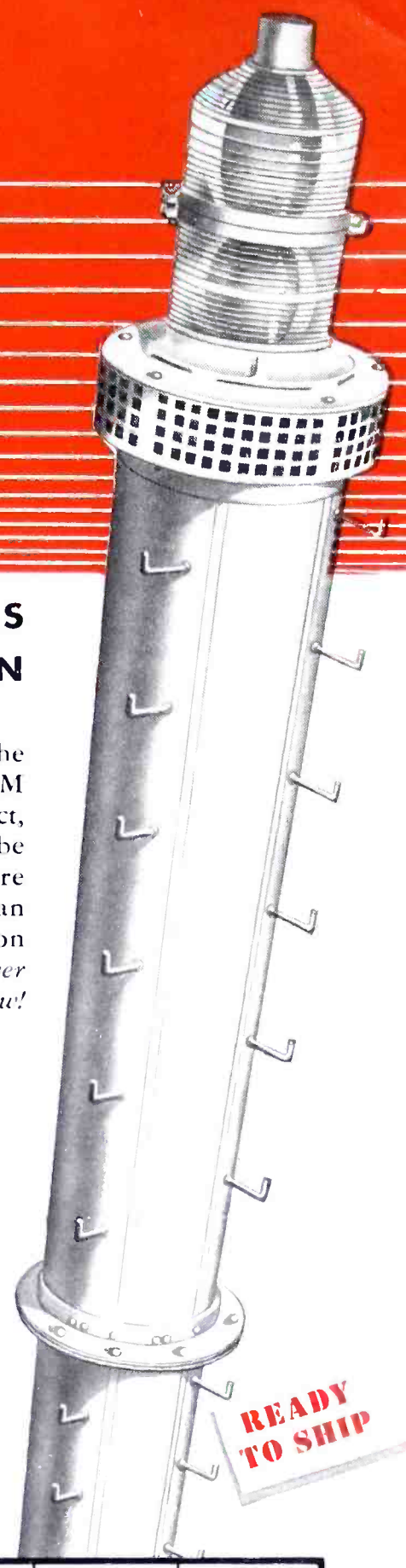
The RCA Duo-Cone Speaker is available in three bass-reflex cabinets; finished in two-tone gray, dark walnut, and light mahogany.

RCA PYLON ANTENNAS FOR EVERY FM STATION

Today, RCA FM Pylons are by far the most popular radiators in the nation's FM broadcast stations. They are easy to erect, completely self-supporting, and can be mounted anywhere. RCA Pylons assure you maximum radiation. For example, an 8-section Pylon operated in conjunction with a 50-kw FM transmitter can *deliver an effective radiated power of over 600 kw!*

RCA Isolation Unit Type BAF-4A

For AM broadcasters who wish to install an RCA FM Pylon atop their present AM tower, and operate AM and FM simultaneously, this unique unit provides complete and efficient isolation of FM and AM signals. Mounts at the base of an insulated broadcast tower.



READY TO SHIP

Data for RCA Pylon Antennas

Standard Pylon. This antenna is designed to meet the requirements of all FM Stations . . . handles up to 50 kw of power. The Standard combines maximum strength and rigidity with minimum weight.

Heavy-Duty Pylon. This is the only FM antenna designed to support the RCA Super-turnstile Television antenna. The Heavy-Duty Pylon is built for locations where winds of hurricane force prevail. It is designed to withstand wind velocities of more than 160 mph when used for FM service alone.

Low-Power Pylon. Here is the ideal low-cost antenna for interim operation and stand-by service. It has the same high gain as other two models, but is available only as a single-section antenna. The Low-Power Pylon handles up to 3 kw.

Type No.	Nominal Power Gain	Sections	Over-all Height (ft.)	Weight (lbs.)
BF-11A/B	1.5	1	13.5	350
BF-12A/B	3.0	2	27	700
BF-14A/B	6.0	4	54	2000
BF-18A/B	12.0	8	108	12497
	HEAVY-DUTY PYLONS			
BF-12E/F	3.0	2	27	4322
BF-14C/D	6.0	4	54	10497
	LOW-POWER PYLONS			
BF-21A/B	1.5	1	13.9	376

RCA TUBES ...

the standard of comparison in FM

● The RCA 7C24 and 5592 "metal header" tubes . . . used in the latest RCA FM transmitters . . . are striking examples of RCA's leadership in modern tube development. In addition to increased ruggedness and operating economy, these tubes require no neutralization, give stable wide-band operation, and provide superior shielding of elements when used in grounded-grid circuits.

RCA has a complete line of modern, more efficient power tubes for FM transmitters. For your convenience, these tubes are now available from your local RCA Tube Distributor or directly from RCA

• • •

For information on any RCA tube, write RCA, Commercial Engineering, Section IP-36, Harrison, N. J.

THE FOUNTAINHEAD OF MODERN TUBE DEVELOPMENT IS RCA

TUBE DEPARTMENT
RADIO CORPORATION of AMERICA
HARRISON, N. J.

(*Continued from Page 36*)

four sections comprise a standard four-section, heavy-duty Pylon which is frequently used to support the RCA Super Turnstile TV Antennas—or as a four-section Pylon where service conditions are unusually severe. It is designed to withstand wind loads up to 150 miles per hour with ½ inch of radial ice. The top four-section unit is simply the standard, lightweight four-section Pylon. The complete eight-section antenna is designed in exact accordance with the RMA standards and meets all of the building code requirements ordinarily encountered in practice.

Eight-Section Changeover Kit Available

An adapter kit is available to FM Broadcasters desiring to convert existing four-section lightweight, or four-section heavy-duty installations into an eight-section Pylon combination. This "adapter," or "conversion" kit consists of a transmission line, a crossover line, and two stub tuners used to complete the changeover. The crossover line is used to bring the input of the top four sections down the back of the bottom four sections where it connects through a two-stub tuner to the common input junction of the top four-section Pylon, bottom four-section Pylon and FM transmitter. The bottom four Pylon sections connect—through a second two-stub tuner and adjustable, gas-tight, constant-impedance, "trombone" type line stretcher—to the common input junction mentioned above. A line diagram of the transmission line harness connections and eight-section Pylon arrangement is shown in Fig. 1.

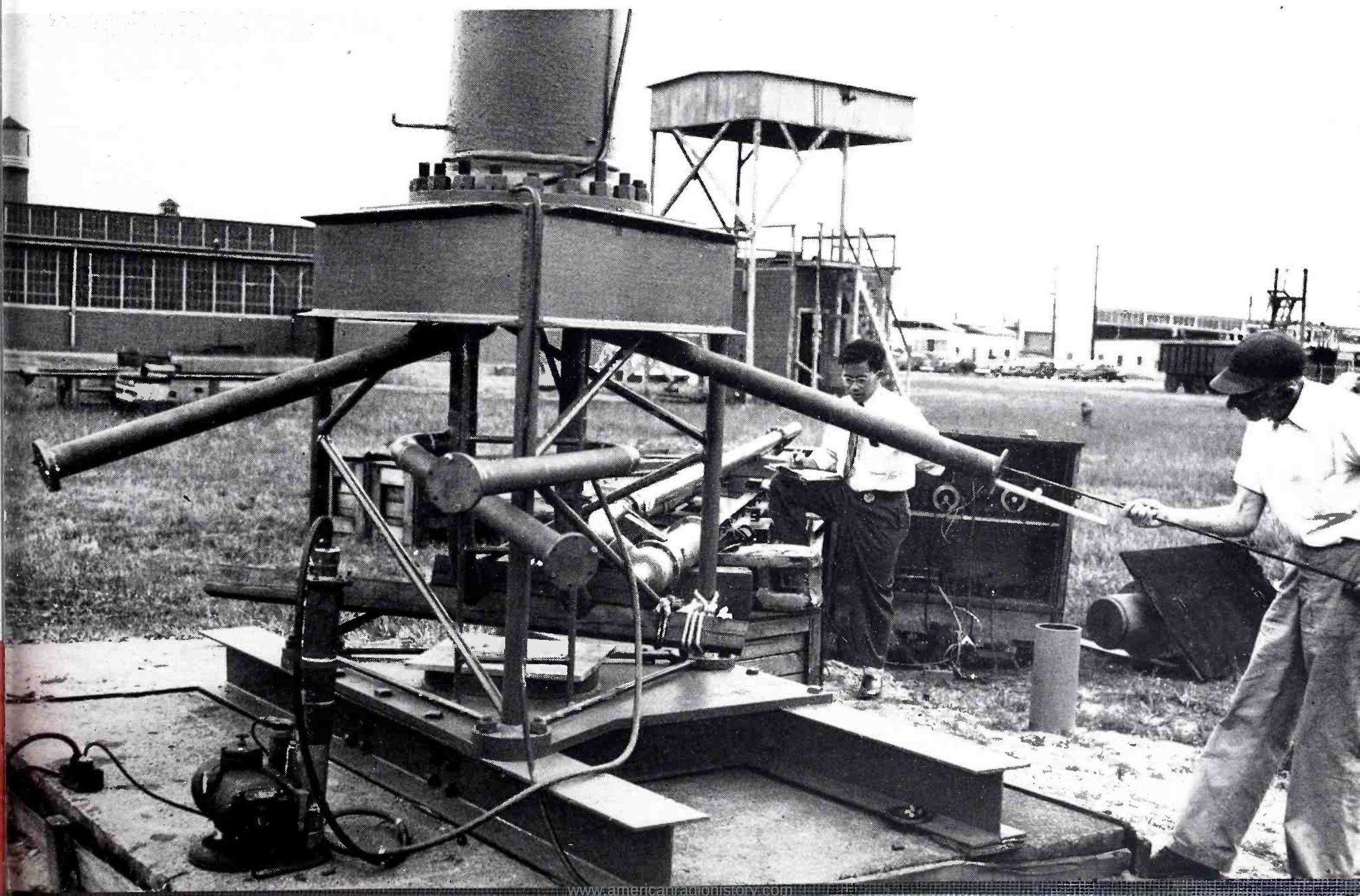
The eight-section adapter kit includes all of the material and fittings required to provide changeover to eight-section operation. The kit includes: crossover and feed lines, (2) two-stub tuners, trombone-type line stretcher, input transformer and miscellaneous hardware and fittings.

Accessory Sectionalizing Switch

The sectionalizing switch, similar to the FM power cutback switch used with RCA 50 KW FM transmitters, is available as an accessory for use in conjunction with the eight-section Pylon antenna. The sectionalizing switch arrangement permits operation of either the top or bottom four sections—or all eight sections, as desired. Selection is accomplished by operating a switch at the tower base or in the transmitter building. Such an arrangement facilitates maintenance or repair, if needed. A simplified block diagram showing the essential features of operation is included in Fig. 3. The sectionalizing switch functions as follows: When all eight sections are in operation, the line shorting switches A and B are open, thus permitting power to flow to top and bottom four sections—the input impedance at the junction of top and bottom four sections is approximately $\frac{51.5 + jo}{2}$ ohms (two 51.5 ohm resistive impedances in parallel). The distance $\frac{D}{\lambda}$ on the input line is selected to obtain a conductance of $\frac{1}{51.5 \text{ ohms}}$ mhos, at the stub connection "F", when eight sections are operating. The distance, E/λ, to the stub—shorting switch "C", is selected to obtain a negative input susceptance to the stub. This is equal and opposite to the susceptance of the antenna admittance at point "F". When shorting switch "C" is closed for eight-section operation, the net input admittance at "F" is then very nearly $\frac{1}{51.5 + jo}$ mhos or a resistive input impedance of about 51.5 ohms at the station's operating frequency.

When operation on the top or bottom four sections is desired, shorting switch "A" or "B" respectively, is closed, thus shorting the respective feeder line to the bottom or top four sections. The switches

FIG. 2. RCA engineer H. E. King and assistant adjusting the two-stub matcher shorting plugs. Stubs have been moved from the normal compact vertical position to facilitate adjustments.



"A" and "B" are shorted approximately a quarter-wave from the common input junction; thus when either switch "A" or "B" is shorted, the input impedance at the common junction to the shorted branch line is very high compared to 51.5 ohms. This condition results in negligible shunting and power loss at the input of the four sections to which power is fed. The input impedance at the common junction during four-section operation is approximately 51.5 + jo ohms, thus providing a near perfect impedance match. The two-stub-matchers in the four-section branch lines are adjusted to match the 51.5 ohm transmission lines to the common junction "G". Consequently, no stub shunt susceptance at junction "F" is required. Thus, shorting switch "C" opens during four-section operation (the stub shunt admittance at junction "F" is very small compared to the line admittance of about $\frac{1}{51.5 + jo}$ mhos). Note that a quarter-wave shorted stub has a very high input impedance. The quarter-wave shorted stub connected at junction "F" during four-section operation thus causes negligible change of input impedance and power loss. The input impedance to the antenna system is thereby maintained at very nearly 51.5 + jo ohms during four- or eight-section operation. No noticeable change in transmitter loading or tuning is observed when the sectionalizing switch is operated.

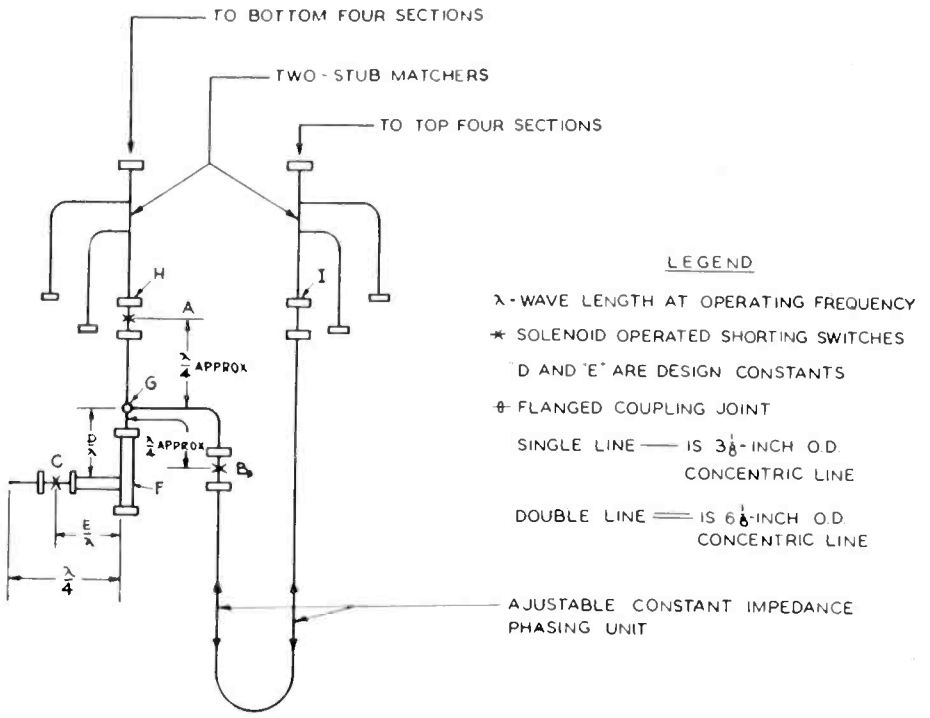


FIG. 3. Schematic diagram of the Sectionalizing Switch System for the eight-section Pylon enabling operation of the top or bottom four sections, or all eight sections by operating a switch at the tower base or in the transmitter building.

FIG. 4 (at left). In this view, Engineer King is communicating with another engineer located at distant field intensity meter, while directing adjustment of the phasing unit during tests at Camden.

SWR Monitors May Be Used

Provision has been made for later inclusion of three power-and-standing wave ratio monitors. They are used in lines connecting to the top and bottom four-section units, and at the common input junction. This monitoring system, used in conjunction with the sectionalizing switch, will assure continuous control and checking of the antenna system and transmission line performance.

Various Feed Line Arrangements Possible

The installation of the two-stub matchers and the phasing unit is quite flexible (see Fig. 2) in meeting particular customer requirements. The phasing unit and two-stub tuners may be mounted in the tower just below the Pylon base in an arrangement like the one shown schematically in Fig. 1. All material necessary for this arrangement of the eight-section antenna system installation is supplied, except transmission line mounting clamps, which vary according to individual installation.

Several variations in the installation of the (2) two-stub matchers and phasing unit are possible. They are as follows:

(1) As described above and shown schematically in Fig. 1.

(2) By inserting any desired equal lengths of standard 51.5 ohm line and fittings between each two-stub matcher and the phasing unit.

(3) By inserting unequal lengths of standard line and fittings between each two-stub matcher and the phasing unit.

(4) By inserting any length of line between each two-stub matcher and the antenna input terminals.

(5) By combinations of (2), (3), and (4) above.

Arrangement (1) is the simplest and most economical. The proper stub and phasing unit settings are given for #1 and #2 in the instruction book furnished with the equipment.

Arrangement #2 may be used where mechanical restrictions below the Pylon antenna base do not permit the installation of the Phasing Unit . . . or, where dual lines to the transmitter building are desired. This requirement might exist in antenna installations employing the sectionalizing switch.

When a dual-line and sectionalizing switch installation is used, the transmitter may be alternately switched from one four-section Pylon to the other, if either maintenance or repairs of a damaged line are needed. Considerable care and ingenuity may be required in obtaining the equal lengths of transmission line which are required in certain arrangements of #2 involving more complex installations.

Fig. 2 illustrates a typical arrangement of #2, which is suitable for mountain-top and building-top installation. In the example illustrated in Fig. 2, two-stub matchers are mounted directly on the input terminals of the top and bottom four-section units. Two identical 90°, long-sweep elbows connect the stub-tuners to the phasing unit which is installed in a horizontal position. When arrangements similar to Fig. 2 are used, the phasing unit and any nearby horizontal runs of transmission line should be protected from the possibility of falling ice from the antenna.

Arrangement #3 may be used when it is considered impractical to install the equal length lines required in arrangement #2. The two-stub matcher settings for

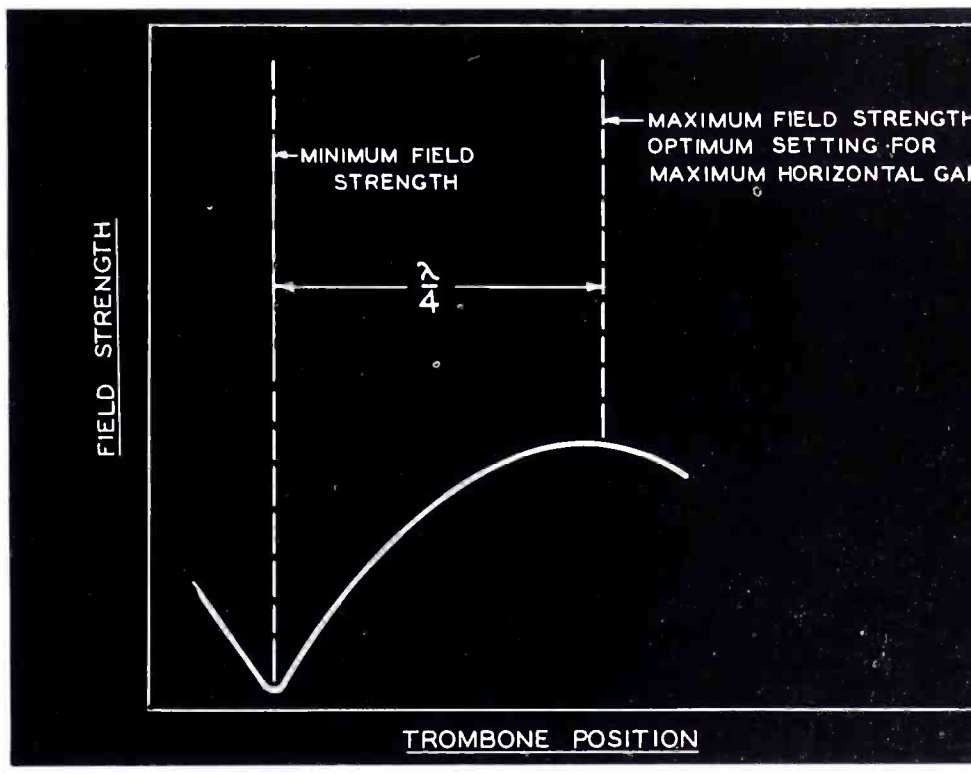
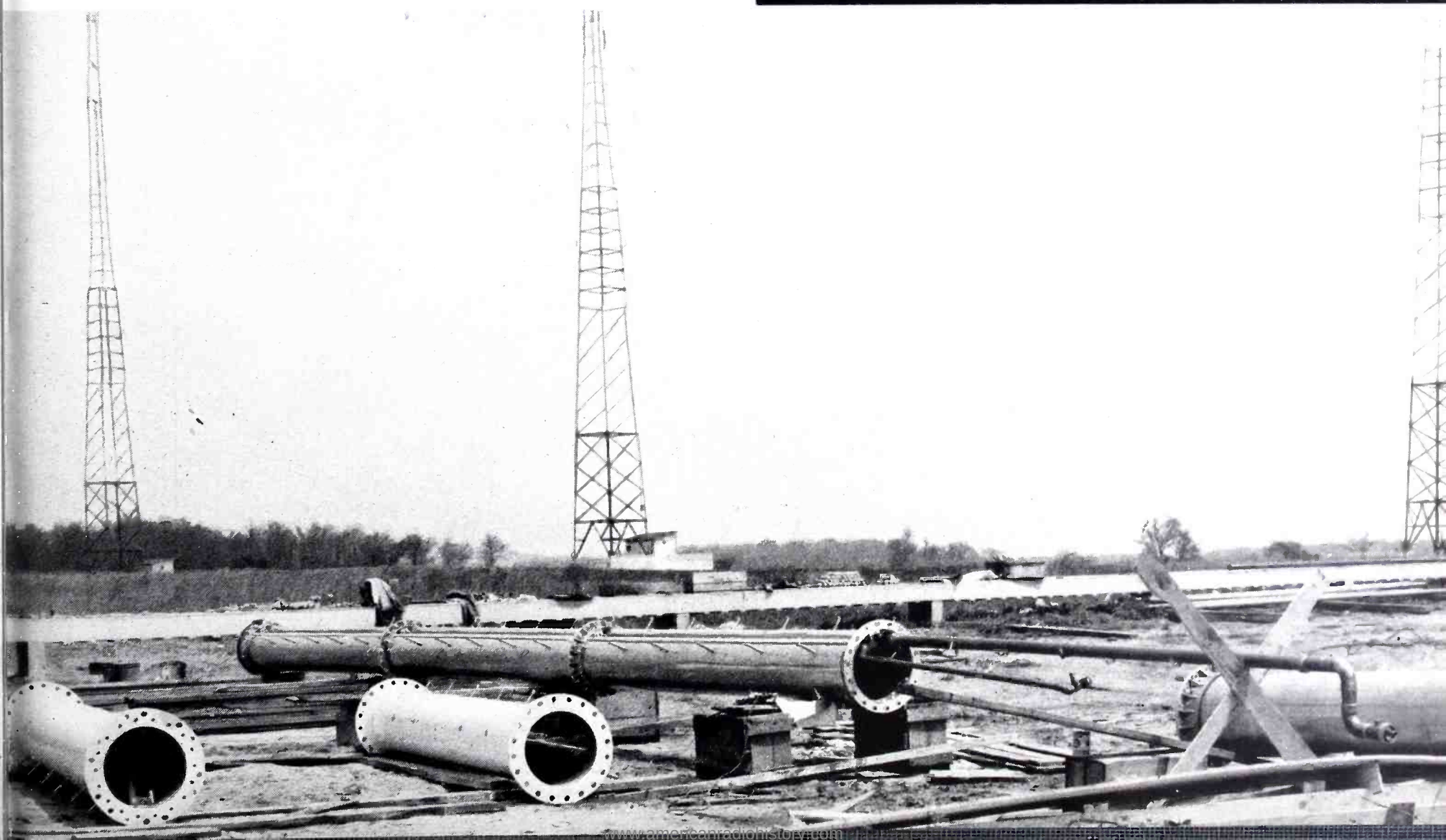


FIG. 5 (at right). Typical field strength variation with "trombone" setting for the eight-section Pylon.

FIG. 6 (below). View of Pylon sections after unpacking. In background is WKJG-AM antenna array. In foreground three of the four standard aluminum Pylons have been bolted together and harness installed. Also visible at left are two heavy-duty Pylon sections.



arrangement #3 are given in the instruction book. However, the optimum phasing unit adjustment must be determined by a qualified engineer present at the eight-section Pylon installation.

Arrangements #4 and #5 may be used in antenna installations where restrictions will not permit utilization of arrangements #1, #2, or #3. Arrangements #4 and #5 represent the least desirable type of installation from the standpoint of simplicity, ease of installation and adjustment. However, no compromise in performance of the eight-section Pylon exists in any of the described arrangements. For arrangement #4 and #5, a qualified engineer must determine the proper stub and phasing unit settings for the customers' frequency after the installation is completed.

Engineering Installation Tests

The proper stub and phasing unit settings are given in the instruction book for arrangements #1 and #2. This information was obtained for the use of the Broadcaster by RCA Antenna Development Engineers who used an actual setup of the commercial eight-section Pylon in conducting tests and measurements.

Fig. 2 shows an engineer and workman making final adjustments on one of the stubs of the two-stub matcher in field tests. Impedance match for the top and bottom four sections is indicated by a zero balance of the high-frequency standing wave ratio bridges (installed just below each two-stub matcher). The actual shorting-plug settings in the two-stub matchers are determined by calculations based on impedance measurements previously made with a precision slotted line. Many different stub settings will give a 51.5 ohm input resistance, but one particular combination of stub settings will give the least possible loss and maximum bandwith. This optimum combination of stub settings is given in the instruction book supplied.

Fig. 4 shows an RCA engineer and workman determining the optimum adjustment of the phasing unit. One engineer is communicating with another, stationed at a suitable distant location, reporting on field strength measurements. The workman in the upper left of the photo is adjusting the "trombone" position according to the engineer's instructions. The setting of the "trombone" is not critical and the field strength variations encountered near optimum "trombone" adjustment is very small, as shown in Fig. 5. The proper "trombone" setting is precisely a quarter-wave greater, or less, than the "trombone" setting which produces minimum field strength at the distant field strength meter. The variation of minimum field strength with "trombone" setting is quite sharp and enables an accurate determination of the "trombone" setting for maximum horizontal gain.

Installation of Eight-Section Pylon

Figs. 6 to 14 inclusive (supplied by WKJG-FM, Fort Wayne, Indiana), illustrate a typical eight-section Pylon erection job. The erection was conducted under the capable supervision and direction of Raul Frye, Technical Director. The erection of the eight-section Pylon at WKJG was accomplished with ease and except for continuous stiff winds which delayed riggers during erection of the top four sections, no particular problems were encountered. The

FIG. 7 (below). The first heavy-duty Pylon section is ready to be hoisted. Winch cables (tied just above center) and tag line are visible as is the FM tower leg at the left.

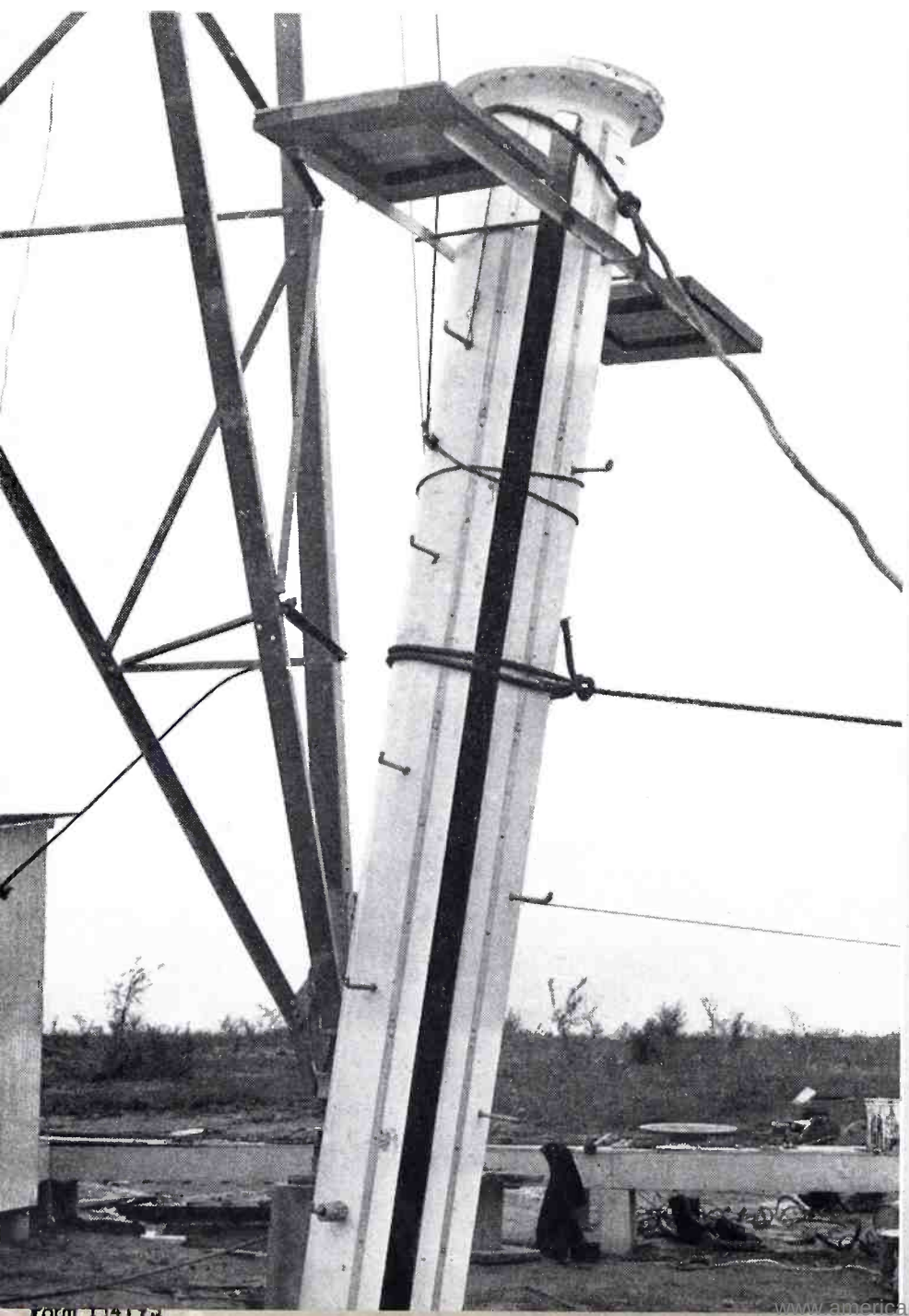
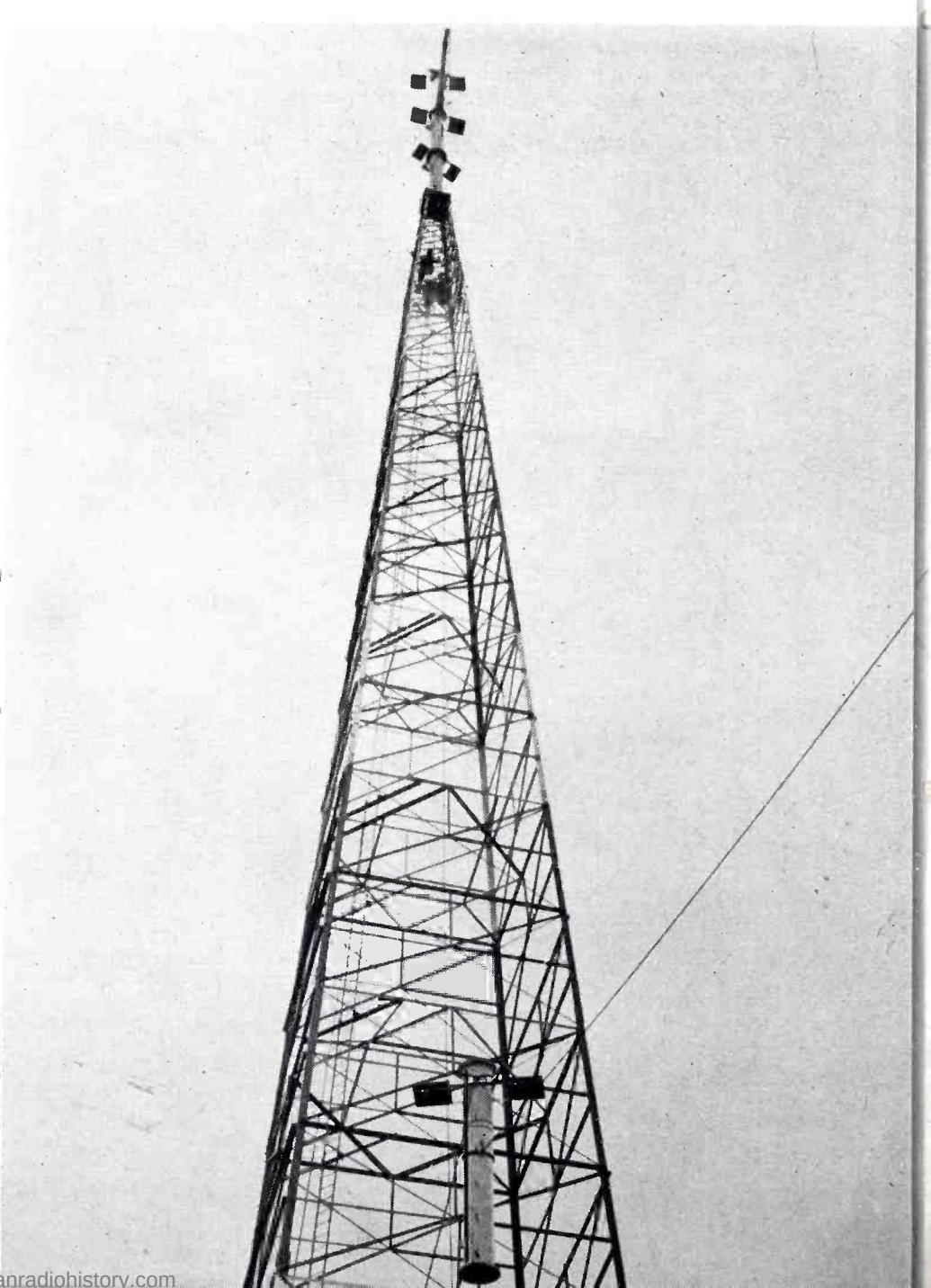


FIG. 8 (below). This view shows that three Pylon sections have been hoisted and mounted into place . . . and the fourth is on its way up the tower. Both tag lines and winch cables were controlled from one winch truck.



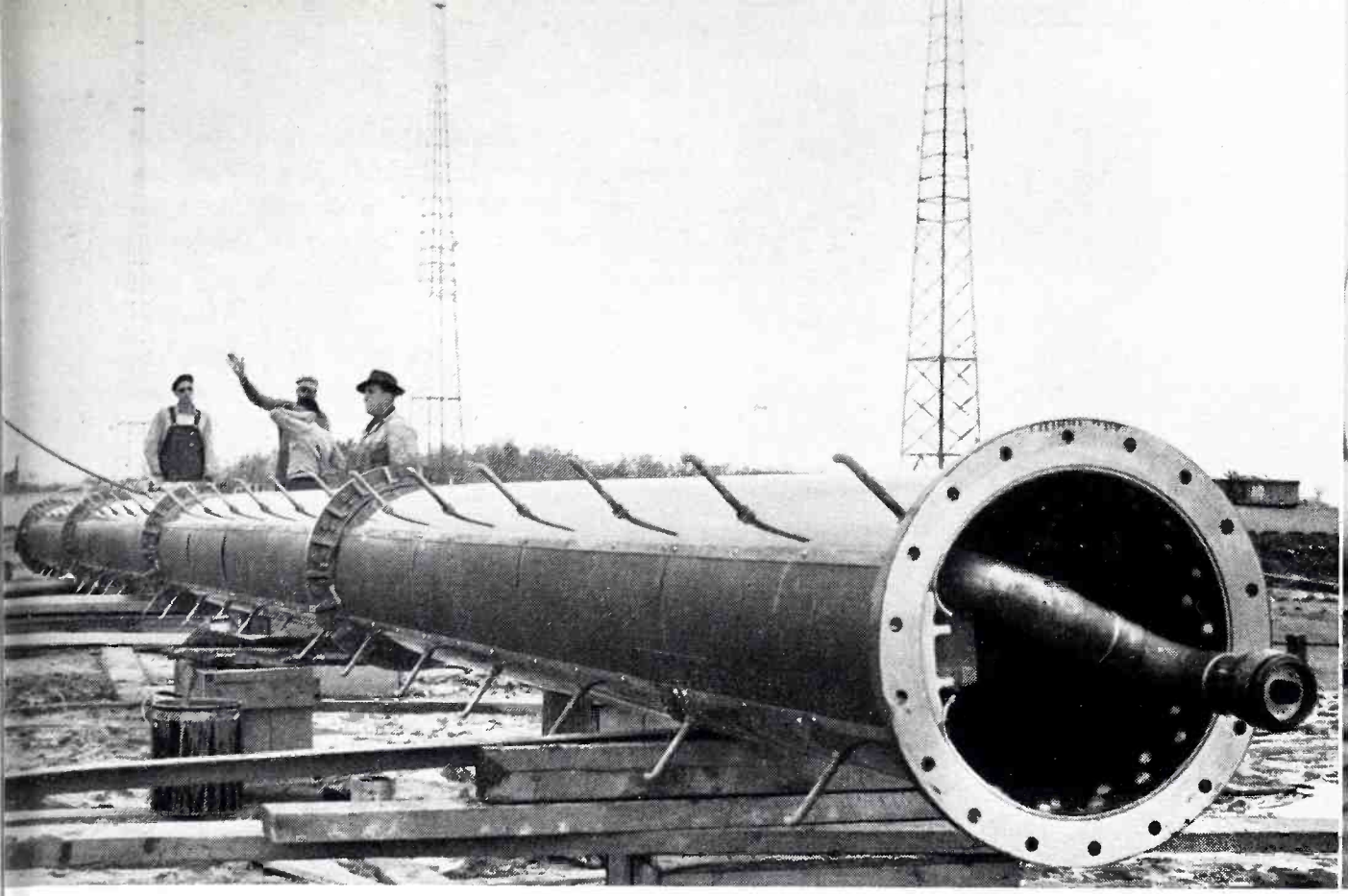


FIG. 11 (above). Here is the top unit—all four standard aluminum sections bolted together and complete with transmission line installed and tested.

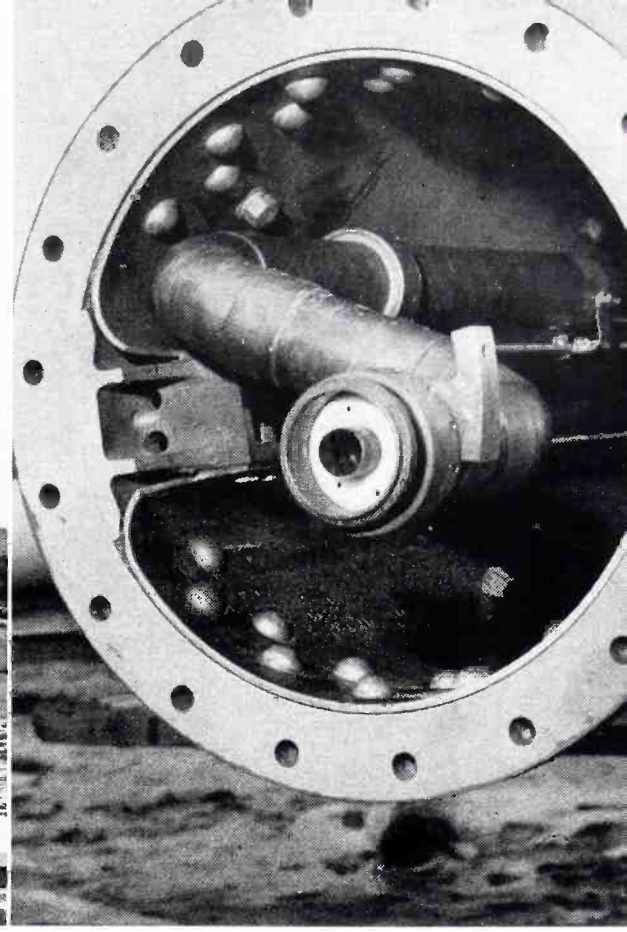
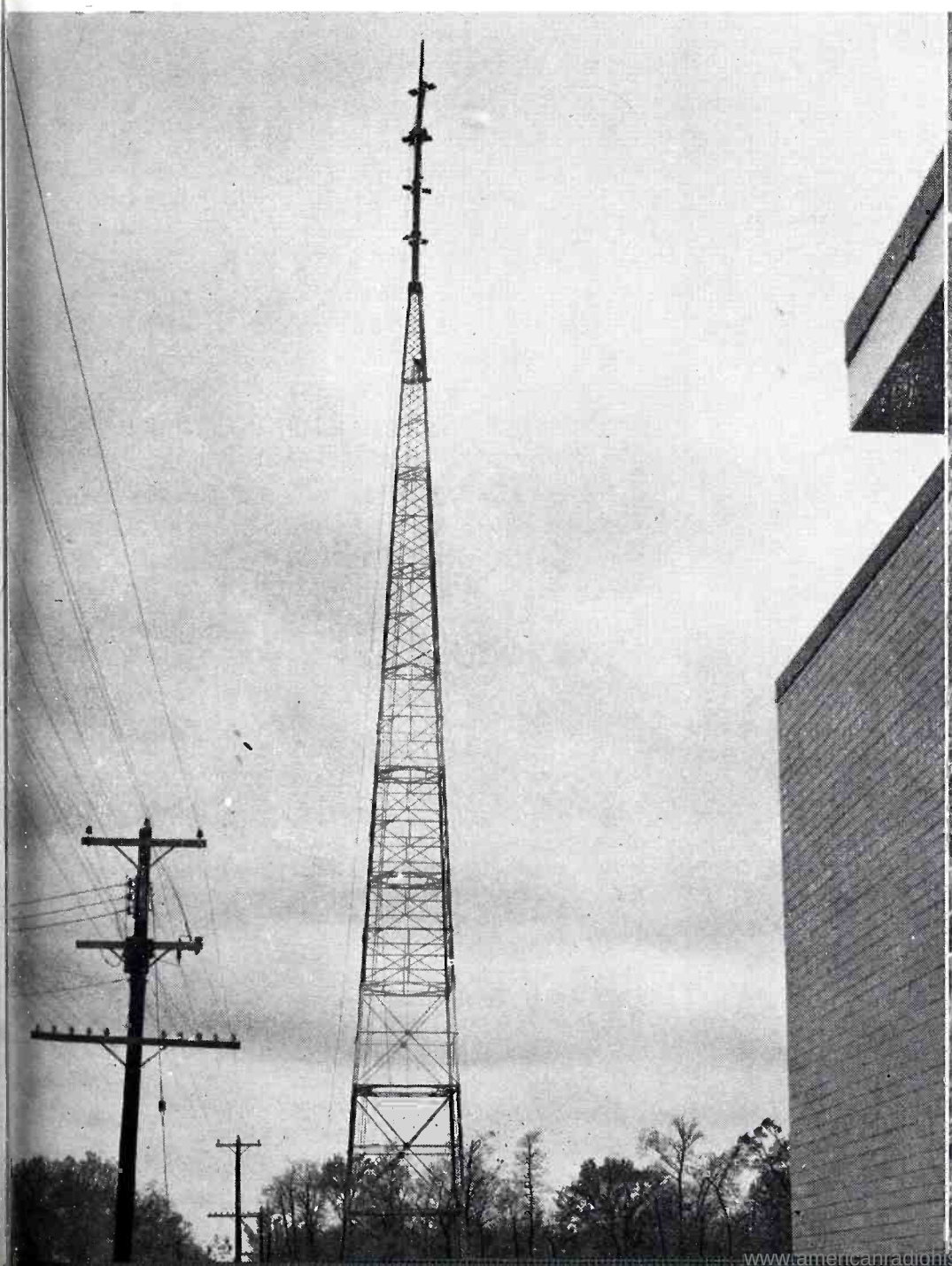
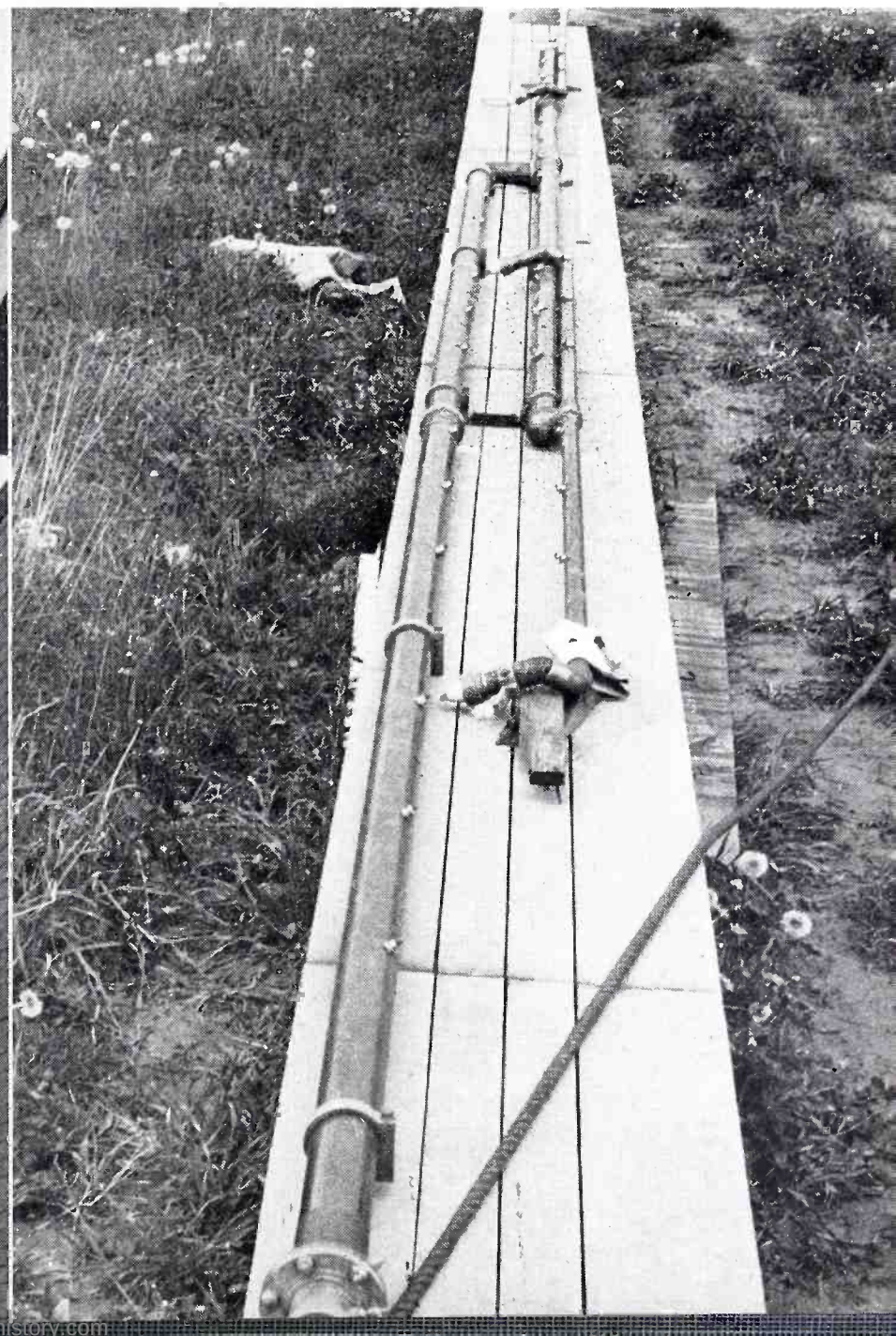


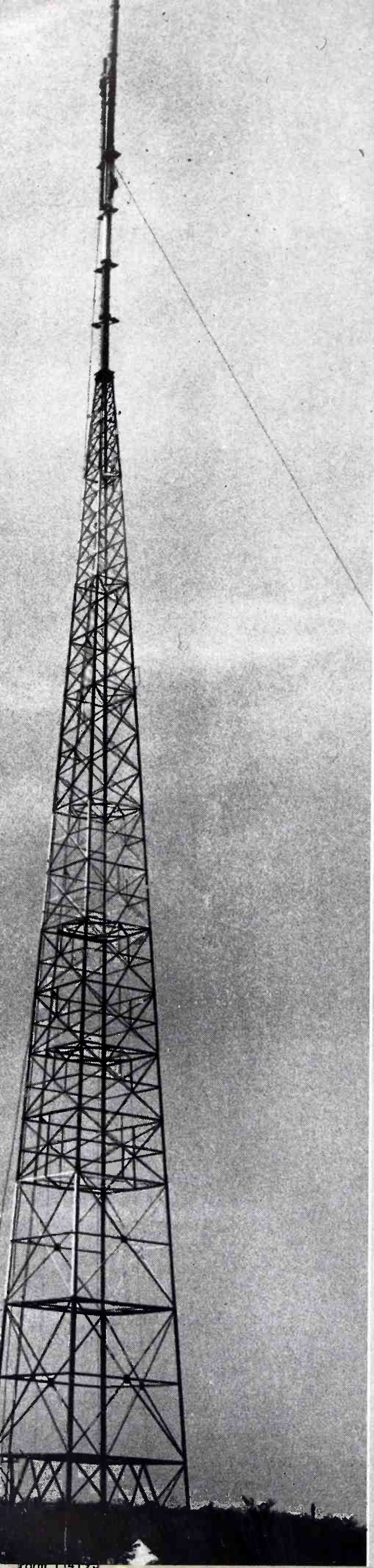
FIG. 12 (above). Closeup of the S-shaped crossover end of the transmission line for the top four sections, as it appeared during ground tests. The crossover connects to the feeder line running up the back of the bottom four sections. After ground tests, the S-shaped crossover was disconnected and tied inside the cylinder for safekeeping during erection.

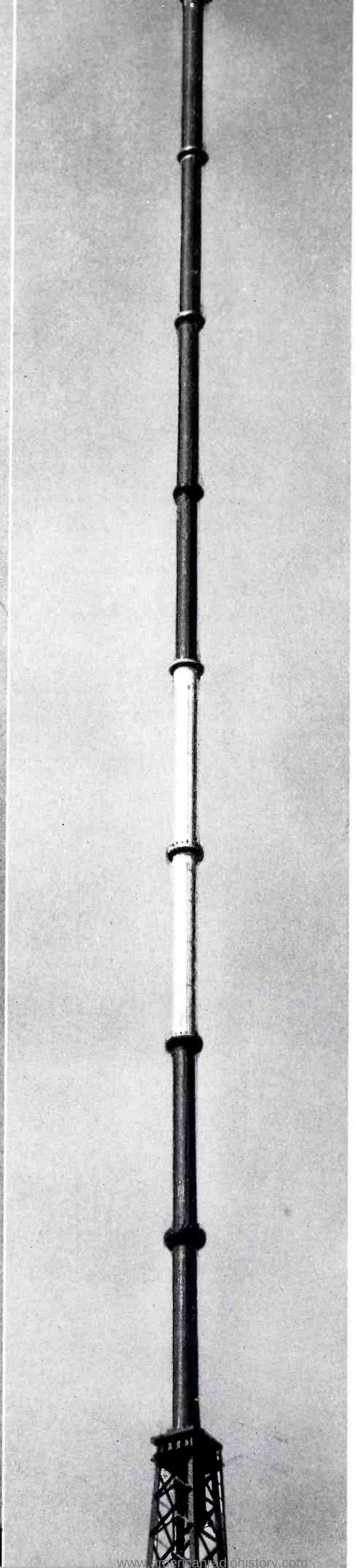
FIG. 9 (below). In this view the fourth heavy-duty section is being lowered into place. Workmen (barely visible) on chair seats are aligning bolt holes, prior to fastening sections together.

FIG. 10 (below). The transmission line harness for the bottom four-sections was assembled on the ground and placed on the station's transmission line trough to provide a flat surface for pressure testing, continuity tests and leakage checks. The assembled harness was later strapped to angle-iron stiffeners and installed within Pylon lower four sections as a complete unit.









wind which delayed erection of the top four sections ceased about five o'clock one morning and the top four sections were hoisted and fastened into place, including transmission line connections, in less than two hours.

An attempt was made to check the phasing unit adjustment by using a modified high-quality commercial FM receiver. Stray pickup from various sources in the receiver would not permit reliable measurements. A commercial high-frequency field intensity meter was used without difficulty and field strength measurements resulted in a curve similar to that shown in Fig. 5. A set of army surplus field phones was used to communicate with an engineer making adjustments at the tower top, and with an engineer located at the WKJG transmitter console. The WKJG engineer checked the transmitter power output and tuning during antenna adjustments, and recorded data. The field intensity meter was set up at the chief engineer's home where he could communicate by commercial telephone with the transmitter engineer.

Dual-Frequency Operation

A 100 kilowatt power input rating permits two transmitters having a total power output of 100 kilowatts to operate on one eight-section Pylon. One common transmission line connects from the antenna to short branch lines which run from the two transmitters. Only one antenna and one supporting structure are required. In general, antennas, transmission lines and towers, together with their installation represent a large percentage of the total equipment costs for an FM Broadcast Station. Thus, the elimination of duplicate installations results in marked economy. When two FM stations operate on one eight-section Pylon, there is no sacrifice in performance compared to the operation of separate eight-section Pylons.

Up to 1200 kilowatts of total effective radiated power may be obtained by using one eight-section Pylon. The eight-section Pylon will just as readily handle 100 kilowatts input from a single FM transmitter, in cases where 1200 kilowatts of FM power is desired. The selection of frequency and power combinations for dual-frequency

FIG. 13 (far left). The top four sections were erected as a complete unit—with all sections bolted together and tested harness installed. In this view the entire top unit is being lowered onto the top section of the heavy-duty Pylon.

FIG. 14. (near left). A closeup view of the RCA eight-section Pylon completely installed at WKJG. The total height of FM tower and Pylon combined is 369 feet.

operation is a special engineering problem, and added savings may be effected by the proper choice of operating frequencies. RCA Engineers should be consulted when dual FM operation is being considered. Dual-frequency operation utilizes a filter especially designed for the particular station requirements. This filter is employed in the output line of each transmitter to prevent cross modulation of the transmitter output frequencies which otherwise might result in unlicensed, spurious radiation.

"Super-Power" FM Coverage

Fig. 15, illustrates the close-in coverage of the eight-section Pylon. The signal strength is about 40 db above the 1000 microvolt per meter value accepted for good urban coverage, thus indicating the future possibility of still higher FM antenna gains to take the power wasted by unnecessarily strong close-in signals and extend the limiting service contour. Fig. 16 shows the calculated 1000 microvolt and 20 microvolt service contours for a typical 50 KW FM transmitter and eight-section Pylon installation. It is well to remember that the extended service contours illustrated in Fig. 16 are always primary service areas and are not disturbed by sky wave interference and fading so commonplace in low-frequency broadcasting.

All operating tests proved the practicability and usefulness of both the RCA high-gain Pylon Antenna and the 50 KW FM transmitter for high-power FM use. The excellent power handling capabilities exhibited by the Pylon will contribute to its extensive use in the high-power FM field. The RCA eight-section Pylon and 50 KW transmitter will enable high-power FM broadcasters to serve primary service areas up to nearly 200 miles in radius, when mountain elevations are used for the high-gain, high-power installation. Up to 600 KW of effective radiated FM power is provided when the RCA 50 KW FM transmitter and eight-section Pylon antenna are installed.

Preliminary field strength measurements at WKJG, Fort Wayne, Indiana, indicate that the radius to the 50 microvolt per meter contour extends 9 to 25% beyond the predicted radius. This exceptional service cannot be explained by any reasonable increase in effective radiated power above the value used for predictions. As some FM Broadcasters have explained it, "there's something about the Pylon that makes it work even better than predictions indicate".

Acknowledgment

The Eight-Section Pylon is the result of contributions by many people; credit is especially due H. E. King, H. H. Westcott, and D. W. Balmer of the RCA FM antenna engineering group.

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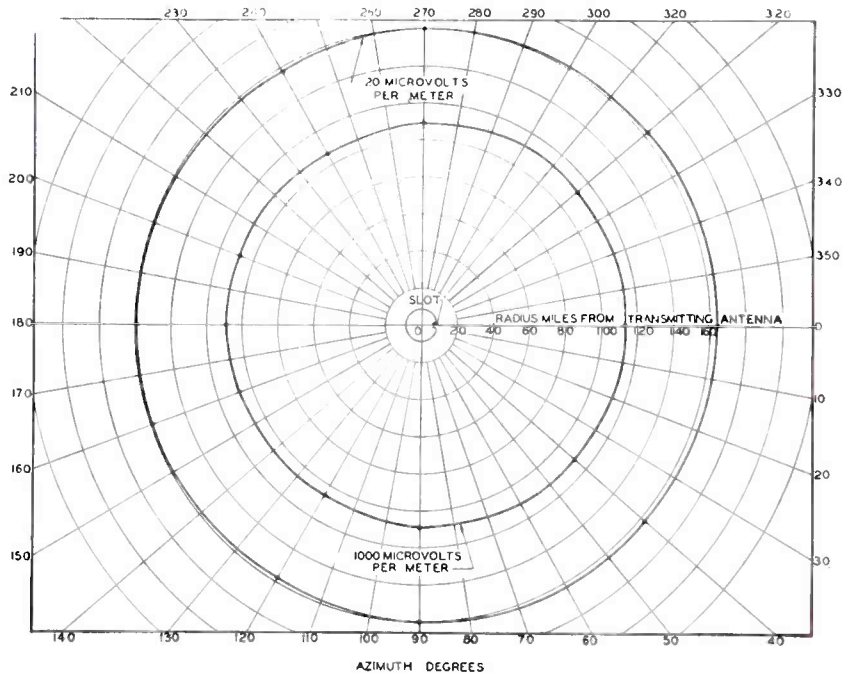
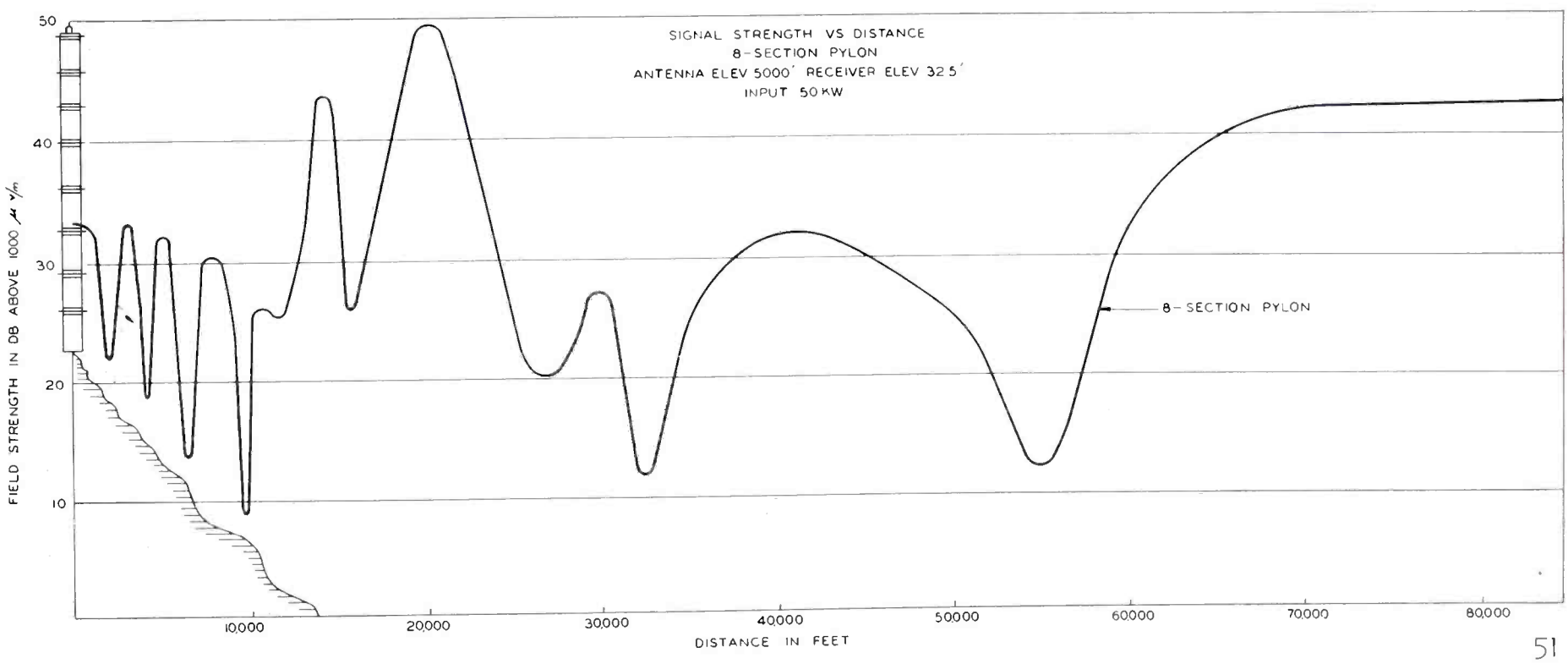


FIG. 16 (at right). Calculated 1000 and 20 microvolt service contours for 50 KW FM Transmitter and eight-section Pylon. Frequency — 98 megacycles. Antenna Height — 5000 feet. Receiving Antenna Height— 30 feet.

FIG. 15 (below). Curve for eight-section Pylon illustrating close-in radiation strength versus distance. In this case, the Pylon is erected on top of a very steep 5000 foot mountain.



WKJG-FM ERECTS HIGH-POWER FM ANTENNA

by R. H. FRYE
Technical Director
Radio Station WKJG and WKJG-FM

The first eight-section "super-power," high-gain, frequency modulation broadcast antenna to be installed in the world has been erected at the transmitter site of Radio Station WKJG and WKJG-FM, Fort Wayne, Indiana, which is owned and operated by the Northeastern Indiana Broadcasting Co., Inc.

The Eight-Section Pylon

The new RCA eight-section Pylon antenna, as illustrated in Fig. 1 below, consists of a four-section heavy-duty type Pylon plus a four-section standard Pylon. As installed atop the 260 foot insulated H 40 tower, the Pylon is located at the maximum distance possible from the four element array for WKJG that operates on 1380 KC. The four steel sections were erected individually on top of the tower and the four-section aluminum Pylon complete with the feed harness was erected in one piece atop the four steel sections. The length of 3⅛ inch line re-

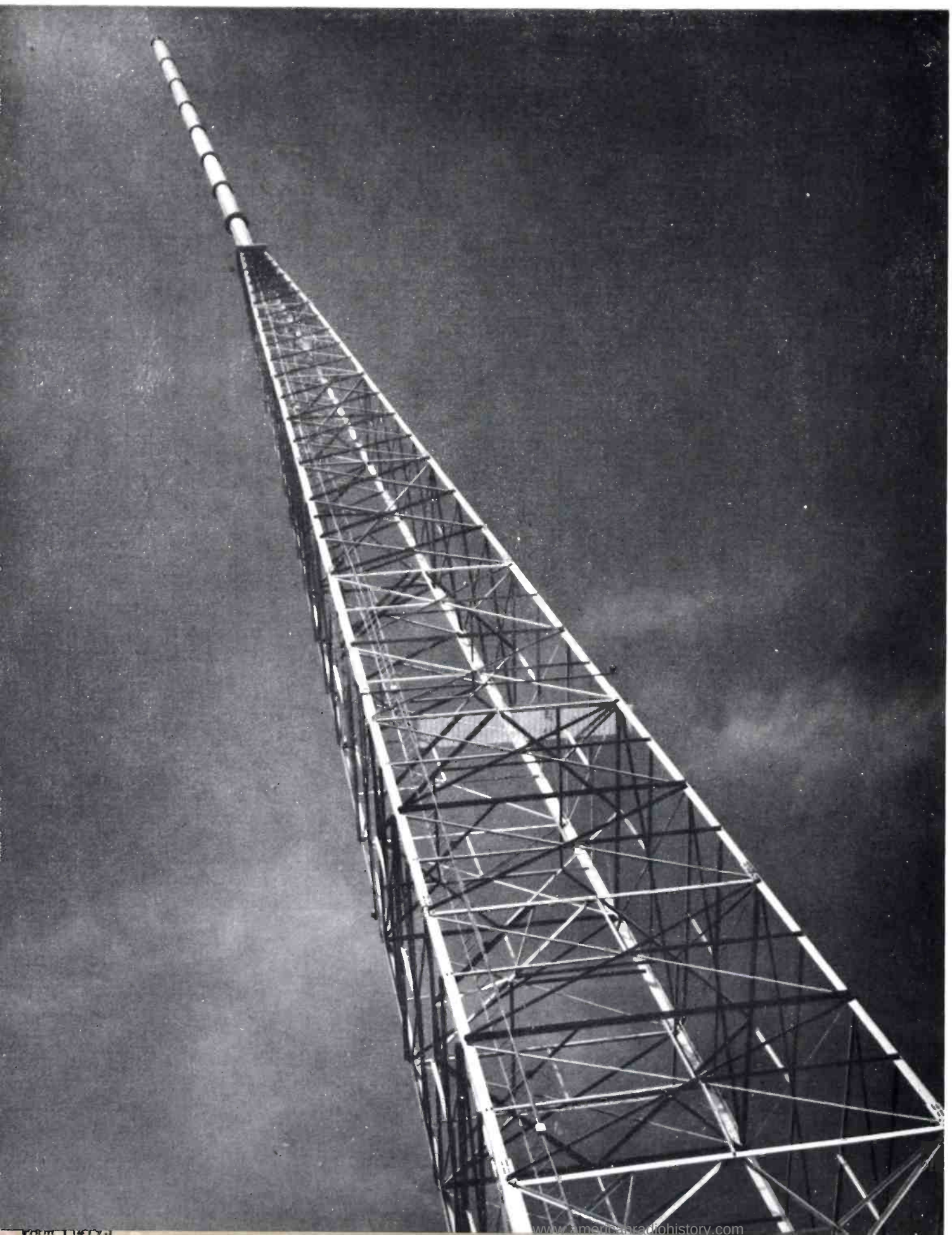
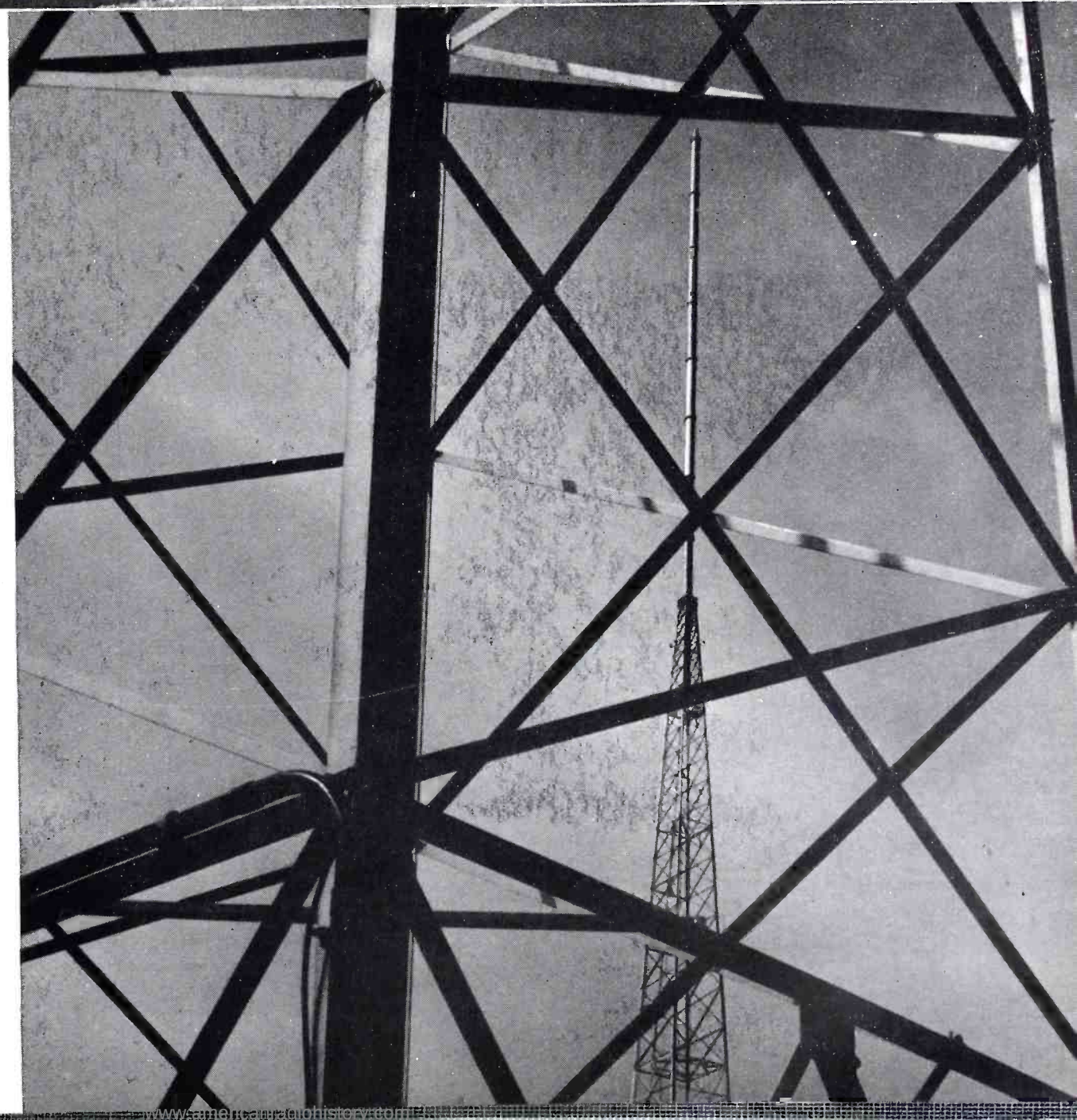


FIG. 1 (at left). Rising to a total height of 369 feet, the new "Super-Power" eight-section Pylon antenna provides an effective radiated power of 30 kilowatts.

FIG. 2 (above). Here is the WKJG-FM and AM transmitter building and towers. Visible in the background is the WKJG AM antenna array—at the far right is the eight-section Pylon.

FIG. 3 (at right). Looking through one of the AM towers, the completely installed eight-section, high-power Pylon is visible.



quired to feed the standard Pylon was pulled in one piece through the steel sections and connected. Then later, the complete harness for the four steel sections was set in place in one piece. Temporary platforms were provided as a place to work at the points of junction of the feeder lines and the Pylon sections. The tuning stubs and phasing units were installed directly below the tower cap and a 3⅛ inch line which runs down the tower to the RCA Isolation Unit, type BAF-4A. The FM/AM isolation unit aids in the efficient transfer of FM power without affecting the WKJG four element AM array. In effect, this unit is simply two resonant circuits coupled together to such a degree as to provide good band-bass characteristics over the FM band of 88 to 108 megacycles.

As now installed and operating, the Pylon antenna rises to a total height of 369 feet, with the antenna rising 109 feet above the tower. Since the antenna was designed to withstand wind velocities of 90 miles per hour with one-half inch of ice covering it and the tower, it is interesting to note that after a storm where gusts of wind up to 75 miles per hour were recorded, the antenna remained plumb. Also, it has been checked for stability with continuous transit readings in winds of velocities varying from 5 miles up to the peak of 75 miles per hour and found to be satisfactory in every respect.

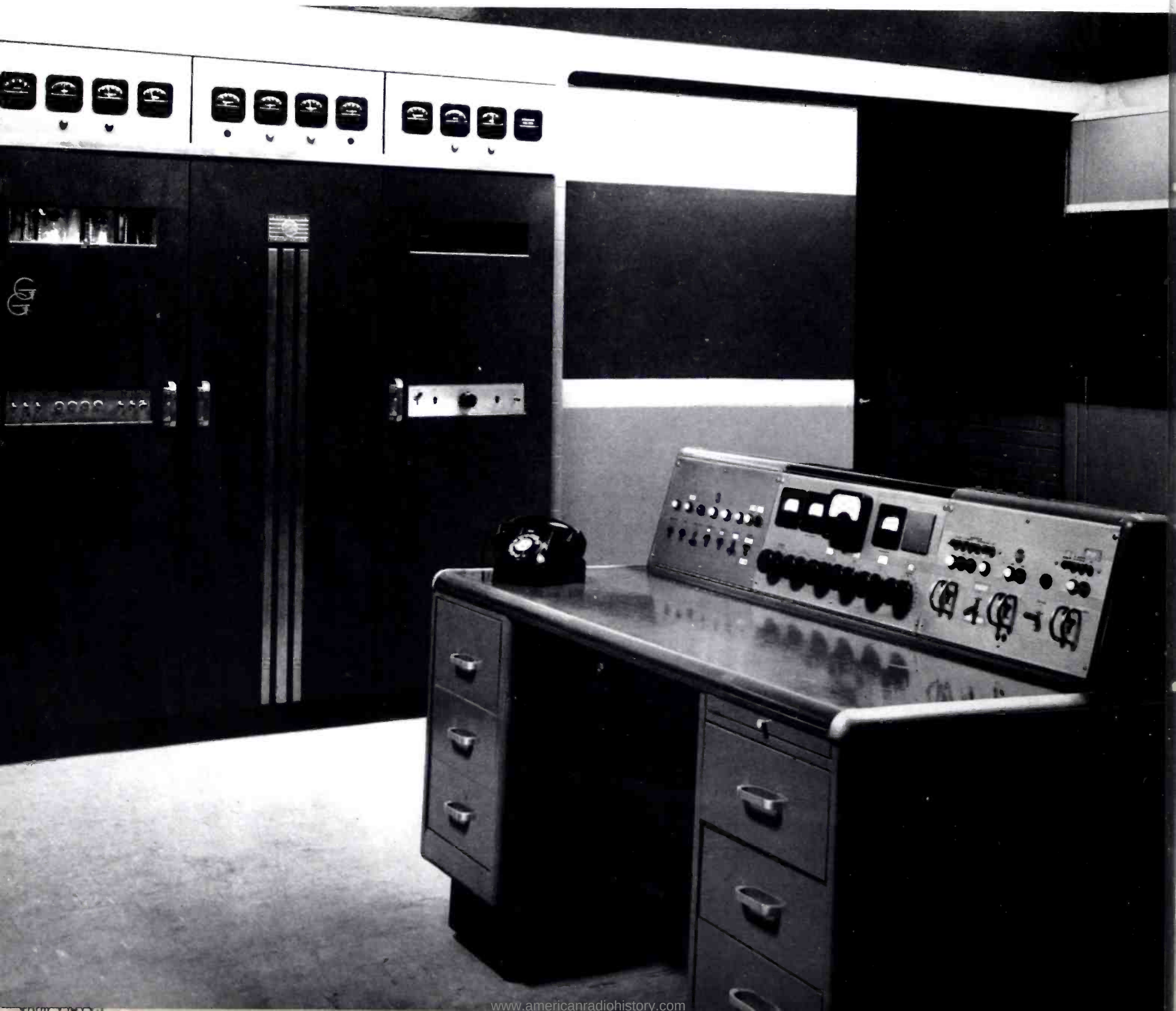
Power is fed to the antenna from an RCA 3 KW FM transmitter, type BTF-3B through 725 feet of 3⅛ inch line and the final tuning and phasing operations were completed in less than eight hours with the aid of a field strength meter located approximately 5 miles from the antenna.

The high-gain Pylon antenna (it has a power gain of 1.5 per section) will increase the effective radiated power of the 3 KW transmitter to 30 KW on its frequency of 106.1 megacycles which will provide the finest possible service to an area of approximately 16,225 square miles around Fort Wayne. A preliminary coverage survey shows that the estimated service radius will be exceeded by approximately 9%.

FM and AM Transmitters

Particularly attractive to the station's management is the "add-on" amplifier feature of the BTF-3B. The 10 kilowatt amplifier, in which r-f circuits are elec-

FIG. 4 (below). The RCA 3 KW FM transmitter is flush-mounted in a wall in the transmitter room. Visible is the Supervisory Console used for AM and FM transmitter control.



trically similar to those of the present 3 KW transmitter, can be added later to furnish the increased power. All amplifiers (1, 3 and 10 KW) employ grounded-grid, concentric-line tank circuits in which RCA type 7C24 tubes are used. Both the present WKJG 3 KW transmitter and the 10 KW employ identical cabinets which are bolted to a common base frame when installed. As the photograph of Fig. 4 shows, the transmitter is now installed in the transmitter house with removable blank enclosure panels adjacent on either side. Wiring channels have been provided in the floor and it is believed that, as increased service is required, WKJG-FM can increase its effective radiated power to 120 KW's without losing any time off the air from its present daily schedule of 18 hours.

Because of the proximity of the FM tower and eight-section Pylon to the four-element array of WKJG, it was necessary to provide a tuning unit at its base and feed the tower with power of such magnitude and phase as to cancel its effect on the four-element pattern. This was done by maintaining field strength meters at the required nulls and adjusting the phasing equipment during the construction of the tower and antenna.

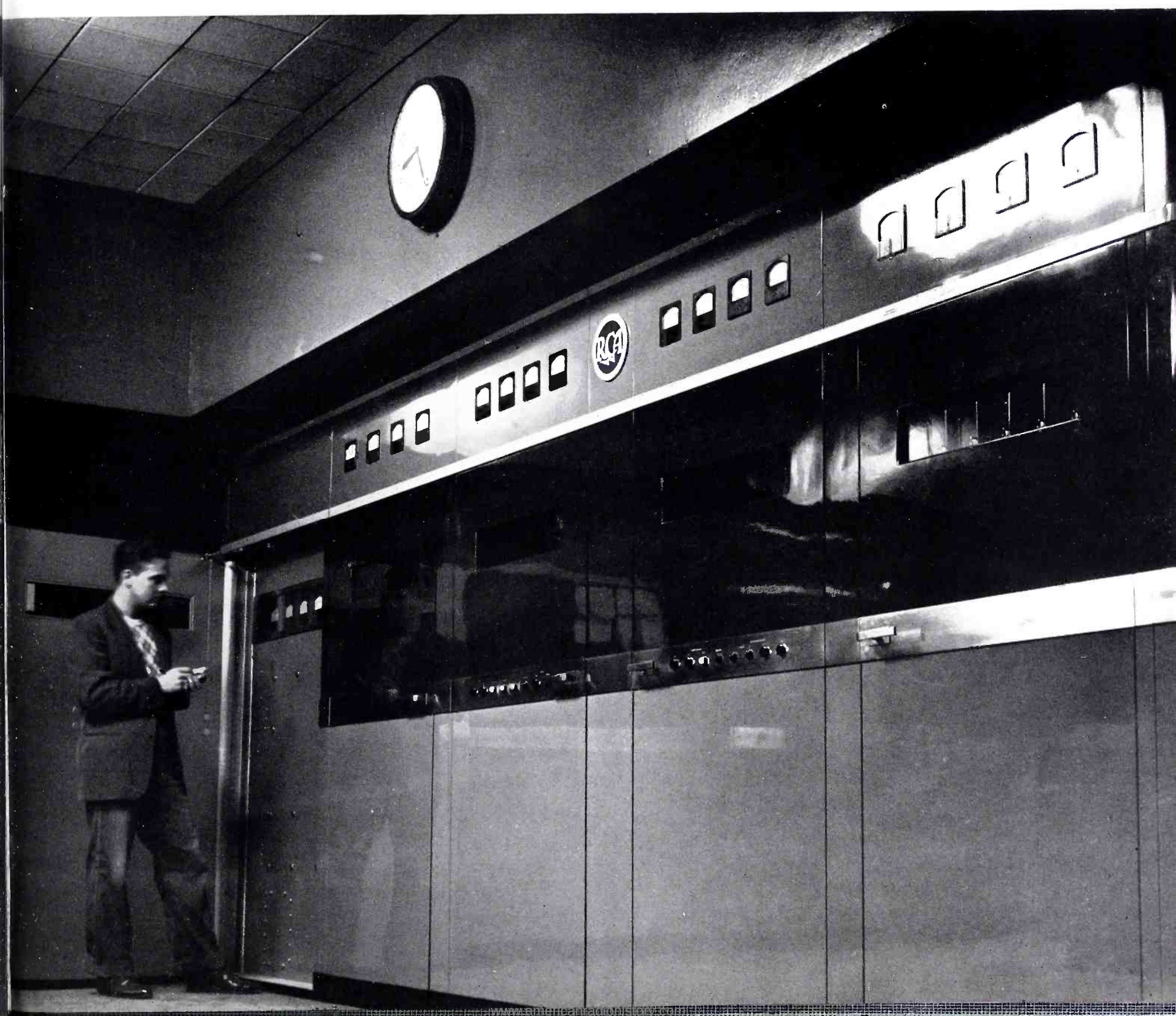
WKJG uses an RCA 5 KW AM transmitter (see Fig. 5) type BTA-5F, with separate custom built day and night phasing equipment which enables the engineers to make adjustments on the array with minimum difficulty, on 1380 KC. The switching of the phasing is controlled by a switch on the power control panel on the AM transmitter.

A custom wired standard RCA AM console provides complete supervisory control of both the AM and FM transmitters with facilities to monitor three incoming program lines, air monitor both the FM and AM transmitters, in addition to providing switching facilities for feeding any program line to either transmitter or feeding both transmitters from one program line.

Audio Equipment

Separate audio input facilities for each transmitter have been provided utilizing BA-3B line amplifiers, 86A1 limiting amplifiers and BA-4C monitoring amplifiers. WKJG—WKJG-FM complete and modern studios are located in downtown Fort Wayne and are entirely equipped with the latest RCA standard and custom-built

FIG. 5 (below). The sleek, business-like 5 KW AM transmitter is an RCA BTA-5F which is also flush mounted in a wall of the transmitter room.



equipment. A complete custom-built recorder has been installed in the recording control room which has two type 73-B recorders mounted either side of a special switching turret that has incorporated in it switching facilities to permit the use of any of six incoming lines on either recorder or both at the same time. Either of the program busses on the cutting unit may be monitored during operation.

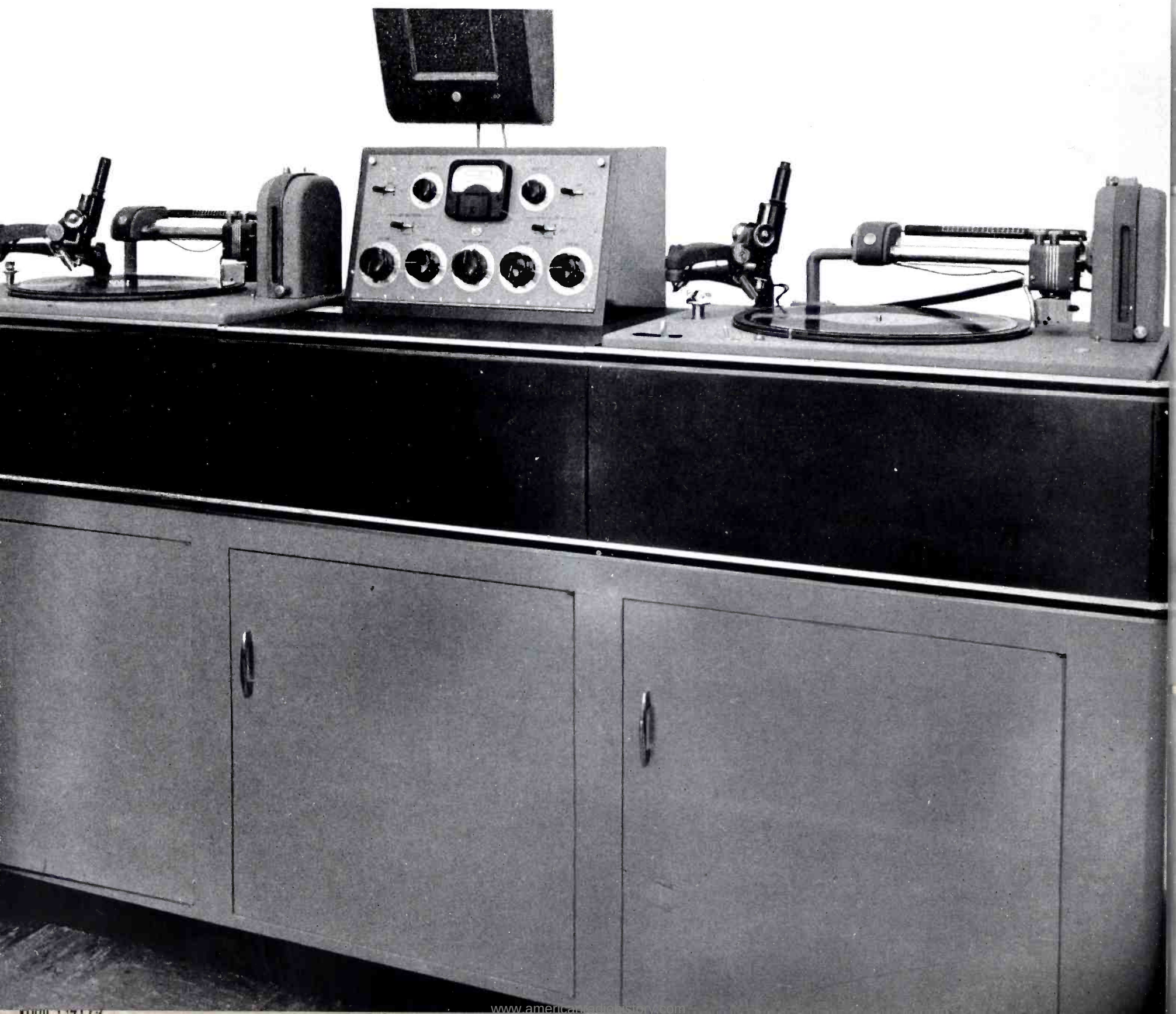
To conserve space all of the necessary amplifiers, filters, equalizers and other associated equipment are built into the consoles as well as providing space for the storage of recording blanks.

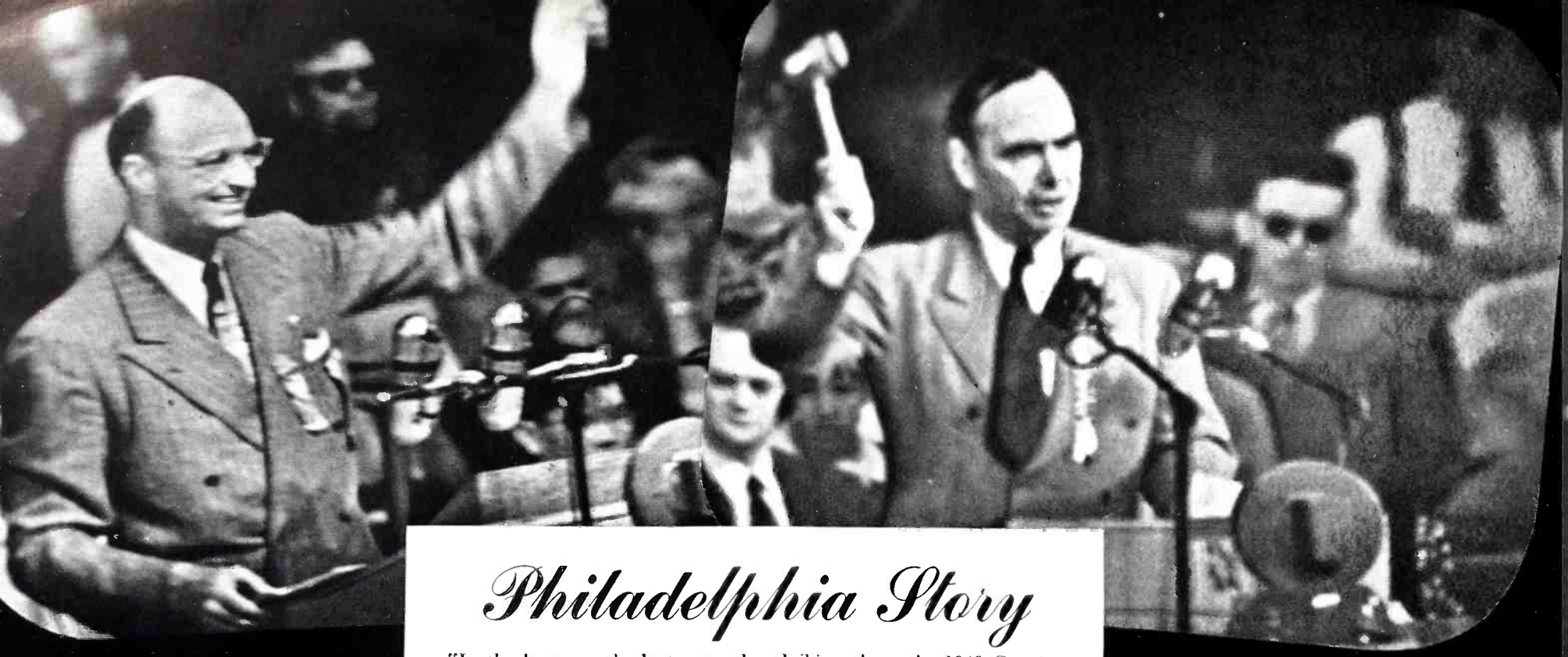
The control room was designed to eliminate rack space wherever possible and provides a maximum of free area for projected television facilities. Therefore, one BR-84, 84-inch rack, two RCA series 76 consolettes and a BCS-1A switching system are used. At WKJG studios, the BCS-1A master switching console is located in the main control room—and the RCA 76 series consolette alongside. A studio sub-control BCS-1A unit is temporarily used with its 76 series consolette in the control room, but will later be moved to its studio. Complete switching and control facilities are thus provided for AM, FM and network lines (and later may be utilized for TV sound). Complete control is provided for these three outgoing program lines, recording room feed and play back, 12 remote lines, and five studios. Two of the studios are equipped with 2 RCA type 70-D transcription turntables with cue-type gain controls on the output of the booster amplifier to allow studio mixing as well as cueing. All of the studios are completely sound conditioned to such an extent that over-all program noise level is maintained at —62 DB on AM and —67 DB on FM programs.

FIG. 6 (below). WKJG and WKJG-FM's custom-built RCA dual-recorder provides complete recording facilities with simultaneous operation possible.

FIG. 7 (right). This modern-appearing, brick-constructed building is located in downtown Fort Wayne and houses WKJG's standard and custom-built studio equipment.

FIG. 8 (right bottom). Complete switching and control of AM, FM and network are provided by this setup of RCA type 76-B5 consolette and BCS-1A switcher units.





Philadelphia Story

"In the long run the best-remembered thing about the 1948 Conventions will doubtless be television. Given the chance to duplicate radio's success with the 1924 convention ("24 votes for Underwood") the new television industry pulled an even more spectacular coup." — *LIFE, July 26, 1948.*

Photos on this page made from receiver screen by the New York Post

HOW TV STOLE THE SHOW

Millions of words have been written praising the fine job that TV and AM/FM did in covering the political conventions. And, countless predictions have been made concerning the effect this "goldfish bowl" development will have on the planning of future conventions. The temptation to strike a "we-were-there" or an "I-predict" attitude is considerable. But BROADCAST NEWS is dedicated to "operations" rather than programming or prophesying. Therefore, the pictures on the following pages and the running story which accompanies them, have been assembled with the idea of showing, not *what was done* at Philadelphia, but rather *how it was done.*

The TV section of this "how" story divides into two parts; the first concerning the operation of the pool, and the second the separate operations of the networks.

The pool was planned and operated, in the name of the "television broadcasting industry," by a committee composed of representatives of the four networks. Costs of the operation were prorated among the eighteen television stations which through coaxial cable or microwave relay were able to carry the program directly. Equipment required for the pool pickups and the technicians necessary for its operation were furnished by ABC, CBS, NBC, and Dumont.

The "pool" pickup covered everything that happened on the floor of Convention Hall, including all of the main meetings as well as activities on the floor itself immediately before and following the meetings. Six cameras were used, four being in the hall itself, and the other two on a mobile unit just outside the front entrance to Convention Hall (where it could pick up delegates entering and leaving).

Activities outside of Convention Hall, including those at Convention Headquarters in the Bellevue Stratford Hotel, the street parades, delegates and luminaries arriving at the railroad stations, and caucuses and press interviews at various locations in Philadelphia, were covered individually by the four networks (and WPIX on its own). In the following account these individual pickups are referred to as "non-pooled" telecasts.

Below—View of Convention Hall at the height of activities. Camera locations are indicated by arrows.

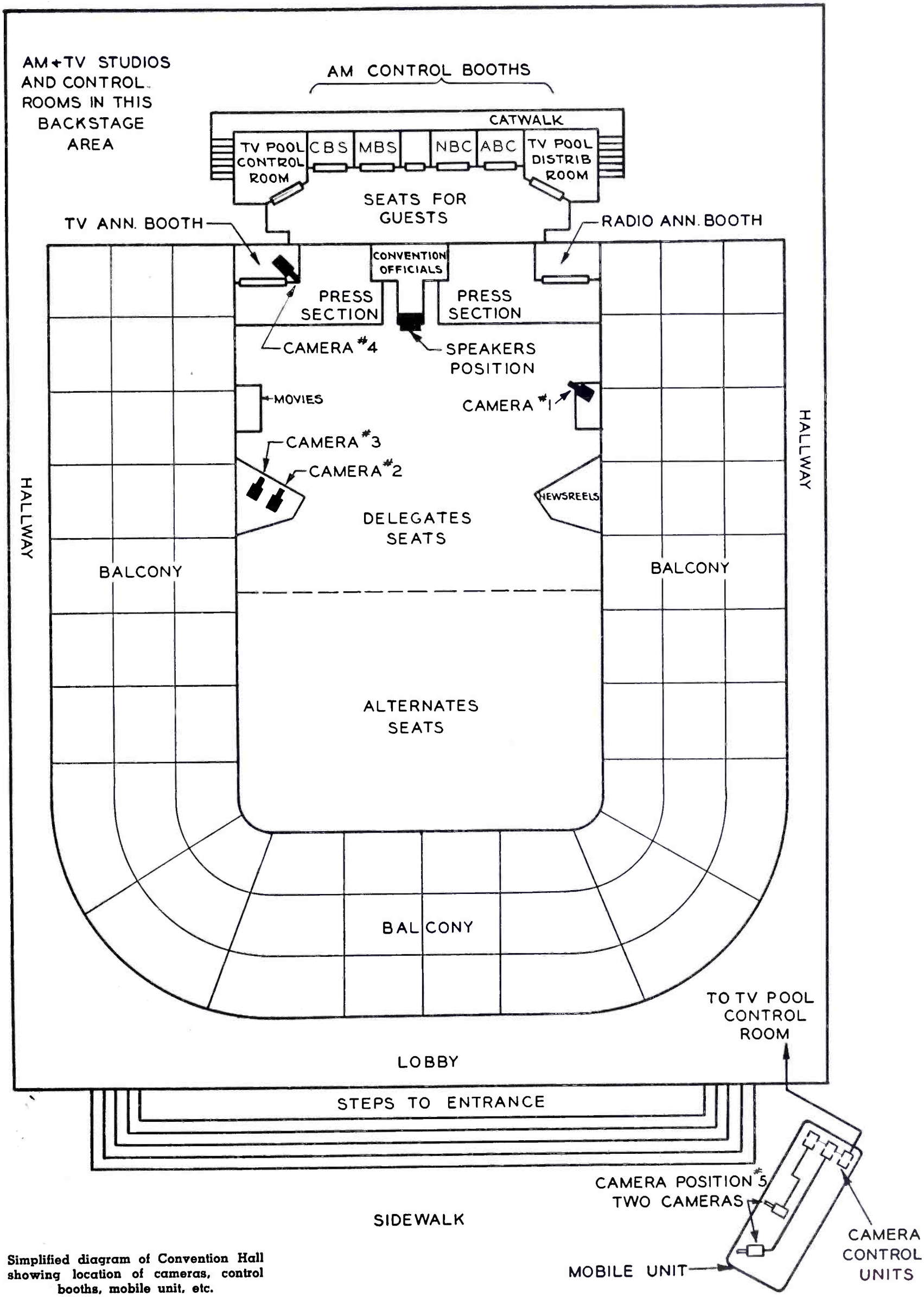
CONVENTION VIDEO - *ARRANGEMENT OF FACILITIES*

The general arrangement of facilities for radio and television is illustrated by the diagram on the opposite page and by the photograph at the bottom of this page. In order to provide the networks with control booths that would have a view of the proceedings, an elevated platform was erected across the rear of the regular stage of the Convention Hall. On this platform were built seven small control booths, each with a window providing a good view of the auditorium. Four of these booths were assigned to the networks for their AM/FM control points. These are easily identified in the photograph below. The small control booth in the very center was reserved for the convention director. At either end (see below) of the platform were larger booths with windows at an angle. These were assigned to TV—the one on the left being used as the pool control room and that on the right as the TV distribution room. A separate booth, in front of and to the left of the stage was provided for the TV commentator. This booth, which is not visible in the photograph below, but is shown in several illustrations on page 67, was so situated as to have a very good view of the proceedings.

Obtaining good positions for the TV cameras was something of a problem. Four small platforms, built out from the balcony at strategic points (see diagram opposite) were available. However, the space on these had to be divided with newsreel and press photographic services. The final arrangement, worked out by a series of compromises, placed the TV cameras as indicated on the diagram. Cameras #1, #2 and #3 were located on the balcony platforms. These positions are indicated on the overall view of the hall shown on page 59. Camera #4 was located on top of the TV commentator's booth. Closeups of the individual camera positions are shown on following pages.

The back stage area at Convention Hall is several stories high with the greater part of the space being divided into small rooms suitable for use as offices or for small gatherings. Each of the networks was assigned several of these rooms. A typical network arrangement consisted of using one room as a TV studio, another as a combined news room and office, and a third as a TV control room. In addition, each network used one or more rooms as AM/FM studios, one as an AM/FM control booth, one as a news room and, in some instances, one as a recording room.

CONTROL BOOTHS for the networks were erected on an elevated platform at the rear of the regular stage. AM/FM Booths are in the center. TV control room is at one end and distribution room at the other end.



Simplified diagram of Convention Hall showing location of cameras, control booths, mobile unit, etc.

CONVENTION VIDEO - *OPERATION OF THE TV POOL*

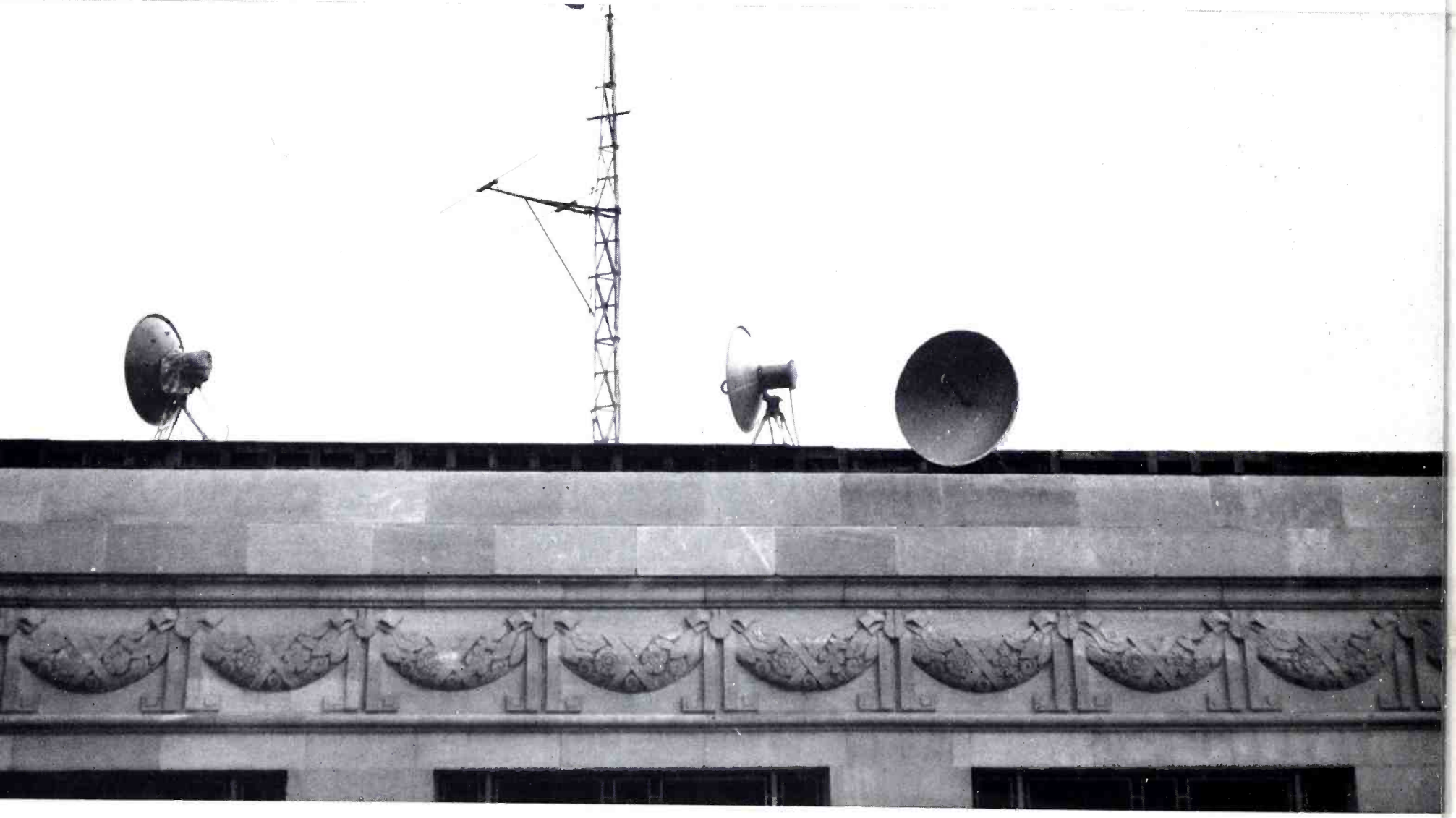
The general arrangement of the pool facilities is shown in the simplified diagram on the opposite page. The four cameras in the auditorium of the hall were fed into camera control units located in the pool control room. Camera control units for the cameras on the mobile unit were located in the unit itself. A switching unit at this point allowed the output of either of these to be fed to the pool control. Thus the director in the pool control room could select any one of five pictures for feed to the outgoing line. From the control room the line ran to a distribution room. At this point distribution amplifiers provided separate feeds; one to the AT&T coaxial cable; one to each of the individual network control rooms; and others to a number of video monitoring points, one of which was the TV commentator's booth overlooking the hall.

The arrangement of network lines is also shown in the diagram opposite. Stations in Philadelphia, New York, Baltimore, Washington, and Richmond were fed by AT&T Coax; those in Boston by AT&T Microwave from New York. Schenectady and New Haven were fed from New York key stations by private microwave. NBC stations had an alternative feed by means of a microwave network made up of relays operated by NBC and its affiliates.

While the pool setup provided all stations with complete coverage of Convention Hall proceedings it did not allow for the side activities—the coverage of which is so dear to the hearts of program planners. All of the networks, therefore, and WPIX on its own, set up additional independent facilities for covering interviews, caucases, parades, and the like. Generally these took the form of small separate studios at the Convention Hall, additional studios at the Bellevue Stratford Hotel (Convention Headquarters) and one or more mobile units with microwave relays to hook them all up.

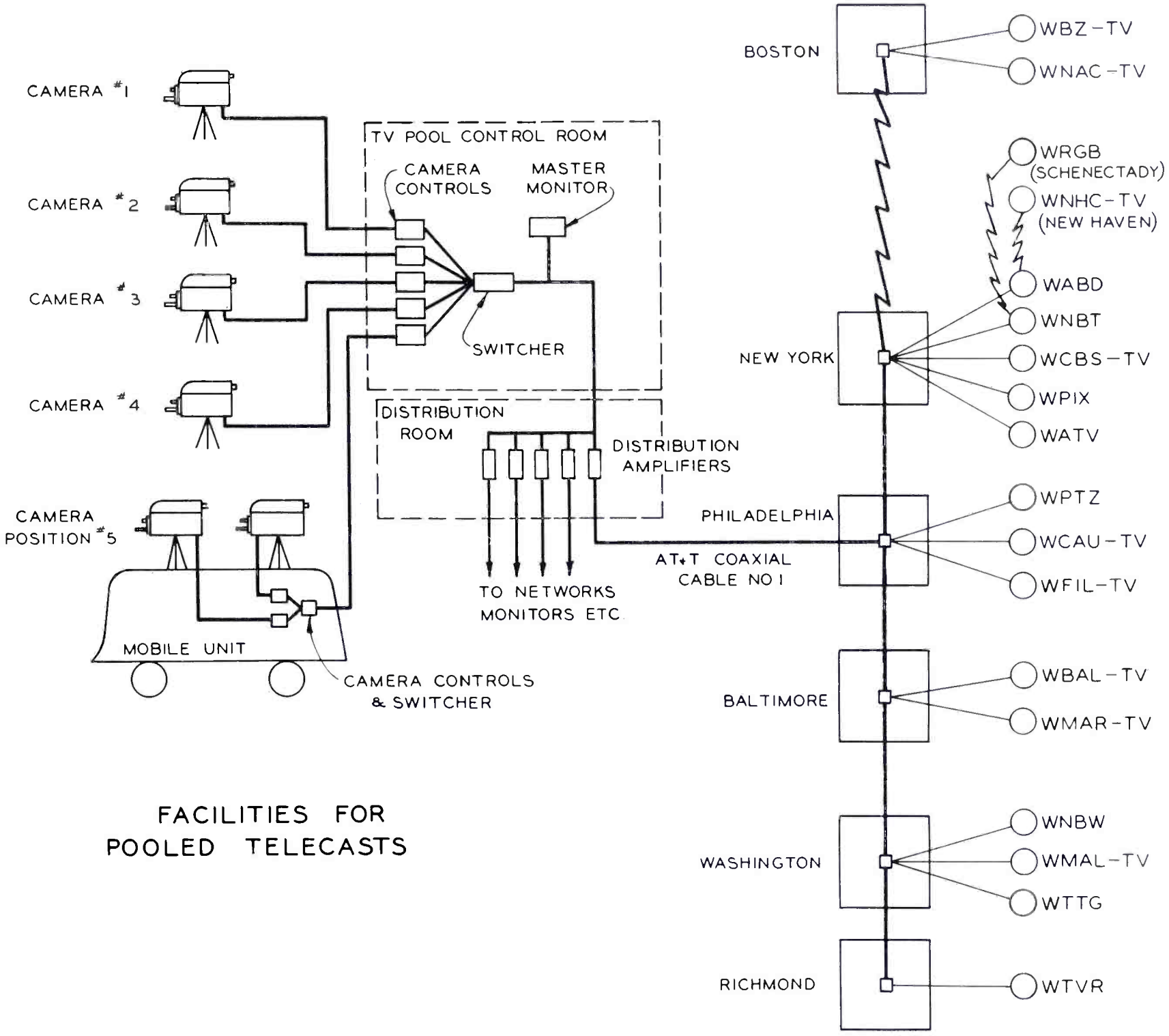
The diagram at the bottom of the opposite page shows how these individual facilities were used. NBC piped its pickups over its own microwave. ABC, CBS, Dumont and WPIX shared the use of a second coaxial cable on a prearranged time schedule. Thus, each of the four had the exclusive use of Coax # 2 an average of fifteen minutes out of each hour, during which time it could feed its affiliates with its own independently produced program. It was these fifteen minute segments which, effectively used for interviews and mobile pickups, added so much spice to the overall video programs.

Equipment for the pool was furnished by the networks according to a prearranged plan which took into account the availability of relatively scarce items and the fact that each network had to hold out enough equipment for its own individual operation. In the latter effort the networks were greatly aided by their Philadelphia affiliates Crews from WCAU-TV (for CBS), WFIL-TV (for ABC) and WPTZ (for NBC) did outstanding jobs—particularly on remotes.

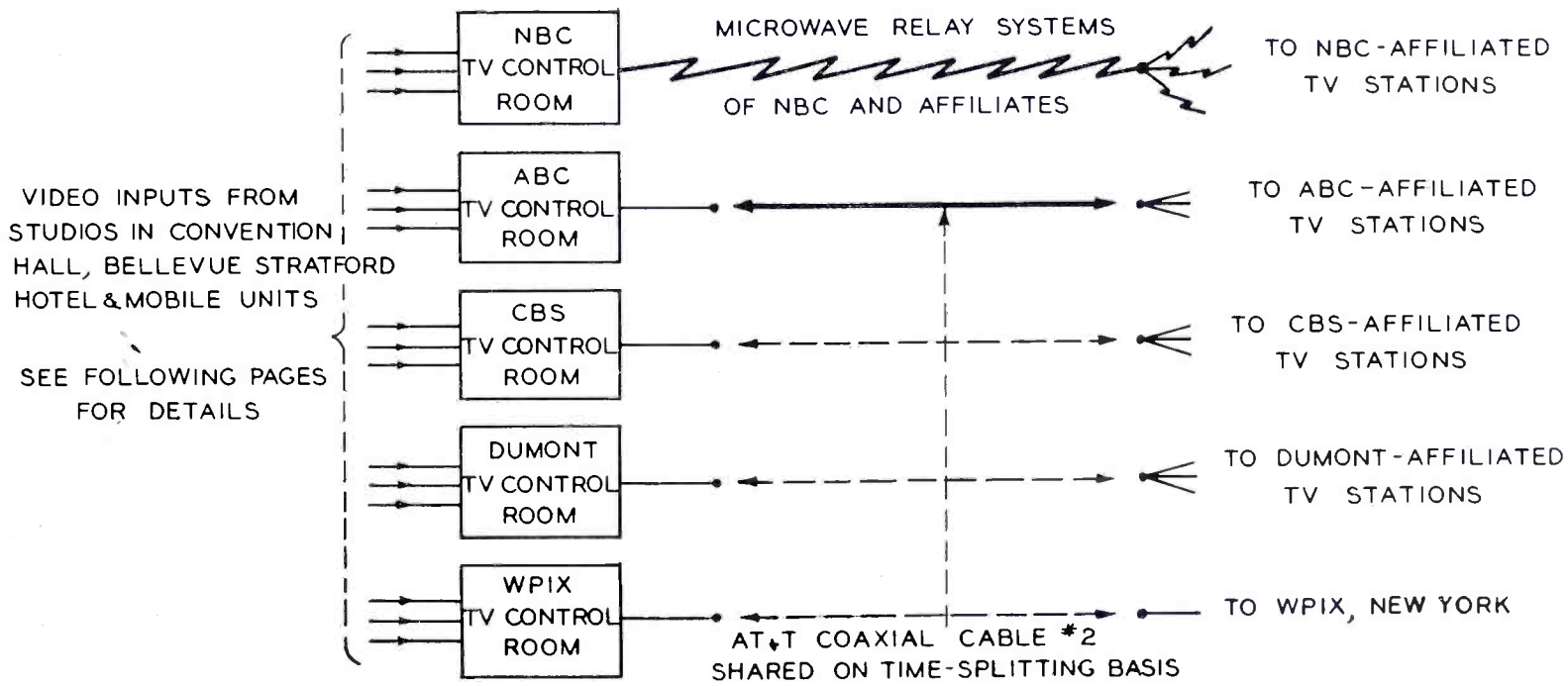


MICROWAVE RELAYS, most of them using standard RCA equipment units, were employed between the various pickup points in Philadelphia. Parabolas on the roof of Convention Hall are shown here. The two on the left are NBC and ABC receiver units on line from the hotel. Parabola on right is NBC transmitter unit directed to relay system terminal at Wyndmoor. Structure on tower is old low-frequency antenna.

FACILITIES FOR POOLED TELECASTS

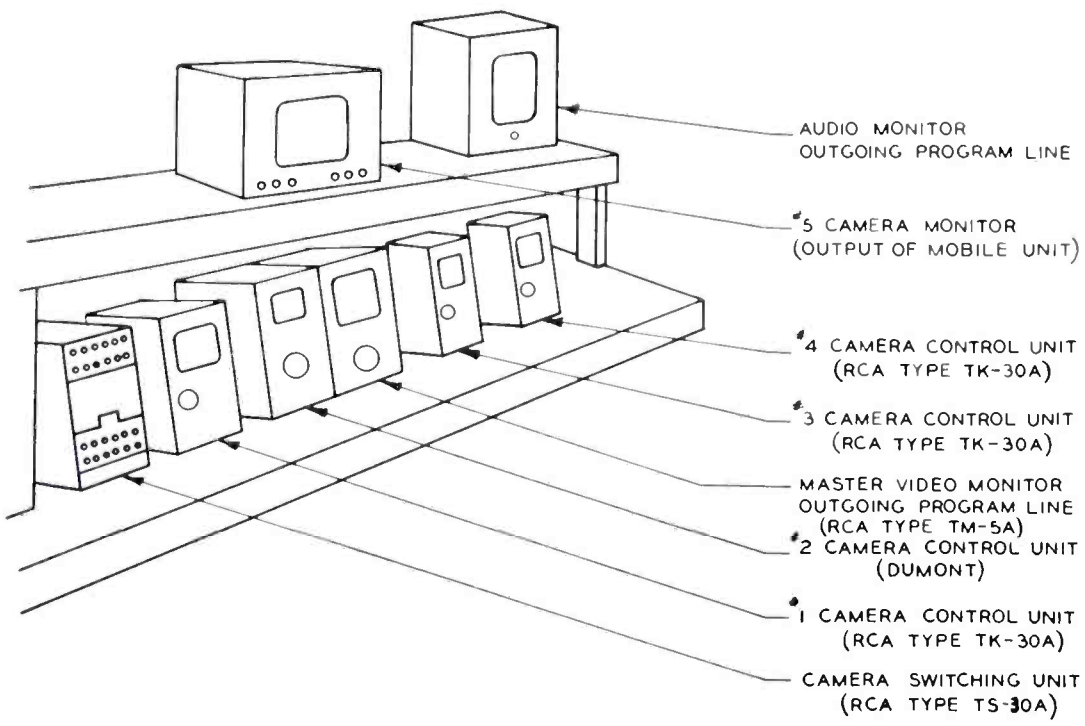


FACILITIES FOR NON-POOLED TELECASTS



CONVENTION VIDEO - *THE POOL CONTROL ROOM*

Center of the TV pool operation was the pool control room located in the large booth at the far left of the elevated stage structure (see illustration at bottom of page 60). Camera control units for the four cameras in the auditorium proper were located here. In addition, the video output of the switching unit in the mobile unit at the front entrance was brought to this point, and displayed on a monitor. Thus the program director had in front of him five different pictures from which he could select. The five corresponding video signals were fed into a standard switching unit (extreme left in illustration below). The operator of this unit switched the desired camera output to the outgoing line at the instruction of the director. A monitor across the outgoing line indicated the picture being transmitted at all times. Equivalent facilities for switching and monitoring audio inputs were provided. The arrangement of equipment and of operating personnel is shown below.

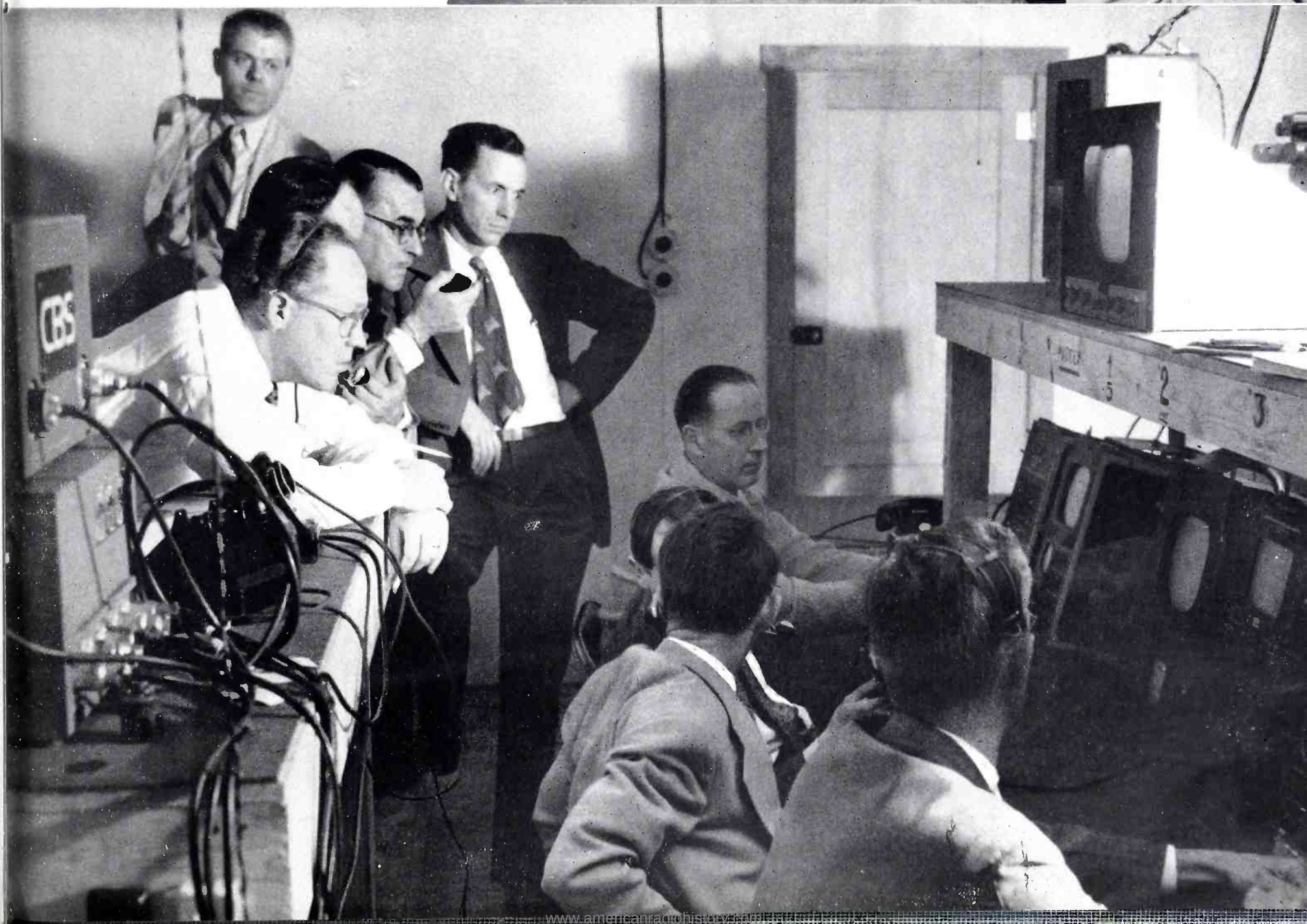


VIDEO EQUIPMENT in the TV pool control room is shown in the above view. A temporary wood and masonite desk was constructed for supporting the main video units at desk height. A shelf above these was provided for the monitors. The camera control units were mounted at a slight angle to facilitate viewing from the elevated directors platform behind the camera operators. The arrangement of equipment and personnel was laid out with the intention of giving the director a view of both the monitors and the actual activities on the floor. However, it was soon found that the bright lights shining in the window were too distracting and it was necessary to place a screen over the window during operation.

IDENTIFICATION OF EQUIPMENT is provided by the diagram at the left in which the video units in the photograph above are sketched and labeled so that they may be easily identified. Camera control units were furnished and operated, for the pool, by the network supplying the cameras themselves (see preceeding pages). Other equipment was furnished on a co-operative basis. All the video units shown, except one camera control and one monitor, are standard RCA field type television equipments.

DIRECTORS POSITION in the TV pool control room looked like this. Program director, assistant program director and technical director, sitting on this elevated platform, could see the camera monitors over the heads of the camera operators on the lower level. At the far end of the directors' table is the audio operator's position. Audio inputs from either the TV commentator's booth, the floor pickup (pooled) or the truck (on interviews) could be selected for transmission with the TV program. Audio equipment units are RCA OP6 and OP7 remote amplifiers.

PROGRAM DIRECTORS ALTERNATED, with one network furnishing directors for the first day, another for the second day and so on. The illustration below, taken on ABC's day, shows Burke Crotty (in white shirt), ABC director of special events, directing the activity. Man with pipe is Ed Ingle, radio director of GOP Convention. Standing in center is Ray Bowley, chief engineer of WPTZ.

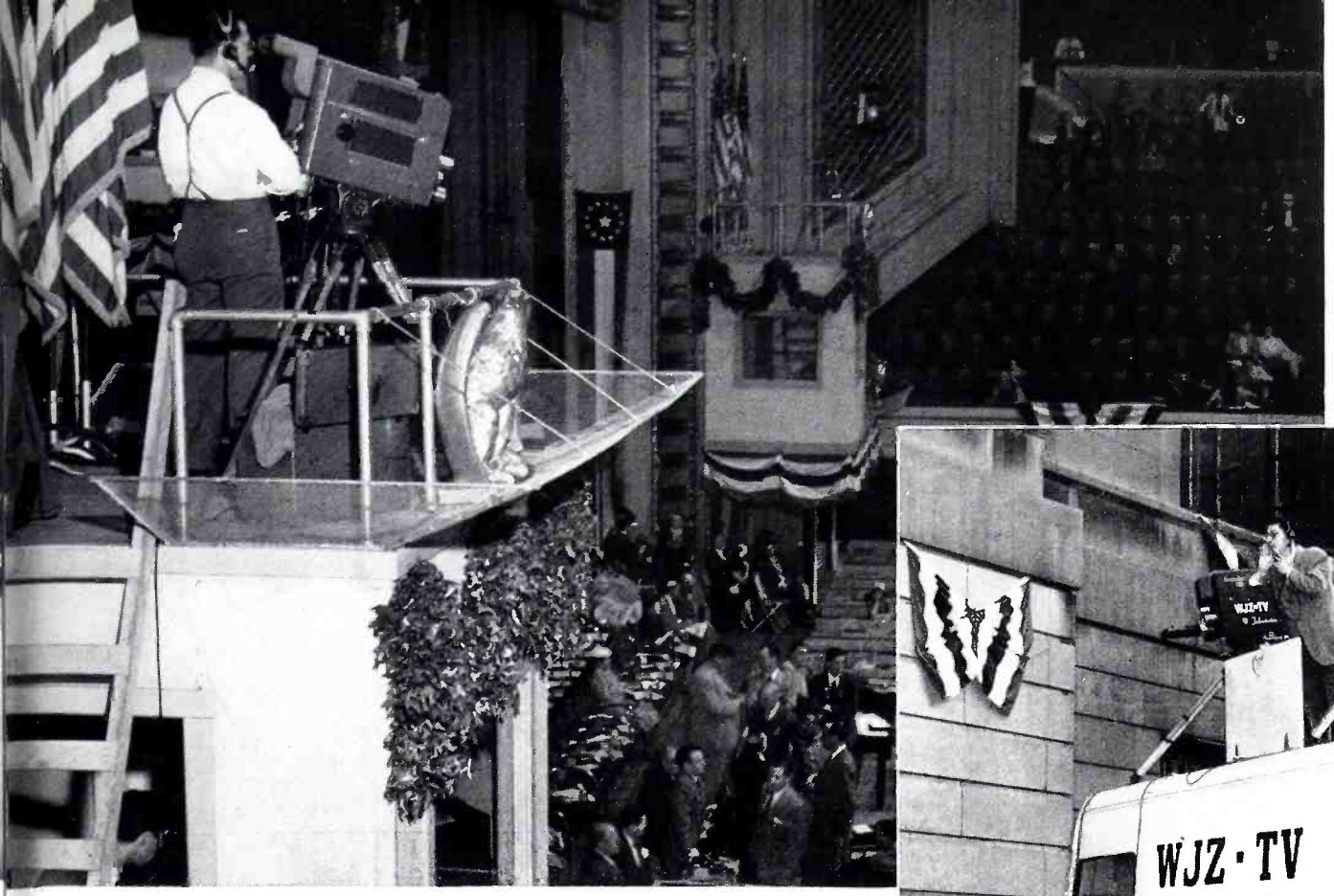


CONVENTION VIDEO-*LOCATION OF THE CAMERAS*

NO. 1 CAMERA POSITION, on a small platform built out from the balcony on the right side of the hall, is shown in the picture at the right. This position was well-forward and quite close to the rostrum, so that it presented a closeup side view of the speaker, a good view of the press section and stage and, with camera turned around, a view of the whole rear of the auditorium. Camera is an RCA TK-30A, furnished by CBS, operated for the pool by CBS cameramen.

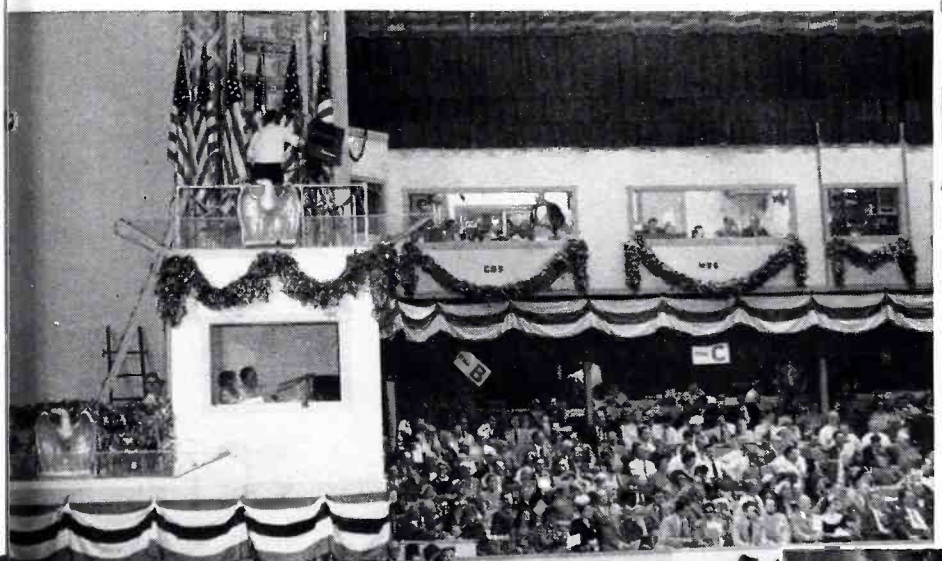
NO. 2 AND NO. 3 CAMERA POSITIONS, on the larger platform built out from the balcony on the left side of the hall, are shown in this view. This platform, which is somewhat further back (see diagram on preceeding page), was shared with the photographic services whose large view-cameras line the rail in front of the TV cameras. Because of the primary importance of the shot obtained from this point, two TV cameras were located here. The one on the left is a Dumont camera; that on the right is an RCA TK-30A furnished by NBC and operated for the pool by an NBC cameraman.

SCENE FROM NO. 3 CAMERA POSITION is illustrated by the photograph at the right which was taken from a position just behind the No. 3 Camera (which may be seen at the right of this picture). From this location an almost straight on view of the speakers rostrum could be obtained and it was this shot which was used during most of the time when the center of activity was on the rostrum. Most of the kinescope views on page 58 are from this position.

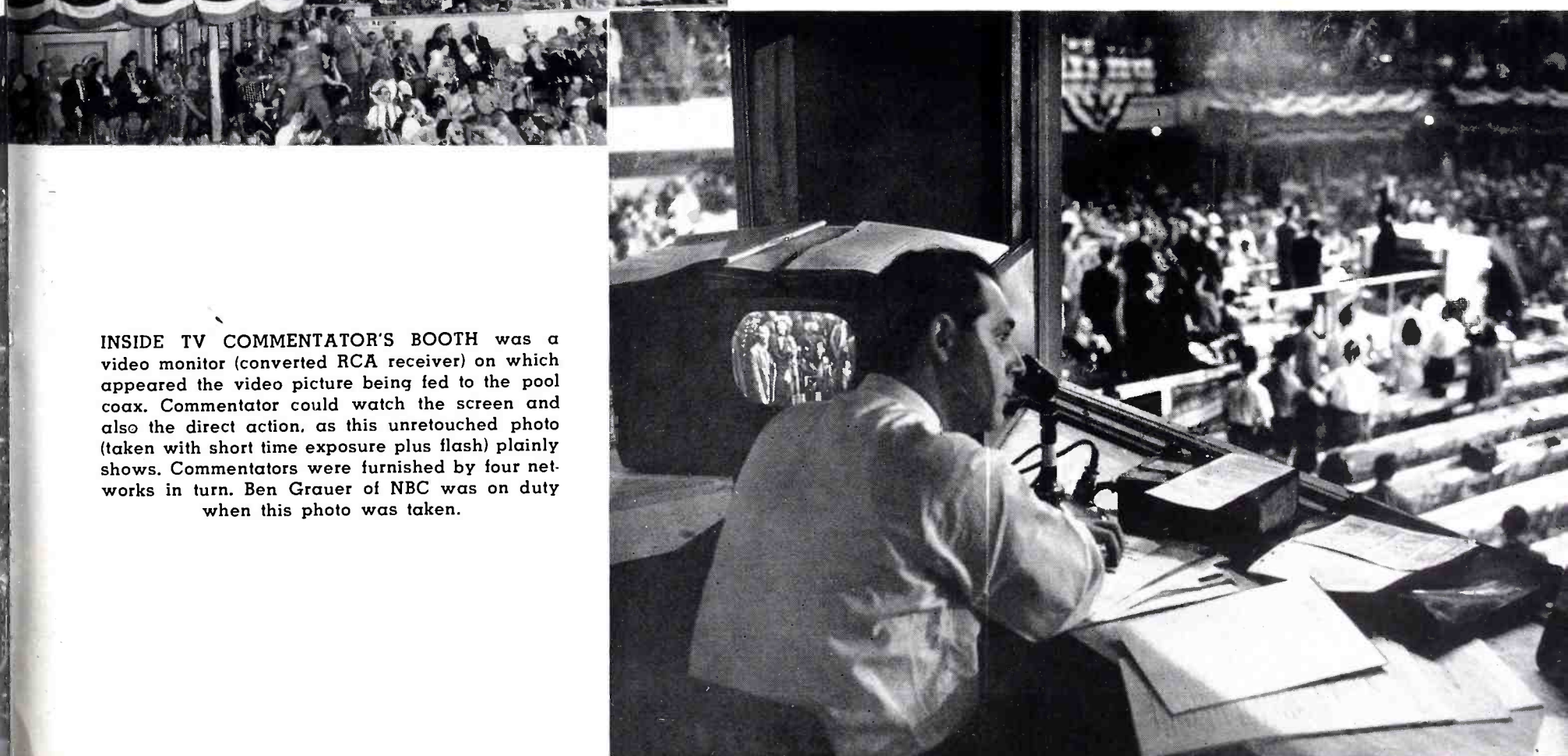


NO. 4 CAMERA POSITION (at left) was on top of the booth built for the TV commentator. This elevated position, at the left front of the stage, commanded an exceptional view of the whole hall (approximately the same view as that shown in the illustration at the bottom of page 59). It was particularly useful when it was desired to show overall activity on the floor of the hall. Camera is an RCA TK-30A, furnished by NBC and operated, for the pool, by an NBC cameraman.

NO. 5 CAMERA POSITION (at right) was on a mobile TV unit just to the right of the main entrance. This was used just before meetings to show delegates arriving. Truck is an RCA Type TJ-50A Mobile Unit; Cameras are RCA TK-30A's. Equipment was furnished by ABC and operated, for the pool, by ABC technicians.

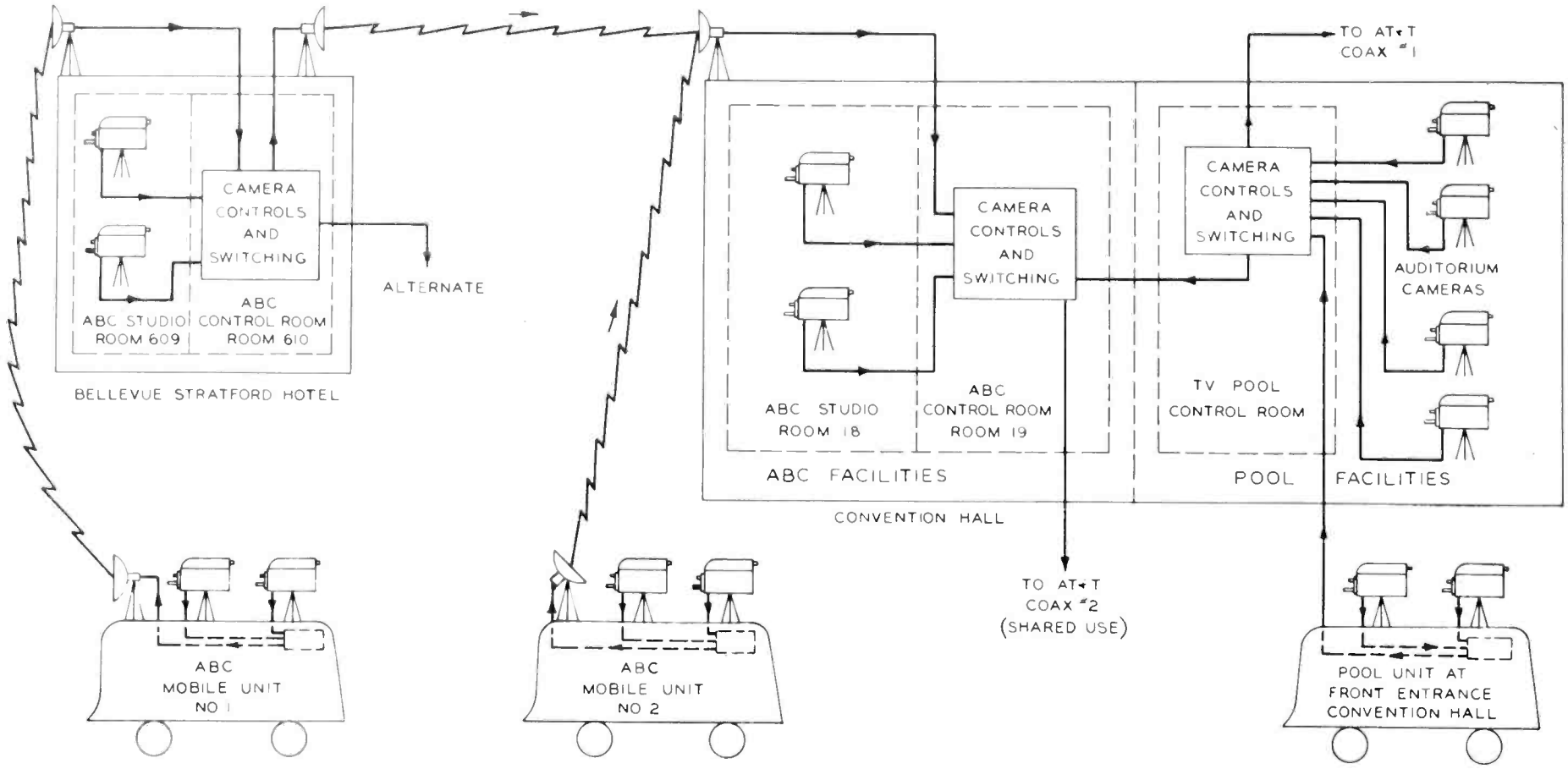


TV COMMENTATORS BOOTH shown in the picture at the left (and also in the picture at the top of the page) was designed to provide the commentator with a convenient working position from which he could easily view the entire proceedings.



INSIDE TV COMMENTATOR'S BOOTH was a video monitor (converted RCA receiver) on which appeared the video picture being fed to the pool coax. Commentator could watch the screen and also the direct action, as this unretouched photo (taken with short time exposure plus flash) plainly shows. Commentators were furnished by four networks in turn. Ben Grauer of NBC was on duty when this photo was taken.

CONVENTION VIDEO - *ABC'S EQUIPMENT SETUP*



ABC TV FACILITIES DIAGRAM, above, shows that ABC had available for "non-pooled" (i.e. exclusive ABC) telecasts, a TV studio and a TV control room in Convention Hall, and a TV studio and TV control room at the Bellevue-Stratford Hotel. In addition, two mobile units (not counting the WJZ-TV unit loaned to the pool) were used. RCA Microwave Relay equipment was employed from Hotel to Convention Hall and from mobile units to Hotel or Hall. AT&T's Coax #2 could be fed from either the hotel or Convention Hall control rooms.

ABC's HOTEL STUDIO, shown at right, was used for interviews and news telecasts. Equipment included two RCA TK-30A Cameras, 44-BX Microphones and floor-type lights.

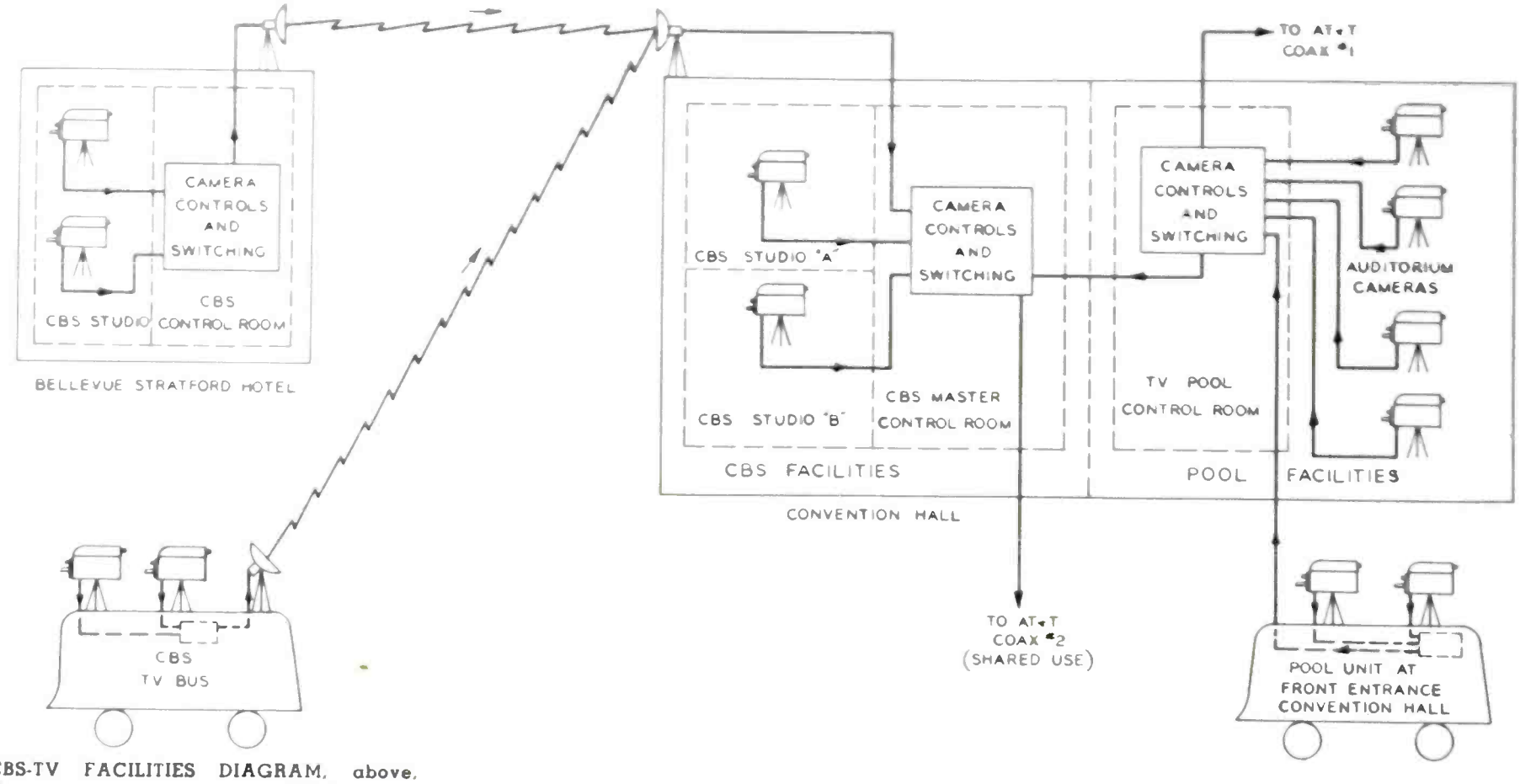
ABC's HOTEL CONTROL ROOM, shown at left during installation, was furnished with standard RCA TV equipment. Units shown are, from left to right, TTR-1A Microwave Transmitter (control only), WO-79A Oscilloscope, TS-30A Switcher, and two TK-30A Camera Controls. On the shelf above, only partly visible in this view, is a modified RCA receiver used as a master monitor on the outgoing line.

ABC's CONVENTION HALL CONTROL ROOM, shown at left, had approximately the same equipment setup. On lower shelf are WO-79A Oscilloscope, TA-1A Distribution Amplifier, TS-30A Switching Unit and two TK-30A Camera Controls (for the two TK-30A Cameras in the ABC Convention Hall Studio, which is not shown). On the upper shelf are three converted receivers used as video monitors on (a) the microwave line input from the hotel, (b) the pool program and (c) the outgoing line to AT&T Coax #2. All equipment units shown, except the small receiver, are standard RCA TV units.

ABC's GEORGE MILNE, chief engineer of the network, directed ABC's technical operations, both TV and AM/FM. In this view Mr. Milne, at right, is talking with Paul Mowrey, national director of television for ABC.

ABC's MOBILE UNITS lined up in front of Convention Hall give some impression of the way the networks made their plans to cover every activity associated with the Convention. The WENR-TV, WFIL-TV and WJZ-TV trucks are standard RCA TJ-50A Mobile Units. The smaller WJZ-TV truck is an auxiliary. Next to it is WMAL-TV's truck, and at the extreme right a station wagon equipped as an AM/FM mobile unit.

CONVENTION VIDEO - *CBS' EQUIPMENT SETUP*



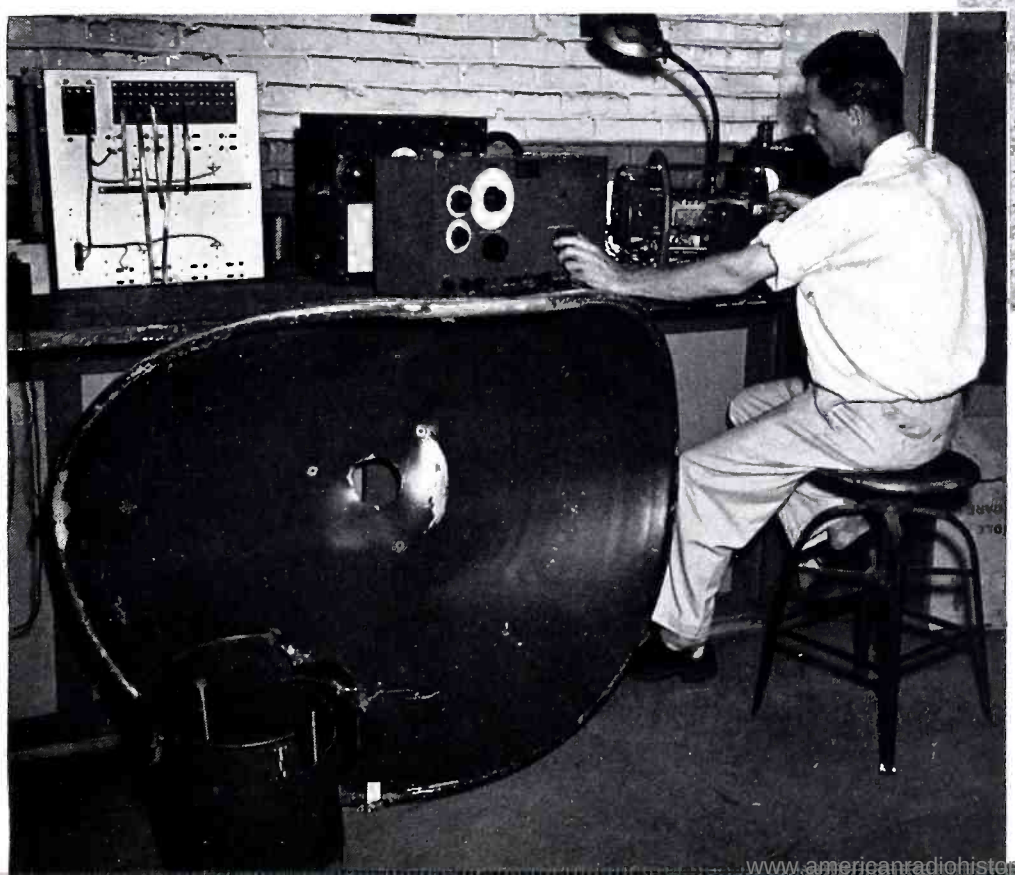
CBS-TV FACILITIES DIAGRAM, above, shows arrangement used by CBS for "non-pooled" (i.e. exclusive CBS) telecasts fed to CBS affiliated stations over AT&T Coax #2. For interviews, news casts, etc., CBS had two studios in Convention Hall and a third at the Bellevue-Stratford Hotel. At each point there was also a control booth in which were located camera controls, switching facilities and monitors. Program was fed from the Hotel and the TV Bus to the Convention Hall by means of standard RCA microwave relay equipment.

CBS's CONVENTION HALL STUDIO (above) was used largely for interviews and news telecasts. Here Douglas Edwards, CBS newscaster, faces the RCA TK-30A Camera in Studio A.

CBS "HANDY TALKIE" was used by newsman Larry Leseur to interview Mrs. Earl Warren, wife of the GOP Vice Presidential nominee, immediately after the convention had nominated her husband.

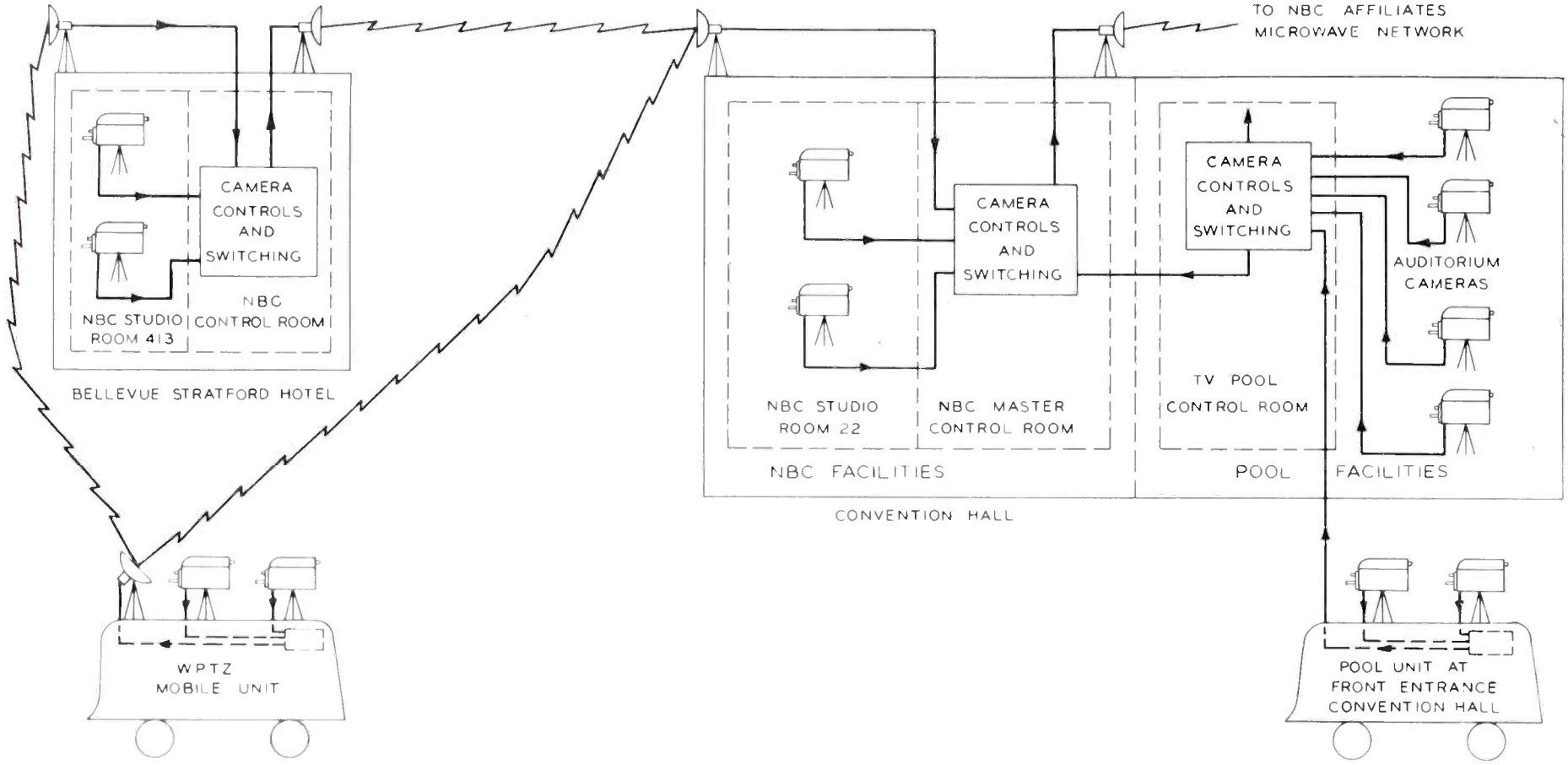
CBS's CONVENTION HALL CONTROL ROOM is shown in action in the view above. Audio operator, technical director and video operator sit directly in front of the equipment. Fred Rickey, CBS program director, is the man with the telephone. CBS used RCA equipment exclusively in its video pickups. In the view above, the audio units, at left, are RCA OP6 and OP7 amplifiers. Next on the right (with the side cover off) is the TS-30A Switcher. Beyond this are two TK-30A Camera Controls with a TM-5A Master Monitor between. On the shelf above is a modified RCA Receiver used as a monitor on the "pool" line.

CBS's PAUL WITTLIG, manager of technical television operations, is shown at right with the RCA microwave receiver set up on the roof of Convention Hall to receive programs from the CBS control room in the Bellevue-Stratford Hotel.



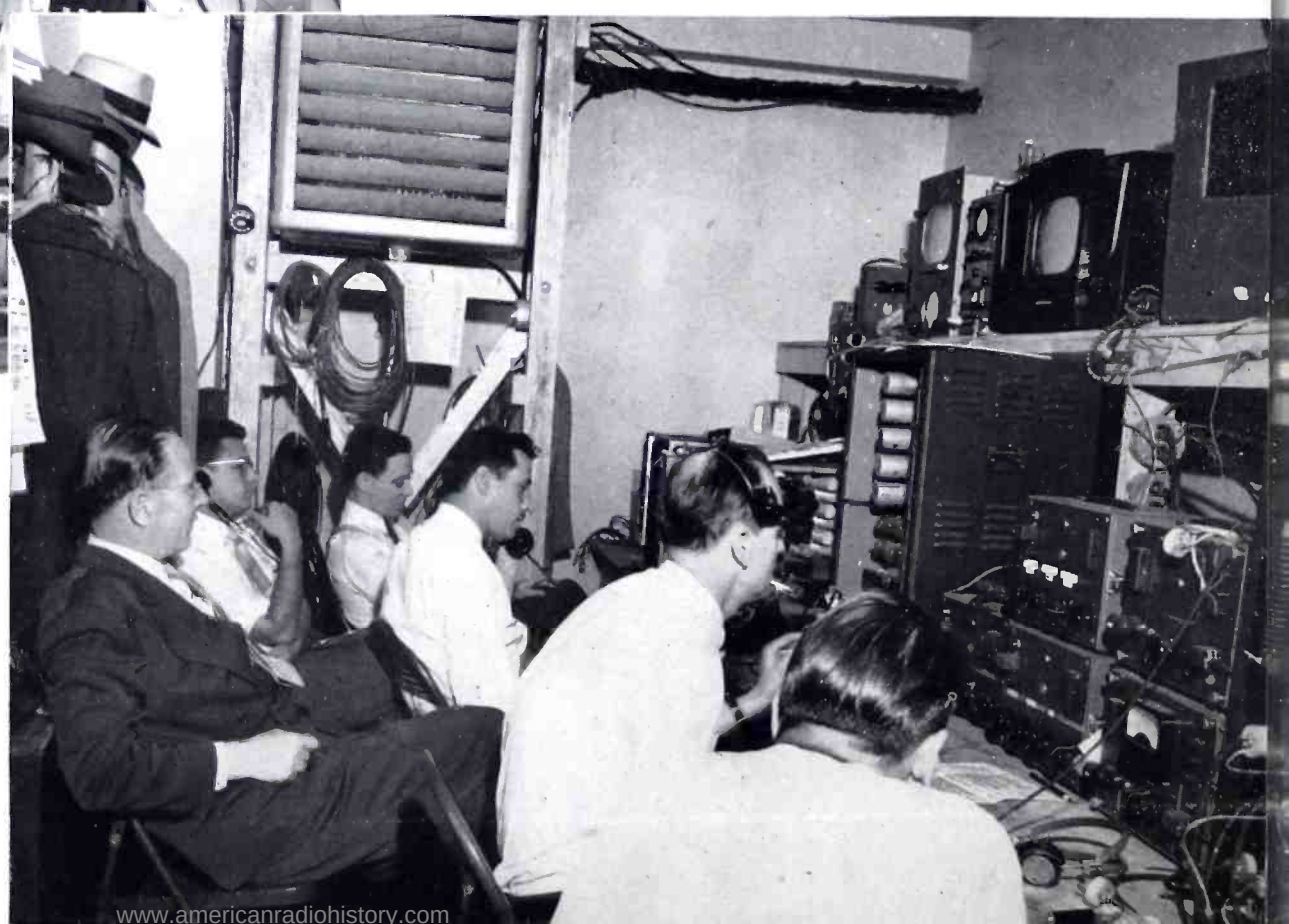
SAME RECEIVER after it was blown off of the 5 stories high roof by terrific storm. Parabola and can were badly twisted, and the latter had to be cut to remove chassis inside. However, when chassis was tested in RCA Laboratory (left) it was found to be still operative.

CONVENTION VIDEO - *NBC'S EQUIPMENT SETUP*

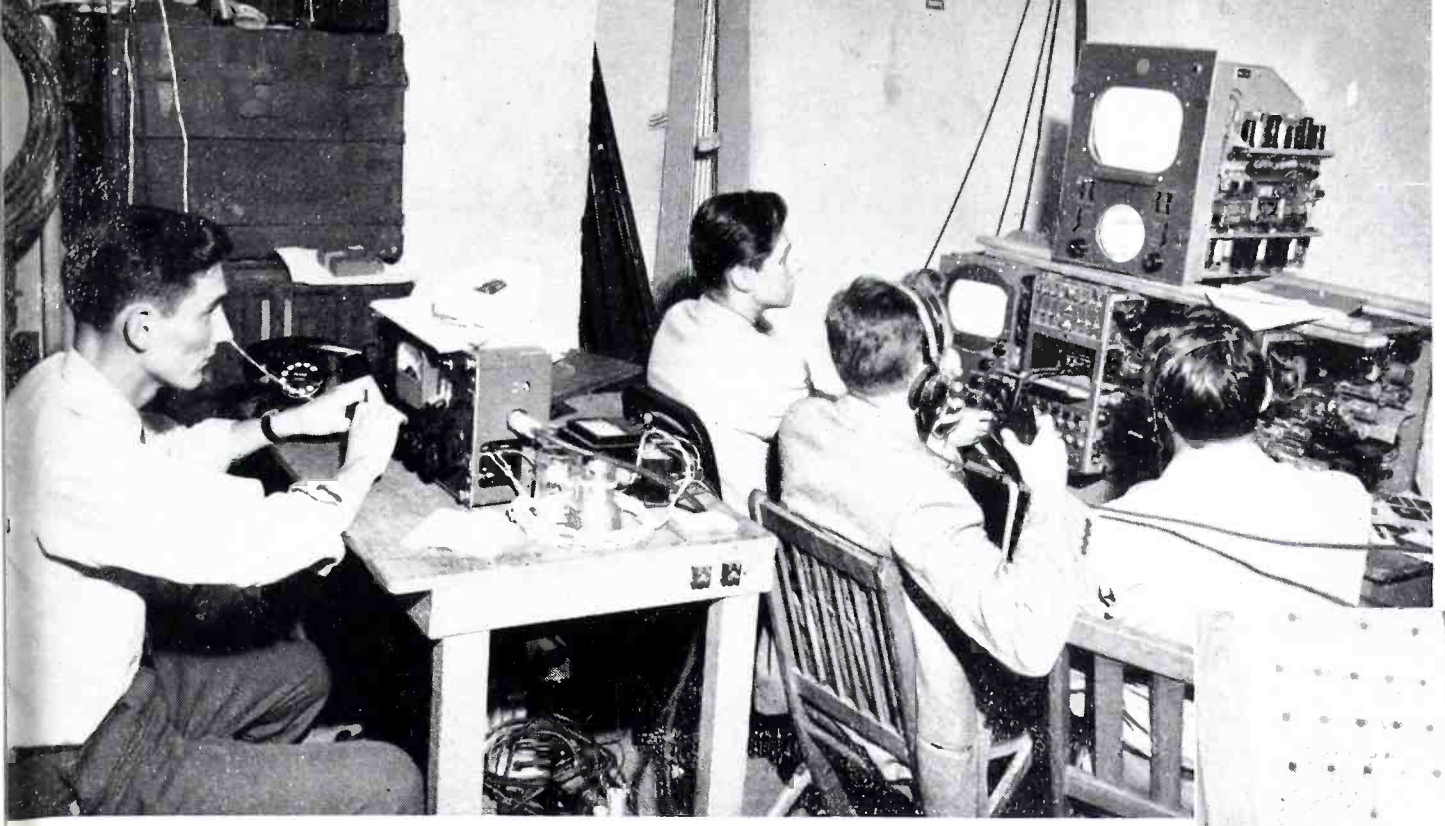


NBC TV FACILITIES DIAGRAM, above, shows arrangement of facilities for feeding both "pooled" and "non-pooled" programs to NBC-affiliated stations. NBC had a TV studio and control room at the Bellevue-Stratford Hotel, another studio (the widely-publicized "Room 22") and control room at Convention Hall. The latter functioned as the main control point. Programs were brought into it from the hotel, from the Mobile Unit (WPTZ's) and from the pool control room. Network was fed by means of RCA microwave equipment to WPTZ transmitter site at Wyndmoor, and hence by regular NBC microwave network to affiliated stations. Thus, NBC stations could take "pool" program by either microwave or coax.

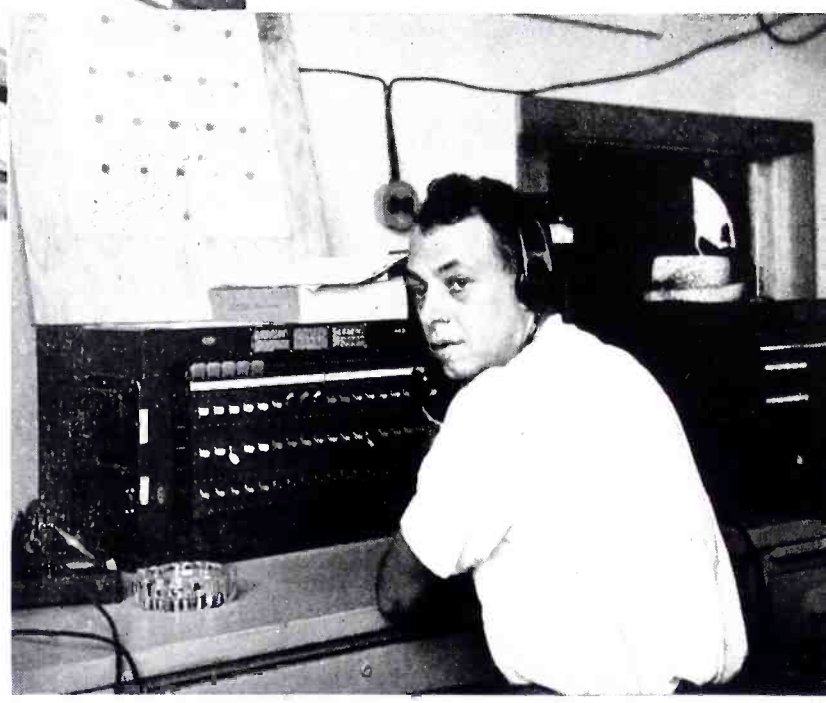
"ROOM 22." NBC's studio at Convention Hall, is shown above in an off moment—quite different from the way most televiewers saw it. Cameras are the ubiquitous RCA TK-30A's.



NBC's CONVENTION HALL CONTROL ROOM is shown here in action. Video equipment, all RCA, is at far end. Cabinet in center houses distribution amplifier and power supplies. At lower right is audio position utilizing two OP6's and two OP7's.



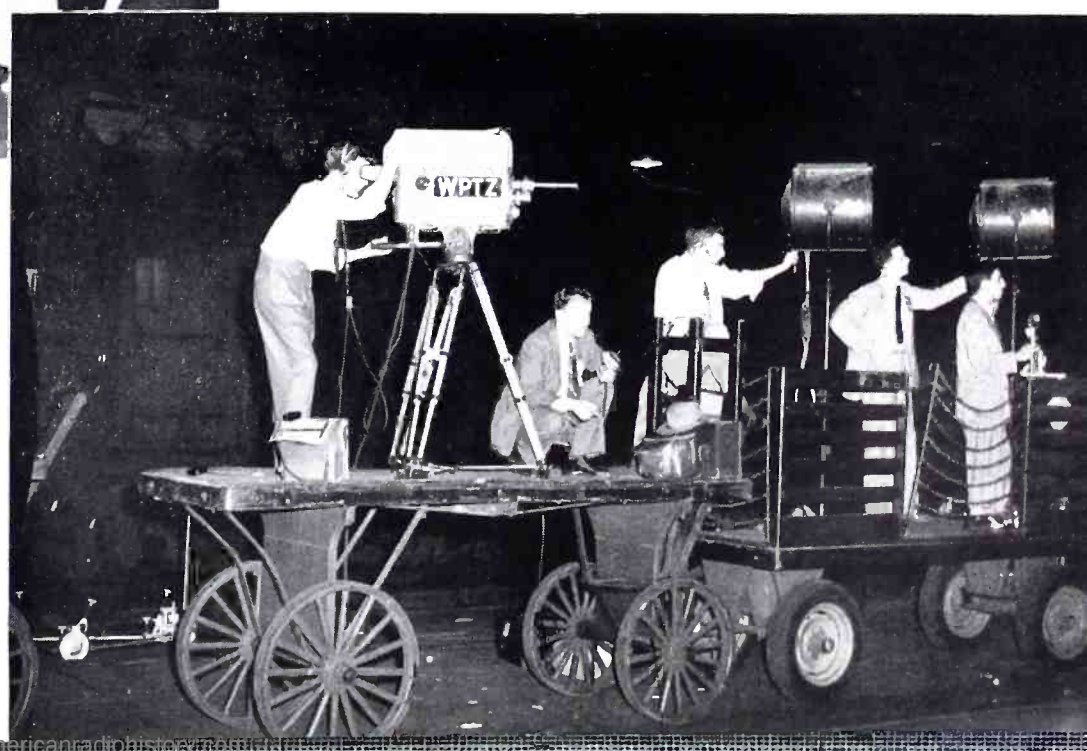
NBC's HOTEL CONTROL ROOM is shown at the left. Video units (at right of picture) include two RCA TK-30A Camera Control Units, with a TS-30A Switcher between, and a TM-5A Master Monitor on top. Audio position, at left, features an OP7.



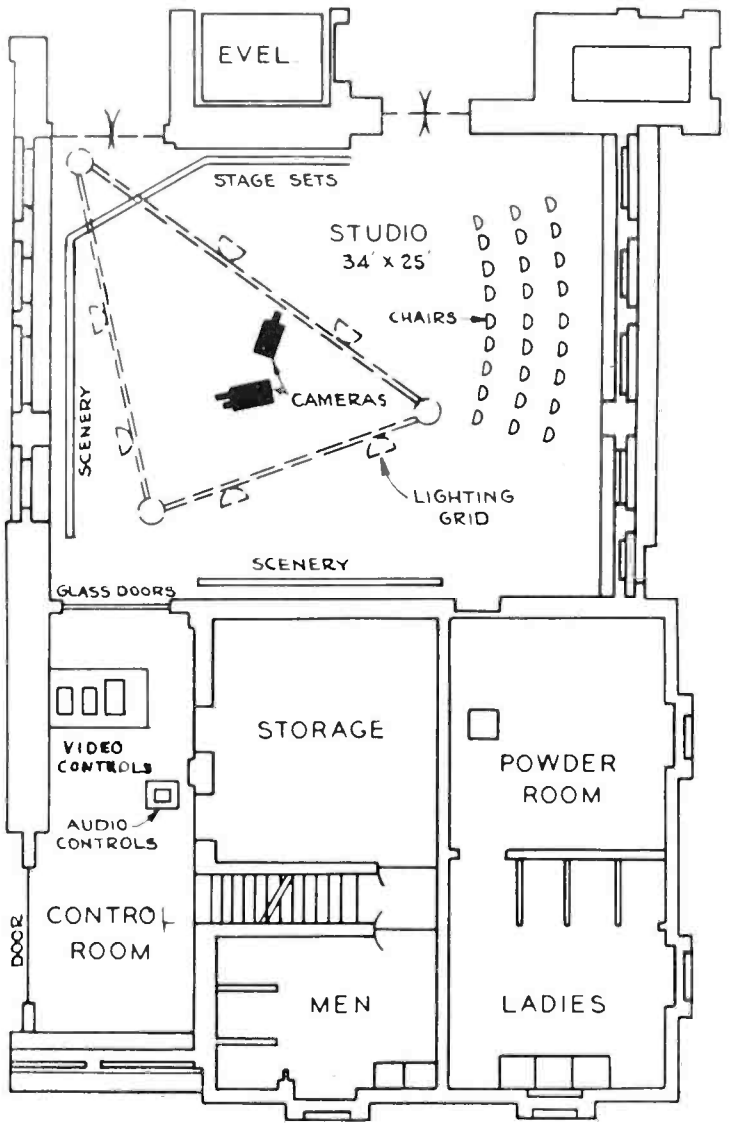
NBC's F. A. WANKEL, assistant director of television engineering operations, is shown (right) at position from which he directed NBC's TV engineering crew. Intercom circuits connect him with every point in the farflung operations. Chart above switchboard shows assignment of engineers to various posts.

WPTZ's FIELD CREW did an outstanding job in making remote television pickups for the NBC TV network. Composed of well-experienced telecasters, and operating literally on their "home grounds" they jumped from one point to another with astounding rapidity. In the picture at the left they are shown making a television pickup from the Dewey headquarters in the ballroom of the Bellevue-Stratford.

NEW LOOK IN MOBILE UNITS may or may not be typified by WPTZ's field crew at B & O station in Philadelphia (to pick up Pres. Truman's arrival). Television set a new high for sustained interest when it showed the President, successively, leaving the White House, boarding the train in Washington, detraining in Philadelphia, and finally arriving at Convention Hall. Spur-of-the-moment improvisation, like that illustrated at the right, made it possible.



CONVENTION VIDEO - *WPIX'S EQUIPMENT SETUP*



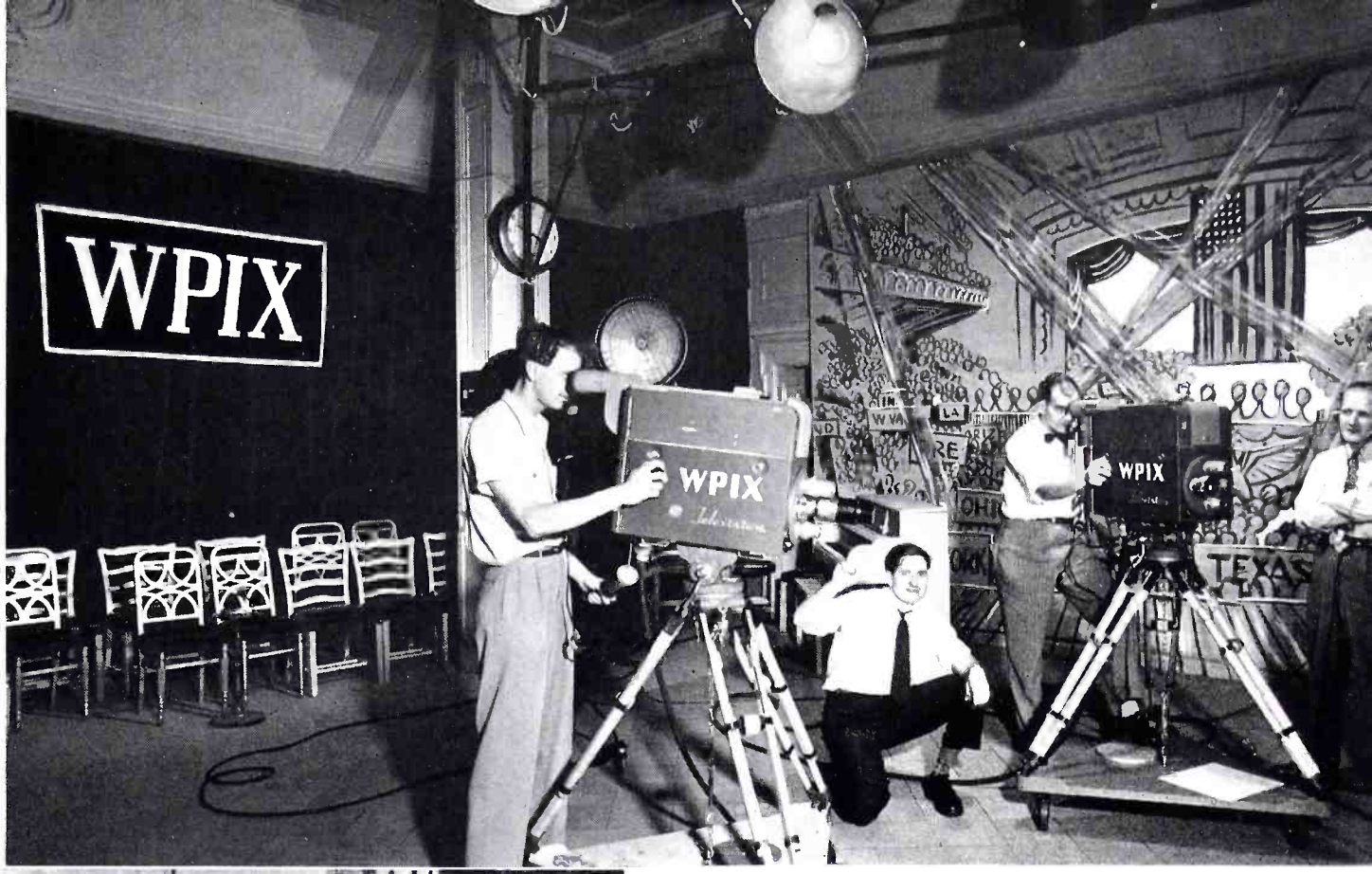
Only non-network-affiliated TV station to telecast the convention was WPIX, the television station of the New York Daily News. WPIX, as a member of the pool, received all of the "pooled" telecasts from Convention Hall. To compete with the networks "non-pooled" telecasts, WPIXsters, headed by their general manager, Bob Coe, set up what was probably the most elaborate of all the studios in the Bellevue-Stratford Hotel. From here they originated news telecasts, interviews and informative "background" stories that easily held their own with the best of the competition.

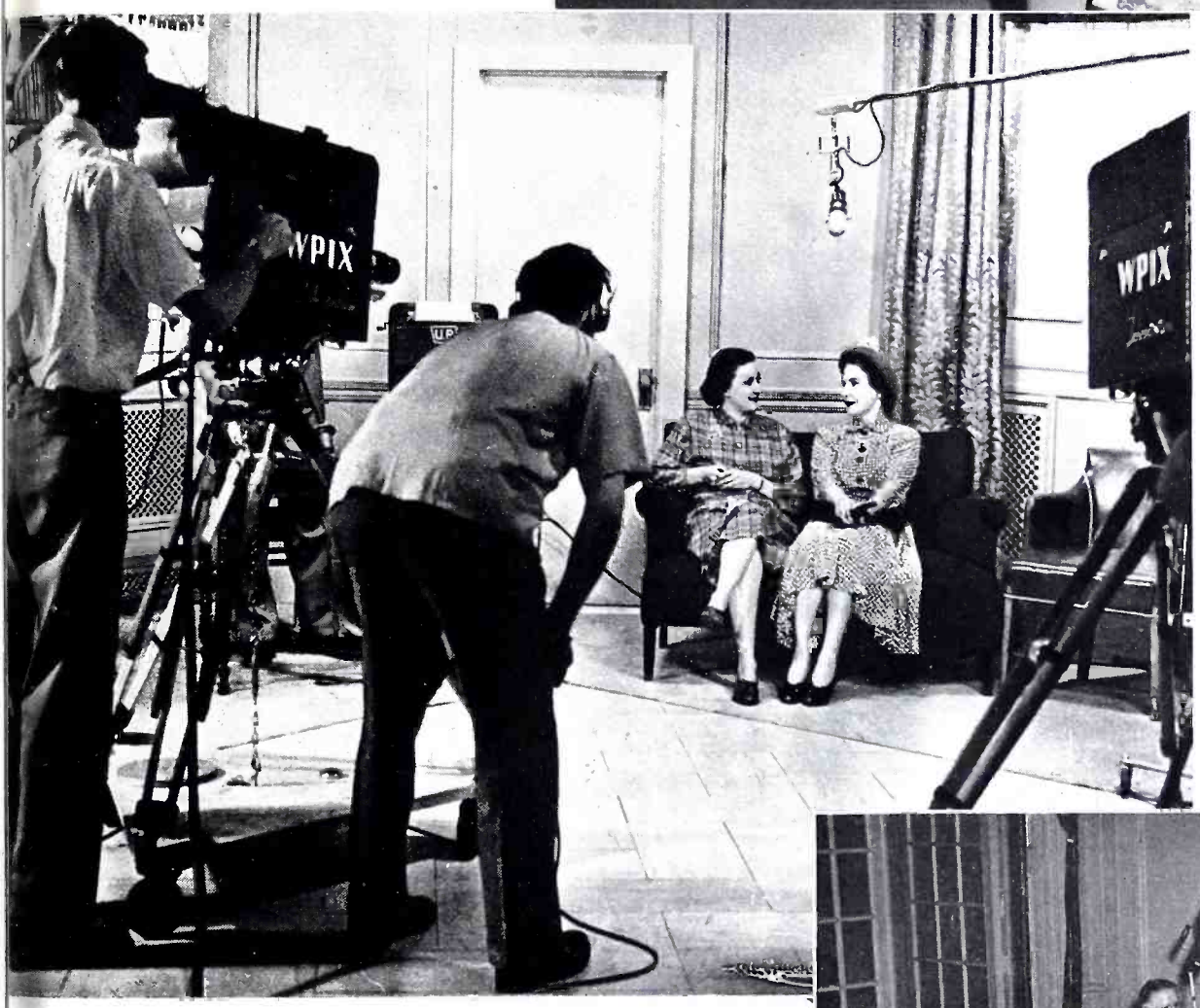
The WPIX studio, located on the 18th (Roof-Garden) floor of the hotel was a generous 34 ft. x 25 ft. in size. Control equipment was set up in a small anteroom with the equipment in such position that the operators and program director looked through glass doors into the studio. Space for storage and conveniences for guests were provided for in adjoining rooms. In most respects this setup was the equal of a permanent studio.

WPIX HOTEL STUDIOS were arranged as shown in the diagram at the left. Cameras, located in the center area of the studio could be directed toward sets arranged on three sides of the room. Overhead lighting grids and other trappings of permanent type studios were provided.

WPIX CONTROL ROOM is shown in the view below. This picture, which was taken from the doorway to the studio, shows the back of the video equipment. The video units, all RCA, are from left to right, a TS-30A Switcher, a WO-79A Oscilloscope, a TM-5A Monitor and two TK-30A Camera Controls. On a table at the far left may be seen part of the audio equipment consisting of an OP6 and an OP7 plus monitoring units.

OVERHEAD LIGHTING GRID, specially prepared backdrops, and various video effects units were rigged up to fit the occasion by Bill Sloat, assistant chief engineer of WPIX, and his associates. WPIX believes that its studios were the most elaborate and best equipped in the hotel.





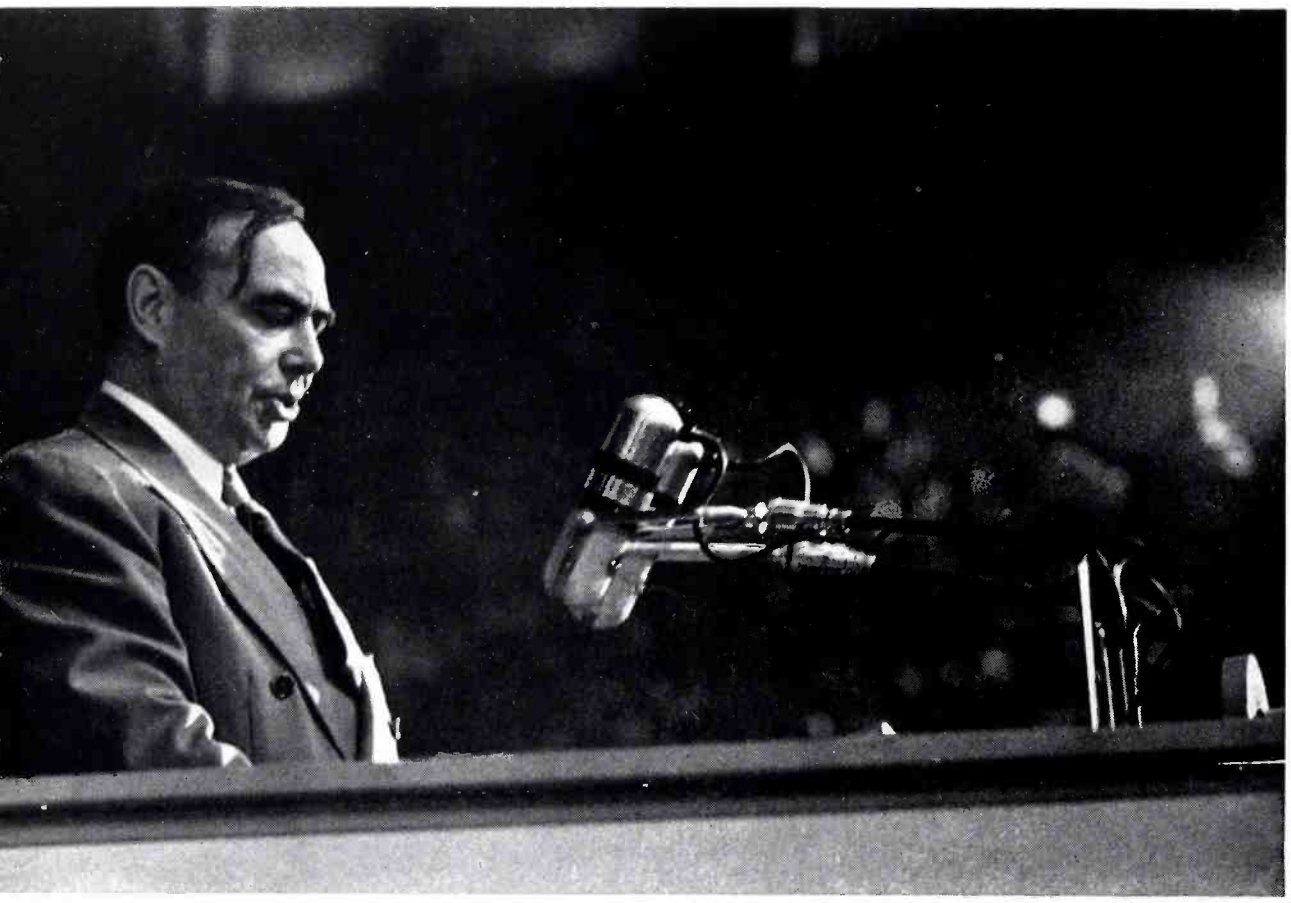
INTERVIEWS (left) were the most interesting feature of the WPIX telecasts, as in fact they were of all the "non-pooled" programs. Candidates, delegates, convention managers, key political figures, page boys and even red caps were interviewed and polled by quick-witted TV announcers—with results that were full of interest if not of surprises.

NEWS TELECASTS (right) by the best analysts in the business were standard fare. With its newspaper connections to draw upon, WPIX had little difficulty competing with the networks.

CONVENTION AUDIO - *THE AUDIO POOL SETUP*

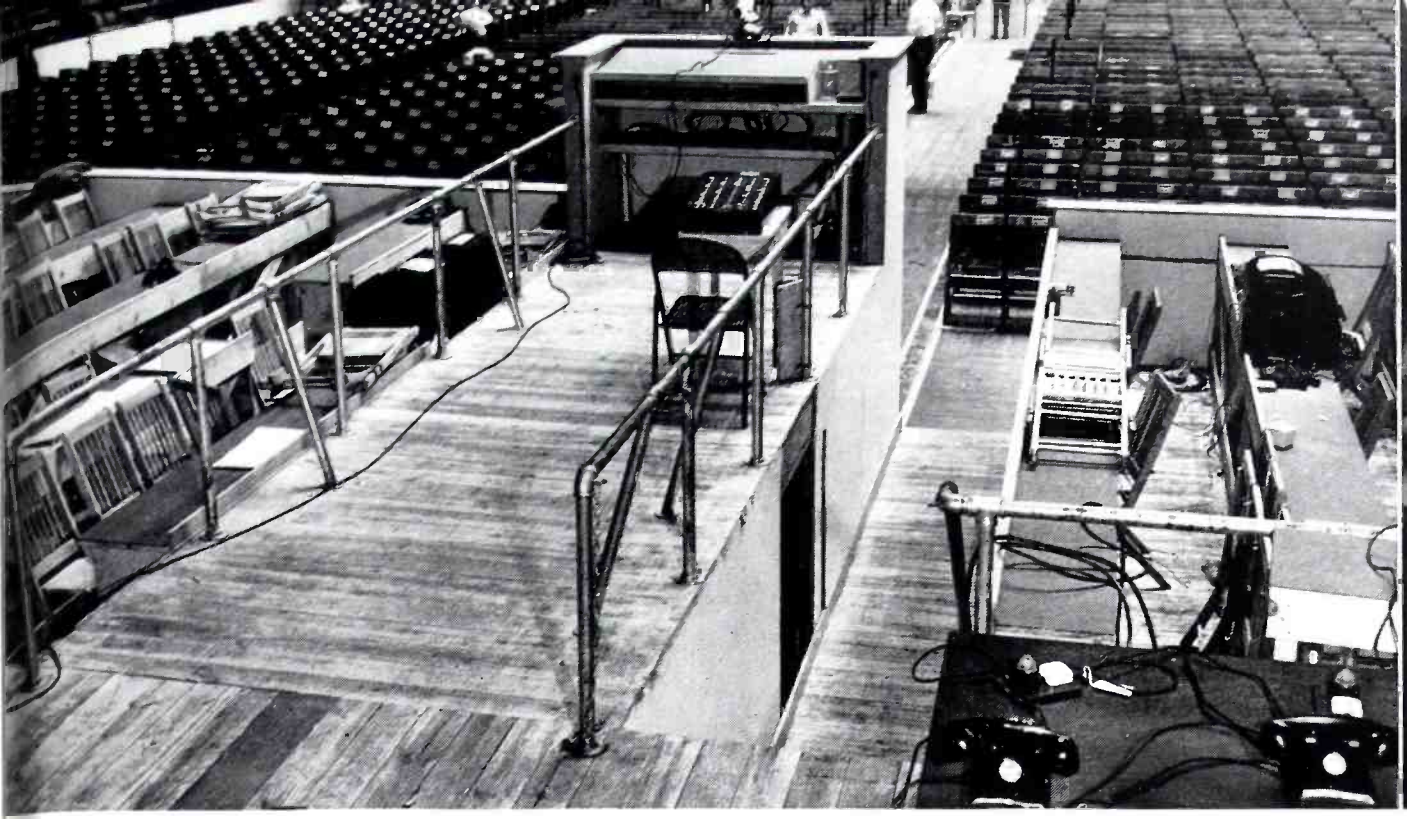
Although less in the news the AM/FM coverage of the Convention was, in its own way, as effective and no doubt more efficient than the TV coverage. The audio pickups from the speaker's rostrum, from the Convention Hall floor and from the many points of activity around Philadelphia were far more extensive, were more smoothly handled, and were marked by much less wasted effort than heretofore. If AM/FM had not had to compete with the flushed glamor of TV, (and with its own sound, which the TV system used during a great part of the time); it would undoubtedly have been acclaimed for the best job ever.

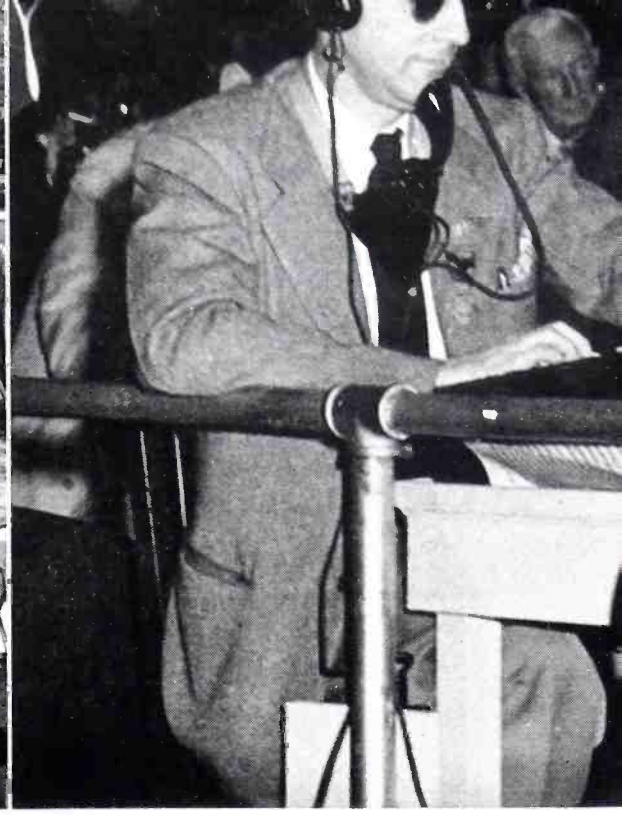
As in the past two conventions, the sound pickup from the rostrum and the floor was "pooled" by the four networks. But more experience and better equipment improved the calibre of this year's job. A floor microphone was set up before the chairman of each delegation, 52 in all. The new small-size RCA velocity microphones (Type KB-2C) were used for this purpose—this being the first public showing of these new mikes. They were controlled from a position just behind the rostrum (see facing page) where an engineer switched them at the direction of the chairman. These microphones, as well as those on the rostrum, were also tied into the Convention Hall public address system so that they played an important part in the proceedings of the Convention.



ROSTRUM MICROPHONES, shown at left, were RCA type 77-D's used in the uni-directional position. They were mounted on special stands which made it easy to raise, lower or tilt them to suit the height of the speaker.

FLOOR MICROPHONES of which there were 52 in all, one for each delegation, were RCA Type KB-2C Velocity Microphones. Small, rugged and of relatively high sensitivity, these little mikes are ideal for many types of remote pickups. Illustrations above show KB-2C's at three locations. At left, the Michigan microphone with Sen. Vandenberg. In the center, Gov. Dwight Green of Illinois. At the right, Gov. Driscoll of New Jersey.

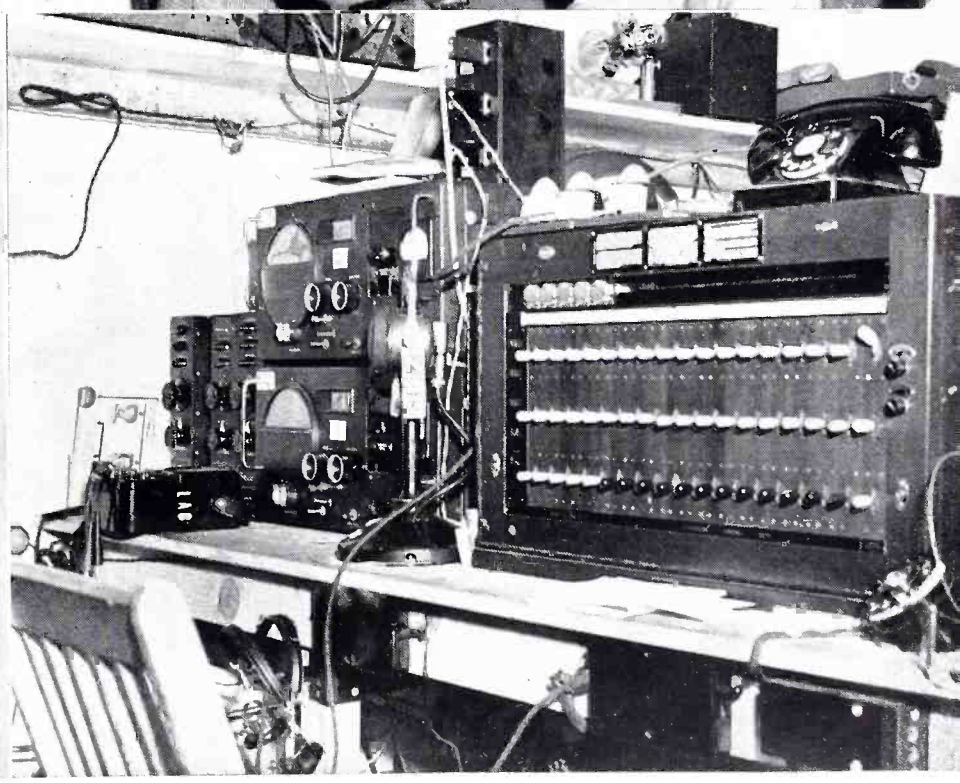




MICROPHONE SWITCHING is an extremely important operation in the conduct of a big convention. The small black box on the table just back of the rostrum (above) contained the switches controlling the floor microphones. A technician sitting at this position (right, above) could connect any floor microphone into the public address and radio systems at the direction of the convention chairman, and disconnect it just as quickly. This control of the situation was a powerful tool for the chairman.

RADIO MIKES were another feature of the audio pickup. In one form or another, they were used by every one of the networks. The illustration at right shows W. W. Chaplin, NBC announcer, using a "radio mike" of the type which RCA now has in production. Use of these mikes allowed reporters to dash about the floor at will, unencombered by the connecting telephone lines that formerly limited their movement.

CBS VERSION of the radio mike is shown above, as Bill Powers, CBS news reporter, is using it to interview policeman on Philadelphia street. Man at right carries portable receiver used for cue reception.

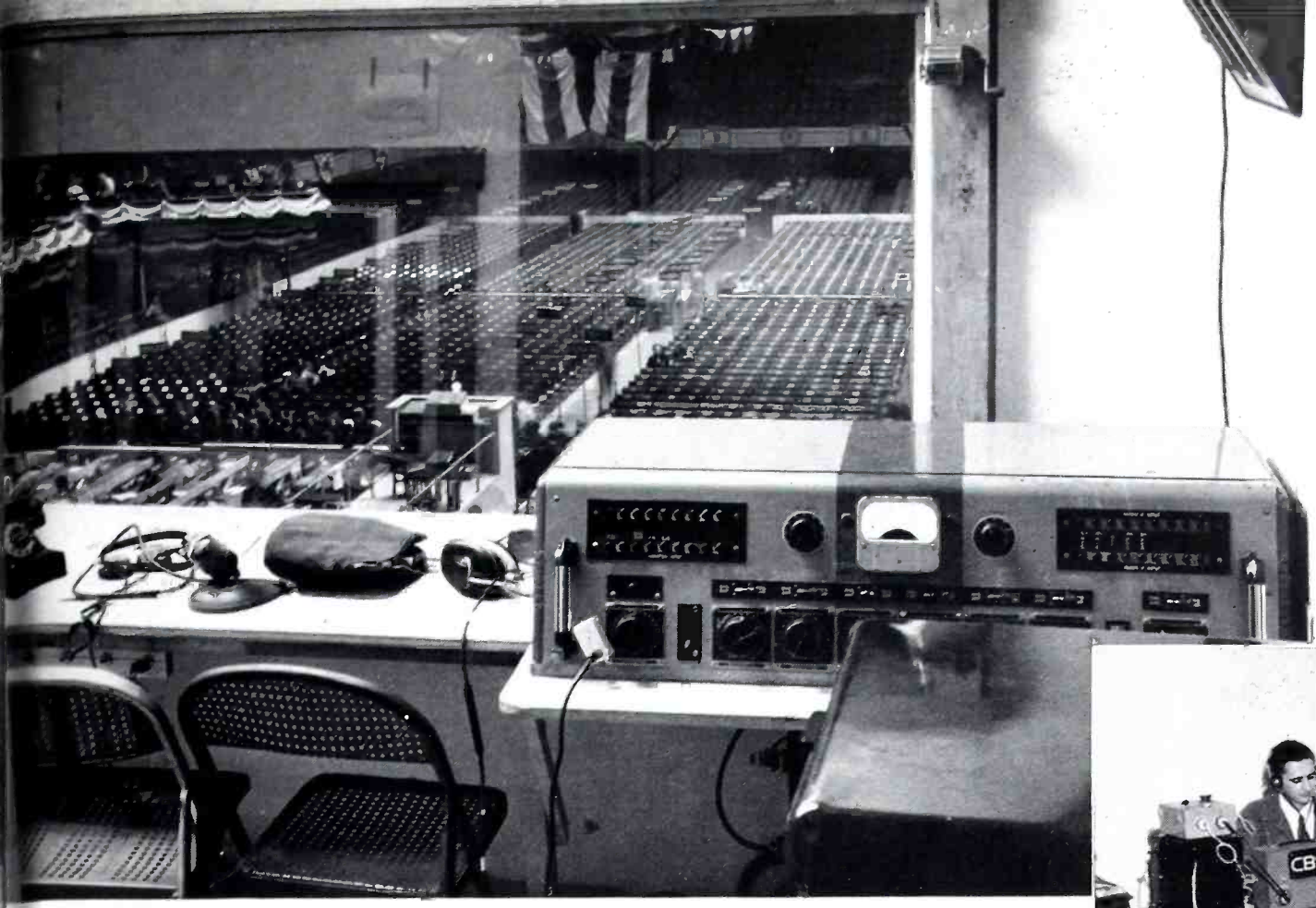


RECEIVING POSITION in NBC control room is shown here. Two communication-type receivers were used to pick up 27 mc transmissions from the radio mikes on the Convention Hall floor.

CONVENTION AUDIO - *THE "Non-Pooled" FACILITIES*

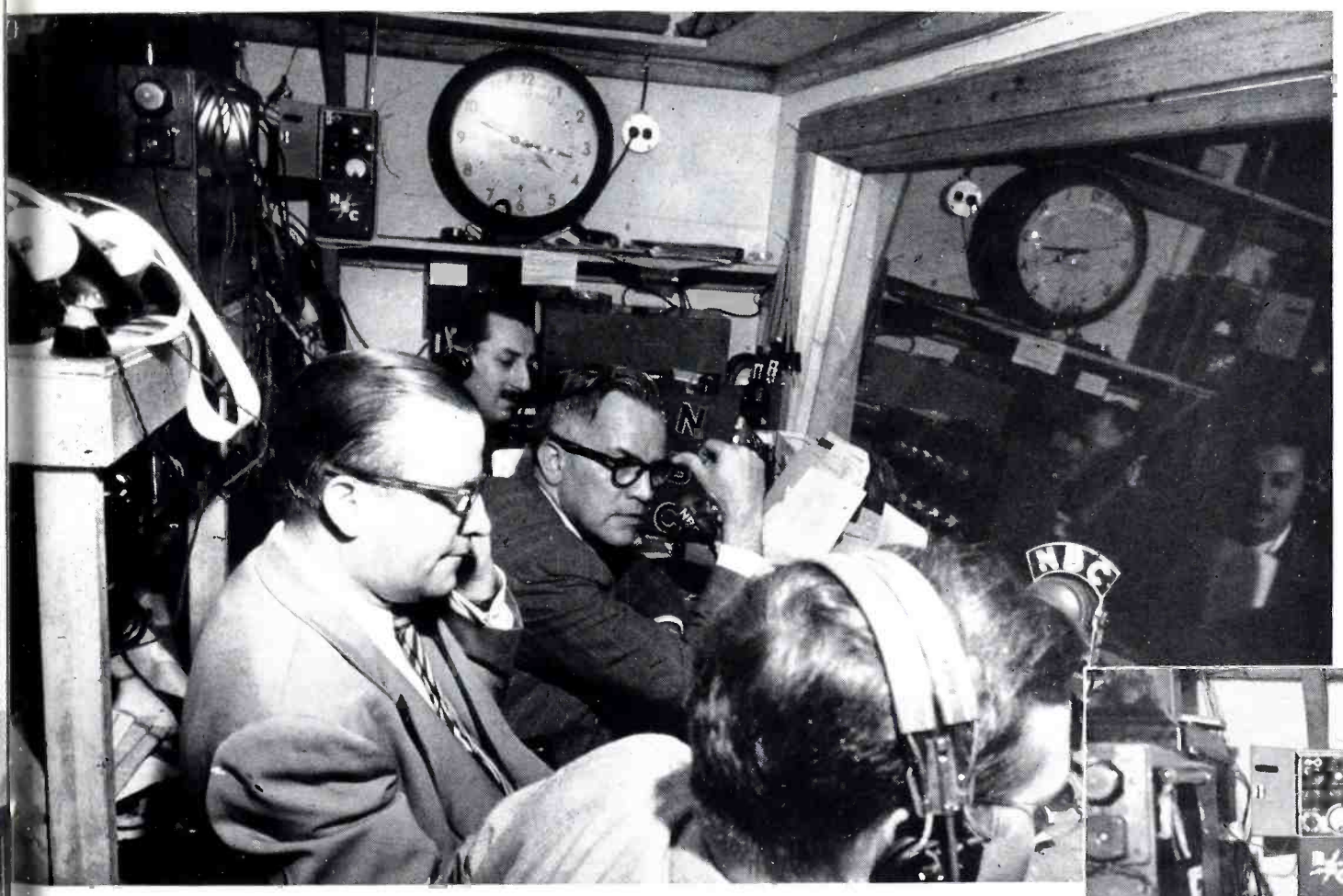
MOBILE UNITS, as someone said, were more numerous in Philadelphia than taxicabs. Not the largest, but easily the most glamorous, was the streamlined CBS unit shown here. The photograph does not do this unit justice. Finished in baby blue, with the CBS call letters in chrome-plated metal and sporting a plexiglass astral dome (not to speak of the fact that whole rear half has a plastic top) this unit attracted attention wherever it went. Most of the time it was parked smack in front of the Bellevue.

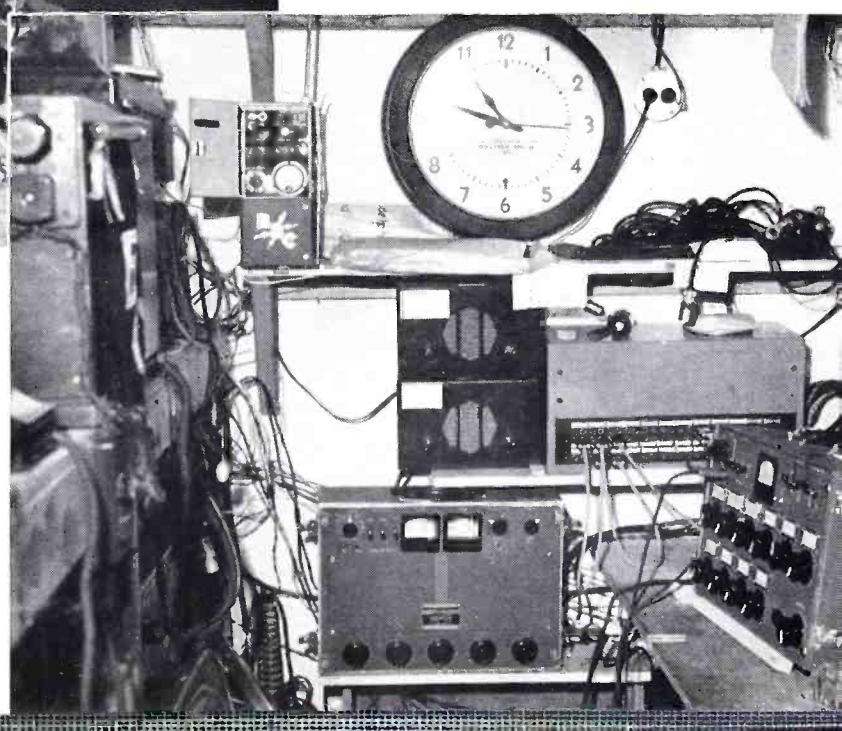
ABC's CONVENTION HALL AM/FM CONTROL BOOTH is pictured here. Equipment position, at right, sported a modified RCA 76-B2 Consolette. RCA 88-A Microphones were used at the announce positions along the table in front of the window. Small picture at the right shows a corner of the ABC sound studio at the Bellevue-Stratford Hotel.



CBS's CONVENTION HALL AM/FM CONTROL BOOTH is pictured at the left. Audio mixing and control is provided by the RCA 76-B2 Consolette. Audio inputs are from floor pickup, from news room, from microphones on table in front of window and from remote points.

CBS's HOTEL AM/FM CONTROL BOOTH is shown at the right. Equipment units are RCA OP6 and OP7 amplifiers.





NBC's CONVENTION HALL AM/FM CONTROL BOOTH is shown above during actual operation. Announcers, analysts and news commentators sat along table in front of the window that looked out on the Convention Hall floor. Engineers position, at the far end in the view above, is shown closeup in the small illustration at the right. Portable equipment used by NBC are similar in general design to RCA OP-5A amplifier used by many stations.

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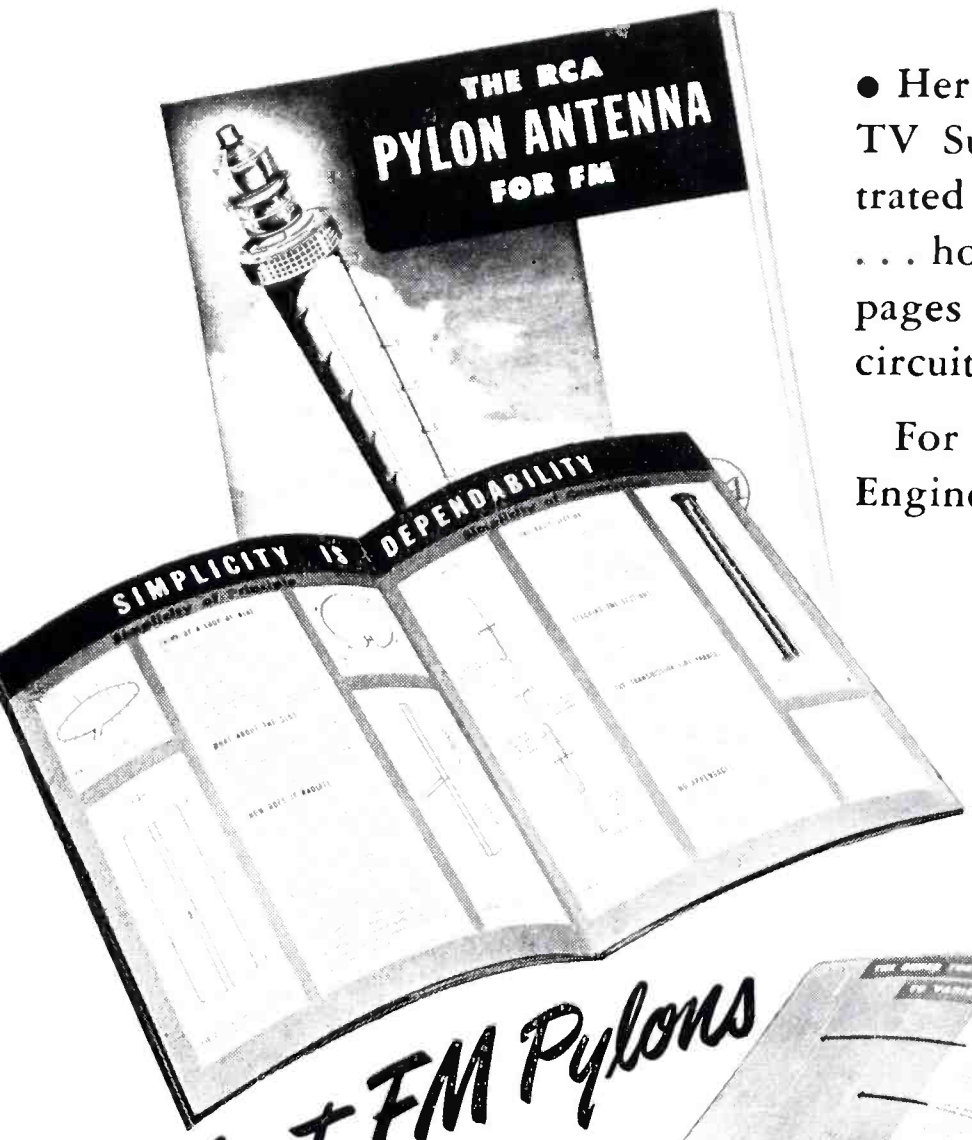

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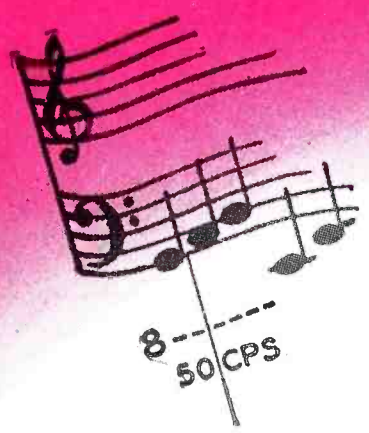
In Canada: RCA VICTOR Company Limited, Montreal



TYPE 70-D
RCA HIGH-FIDELITY
TRANSCRIPTION TURNTABLE

Standard of the Studios—NEW EDITION

Over 3000 units of this professional series are now in use

● Type 70-D is designed specifically to meet your needs for higher and higher reproduction quality in studio transcriptions.

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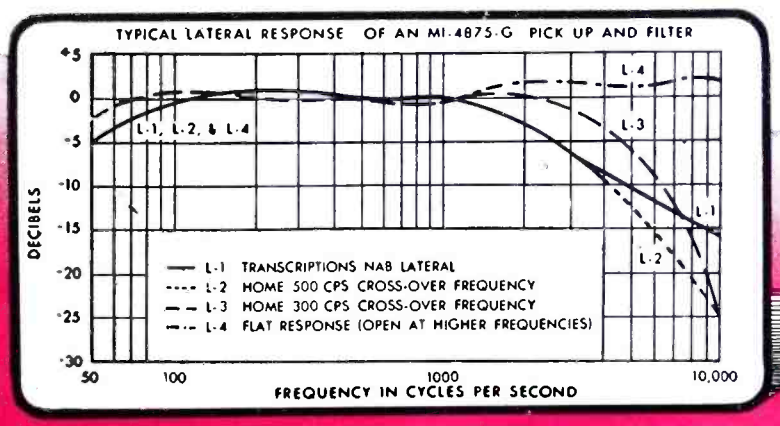
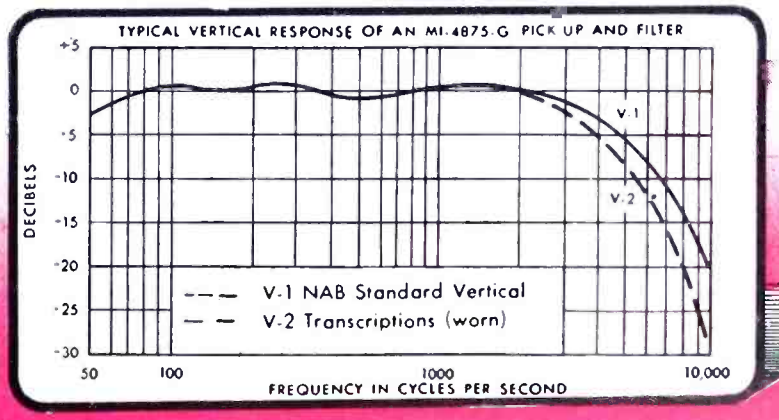
There's the heavy-duty, constant-speed synchronous motor with all the driving power you need for recording *and reproducing* at 33⅓ or 78 rpm. And there's the handsome new hinged-door *metal* cabinet with its durable formica top . . . with the inside space to house booster amplifiers and record cueing amplifiers . . . and with accommodations on the formica top for adding an RCA. 72-D or 72-DX Recording Attachment when you decide to go into recording.

For the finest response from your recording . . . for dependable timing to the very last second . . . for even running and smooth starts and stops, this studio turntable has it! Available in two cabinet-top heights . . . 28 inches and 30 inches. Equipped with convenience-plug outlets for a-c and audio circuits. Ask your RCA Broadcast Sales Engineer for complete data, or write Dept. *115-L.*





BROADCAST EQUIPMENT
RADIO CORPORATION of AMERICA
ENGINEERING PRODUCTS DEPARTMENT. CAMDEN, N.J.

In Canada: RCA VICTOR Company Limited, Montreal

FM

AM

TV

RCA-5592, *used in 50-kw FM transmitters*

RCA-5671, *with thoriated filament, used in 50-kw AM transmitters*

RCA-8D21, *used in 5-kw television transmitters*

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Year after year, RCA tubes have set the pace in quality, performance, and value. They have won an unequalled reputation for engineering excellence, dependability, and true operating economy. That's why experienced broadcasters buy RCA tubes.

For your convenience, RCA tubes are now available from your local RCA Tube Distributor or directly from RCA. For information on any RCA tube, write RCA, Commercial Engineering, Section FP 36, Harrison, N.J.

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