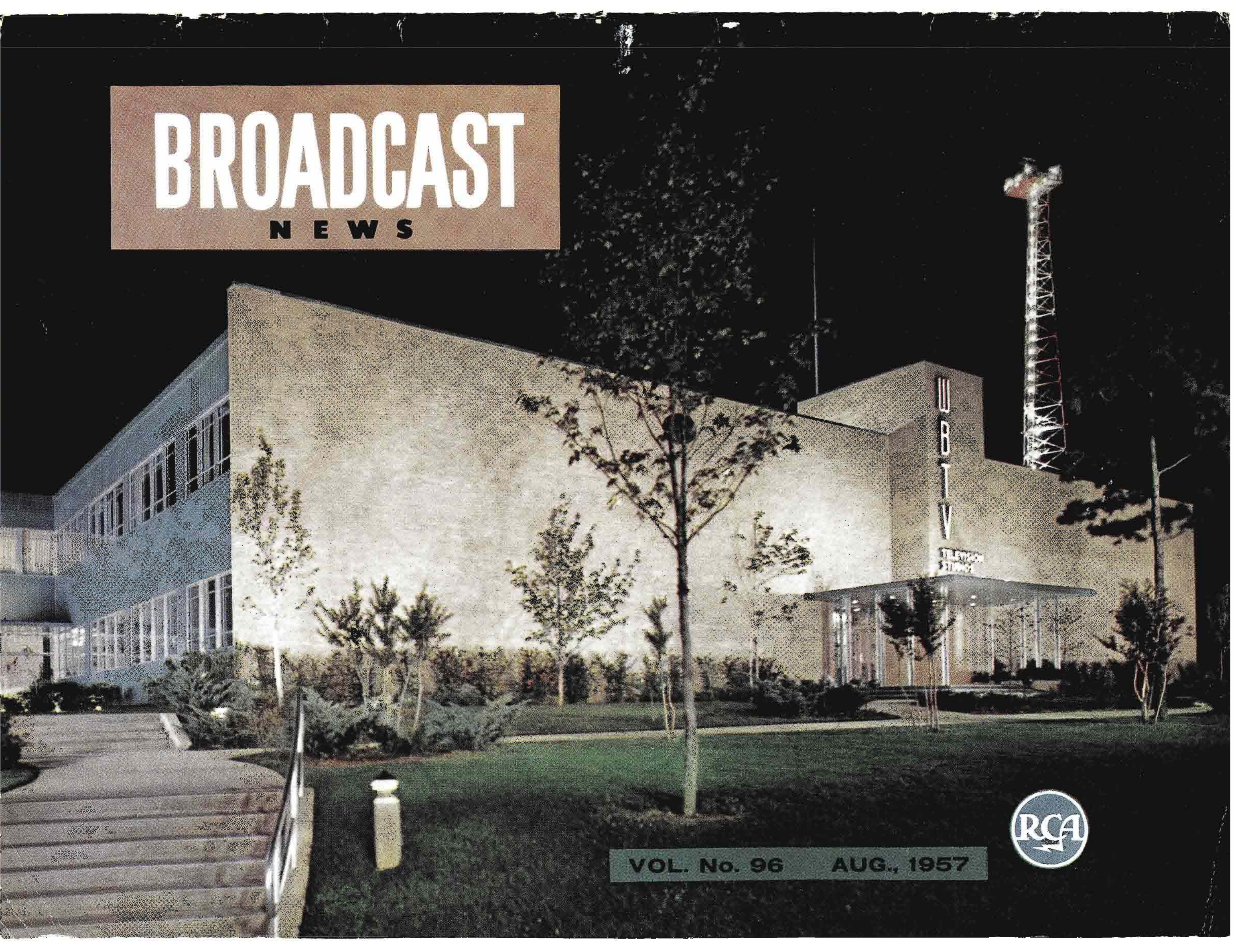
BROADCAST NEWS



VOL. No. 96 AUG., 1957

RCA

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Vol. No. 96 | August, 1957

BROADCAST NEWS

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BROADCAST & TELEVISION EQUIPMENT DEPARTMENT
CAMDEN, NEW JERSEY

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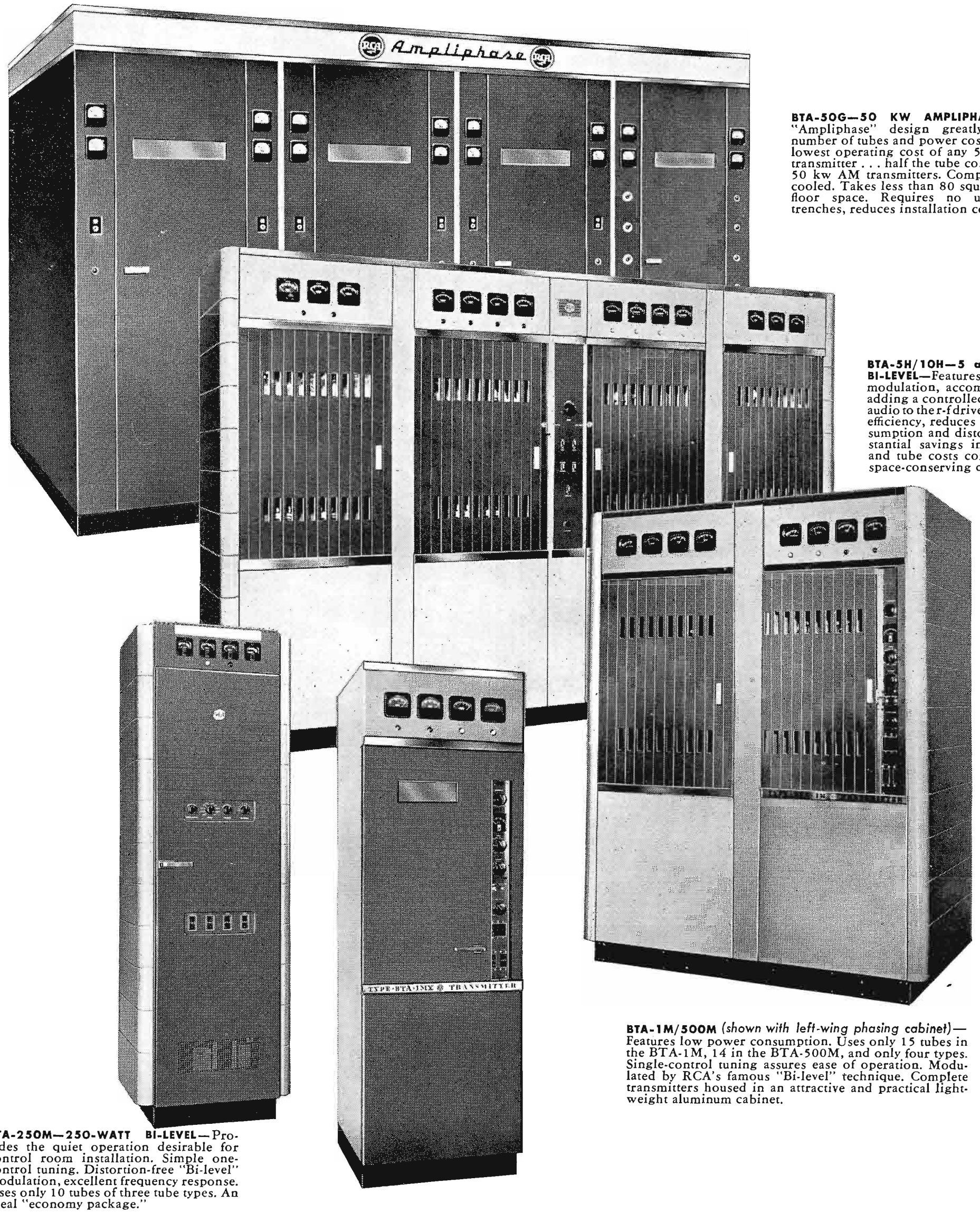
the truth about... RCA



BTA-50G—50 KW AMPLIPHASE—New "Ampliphase" design greatly reduces number of tubes and power costs, assures lowest operating cost of any 50 kw AM transmitter . . . half the tube cost of older 50 kw AM transmitters. Completely air-cooled. Takes less than 80 square feet of floor space. Requires no under-floor trenches, reduces installation costs.

BTA-5H/10H—5 and 10 KW BI-LEVEL—Features "Bi-level" modulation, accomplished by adding a controlled amount of audio to the r-f driver, increases efficiency, reduces power consumption and distortion. Substantial savings in operating and tube costs combine with space-conserving design.

BTA-1M/500M *(shown with left-wing phasing cabinet)*—Features low power consumption. Uses only 15 tubes in the BTA-1M, 14 in the BTA-500M, and only four types. Single-control tuning assures ease of operation. Modulated by RCA's famous "Bi-level" technique. Complete transmitters housed in an attractive and practical lightweight aluminum cabinet.

BTA-250M—250-WATT BI-LEVEL—Provides the quiet operation desirable for control room installation. Simple one-control tuning. Distortion-free "Bi-level" modulation, excellent frequency response. Uses only 10 tubes of three tube types. An ideal "economy package."

BTA-1MX/500MX—Designed for high-fidelity operation, transmitters BTA-1MX (1KW) and BTA-500MX (500 watts) offer single-control tuning, desirable Bi-level modulation, low power consumption, fewer tubes and fewer tube types. Minimum floor space required . . . approximately 6 square feet.

REMOTE CONTROL EQUIPMENT—RCA Remote Control Equipment provides facilities to switch program lines, adjust plate or filament voltage, operate a line variac control on emergency transmitter, control Conelrad switching, operate power contactors and reset manual overload breakers, from any desired control point, regardless of transmitter design or power.

AM transmitters

FOR 25 YEARS RCA broadcast transmitters have been widely acknowledged as *the* best. During this period they have been the transmitters most often chosen by those stations which wanted, and could afford, the very best. Thus they early became, and have remained, the standard to which all others are compared.

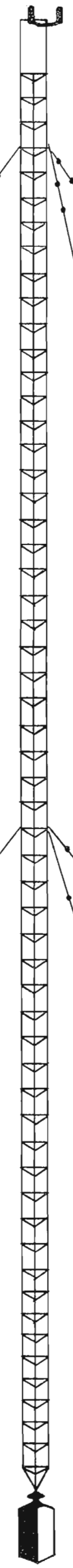
Unfortunately, some stations have believed that they could not afford such quality—no matter how much they wanted it. Today any station can "afford" one of these top-quality transmitters. In fact, it is hard for us to see how a station can afford *not* to buy one.

Why is this so? Simply because today RCA transmitters cost only a very little more than the lowest-priced (sometimes no more). And the small extra original cost (if any) is more than made up for by these two *facts:*

1. RCA transmitters are generally less expensive to operate. This is so because in almost every power class RCA transmitters either use less power, or have lower tube cost (in some cases both).

2. RCA transmitters almost always have higher resale value. This becomes very important when you go to higher power, or if you should decide to sell your station.

What is the moral? Simply this: don't jump to the conclusion you can't afford RCA. We believe you can, and we would like an opportunity to prove it. Call our nearest *AM Specialist* (see list). He will be glad to go over your situation with you, give you the benefit of his (and RCA's) broadcast equipment knowledge, and leave with you a complete and fair proposition. With such *facts* at hand you can make a correct decision. There's absolutely no obligation. You owe it to your station to find out. Act now!



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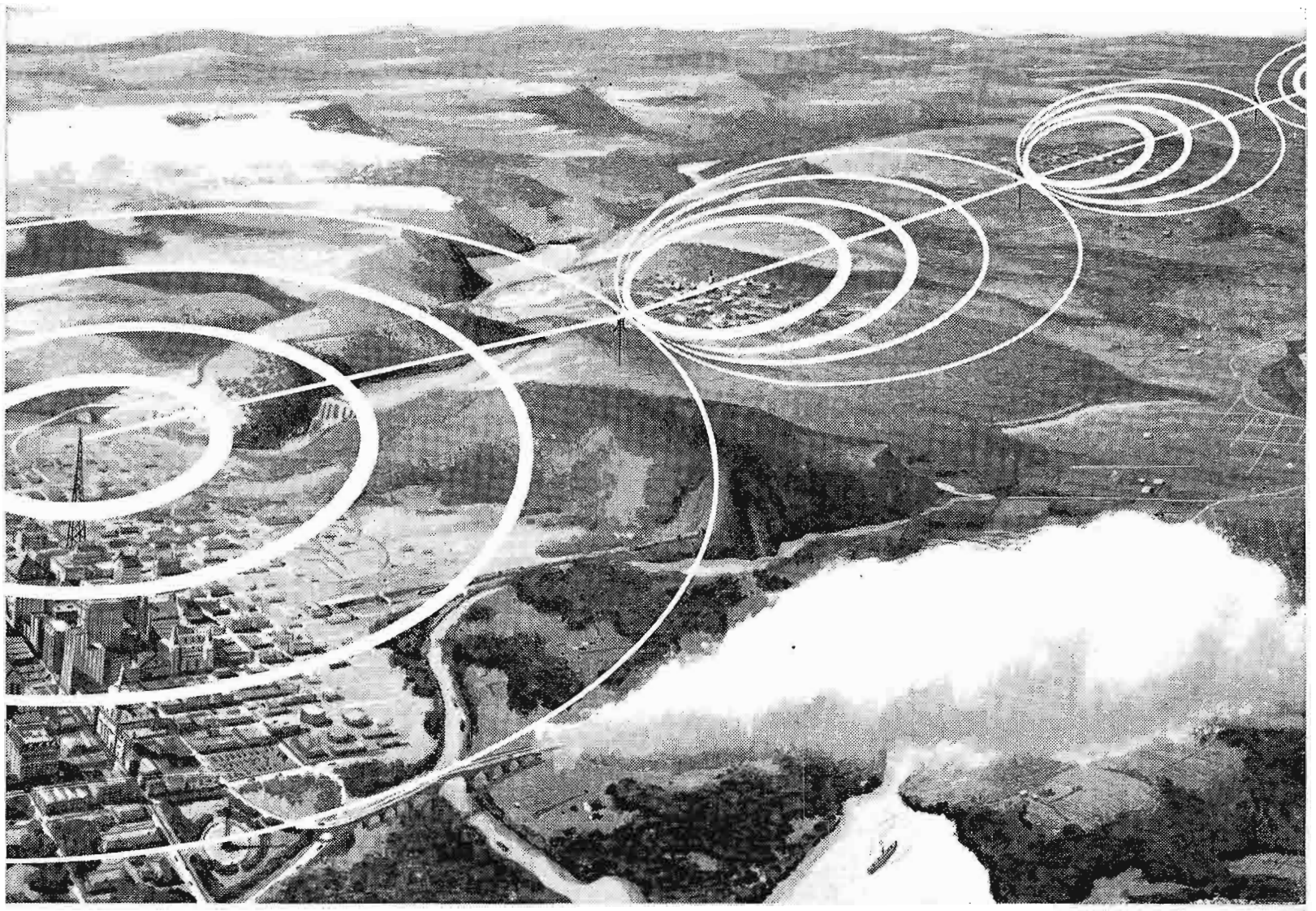
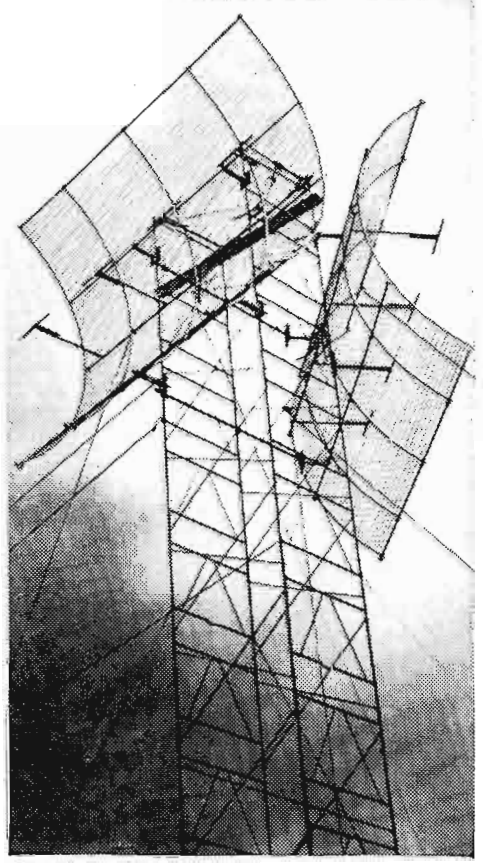
Economically extends VHF TV Station Coverage



Since the TVR-1 relay system uses standard TV frequencies, it enables those in its path to receive your station's broadcasts on their home receiver. Eight repeaters, or more, may be linked in tandem to relay television programs while providing home reception between repeaters.

The RCA TVR-1 offers the TV broadcaster an opportunity to extend economically the coverage of his stations, and provide inter-city television relaying. Communities which may not be receiving a sufficiently strong signal, or those small communities which are outside the station's service area and could not hope to have television, will now receive your broadcasts. Unlike conventional microwave relay systems, the TVR-1 is capable of rebroadcasting at each relay station. Designed for unattended operation, each repeater is in essence an automatic station. Directional or non-directional antennas can be used, depending upon local coverage considerations. For full details on new RCA TVR-1 relay-broadcast system, contact your RCA Distributor or write Dept. TV-12-H — at the address below.



Typical TVR-1 repeater antenna installation.

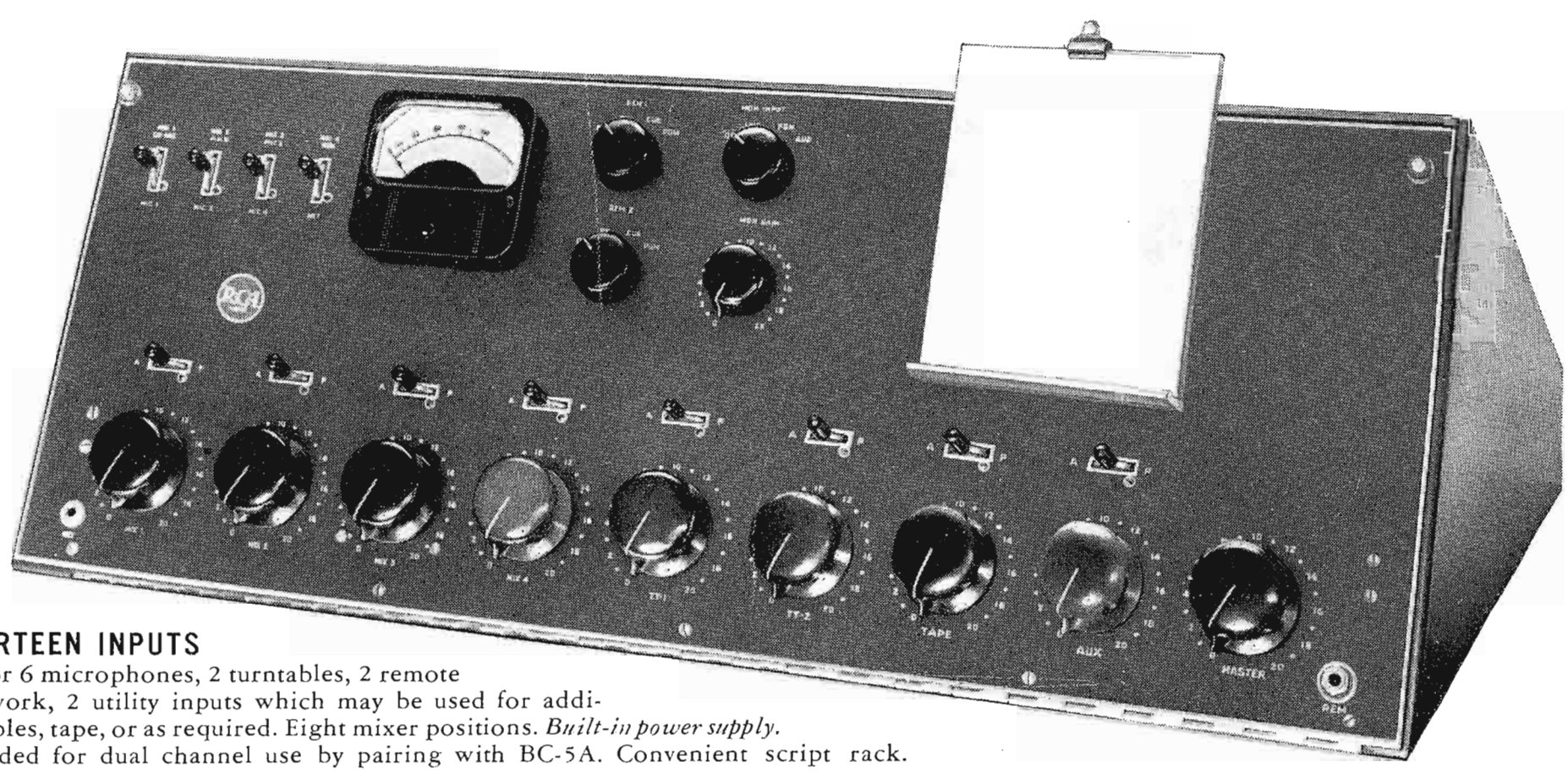
RCA INTERNATIONAL DIVISION

RADIO CORPORATION OF AMERICA

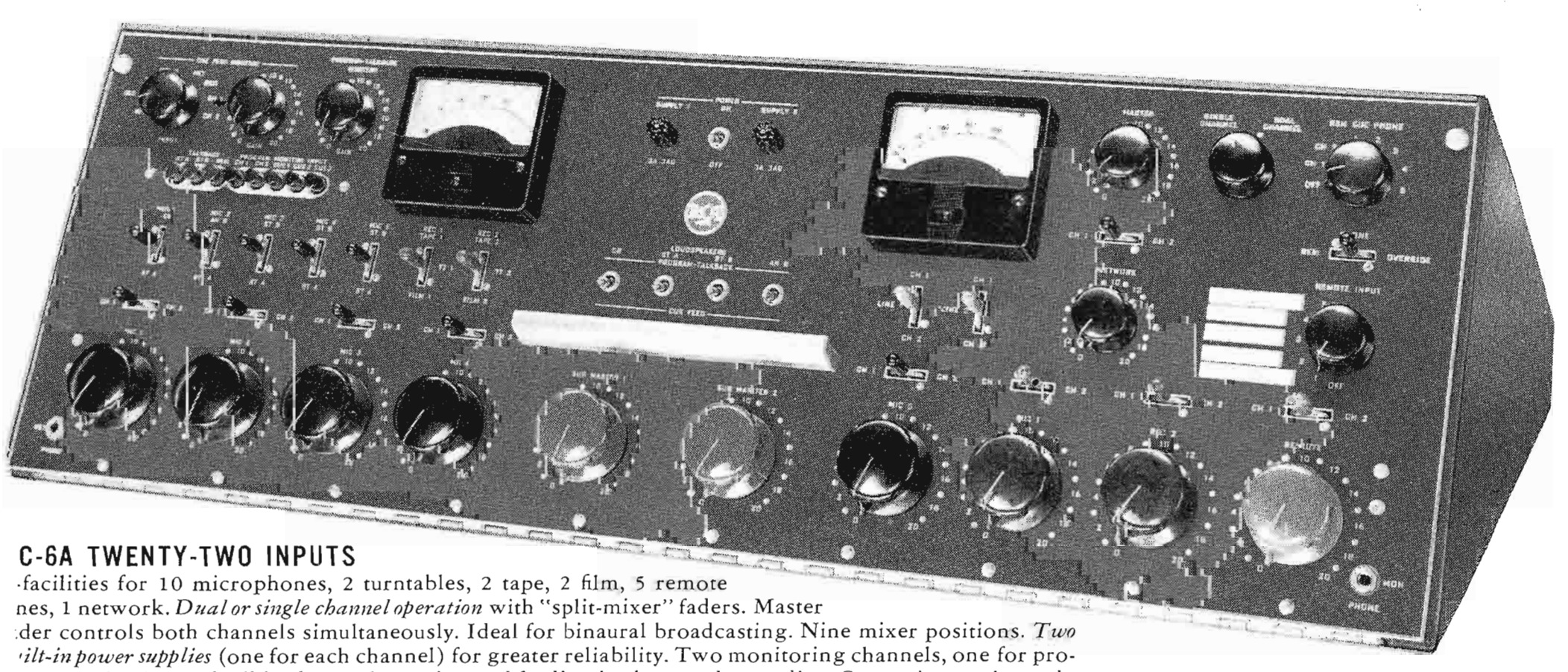
30 ROCKEFELLER PLAZA • NEW YORK 20, N.Y., U.S.A.

CONSOLETTES

BC-5A NINE INPUTS
—facilities for 4 microphones, 2 turntables, 2 remote lines, 1 network or tape. 4 mixer positions. *Built-in power supply.* Easily expanded for dual channel use by "pairing." Block building lends "custom touch" when paired with existing BC-2B's.....



BC-3B THIRTEEN INPUTS
—facilities for 6 microphones, 2 turntables, 2 remote lines, 1 network, 2 utility inputs which may be used for additional turntables, tape, or as required. Eight mixer positions. *Built-in power supply.* Easily expanded for dual channel use by pairing with BC-5A. Convenient script rack.



C-6A TWENTY-TWO INPUTS
·facilities for 10 microphones, 2 turntables, 2 tape, 2 film, 5 remote
nes, 1 network. *Dual or single channel operation* with "split-mixer" faders. Master
:der controls both channels simultaneously. Ideal for binaural broadcasting. Nine mixer positions. *Two*
'ilt-in power supplies (one for each channel) for greater reliability. Two monitoring channels, one for pro-
ım monitoring and talkback, one for cueing and feeding background to studios. Convenient script rack.

FIG. 1. The Pope's Easter blessing goes out over Vatican Radio and is also supplied to West European radio networks by telephone line.

WORLD WIDE PHOTOS

RADIO LENDS WINGS TO THE VOICE OF THE VATICAN

Eight Transmitters and Twenty-Eight Languages Employed in Broadcasts to Peoples of the World

by FR. ANTHONY STEFANIZZI, S.J., *Director, Vatican Radio*
as told to PAUL A. GREENMEYER, Managing Editor, BROADCAST NEWS

FIG. 2. After the first broadcast from Vatican Radio on Feb. 12, 1931 . . . Pope Pius XI, who delivered the first message; at left, present Pius XII, at that time Secretary of State in Vatican; between these two, Guglielmo Marconi.

The Vatican Radio System received its official start February 1931, with the now historic Latin broadcast of Pope Pius XI "To every Human Creature". Under the guidance of Pius XII it has become a powerful force for good through the generosity of Catholic communicants throughout the world. Gifts of money and equipment have created a medium to carry words of hope, life and encouragement to peoples in all parts of the globe—especially to those behind the Iron Curtain. Consequently radio has become a foremost weapon in the Church's fight against Communism. Modern RCA-equipped studios and control rooms are employed throughout. Transmitting equipment reflects the supranational character of the station. Broadcasts are made in twenty-eight languages and average twelve hours daily. Programs cover news, as well as religious, cultural and educational subjects.

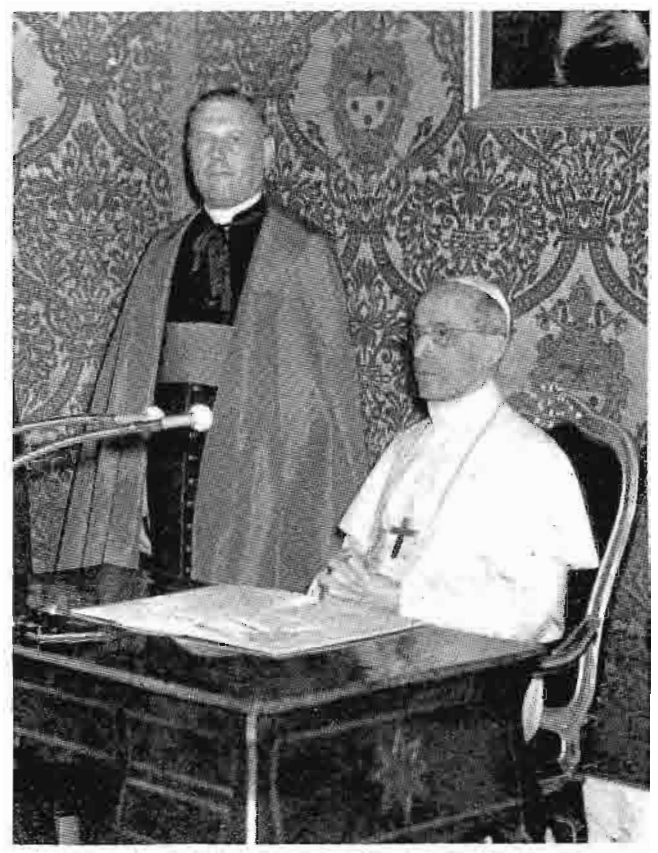


FIG. 2a. The Holy Father, Pope Pius XII, from summer residence at Castel Gandolfo, addressing radio audience; left, His Excellency Mons. Angelo dell Acqua, Substitute of the Secretary of State.

FIG. 3. View of Vatican City, showing St. Peter's at right, and Leonine tower with radio mast and studio to the left.

FIG. 4. Father Stefanizzi surrounded by his staff of programming experts (Jesuit Fathers).

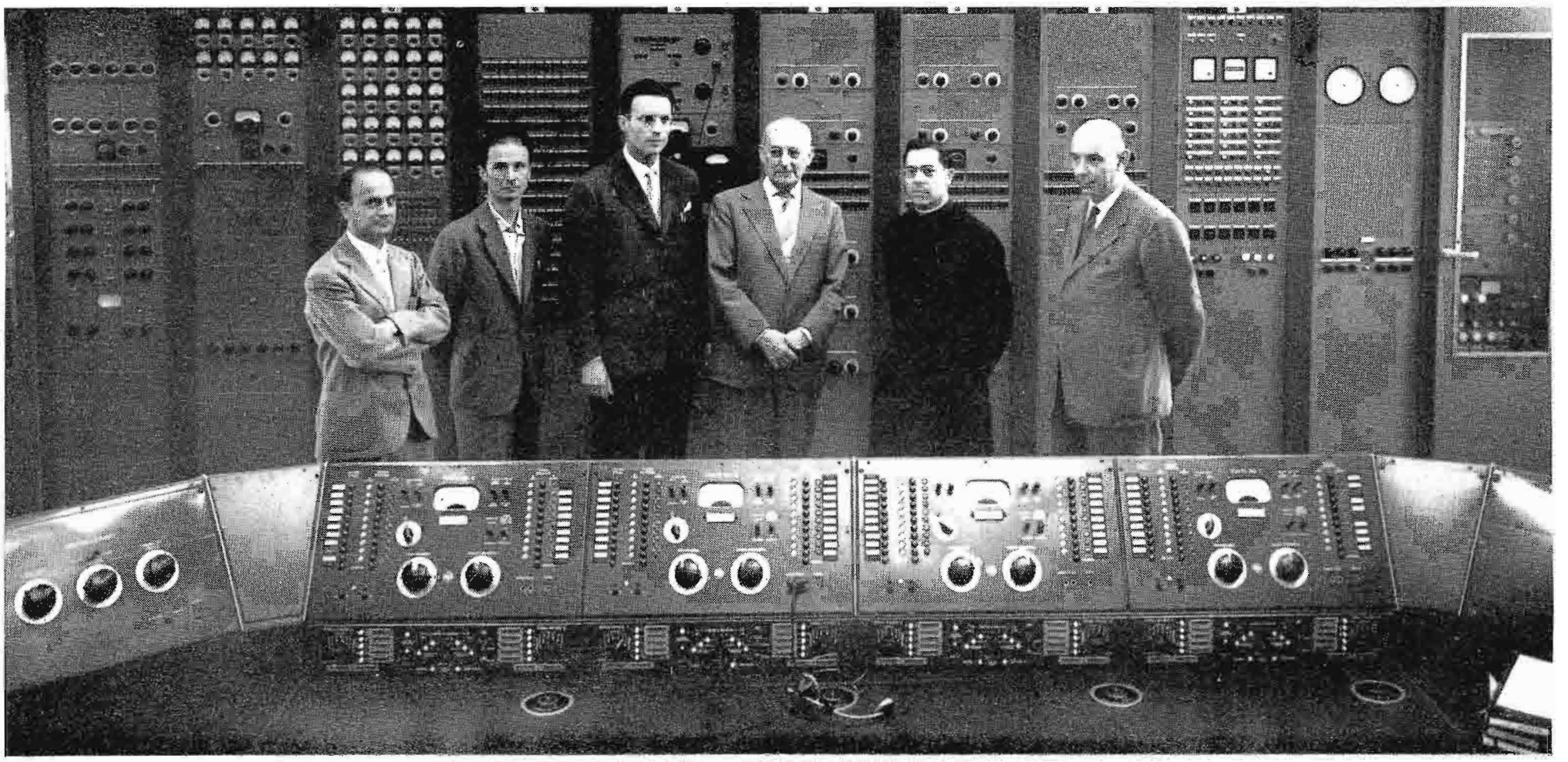
Radio Apostles

This world-wide apostolate is effected by the zealous work of some twenty Jesuits and by the part-time contribution of many other laymen and priests. Operations are in charge of Father Anthony Stefanizzi, S.J., Director of the Radio Station, who is supported by a devoted staff of some fifty laymen. They attend to the technical details of maintenance and transmission and to the translation of news bulletins and important documents into numerous languages.

Mission of Vatican Radio (HVJ)

The mission of Vatican Radio is not to entertain, in the common acceptance of the term. Station HVJ is an organ of information and education—an instrument of religious enlightenment. Some classical music programs are also presented from time to time. Important visitors from all parts of the world, who make the pilgrimage to Rome, frequently address the radio audience. All programming is in keeping with prescribed high standards, since the radio facility is part of the Temporal Domain of the Pope, and indeed was chiefly designed "so that the Supreme Pastor's voice might be heard over the airwaves to the utmost bounds of the earth."

FIG. 5. Fr. Stefanizzi and his technical staff (L to R): Donato Fiermonte, engineer; Michele Lemme, chief transmitter engineer; Giorgio Caravani, chief studio engineer; Tullio Gorio, chief engineer, Vatican radio station; Fr. Stefanizzi; Mauro Ercole, studio engineer.



Pope's Broadcasts

Pope Pius XII is in constant contact with Vatican Radio. In the past year alone he has used its services on the average of once every four days. Portable equipment is set up in his apartments for special broadcasts, and there is a network of permanent radio outlets throughout Vatican City and St. Peter's Basilica. "We have as many radio studios as there are rooms in the papal palace," is Vatican Radio's proud boast.

Some of the Pope's most widely-listened-to broadcasts are his Christmas and Easter messages (this year relayed by 29 national networks), important general audiences, canonizations, etc. And when the Holy Father isn't busy using the air, his radio staff is, to follow up his talks with commentaries and summaries, as well as day-to-day Vatican news and views.

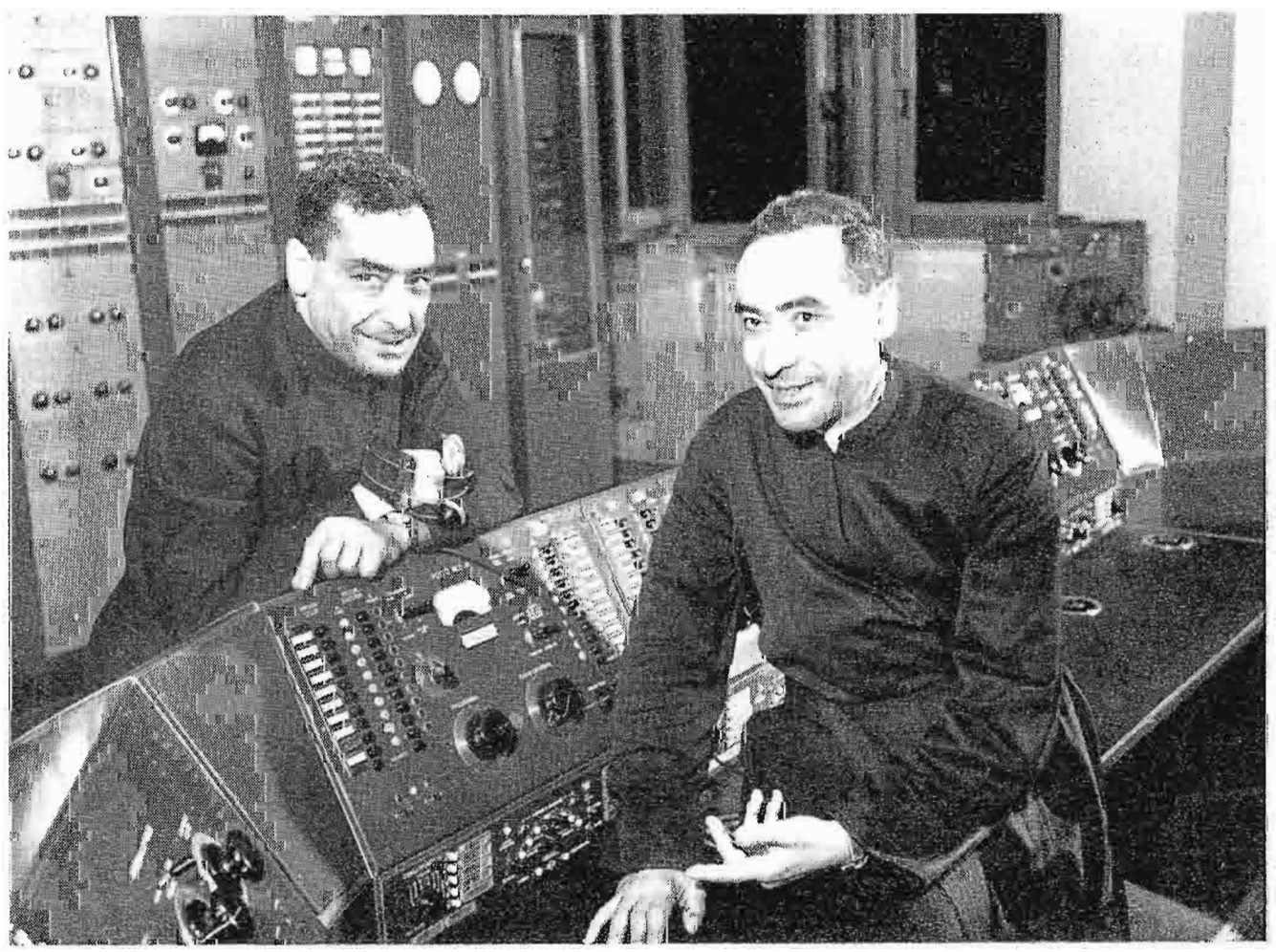
Programs in 28 Languages

The daily broadcasts are divided roughly into two classes: news commentaries in the afternoon and regular programs in the evening. Regular programs, usually 15 minutes each, are given in the principal European and world languages. There are two daily broadcasts in English, besides a special newscast to India and the Far East every Tuesday. The Italian language has three daily broadcasts and twice weekly an Italian program is beamed to the Middle East. The French language also has three daily broadcasts, while a fourth program is directed three times weekly to West Africa. The Spanish language has a similar number, Thursday being the day for the special South American broadcast. Daily programs in German, Portuguese, Czech, Russian, Slovak, Polish, Hungarian, Lithuanian are carried over the air. The four other principal Slavic languages (Croatian, Slovenian, Ukrainian and Ruthenian) are employed several times a week.

Nine Latin broadcasts each week are destined especially for priests and seminarians behind the Iron Curtain. They bring them important religious news, keep them up-to-date on pontifical documents, and refresh their memory of pastoral theology.

Such languages as Chinese and Arabic are also employed as well as a number of minor languages. In all, there are 28 languages through which the Vatican Radio speaks to what has been called "our spiritually undernourished world."

FIG. 6. Fathers F. Pellegrino and E. Pellegrino who are twins and Jesuit Fathers. One is Italian Program Director, the other, the Italian Commentator for Special Events.



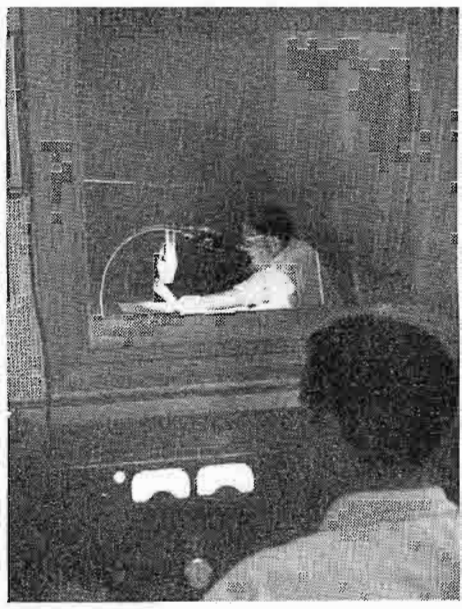


FIG. 7. Typical foreign language broadcast (German).

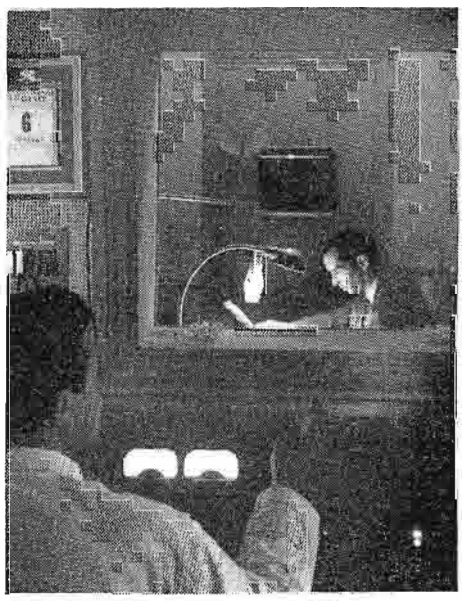


FIG. 8. Typical foreign language broadcast (Italian).

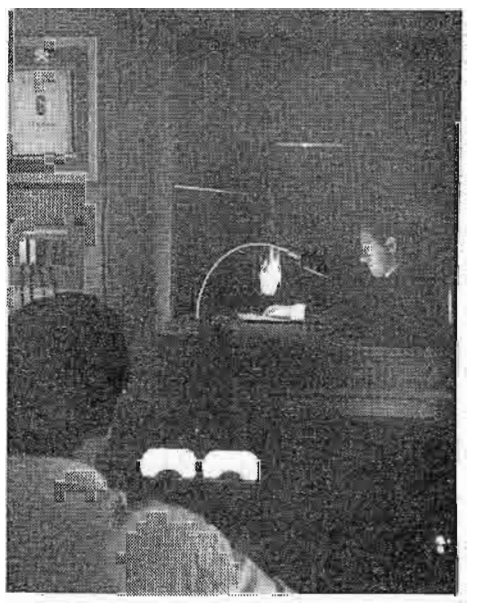


FIG. 9. Typical foreign language broadcast (Spanish).

FIG. 10. Program language translators at work prior to newscast. From fore-to-background: German, French, Polish, English.

Program Production

Although Vatican broadcasts are usually a brief 15 minutes, hours of hard work and the collaboration of many are necessary to prepare each program. The news must be gathered, checked carefully and translated into the different languages. A special section of the radio staff gathers the news items: The Vatican Radio Information Bureau, designated IRVAT (Informazioni Radio Vaticana). One of the Fathers who is an exceptionally fine linguist selects the news items in numerous languages and issues a daily news bulletin in Italian. A staff of laymen translates this bulletin into the respective languages. Talks must be written out in full detail and submitted to the judgment of competent commission. Considerable effort and ingenuity are required to maintain variety, freshness, and interest year after year. Dramatic, musical and other group programs are carefully rehearsed.

One source of news is the semi-official Vatican daily, the OSSERVATORE ROMANO, supplemented by the Vatican press office. Other news agencies, such as Fides, NC, KNP (Dutch), KNA (German), KIPA (Swiss), about 40 in all are called into service by the Vatican, to supplement its own sources.

After programs are prepared and translated into the various languages, many are put on tape before broadcasting for convenience in checking quality and for editing. The speakers are priests and laymen, some refugees from the religious persecution in their native countries behind the Iron Curtain. In this way they serve their fellow countrymen, as well as their worldwide radio-audience.

Iron Curtain Broadcasts

Station HVJ is now beaming its voice toward the Iron Curtain. Frequently refugee priests from the enslaved countries speak the messages of hope to their compatriots. For example, Father N. N., a Russian priest, is the speaker for the broadcasts to Russia. Himself a refugee from his homeland, Father N. N. understands well the near-despair of his brothers still under Communist domination.

Another bright cloud in the Red sky is the Vatican's daily broadcast in Latin to priests. Although this program of religious instruction for priests (begun in 1951) is closely monitored by the Communists, there is every reason to believe that it is getting through.

Messages of Hope

"Against the falsehoods of the Communist radio, the Vatican radio spreads the voice of truth," writes Father Theodoric Zubek, a Franciscan priest who escaped from a Communist concentration camp in 1951.

"I tell this from my personal experience, for until recently I was one of those slaves under Communist domination who pressed his ear to the radio receiver like a prisoner to the barred window of his cell. From the Vatican broadcasts, even as masses of others, I drew strength and courage in the hours of anguish and despair."

FIG. 11. Antenna system atop studio building for FM broadcasting, mobile link, and STL in that order from top down.

The Physical Plant

All the studios, the transmitters and antennas are crowded into the Vatican gardens. The studios are located in the former summer residence of Leo XIII which adjoins an ancient tower built by Leo IV over 1100 years ago. This ancient edifice—called the Leonine tower—also served as the official Vatican observatory until a few years ago. The Leonine tower has walls over 12 feet thick and it now houses a beautiful chapel dedicated to the Archangel Gabriel—heavenly patron of radio and all other telecommunications. Appropriately, at the top of the tower is a mast supporting several Vatican radio antenna systems.

Telegraphic Department

The telegraphic department is also located in the Leonine tower. It relays to the Nunciature and Apostolic Delegations the coded communications that are sent and received through the facilities of the Vatican Radio System. It also handles the commercial radiograms from the Vatican State.

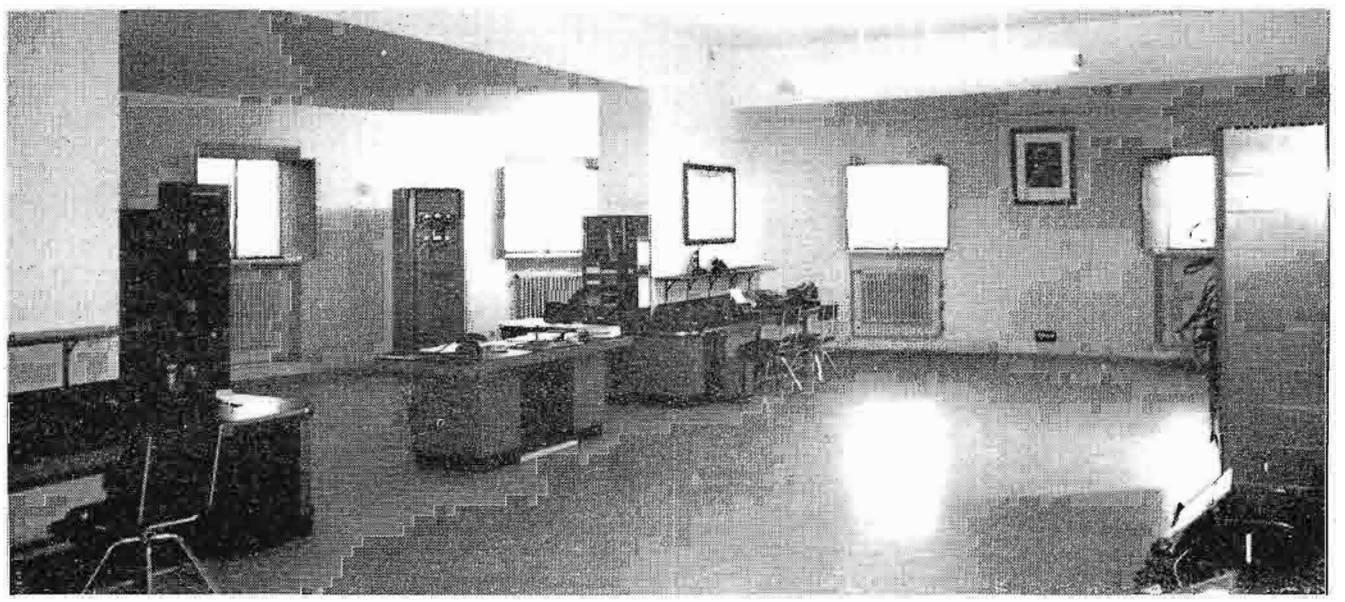


FIG. 12. Vatican world-wide radio telegraph and teletype communications center uses RCA radio equipment.

FIG. 13. Medal struck in commemoration of the Archangel Gabriel being declared the patron saint of electronic communication. Translation of the Latin reads: "The Word of God Remains."

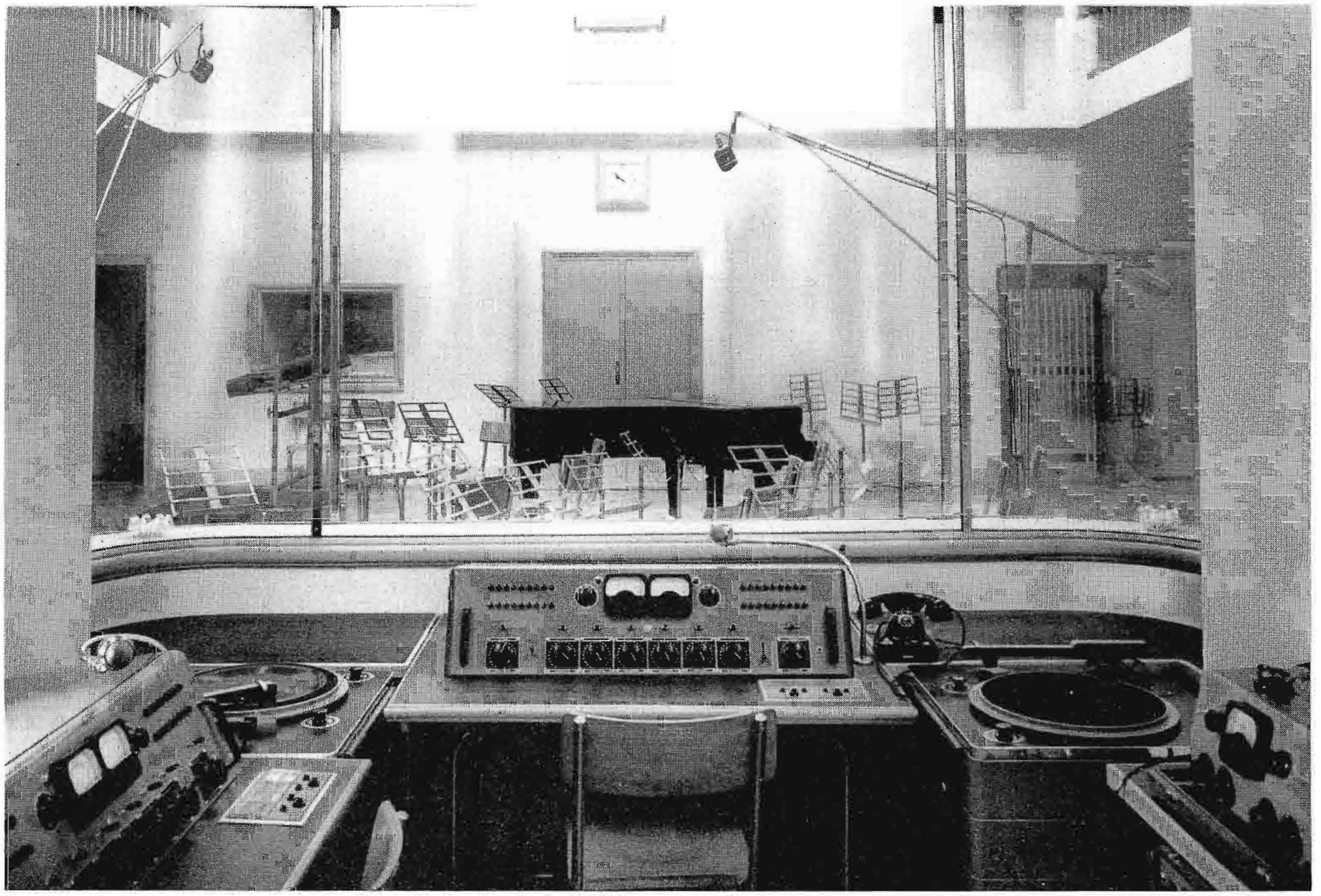
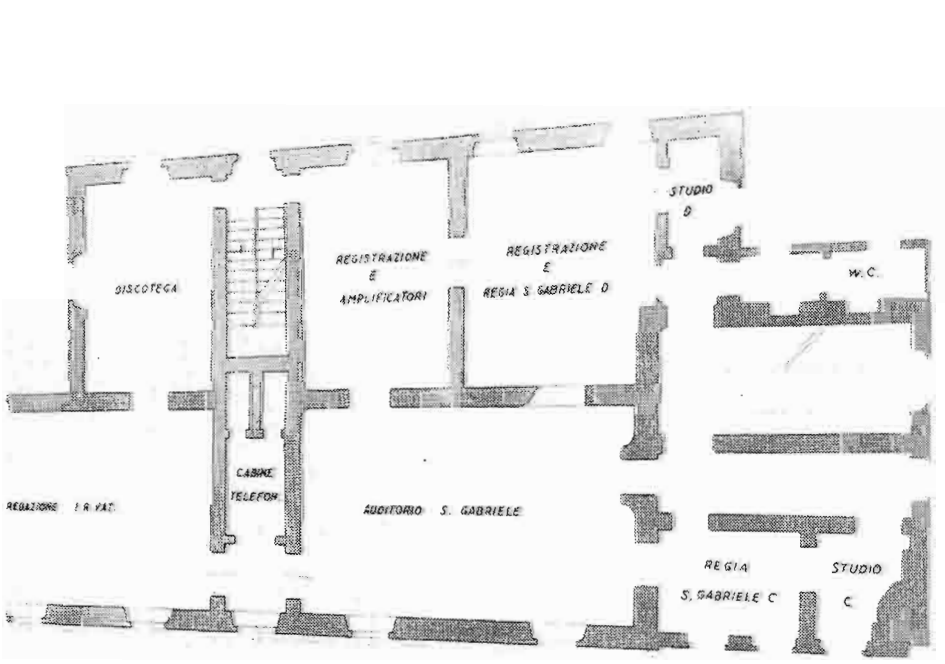


FIG. 14. Auditorio Assunta: A studio used for classical music programs and other large events. Note RCA control room equipment in foreground: two 76-B consolettes and two 70-C turntables and tape recorder at extreme right.

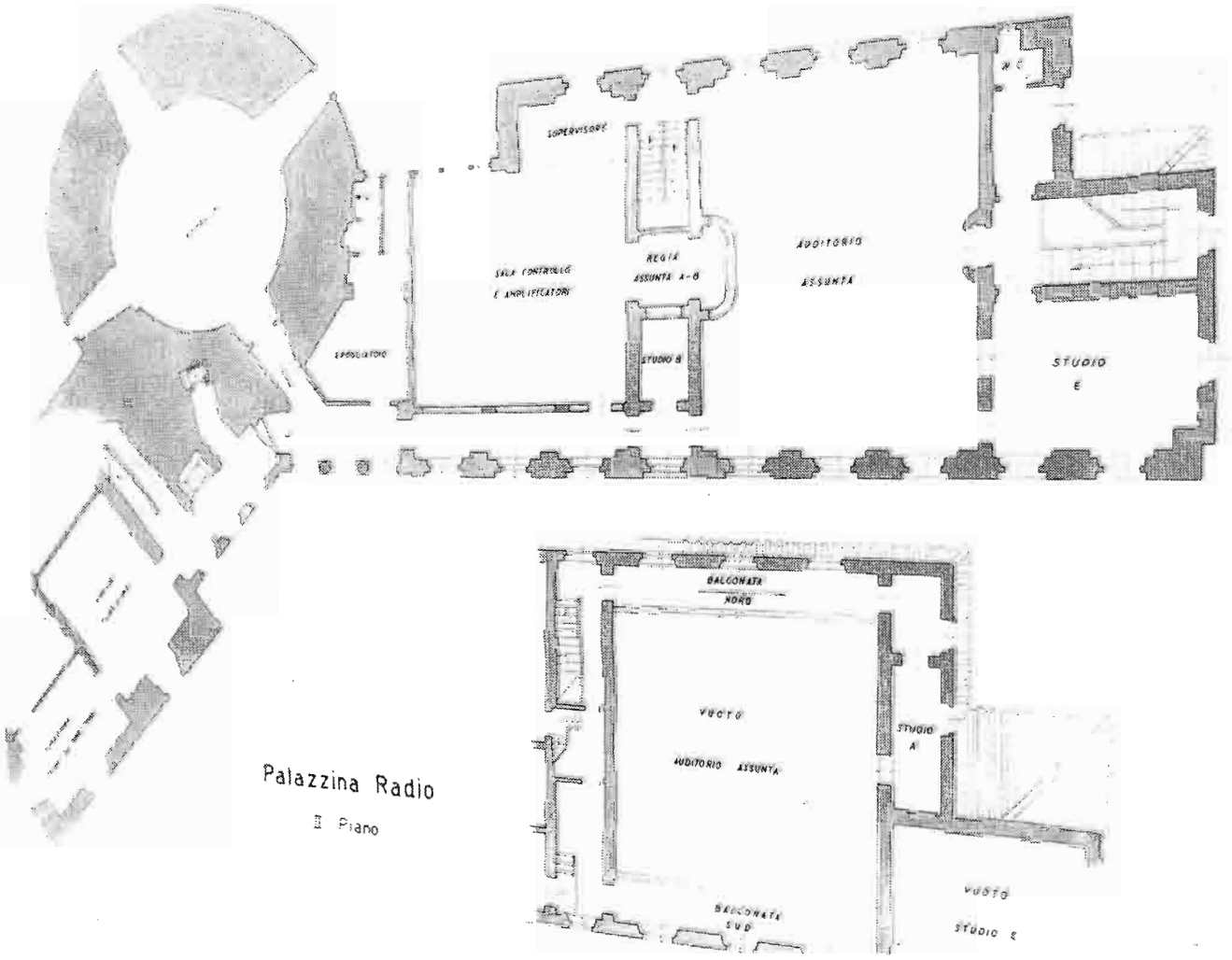
FIG. 15. First floor plan of studio building.



Palazzina Radio

I Piano

FIG. 16. Second floor and third floor plans of studio building.



Palazzina Radio

II Piano

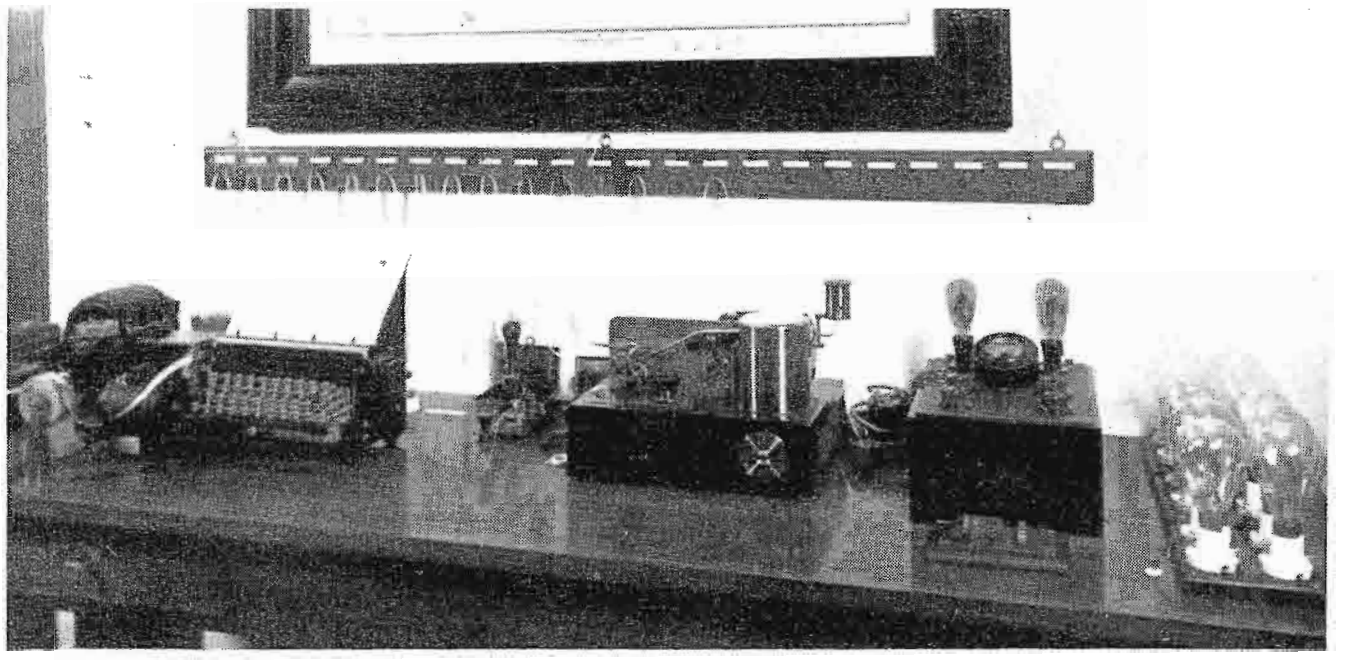


FIG. 17. The Vatican radio communications center as it looked in its earliest days.

Studios

There are seven studios in the building adjoining the Leonine tower, and of these, four are what are known as speaker studios. They are about equivalent to our American announce booths. They are used for newscasts and foreign language programs in which only one or two speakers are involved. Each is equipped with an RCA Type 44-BX microphone, a signal panel and a large clock. The walls and ceiling are constructed of acoustical tile. The other three studios are larger in size and can accommodate groups of various size for educational, cultural and religious programs.

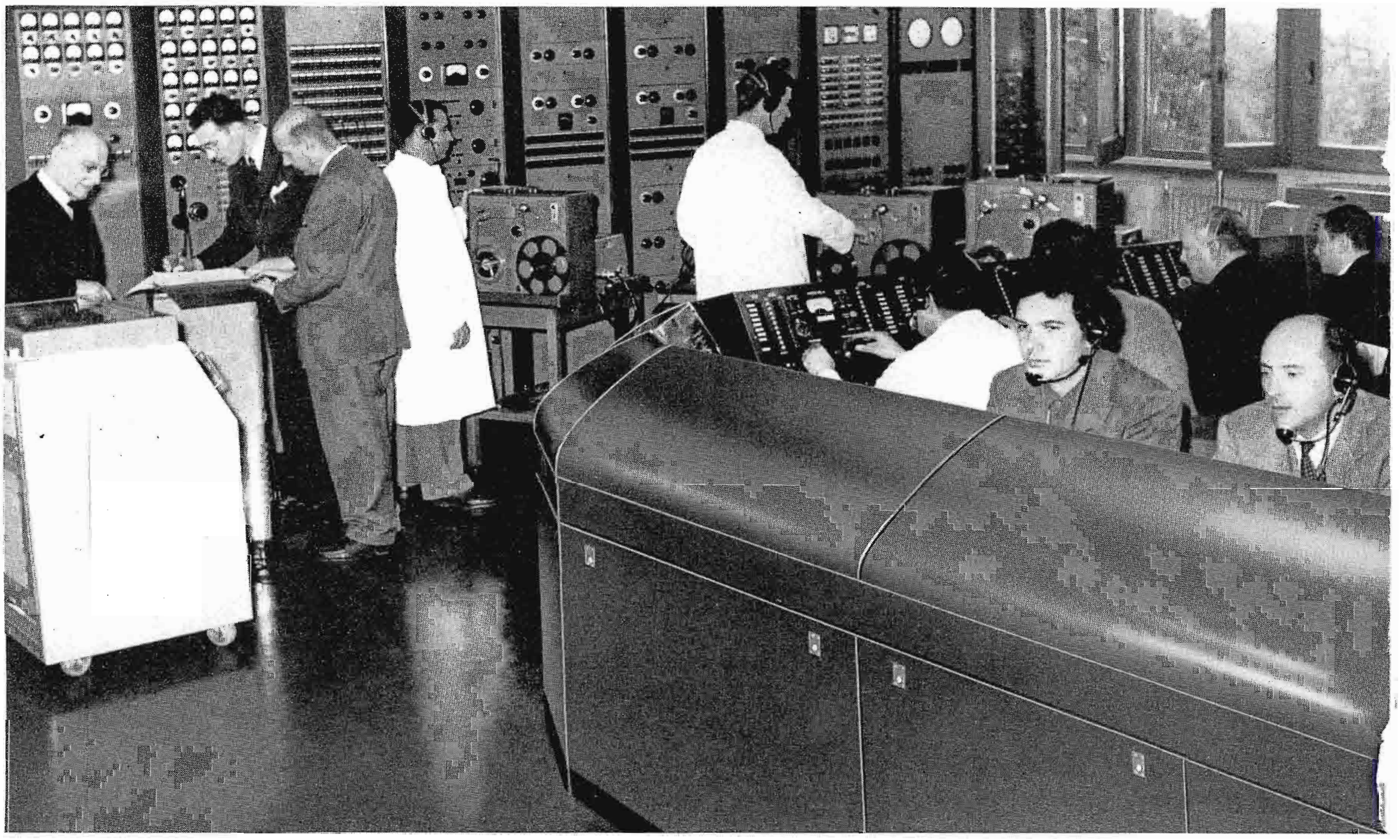
Control Rooms

Each studio has an associated control room (REGIA). These are equipped with one 76-D consolette, two 70-C turntables, one LC-1A monitoring speaker and two tape recording machines.

For signalling between control room and speaker studios a special signal light panel has been constructed by the Vatican radio staff. One panel is built into the desk upon which the consolette rests, the other is in a portable unit on the speaker's table (see Fig. 18 and also Fig. 23). Provision is made for eight indications. Two-way signalling is possible.

Intercom facilities are available at all control positions with all other parts of the radio system, both transmitters and studios. In addition, there are telephone facilities with connections to the Vatican City switchboard and to Rome.

FIG. 18. Typical control studio. One of five similar control rooms. Note speaker's signal panel built into desk (left).



Simultaneous Programs

Vatican Radio is perhaps exceptional among the world's production centers in being required, periodically each year, to broadcast an identical program to several nations simultaneously, along with superimposed commentary in the language of the country to which it is destined, thus enabling listeners to follow the ceremony as it proceeds. This is usually the case at Easter and Christmas, on the occasion of important addresses by the Holy Father as of special religious events of interest to the entire Catholic world. For example during last year's broadcasts these programs were relayed by 29 national networks to their listeners.

This special requirement called for the design of a unique audio control and distribution system, so constructed that the basic program can be directed into as many as ten different audio channels, each one of which goes to a radio transmitter beamed to a single geographical area, or into an international line carrying the program direct to the transmission center of one of the national networks.

During one of these great broadcasts, therefore, there may be ten different commentators speaking in ten different languages, through as many channels. Each commentator has before him signal lights and intercommunication facilities. In this way he keeps in touch with the operators managing the basic program to receive cues and instructions for inserted comments.

Master Control

The operators regulate and supervise the ten audio channels at a large RCA custom-built console located in the master control room (see Fig. 19). There is a separate control panel for each channel so that during a very large and complex broadcast, as many as ten operators could be seated at the console.

There are 30 incoming program lines available, consisting of ten local studios, ten remote studios and ten language announce studios. Each control position can select one of the local studios as a basic program source, regardless of how many other operating positions are connected to this program. Thus, one local program may be fed to all ten transmitting positions if desired. Each control position can alternately select one of the remote studios as a basic program. However, the selection of any one blocks other positions from selecting the same one. Not until it is released can it be picked up at another position. Indicator lights on each panel show the total number of remote studios in use. A supervisor or incoming new operator can immediately see the status of all circuits.

Each control position can select one of the ten language announce studios to be used in conjunction with the basic program. These are interlocked and provided with indicator lamps as for the remotes.

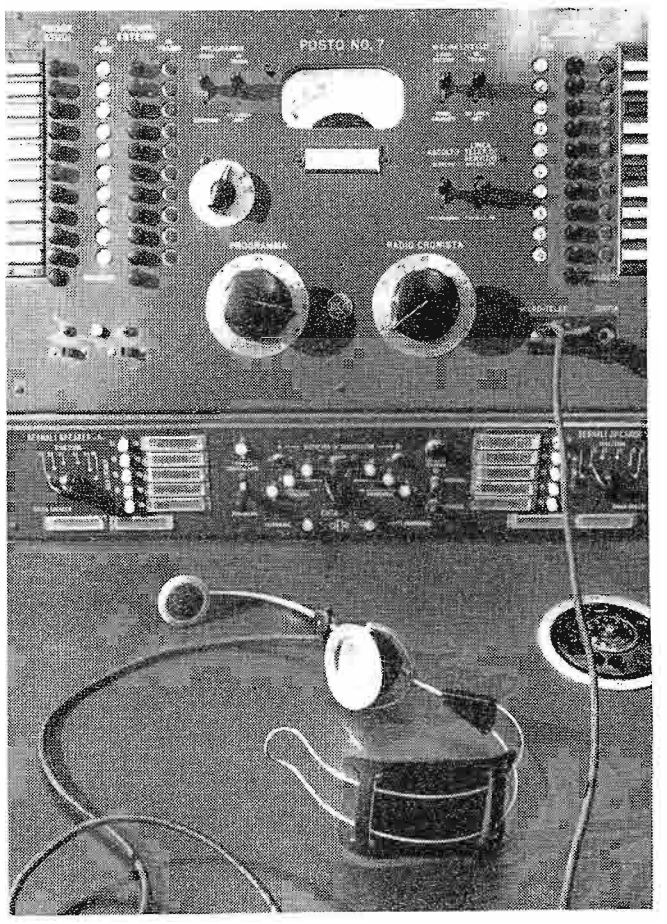
All circuit switching is done by a relay cross-bar system, comprised of 320 relays mounted in three cabinets and installed directly back of the equipment racks. Control of the relays is accomplished by push-button switches on the control panels.

One of the control positions is shown in Fig. 20. The lower panel accommodates the intercommunication and signalling system which was built and installed by Vatican engineers.

The two controls on the lower central part of the main panel are the variable attenuators which are adjusted to provide

FIG. 19. A team of ten operators is used at master control of Vatican Radio when simultaneous programs are relayed.

FIG. 20. Close-up of one of ten control panels in master control console. This is the Portuguese position.



the proper balance of signal level between the basic program and the superimposed commentary.

The VU meter is normally connected to the outgoing program line. However, the signal level of the basic program or the language translation may be observed independently by switching the VU meter to the appropriate circuits.

The row of push buttons to the left controls the relays for selection of a studio program. These studios are identified by printed designations which can be inserted in the card holders.

The second row of push buttons controls the remote studio circuits. The white indicator lamps (one through ten) show which lines are in use, and the remote that is selected at this panel will be indicated on the lamp bank to the right. Switches and indicator lights for the language announce circuits are positioned on the extreme right of the control panel. Operation of the associated relays and indicator lights is the same as the remote studios. Jacks are provided to accommodate a headset for telephone communication as well as a pair of headphones for line monitoring.

FIG. 21. Operators Vincent Minelli and Nicola Mancini at two of the master control positions.

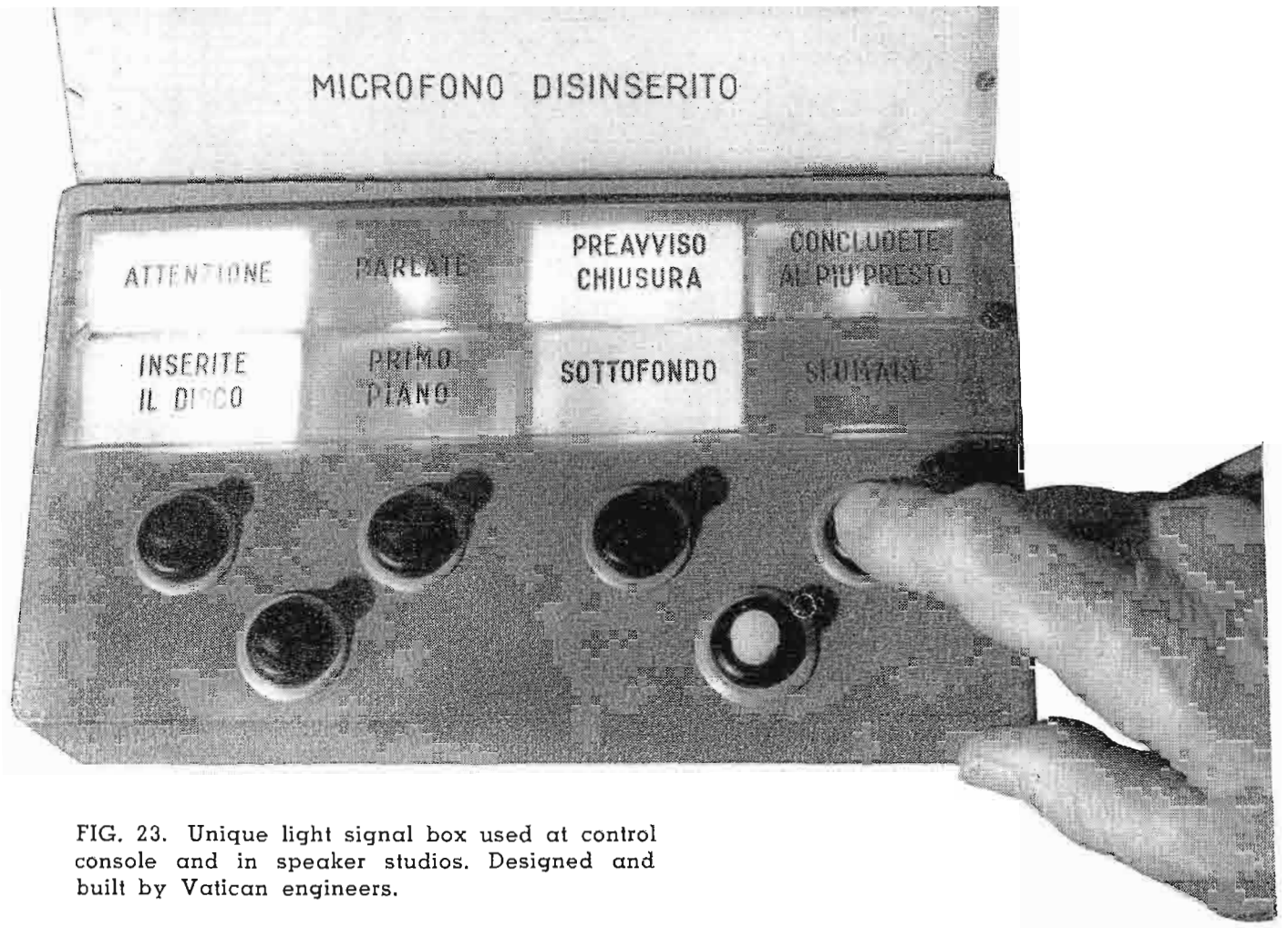


FIG. 23. Unique light signal box used at control console and in speaker studios. Designed and built by Vatican engineers.

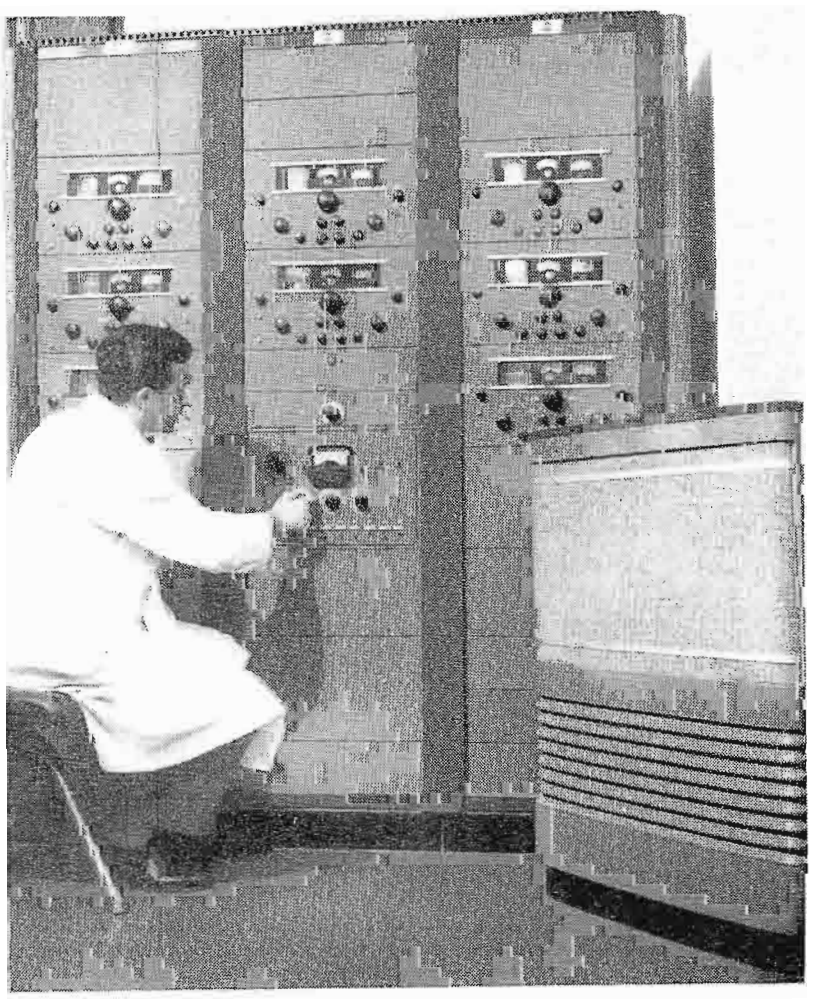


FIG. 22. Master monitoring room for automatic sequential monitoring of eight transmitters. Note control panel within easy reach of supervisor.

Signalling

Signalling consists of controlling a series of illuminated signals which each commentator and each control operator has before him. These signals consist of small translucent indicators, each being engraved with a significant type of information. These signals are: "GET READY", "BEGIN SPEAKING", "SIGN OFF", etc.

When the control operator pushes a button to convey information to the commentator, the appropriate signal becomes illuminated at both positions. The commentator to acknowledge reception, pushes a button which puts out both lights.

In addition to the optical signalling system just described, there are also three telephone lines available to the control operator. One goes direct to the transmitter or to the tied-in national broadcasting center, one to the commentators' position and the third connects to the inside telephone exchange (PAX).

Figure 19 also shows the monitor control positions for the master control room. This provides either loudspeaker or headphone monitoring of all program sources as well as outgoing lines. There is also a separate supervisory monitoring booth.

Supervisory Monitoring

Adjacent to the master control room there is a glass-enclosed soundproof area (Fig. 22) used as a supervisory monitoring booth. Installed in this room is a specially designed ten-channel monitoring console which provides comprehensive supervision of the Vatican's complete radio system. Eight of the monitor channels are equipped with communication receivers, RCA Type CR-88B, which are mounted in three cabinet racks. Two channels reserved for future expansion do not have receivers installed. A control panel (see Fig. 22) is located in the center rack within easy reach of the supervisor. By the use of headphones, or loudspeaker, he can monitor transmissions from the air by radio or check three separate test points in each master control channel.

A feature of this system is the automatic sequential monitoring of the ten radio channels. After the tenth channel is monitored, the sequence repeats beginning with channel 1. The sampling can be adjusted to any time interval of 2 to 15 seconds.

Unused channels may be by-passed so that only active transmissions are included in the monitoring sequence. Indicator lamps, (1 through 10), show which channel is being tested at any instant.

A rotary stepping switch is arranged and wired so that the three separate test points associated with each channel are sampled simultaneously with the corresponding receiver. Only one at a time is connected to the monitor system, depending on the setting of the control selector.

The supervisor will normally monitor the air receivers which is position "D" on the selector. He checks each transmitter against assigned frequency and observes time of frequency changes. If any irregularity exists in the transmission, the automatic timing device can be stopped to provide prolonged observation. Trouble can be localized quickly by use of the control selector. For any channel, position "A"

checks the output of the language booth, position "B" checks the basic program circuit, and position "C" checks the line feeding the BTL-1A relay transmitter. Position "D", as mentioned previously, is the receiver check for each channel.

The signal being monitored by the Supervisor also connects to the private automatic telephone exchange (PAX). Anyone, by dialing the assigned number, can hear the program in his telephone. The supervisor by use of the above equipment plus a telephone headset used for ordinary intercom purposes can monitor and supervise the entire radio operation.

Transmitters and Antennas

The present transmitting site is approximately one-quarter mile from the studio building. Here are housed seven of the eight transmitters used in present Vatican Radio broadcast operations. Two transmitters are broadcasting on medium waves and five on short waves. The eighth transmitter is housed in the studio building and consists of two RCA Type ET-17 250-Watt FM Transmitters. It is used for local broadcasting operations.

The present AM radiating system, confined to the 10 acres of the tiny Vatican City State, consists of some 15 omnidirectional antennas, located on some of the highest ground in Vatican City. The FM Turnstile antenna is located atop the Leonine tower, the highest point in Vatican City except for the Dome of St. Peter's.

Mobile Studios

To supplement the studio programming there are two fully furnished mobile units. They have a radius of 30 miles and are equipped with recording apparatus. They pick up broadcasts in basilicas, in churches and at major religious gatherings. These are either recorded for later transmission or relayed to the station for immediate transmission.

The two mobile units use Fiat chassis and body, with RCA radio equipment. Each contains three FM transmitters, Type CTR-1, one FM and one AM receiver. Included also are one 70-D consolette, two tape recorders, a power amplifier and two disc recorders.

Power Supply

Vatican Radio uses 125 volt, 50 cycle a-c supply for master control and studio operations which require only 15 kw of

FIG. 24. Vatican transmitter building, showing partial view of antenna system. This building houses eight transmitters.

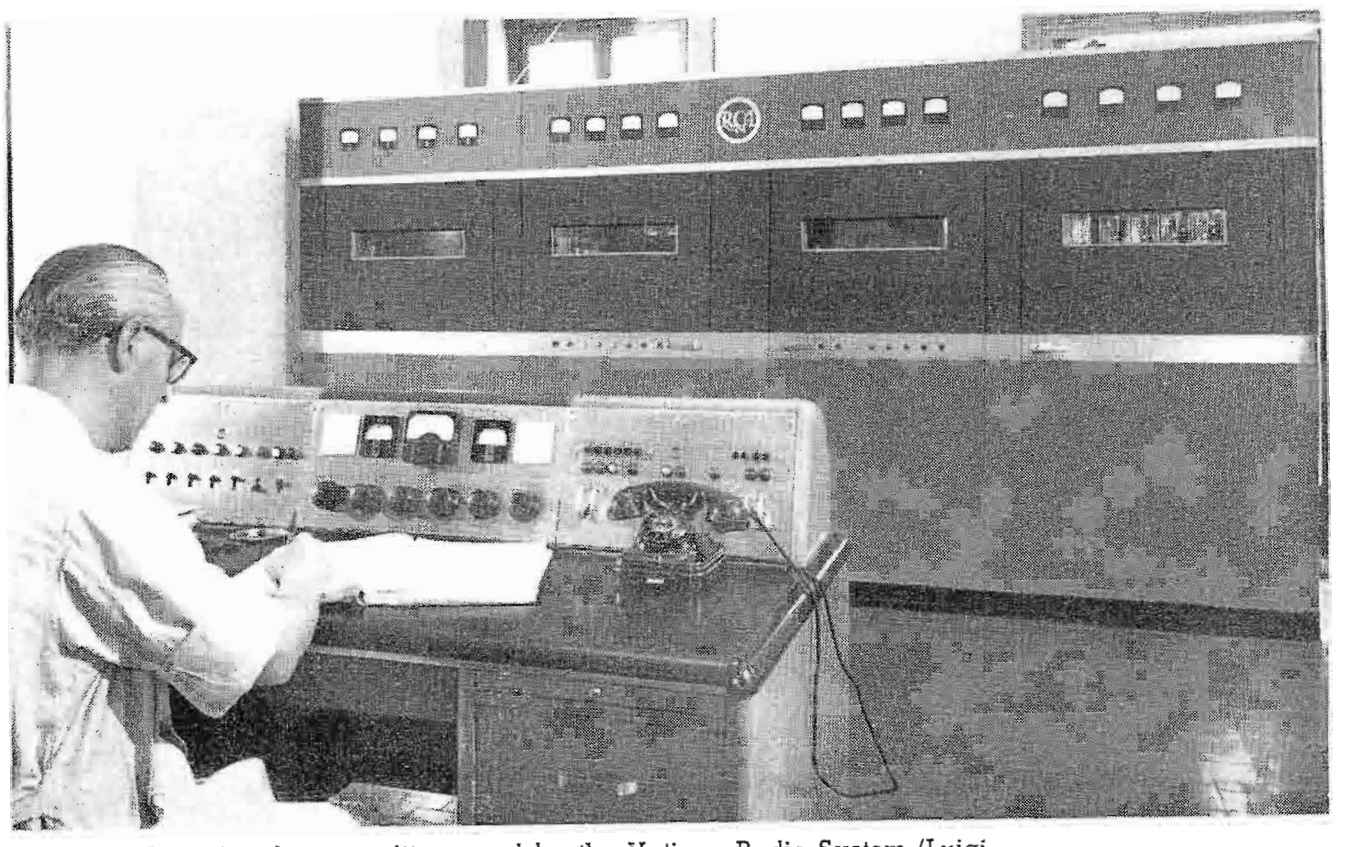


FIG. 25. One of eight transmitters used by the Vatican Radio System (Luigi Arrú, transmitter engineer). This is a 5-KW Type BTA-5F AM Transmitter.

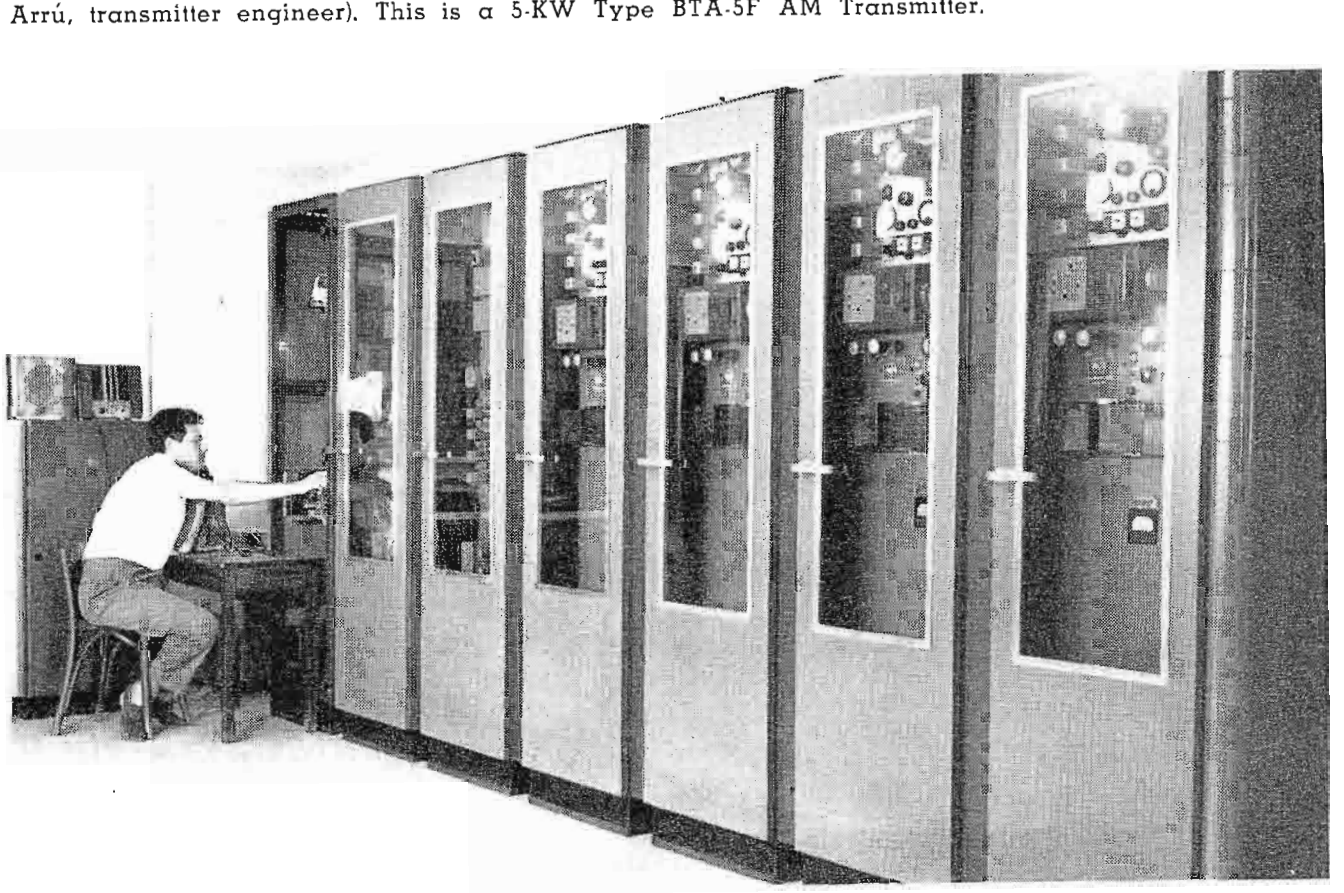


FIG. 26. Operator Ghislandi at communications circuit of six-channel STL system.

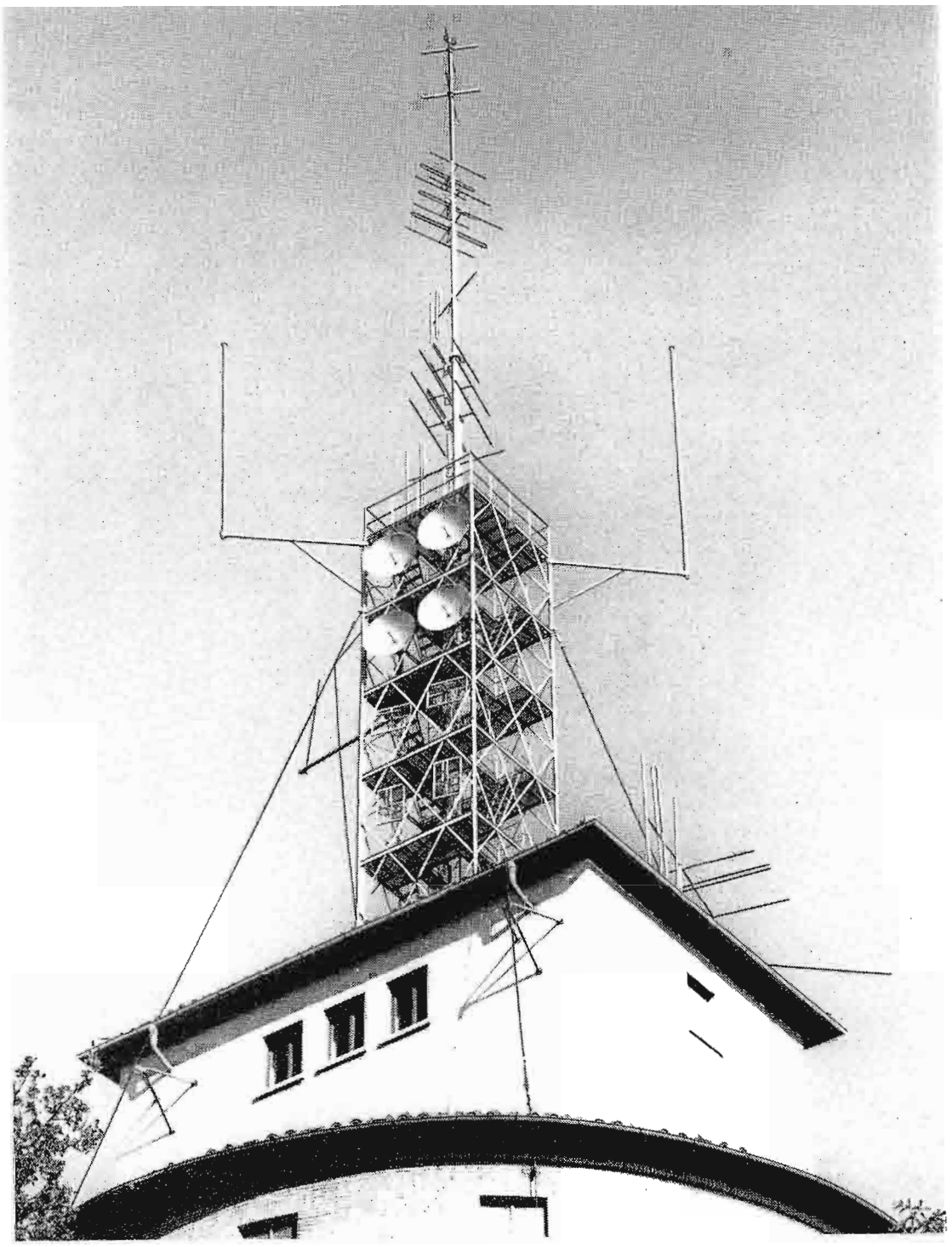


FIG. 27. Antenna system atop Leonine tower of studio building. Note FM broadcasting, mobile link, and STL in that order from top down.

FIG. 28. Two RCA 250-watt FM transmitters are used for local (Italian) broadcasting by the Vatican.

power. A 3-phase, 220-volt, 50-cycle supply is used for transmitters, which require 600 kw of power. Emergency power is available from a diesel and water turbine generating system which can supply the entire Vatican City, St. Peter's and the radio station.

Financing the Vatican Radio

The two usual sources for maintaining a radio station—advertising and license fees—cannot be tapped by the Vatican. Hence, the Holy See through the voluntary offerings of the faithful must make a considerable outlay of money. Since the Jesuit speakers on the radio and many priests and laymen may accept only a nominal sum, they are able to make a constant and substantial contribution to the Holy See. However, the salaries of technicians, as well as the cost of repairs and the constant upkeep of buildings and equipment, are so many headings of considerable expense.

Facing the Future

The vastness of the territory to be reached, and the variety of difficulties to be overcome, place demands upon the Vatican Radio that no other network experiences. The increase of radio stations around the world, and carefully planned and executed interference make it imperative to secure more powerful equipment, above all, directional antennas in sufficient number and with adequate power to reach every corner of the world under all conditions.

Work on the erection of a new and more effective transmitting center has begun, but lack of adequate funds has greatly hampered the project. For the Golden Jubilee of Pius XII in 1949, a considerable sum of money was collected to purchase and set up this new equipment. Particularly generous were the Dutch, Spanish and American Catholics, but even so, much more is needed if the Holy See is to have the radio system that will convey its message effectively throughout the whole world.

The new transmitting site is approximately 16 miles from the studios in Vatican City. Agreement has been reached with the Italian authorities to give the ground embassy status, i.e., extra-territorial jurisdiction. The center covers an area of some 200 acres. There are plans to install five 100-kw transmitters. Already installed is a 100-kw short-wave transmitter—a gift of the people of Holland. Also installed is a 120-kw transmitter made

FIG. 29. One of two RCA-equipped mobile units used by Vatican Radio for remotes from basilicas, churches and special events within a 35-mile radius of St. Peter's.

About the Author:

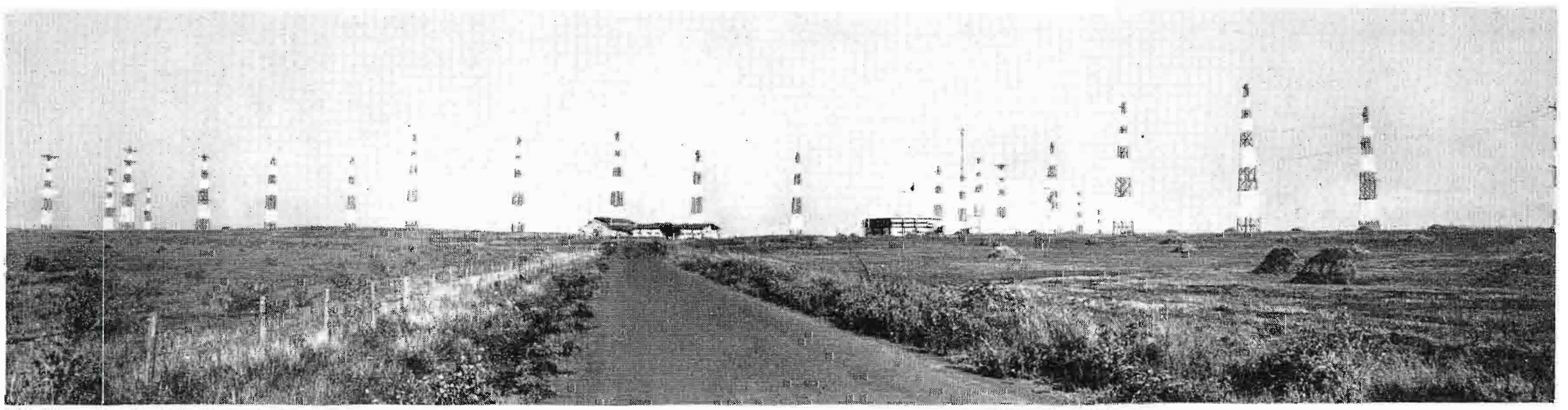
Father Anthony Stefanizzi, S. J., was born in Italy, 1917, and licensed in philosophy, 1938. He received his doctorate in physics from the University of Naples in 1943. Ordained as priest in 1946, he did research work in cosmic rays during 1949 and 1950 under Nobel prize winner Victor F. Hess at Fordham University in New York. Fr. Stefanizzi served as Professor of Philosophy and Science at the Gregorian Univeristy in Rome, 1951-52. He assumed his present position as Director of Vatican Radio in 1953.

possible by the generosity of Catholics during Holy Year. Other transmitters will be added as soon as financial means permit. Twenty-one curtain antennas, surrounding the transmitting center star-wise, are now being erected. Each array is provided with a reflector and the feeder arrangements allow for reversing and slewing. Slewing in azimuth of the direction of maximum radiation is 15 degrees on either of the normal direction and consequently with three antennas in a unique star-system design it will be possible to cover 360 degrees. Slewing is also possible in the zenith direction, and so programs can be beamed with accuracy and efficiency to a wide range of countries, laying on the same azimuth but at various distances.

An STL link is being installed between the present studios and the new transmitting center, using Type BTL-1A equipment over the 11-mile route. Frequencies in 900-250 mc range are being employed. Six channels are provided by this link. It is expected that the new transmitting center will be ready for operation in a few months.

This great new effort in the cause of world peace waits upon the unfailing bounty and good will of the children of the Roman Catholic Church throughout the world. Already generous gifts have poured in. As people in other parts of the globe respond with equal generosity, those abiding words of hope, light and encouragement will go forth from the center of Christendom with greater power to more nations and people than ever before.

FIG. 30. New transmitting center, now under construction.



BRINGING RADIO TO THE PUBLIC —1957 STYLE

THE PROBLEMS POSED BY THE REQUIREMENTS OF TODAY'S SUCCESSFUL FORMAT BRINGS MANY CHALLENGES TO THE STATION ENGINEER

by HARRY DENNIS, *Chief Engineer*
Station WERE, Cleveland, Ohio

FIG. 1. Equipment once used for remote disc-jockey type pick ups. This included heavy, studio-type 70-D turntable, remote amplifier and other necessary equipment. It was a bulky lot, very inconvenient to move from place to place.

FIG. 2. The use of a portable turntable made the job of doing a remote d-j show somewhat more convenient.

While certainly not a new subject to radio broadcasters, bringing radio to the public in 1957 Style *is different*. Just a few short years ago we were concerned with the old, but not to be forgotten dance-band remote, or the Saturday morning Amateur Hour from the auditorium of the local department store. Today, it is not this but the disc jockey who now occupies five or more hours of air time daily. Those of us who are engineers are faced not only with technical problems of equipment but, more importantly, with the problems of how to adapt our tools to meet the challenges of a successful program format.

At WERE our programming structure is the block-programming style of a disc jockey around the clock. While many are not yet responsible for stations which use this style of programming, I will endeavor to demonstrate some of the types of equipment we use at WERE for disc-jockey remotes, lasting from a minimum of five hours to all-day operation. Perhaps we use something which might be of value to those who are interested in programs of this type from the field.

While all our engineering planning for this type of remote is based on the use of technical personnel assisting the disc jockey, our system might also be adapted to the "combo" type of operation.

Rise of Remotes

Our original attempt at the disc-jockey remote came about in 1950 with the arrival, on the Cleveland scene, of our sister medium—Television. In my mind, I compare our first attempts at this type of remote back to the old days of the carbon microphone with its companion, the storage battery. We, like many others, went into the business of selling television sets with a real vengeance in 1950. A leading Cleveland dealer, with stores on both the east and west side of Cleveland, purchased sufficient amount of time to take our first five-hour. disc-jockey remote to the field and, I might add also, five days a week.

FIG. 3. Single-package remote unit designed by WERE Engineering Staff. It weighs only 70 lb., including two turntables, amplifiers, PA system and audio-consolette. Note handles for carrying. This is easily moved from one location to another.

This meant taking a 70D turntable, a remote amplifier, a PA system, speakers and other necessary items (see Fig. 1). In the few moments it takes to mention these items, it does not seem like a lot, but for those of us who have ever lifted a 70D turntable, know well what I mean, when I say those days remind one of the carbon-microphone and storage-battery era.

After a five-day period at one store all equipment had to be packed and taken acrosstown. To those familiar with Cleveland, you know this was no simple task. A good half day's time was consumed in moving from east to west and vice versa. I might add at this point, all this effort was rewarded with success for both the sponsor and WERE.

We continued with the back-breaking struggle for a few years with the studio-type turntable. The popularity of this type of remote kept increasing until the need for more portable-type turntables was almost a necessity. This type of remote was more and more in demand from restaurants and night clubs as an entertainment feature to supplant live entertainment.

FIG. 4. Mobile studio-on-wheels proves to be the ultimate for doing traveling disc-jockey shows. This WERE unit is equipped to operate independently of outside facilities. The turret on top is used by the announcer at outdoor public events. It is raised and lowered by hydraulic operation, off the engine.

FIG. 4A. WERE mobile unit in use at the 1956 presidential political campaign meetings. Note that turret is in "recessed" position.

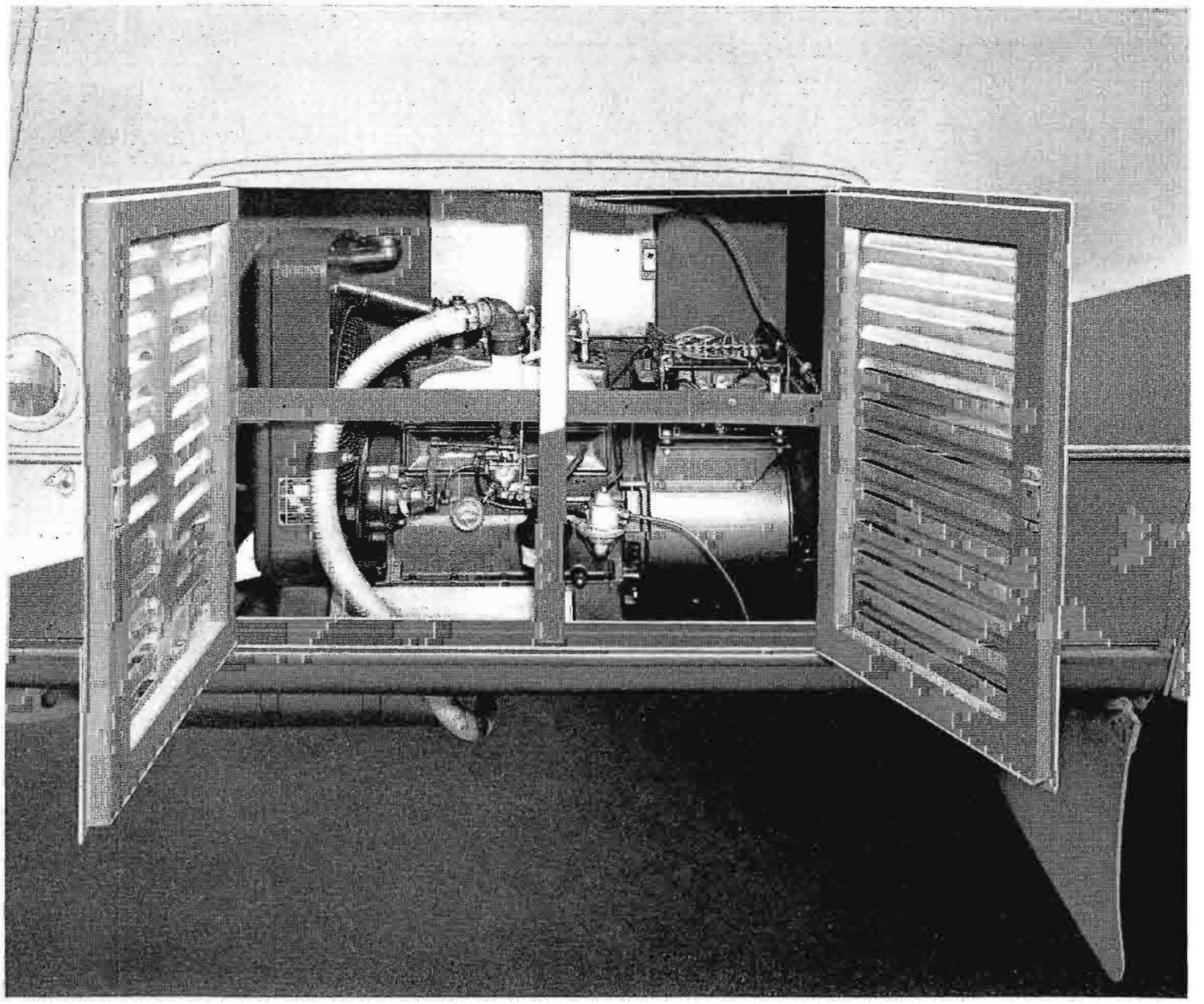


FIG. 5. A 5,000-watt generator is built into the mobile unit. It is used to supply power for equipment as well as for lighting the unit, inside and outside. (Included in lighting is a theatre marquee-type sign on each side and a revolving beacon in the turret).

The increasing popularity of better home-record-playing systems was a real blessing in disguise to us. Fairly decent turntables were available on the market. It did not take us long to locate something that would replace the extremely heavy, studio-type turntable. We still had the remote amplifier, plus an external PA system. (We found that the PA system was almost as important a requirement as was the remote amplifier.) I might add at this point, we were able to reduce overhead in doing this type of remote by utilizing WERE-FM to great advantage.

At WERE, we never take any spot commercials to the field. All spots are played during these remotes from either a studio control room or master control, depending upon the time of day. Good FM tuners became available on the open market. Instead of purchasing a cue circuit from the telephone company, we utilize our FM signal as a PA feed for the audience watching our broadcasts. This gives the audience a complete feed of whatever is on our air. There is no reason why an AM signal cannot be used to just as good advantage. We happen to duplicate all programming on FM and there have been times when we have done these remotes from outlying areas where our AM signal is subject to nighttime sky wave interference. Hence, the use of FM.

Lightweight Remote Unit

Since WERE is a very alert station when it comes to promotion, we found that the disc-jockey remote was one of the best promotional items we had. Not only were these remotes good for WERE, but these remotes were good for our advertisers. More and more of our disc jockeys were in demand to do their programs from the field. While we now had a lightweight turntable, the whole operation was still too cumbersome. We needed lightweight equipment. What we needed was something that one man could handle with ease.

We decided to build our own equipment. We endeavored to put it all into one package that was complete and still able to be handled by one man. After considerable deliberation and after many suggestions from the members of WERE Engineering Staff, we came up with a list of equipment that we felt would certainly fulfill all requirements for this type of operation. We combined all the necessary facilities in one complete package, weighing approximately 70 pounds (see Fig. 3).

This unit includes preamplifiers, line amplifier, turntables, PA system, and all necessary controls. We endeavored to make

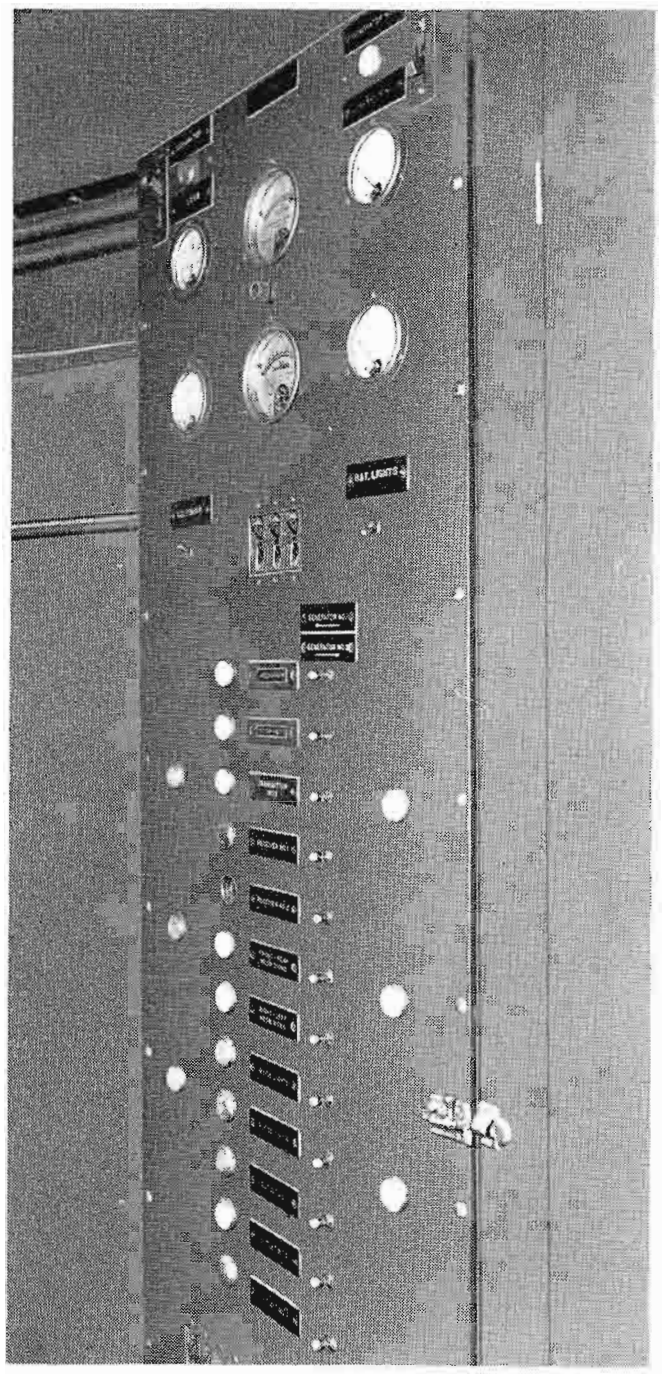


FIG. 5A. Power panel inside WERE mobile unit.

the operating controls correspond to the studio controls so that the operating personnel would be as familiar with field as with studio equipment. This remote unit fulfilled our fondest desires. It was, by comparison, light in weight and easily moved from location to location. We are still making use of this equipment.

Studio on Wheels

For doing traveling d.j. shows, our Vice-President, Dick Klaus, felt that we needed something more adequate. Certainly the type of equipment we had was not suitable, for example, all day operation from shopping-center openings. We decided to purchase and equip a studio on wheels.

In this undertaking our biggest difficulty was to be in finding the right vehicle. We looked at all types of trucks, station wagons and trailers. For a long time we never could find what would really fill our needs.

One day, quite by accident, we came across an advertisement of a most unusual vehicle. I was dispatched to Illinois to look it over. When first I saw this truck, I knew we had found what we were looking for. This was one of those "once in a lifetime opportunities" to purchase a truck that would fulfill all our hopes and wishes for a studio on wheels. Many of our basic requirements were already in the truck. The interior construction of the truck, for example, made it possible to allow for a studio and control room. We decided to

FIG. 6. Control console inside WERE mobile unit. Three-speed turntables are used. An RCA Type BC-5A Audio-Consolette is employed. The complete control console can be removed as a unit for use in semipermanent remotes.

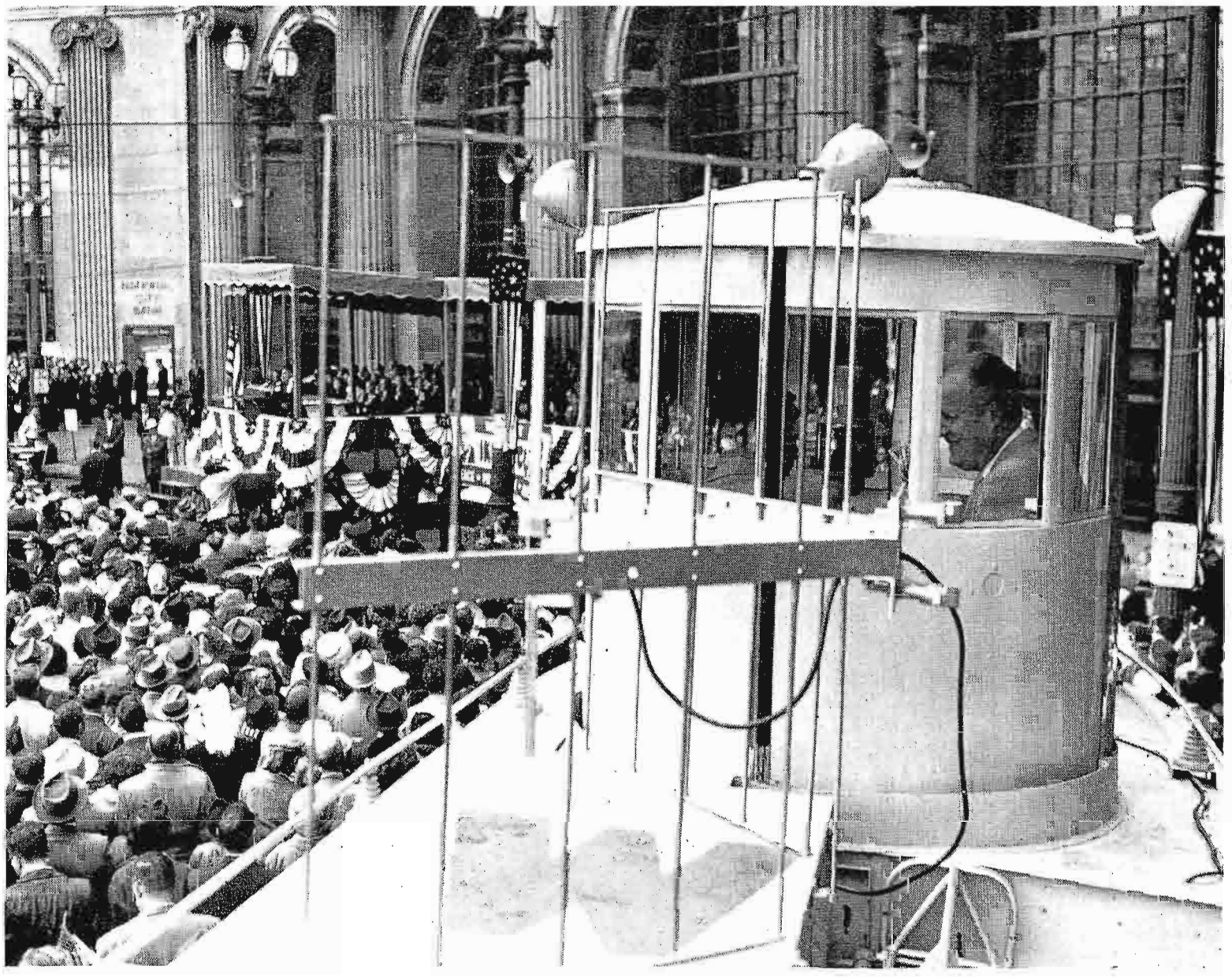


FIG. 7. Note directional antenna atop WERE remote unit. This is used with 25-watt FM mobile transmitter to send signal back to station. This feature enables WERE mobile unit to be used in places where it not possible to obtain wire lines.

FIG. 8. Complete equipment in WERE mobile unit includes a tape recorder. The equipments external to the console are rack-mounted. All switching is readily available to the operator. On location, it is only necessary to plug in the microphones.

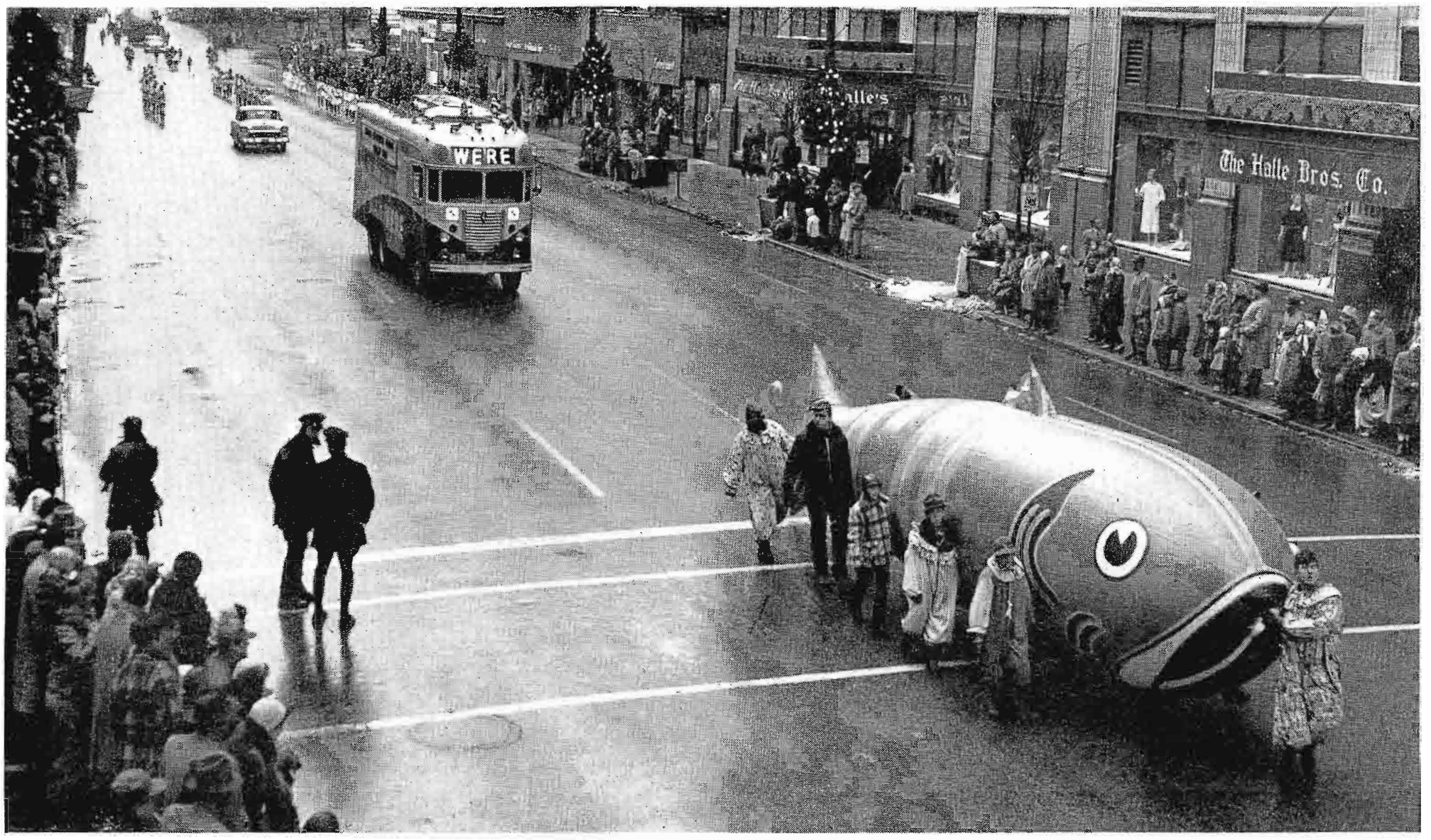


FIG. 9. Typical use of WERE mobile unit for local parade. Unit is made available to Police Dept., Welfare Agencies and Civil Defense. It serves as an excellent promotion for WERE.

equip this truck in such a way as to permit complete mobile radio operation independent of any outside facilities (see Fig. 4).

While planning this truck to fulfill our own special requirements it became quite apparent to us that we could also do a service for the community. Here was an opportunity for WERE to do an excellent "public service" job by combining the efforts of our Engineering and Promotion Departments.

In planning the equipment for our studio on wheels, we decided to equip it as completely as possible, keeping in mind other uses besides actual broadcasting. We did not want to limit our application of this truck. As a result, we started out by equipping the truck with a 5000-watt generator to supply not only all the necessary power for equipment, but also to have sufficient power for lighting the truck on the inside and outside (see Fig. 5).

Our planning called for two turntables. We decided to use 3-speed turntables so that we could play all types of records.

Our next problem was a console. One of our problems encountered in the field has been feedback. Therefore, it was deemed necessary that by using a small console we could take advantage of speaker relays to help beat this problem. We selected the RCA Type BC-5A Audio-Consolette (see Fig. 6).

At the same time space was a problem. We designed a special console table that would fit into the available space in the truck. The size of this console was such that we can remove it from the truck and use it also in the field as a semipermanent setup, such as an auto show where we might do a week of broadcasting.

Some of our field pickups have come from areas where lines were hard to obtain. We added a 25-watt mobile FM transmitter so that we could go any place. This, together with our portable power plants, enables us to make remote pickups at out-of-the-way places.

We chose to use a directional antenna with our transmitter, figuring it was simpler to orient the antenna at the pickup point toward the receiver. So far this has proved a satisfactory way of doing mobile pickups from a fixed location (see Fig. 7).

It might be interesting to recount a mobile pickup we did from a ship on the

FIG. 10. This is the "studio" portion of the WERE mobile unit, used also as the "clients' lounge."

Great Lakes. A new cruise ship called the SS Aquarama was brought to Cleveland last summer. The first night that this ship sailed from Cleveland was "WERE Night." It was decided to do our night disc-jockey show while the ship cruised Lake Erie. In this instance we installed our transmitter and antenna on the bridge of the ship, and did the actual broadcasting from one of the lounge areas. We did not attempt to play records aboard the ship, but used only a voice channel from the ship. Our FM signal was utilized to feed the ship's PA system. Although we worked a range of 30 miles over water to our receiver it proved to be a very successful mobile pickup. A man was stationed on the bridge to rotate our transmitting antenna as the ship turned, and thus our broadcast was accomplished.

In addition to the console, turntables and transmitter, we also equipped our truck with a tape recorder. We rack-mounted all our equipment that was external to the console (Fig. 8). The truck also has a 20-watt PA system with speakers mounted outside on the four corners.

All necessary switching equipment is readily available to the operator so that no connecting is necessary other than plugging in the microphones on location.

All equipment is set up to feed the studio by line or off the air and at the same time feed the truck PA, external PA systems and a tape recorder. The tape machine can also be used to feed the console or the truck PA while the truck is in motion. This is frequently done in public-service operations.

In putting radio on wheels, we of the Engineering Department have been able to serve two and even three masters. Not only do we provide the necessary technical equipment, but also a useful means to serve our Promotion Department, and provide a real service to the public.

In addition to the technical equipment installed within the truck, we installed a theater marquee-type sign on each side. We can advertise WERE or a civic venture. We use the same type of plastic lettering, with back-lighting as used by theaters on their marquees. This permits nighttime displays as well as daytime signs. (See Fig. 4.)

Public Service

We have made this unit available to Cleveland's Police Department, Welfare

Agencies and Civil Defense Officials. Last year, for example, a severe windstorm struck the west side of Cleveland. Within an hour the unit was on the streets where severe wind damage took place, urging citizens off the streets because of fallen live wires. We were even requested to go and help supply power from our generators to light a police station.

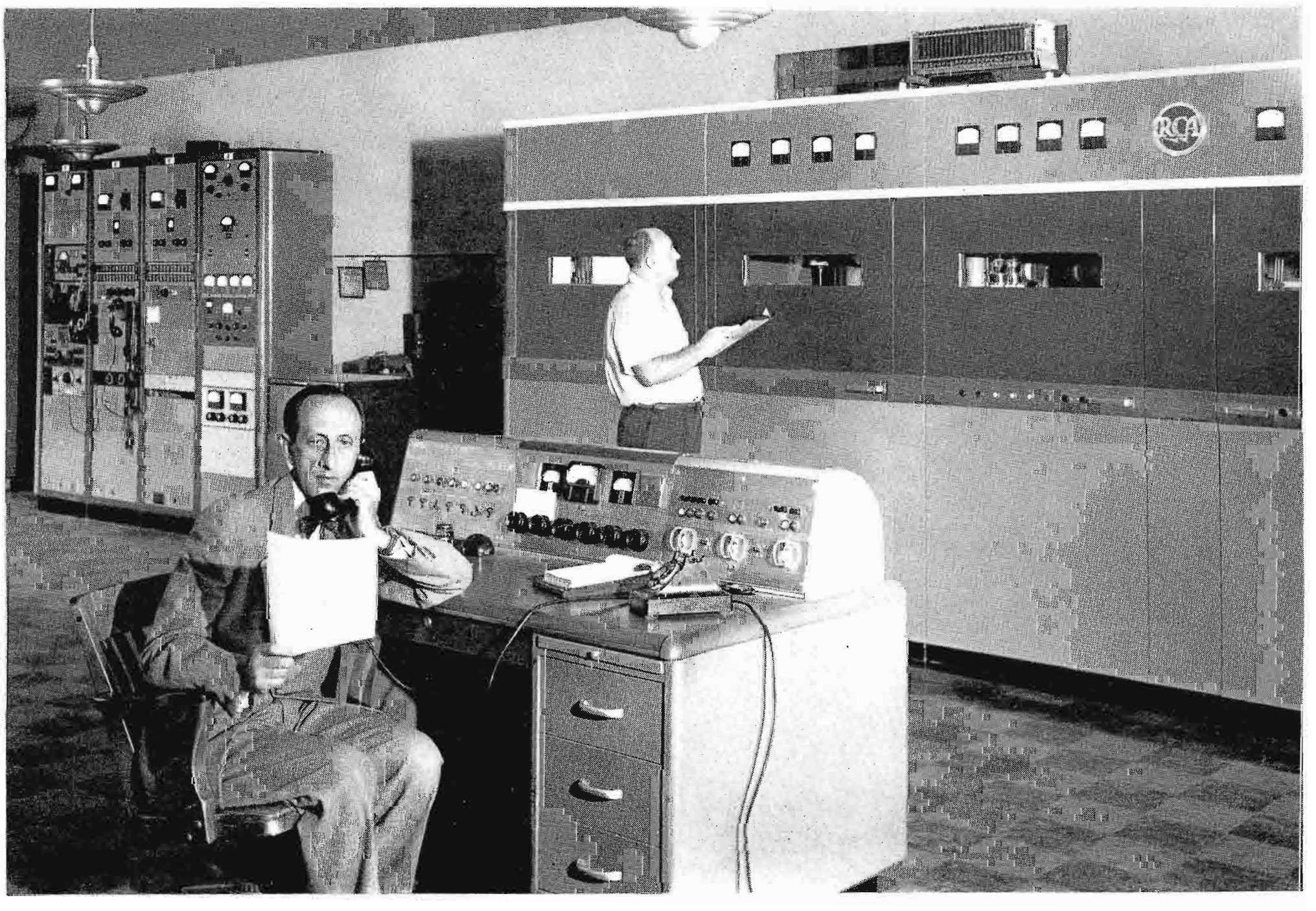
We cruise this unit through the downtown area supporting all civic drives such as the Red Cross, March of Dimes and Community Fund. In these instances we make a tape of our air personalities urging citizens to support these worth-while civic affairs. This is interspersed with music. Not only do we help the community, but we are helping WERE at the same time.

I would like to quote you an example of how a unit of this type can help a station. The city of Cleveland was in dire need of having a tax levy passed. All media was striving to have this levy passed at a special election. I was sitting in an office of an advertising agency, going over some problems in connection with our baseball network, and suddenly the sound of music came up from the street. The agency man said to me, "I hear you are out trying to get the levy passed." Cleveland has come to expect WERE out on the streets to aid any worth-while civic venture. This typifies how we use our generators, tape recorder and PA system while in motion.

Conclusion

The evolution of our equipment has followed closely the evolution of the engineer's role in Bringing Radio to the Public—*1957 Style*. Our job today is not only transmitters, antennas, control rooms, but how we can best adapt our tools to today's changing needs.

FIG. 11. Harry Dennis, Chief Engineer, at control desk in transmitter room. In background is John Geczi, Transmitter Engineer, at RCA Type BTA-5F 5-KW Transmitter. To the left are the audio racks. (Not seen at extreme left, is RCA Type BTF-10B 10KW FM Transmitter.)



impact

Is color TV more effective than black and white in TV commercials? Is the difference measurable? What special problems does the color medium impose on the television advertiser? What has the performance been up till now, and what is the shape of things to come in commercial color TV?

In undertaking to answer these and other questions that should be, but too often are not, raised by the advertisers who will be taking the plunge into color, Schwerin Research Corporation is relying on nearly two years of actual pretesting experience. Our studies embrace more than a dozen different products and services, and roughly one hundred individual commercials.

Horace S. Schwerin, President, Schwerin Research Corporation.

The following remarks will give a researcher's view of the situation in color TV today. It seems almost superfluous to add the observation that the problems posed by this exciting new medium are industry-wide. Station managers, in particular, will have to prepare themselves for the difficult period of transition when the problems of compatible transmission will require sure mastery, not plain guesswork. The manager, who assumes he can adopt a passive wait-and-see attitude with regard to color, will probably find himself outdistanced, like the unresponsive advertiser, by those who mastered the medium of color TV by first solving its inherent problems.

Color Commercials are More Effective

Are commercials more effective in color than black and white? Our answer is an emphatic *yes*. That affirmative will have to be qualified, and the greater part of these remarks devoted to qualifications rather than bald affirmation. But the outstanding fact disclosed by our pretesting research is that color, *when it is used properly*, enjoys a tremendous advantage over the same commercials in monochrome.

Late in 1955, Schwerin Research Corporation began pretesting RCA Victor appliance commercials in "compatible" color. The same commercials were audience-tested in both full-color and black-and-white versions in identical control shows. Out of these tests, which continued throughout 1956 and are still going on, emerged the central finding that—all other things being the same—*color increased the effectiveness of the commercials over their black-and-white versions by an average of 100 per cent* (see Fig. 1).

Other principal findings from our pretesting inquiries might conveniently be summarized here:

(1) Color, while it increases commercial effectiveness, tends to decrease remembrance of sales ideas;

(2) Natural settings have proved more effective than "showcase" settings;

(3) Distracting use of color diminishes the effectiveness of the commercial;

(4) Commercials in the middle range of effectiveness benefit most from the use of color;

(5) Color helps certain product types more than others;

(6) Women are more influenced than men by color;

(7) Color is particularly effective for holidays and other special promotions.

Color TV Timetable

As research people we cannot chart the rate of growth of color television. We can only estimate at what point in time color will overtake black and white and supplant it. But we suspect it will occur sooner rather than later. And we know that when the rush to color begins, those in the industry who expect to make the switchover from monochrome *as a matter of course* will be in for a disillusioned awakening.

Popular Illusion Re Color TV

The first big illusion to go will be the all too prevalent attitude held by advertisers of products in the sensory field—foods, fabrics, etc.—that merely splashing color on their products will trigger the viewer to rush to the store and lay in a supply.

This misconception brings to mind a poetaster who approached us once for an opinion about her latest poetic effusion. It was an utterly pedestrian piece of versifica-

OF COLOR TV COMMERCIALS

A Researcher Looks at Color Television—Notes Increased Effectiveness of Commercials, But Wonders Why Products Most Sensitive to Color are Undergoing the Least Amount of Preparation for Color

by HORACE S. SCHWERIN, *President, Schwerin Research Corporation*

tion; hack work cut from the whole cloth. The only imperishable thing about it was the terse reminder appended at the bottom of the paper: "Add colorful imagery."

A good poem is obviously not made by rhyming some words, then stuffing the result with colorful imagery. Neither is an effective color commercial made by simply waving a rainbow over a black-and-white rendition of the product. It seems almost self-evident that products with sensory appeal such as foods, beverages, apparel and fabrics stand to gain the most from color commercials. One would expect products in the sensory field to be girding for the competitive struggle that is sure to develop as color TV comes of age. But the surprising fact is that those products that have the most to gain from color are doing the *least* experimenting.

Advertising Paradox

Figure 2 illustrates this paradox in terms of our experience. Products with taste appeal are doing only about one-fifth as much research in color as they are in black and white. And they account for only a small fraction of all color-commercial tests.

In other words, those products that presumably have least to gain are doing the most experimenting in color. By pretesting, the nonsensory products will be able to reap a rich harvest from color, particularly in the early phases. The RCA Victor example is a good case in point.

Meanwhile, the advertisers with sensory-appeal products are holding aloof from pretesting in color, reasoning (wrongly) that at the right moment they can leap into the medium with a "natural." When color does open up in earnest, everyone in the food field will jump simultaneously. And in the face of extremely heavy competition, the advertiser who has not learned the potentialities and limitations of color will be lost in a kaleidoscopic shuffle.

Toward the beginning we summarized the main findings gleaned so far from our color-commercial testing. Here, with some examples from specific commercials, is a fuller discussion of these points:

(1) Color, while it increases commercial effectiveness, tends to decrease remembrance of sales ideas.

Figure 3 illustrates this in terms of the average of all commercials which were tested in both color and black-and-white versions.

The effectiveness results are in terms of the Schwerin Competitive Preference Measure (see appendix). Audiences are asked both before and after viewing the commercial to indicate what brand they would want to receive if they were the winners in a drawing. The switch from *pre* to *post* for the advertised brand is taken as a measurement of the effectiveness of the commercial.

The average color version was one-and-one-half times as strong as its black-and-white counterpart. In the case of RCA Victor commercials, color proved nearly twice as effective as monochrome (see Fig. 1).

There was, however, no commensurate increase in the remembrance of sales points. In fact, color tended to diminish the amount viewers remembered. Not enough testing has been done to determine

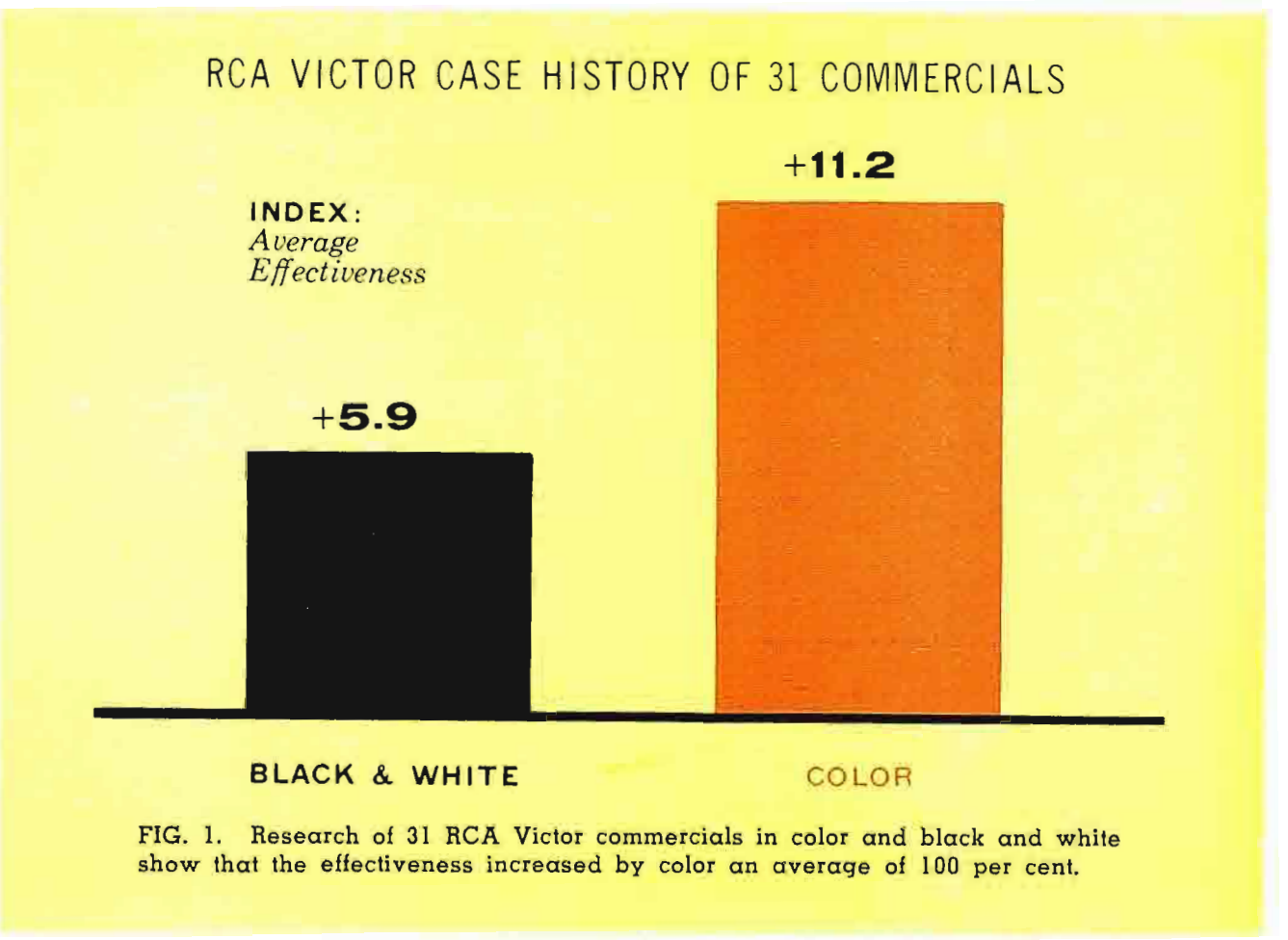


FIG. 1. Research of 31 RCA Victor commercials in color and black and white show that the effectiveness increased by color an average of 100 per cent.

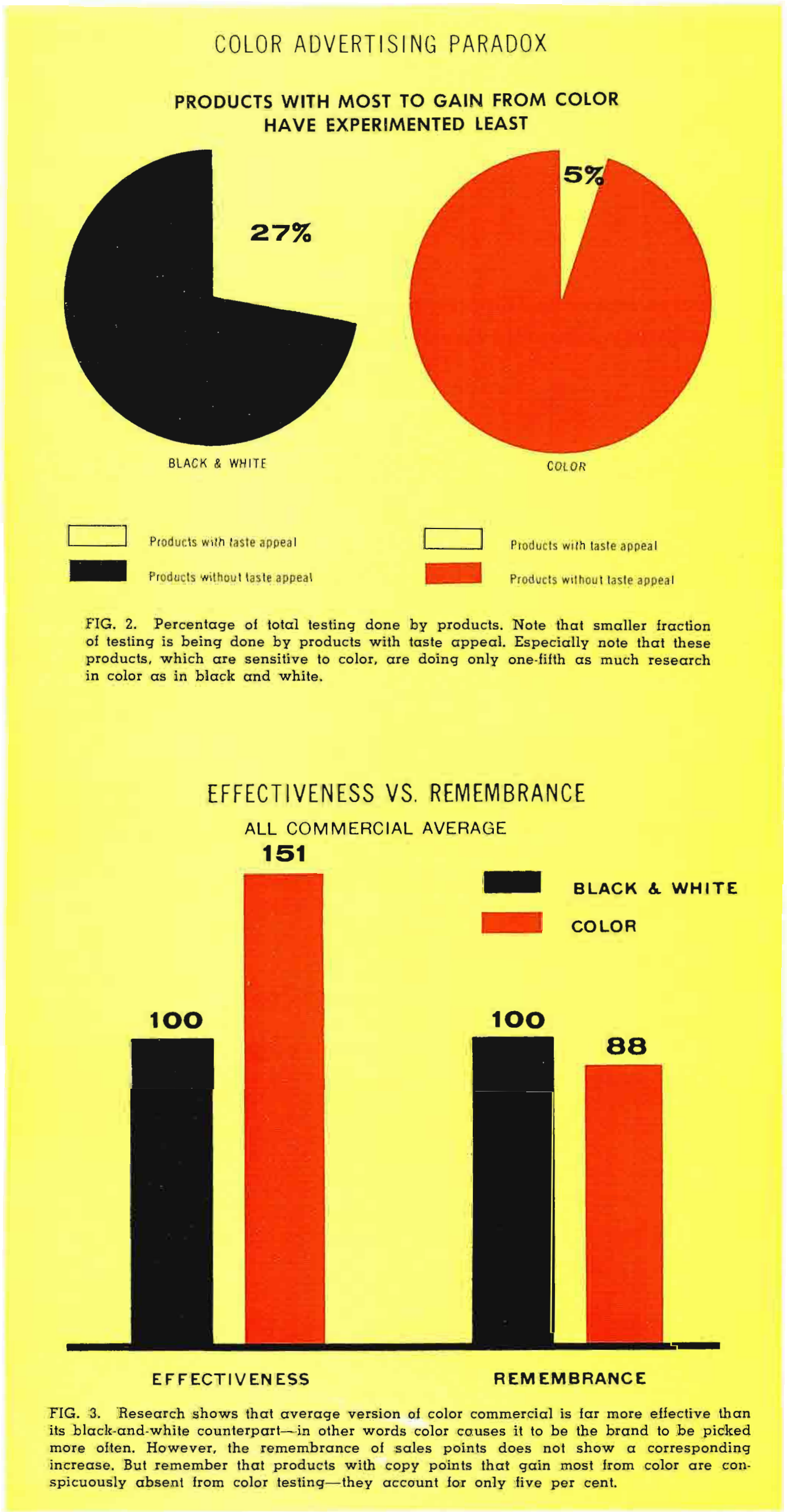


FIG. 2. Percentage of total testing done by products. Note that smaller fraction of testing is being done by products with taste appeal. Especially note that these products, which are sensitive to color, are doing only one-fifth as much research in color as in black and white.

FIG. 3. Research shows that average version of color commercial is far more effective than its black-and-white counterpart—in other words color causes it to be the brand to be picked more often. However, the remembrance of sales points does not show a corresponding increase. But remember that products with copy points that gain most from color are conspicuously absent from color testing—they account for only five per cent.

if this pattern is a built-in factor peculiar to color commercials. It probably isn't. We've already mentioned the conspicuous absence of sensory-appeal products from these tests, products that is, with copy points that stand to gain the most reinforcement from color. And, in fact, baking product commercials tested by Schwerin Research Corporation in both color and black-and-white resulted in copy point recall a third again as great for color.

A second probable reason for this higher effectiveness and lower remembrance is that color was not used primarily to establish explicit sales points, but to communicate mood and emotional values.

(2) Natural settings have proved more effective than "showcase" settings.

The most successful color commercials tested to date have been those which employed natural, recognizable backgrounds and settings. This was one of the major findings to emerge from the RCA studies. Commercials which featured portable and clock radios, television sets and phonograph records, in abstract settings—bright solid colors providing a sort of chromatic limbo—failed to do significantly better than the same commercials in black-and-white. Natural settings, on the other hand, whether interior or exterior, gained a large advantage from color presentation. Figure 5 shows the extent of that advantage.

It would appear that color is most effective when it adds to the visual impact of scenes that are familiar and recognizable to the viewer. But using color for *mere* effect in an off-beat, abstract manner evidently distracts the viewer and renders the "sell" weaker.

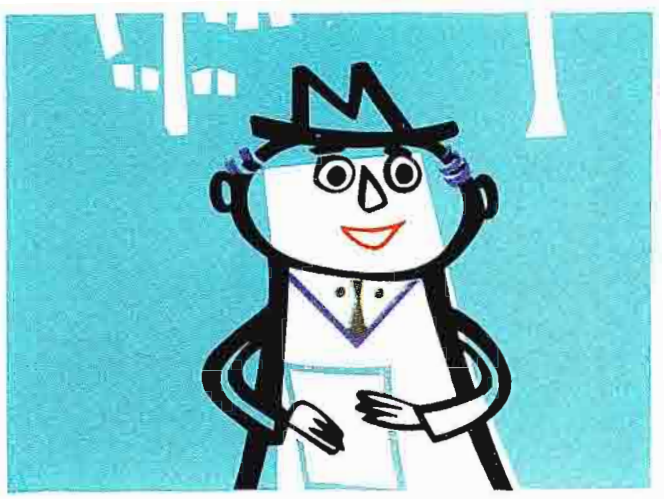
A word in passing about animation in color: the two appear to be quite compatible. Schwerin Research Corporation has tested several outstanding animated color commercials—for a food product as well as for RCA Victor appliances. In all instances the black-and-white commercial was a relatively effective one on the Competitive Preference Measure, and color served to boost the effectiveness. We are certain, however, that the advertiser who relies on color to rescue an inadequate animated (or, indeed, any other variety) commercial will get disappointing results.

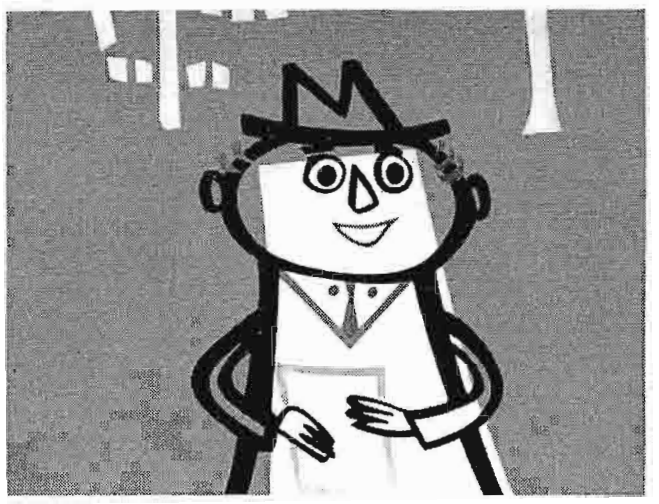
(3) Distracting use of color diminishes the effectiveness of the commercial.

Color has been misused and overused in several of the commercials tested by us.

One such commercial made use of a large number of scene-and-idea changes: it was too "busy" in its video. The black-and-white version reflected this confusion by securing from the audience a change on the

COLOR vs BLACK & WHITE





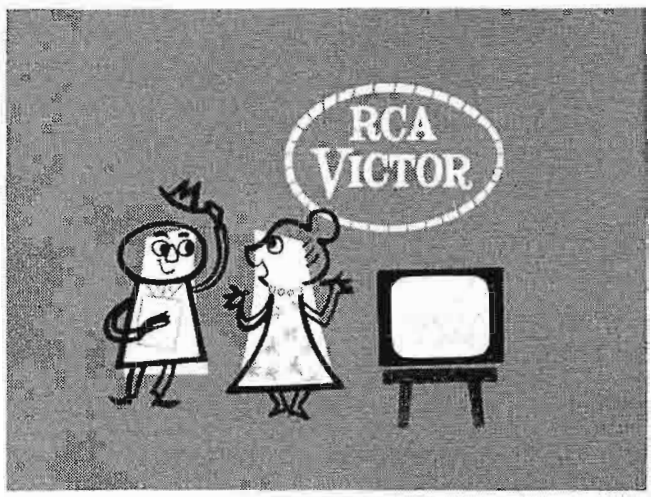


FIG. 4. Just a good example of color versus black and white. Although black-and-white version was effective, in color it did substantially better.

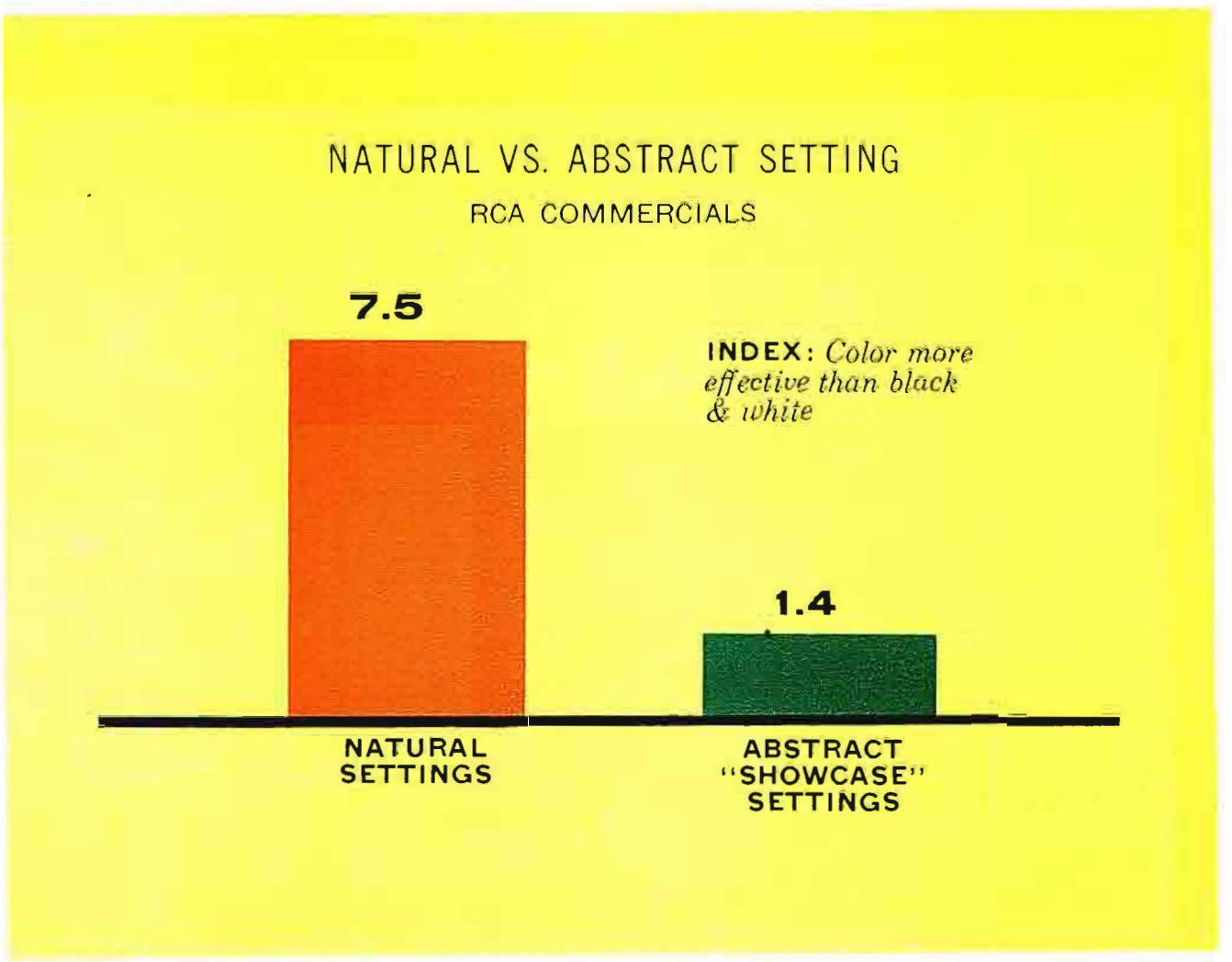


FIG. 5. Natural settings prove more effective than showcase settings for RCA Victor color commercials.

post choice of only three per cent, which was well below average for this particular advertiser.

When it was done in color, the felony was compounded. The commercial became a many-tinted chaos that failed to move *any* viewers to that product. In addition to making the commercial ineffective, color also reduced sales point recall 40 per cent.

(4) Commercials in the middle range of effectiveness benefit most from the use of color.

Neither extremely weak nor particularly strong black-and-white versions pick up as much effectiveness with color as do moderately effective commercials. The following table shows this quite distinctly:

B&W Versions with Preference Change of:	*Average Added Effectiveness Increase in Color:*
Less than 4 per cent	3.6 per cent
4 per cent to 10 per cent	6.4 per cent
Over 10 per cent	2.6 per cent

If a commercial cannot hold its own in black-and-white, the color-splashing technique will not do it much good. On the other hand, the monochrome commercial that is highly effective in its own right can get little additional value from color.

This matter of "compatible effectiveness," of creating commercials that are successful in both mediums, has already been solved by some advertisers through pretesting. It is they who will have clear sailing as the transition from black-and-white to color gains momentum, leaving the expensive method of trial and error to their less foresighted brethren.

(5) Color helps certain product types more than others.

In general, the more familiar the product is the less benefit it will reap from color, while the new brand will probably gain a great deal from multichromatic exposure.

When Schwerin Research Corporation audience-tested commercials in both black-and-white and color for a familiar household product that has been on the market a long time, the color version gained no advantage in brand identification.

A second product was a familiar household appliance, having, unlike the first, no "package"—only a company trademark. Here, again, the color version did not secure appreciably higher brand identification. It is probably true, though, that highly colorful emblems and trademarks—such as gasoline pump symbols—will be helped by color.

A third example, a baking product, did seven per cent better in getting brand identification when it was in color. Not a particularly well-known package, it was *inevitably* benefited from being shown on-screen in full color.

The largest increase in brand identification gained by color over black-and-white was for a deodorant commercial. This was a new brand on the market, and showing the package in color aided the establishment of the brand name better than black-and-white did.

(6) Women are more influenced than men by color.

Or perhaps we should say there are *indications* that this is true. The products studied to date are not widely representative enough to permit more than a tentative generalization, which subsequent research may either substantiate or revise. But the results so far for one general-appeal product reveal that, whereas most of its black-and-white efforts influenced men and women about equally, women have been more influenced by the color advertising it has done to date.

(7) Color is particularly effective for holidays and other special promotions.

Several of the most effective commercials we've tested have been of this nature. Evidently the colorful, festive and association-laden trappings of Christmas, Thanksgiving and vacation time are most completely captured in color.

Conclusion

This assessment of color television commercials covers less than two years of testing, and represents no final and definitive judgment. Advertisers have proved somewhat less than eager to experiment and pretest in color up till now, a situation that, when the medium snowballs, may find them unprepared and, as Shakespeare observed in a slightly different context, "Mocking the air with colours idly spread."

APPENDIX

Competitive Preference Measure

The Schwerin Research Corporation has developed means for testing TV programs and for measuring the effectiveness of TV commercials. The technique used employs a studio audience. Audiences are attracted principally through mail, a roughly representative cross section of about 350 people attending each session. They receive gifts in return for participating. Particularized audiences (children, primary market groups, etc.) are brought in when required.

The sessions are held at the Schwerin Research Corporation's private theater in New York City. Here the special equipment required for showing and testing programs and commercials is permanently set up.

Each session begins with a short orientation by the test director. The audience members then fill out a detailed questionnaire, which covers both standard characteristics (sex, age, education, rental group and so on) and the factors having to do with the programs and products being studied at the session.

They then view the Kinescope of a television program, at intervals during which numbers are flashed on a second, smaller screen; each number signals the audience members to indicate on score sheets with corresponding number whether they liked, didn't like, or were indifferent to the portion of the show they saw since the last previous number was flashed. *Good, fair* and *poor* are the three choices given the audience to check, with *interesting, mildly interesting* and *not interesting* being substituted for certain types of programs. (The same procedure is used in testing radio, with a transcription being used.)

Immediately after viewing the program, the audience members are asked to write down, on a blank sheet of paper, the name of the product advertised and everything they remember having seen or heard about it in the commercials.

Following this, they are given a list of the leading brands of the product and asked to indicate which one they wish to receive if they are the winners in a drawing. The drawing is held immediately thereafter; the winners are identified at the time and the brands they selected are sent to their homes, a year's supply being provided in the case of lower-cost items. This measure, the so-called, *Competitive Preference Test*, had also been given to the audience before the commercials were seen, so that any changes in the number of people choosing the brand after exposure to the advertising can be noted.

Various special measures, such as belief, attitude and comprehension, are sometimes applied at this point in the session.

There then is a discussion period, in which individual audience members volunteer their comments regarding the show and the commercials. These comments are then rephrased by the test director in the form of questions for the whole audience to vote upon. Some rephrased questions, based on past experience with shows of a similar type, are also used.

Customarily, two programs are tested in this manner at each session. When the client is interested only in a study of a commercial, a standard "control" program is used as the vehicle.

The session audience is not the final sample, which is post-selected on the basis of important factors (obtained from the information in the questionnaire filled out by each respondent at the beginning of the session). Samples are controlled on a minimum of three factors with as many as six subgroups within a factor.

When a program has been tested, the following main types of information are reported to the client: Comparison in terms of audience liking with other shows of the same type; profiles showing the minute-by-minute ups and downs of liking for each edition tested; liking scores for important audience groups; audience opinions, brought out in the voting, about the performers and the other elements of the program.

The principal information from commercial tests includes these types of data:

How many people remember the brand name; how many remember at least one sales point; how many remember each of the ideas presented; how many were motivated by the commercial to prefer the brand; how many believe key claims that were made.

Clients customarily retain Schwerin Research on an annual contract basis. In the program field, they use the service to find how the audience appeal of shows can be increased; to evaluate programs' over-all quality; to check up on shows at periodic intervals to make sure that quality is being maintained; and to decide whether to sponsor shows, either new programs or ones already on the air. In the area of commercials, the service is used to find how the effectiveness of commercials can be increased; to see how the client's advertising compares with that of competitors'; and to pretest new approaches and campaigns through the use of low-cost "rough" commercials.

Editor's Note: *Schwerin Research Corporation was founded in 1946, but the development of its methodology began ten years earlier. Preliminary work included qualitative radio tests by Horace Schwerin and associates before hundreds of club and studio groups between 1936 and 1941, followed by Schwerin's wartime studies for the army on how to make "G.I. commercials" and training messages more effective.*

Schwerin Research Corporation's first six months were devoted to a project, backed by the National Broadcasting Company, designed to establish the applicability of the methodology to the practical testing of programs. The organization then began testing for radio clients, subsequently entering television testing, as well as qualitative research in other communications and informational areas.

The natural development of Schwerin Research Corporation's efforts moved from qualitative program testing to increased client interest in the relationship between shows and commercials; this led to developing techniques for measuring the effectiveness of commercials concurrently with the program tests.

In addition to radio and television productions, Schwerin Research Corporation tests informational and educational films put out by industry. Also, besides its qualitative testing, on occasion it runs related surveys and interviews to bring out further information for its studies.

FIG. 6. Scene at a typical Schwerin test session.

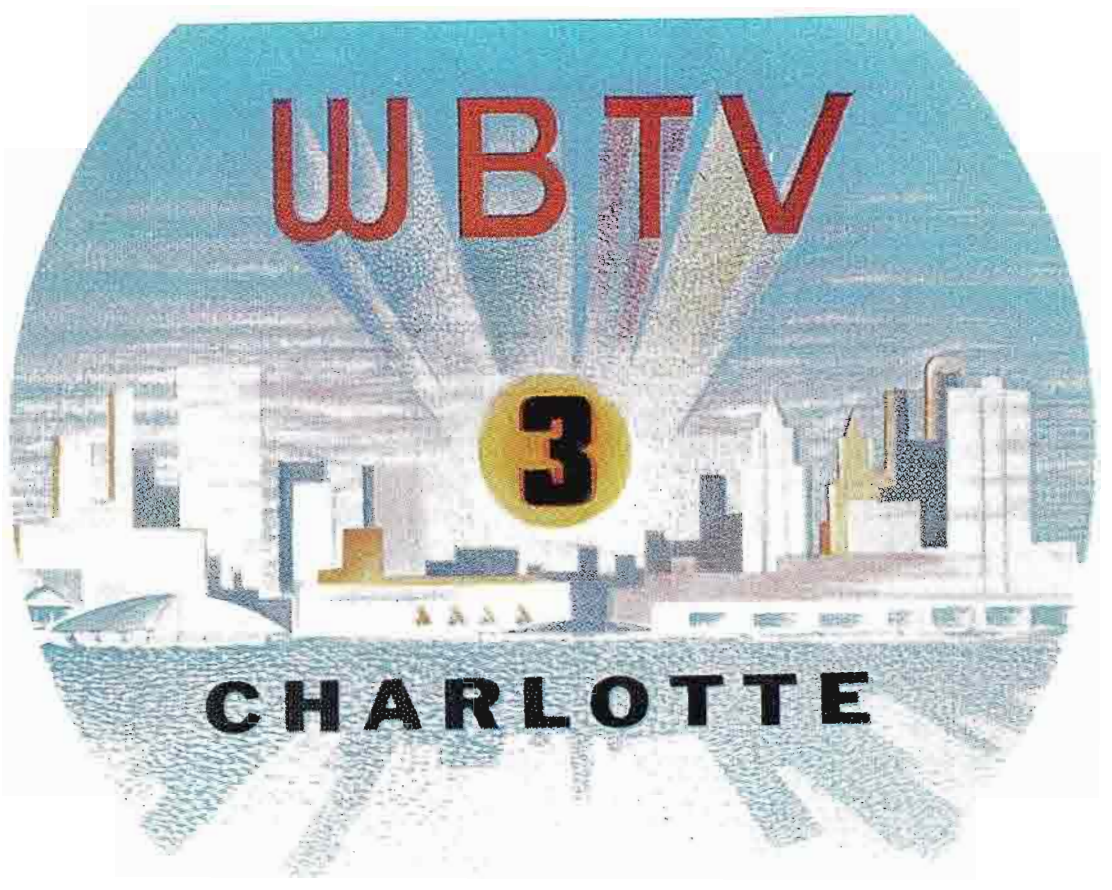


FIG. 1. WBTV's color station ID.

WBT-WBTV STUDIOS

FIG. 2. Joseph M. Bryan, President, and Charles H. Crutchfield, Executive Vice-President and General Manager, of Jefferson Standard Broadcastin g Company, at WBTV RCA Live Color Camera.

by JOHN P. TAYLOR
Editor, BROADCAST NEWS

"The Jefferson Standard Broadcasting Company welcomes you to One Jefferson Place. Here, we believe, you will find the last word in broadcasting and telecasting facilities. New and unexplored opportunities in those fields are now available. We intend to take full advantage of these opportunities, so that in turn we will be able to provide more complete service to you and the three-and-a-half million listeners and viewers of our stations."

These were the words which Mr. Joseph M. Bryan, President of Jefferson Standard Broadcasting Company used in April 1955, in welcoming the public and the industry to the new studio-headquarters building of WBT-WBTV Charlotte.

The visitors to WBT-WBTV on that opening day found that Mr. Bryan was not exaggerating. So have thousands of Carolinians and hundreds of the industry's leaders who have accepted Jefferson Standard's invitation to visit and view the beautiful quarters of WBT, the South's oldest commercially-licensed radio station, and WBTV, the Carolinas' first tv station.

FIG. 3. The WBT-WBTV Building is located on a beautifully landscaped six-acre plot at the top of a sharp elevation in southwest Charlotte, just a few minutes from the center of the business area. This view also shows the 160 ft. microwave tower at the rear of the building.

People of the Charlotte area have visited WBT-WBTV because of the graciousness of Jefferson Standard's management and staff—and because of the manner in which the station has integrated itself with the pride and purpose of the community. Leaders of the broadcasting and telecasting industry have come for a different, and perhaps even more complimentary, reason. They have visited WBT-WBTV to see at firsthand the building which has been heralded throughout the industry as one of the finest and most efficient radio-tv station facilities built to date. And they have not been disappointed. For here, as Mr. Bryan has pointed out, is a building designed not just for today's realities, but for "new and unexplored opportunities." A building which is not too big for now—but is easily expandable for tomorrow, a facility which airs most of its present programs in monochrome—but which has been completely planned for a near-future switch to all color. A plant which makes engineers drool—but which managers admire for its cost-cutting efficiency.

That the WBT-WBTV Building is a model facility is not due to accident or even to a touch of luck—rather it is a triumph of long experience, careful planning and painstaking attention to detail. Radio Station WBT is one of the oldest in the country—dating its start back to Station 4XD, which went on the air in 1920. WBT received its commercial license in April 1922—one of the first in the United States, and the first in the South. In 1949, WBTV became the first television station in the Carolinas. In 1954, Jefferson Standard established another television station, WBTW, at Florence, South Carolina.

WBT has always been one of the nation's most distinguished stations—and, in keeping with this tradition, it has a distinguished staff topped by a management team whose experience is surpassed by none. Mr. Bryan has been President of Jefferson Standard Broadcasting Company since WBT was acquired by Jefferson Standard Life Insurance Company in 1945.

Charles H. Crutchfield, Executive Vice-President and General Manager, has been with the station since 1933. He has been manager since 1945. Thomas E. Howard, who as Vice-President, Engineering, planned and supervised construction of the building, is one of the most experienced engineers in the business. In 1946, Tom supervised the installation of KSD, St. Louis, the first postwar television station (BROADCAST NEWS, Volume No. 45). From KSD he went to WPIX where he planned and supervised the first WPIX installation in the DAILY NEWS Building (BROADCAST NEWS, Volume No. 56) and WPIX's later installation in the Empire State Building.

When WBTV decided to build a new studio plant, General Manager Crutchfield laid down the general requirements then, wisely, gave Tom Howard carte blanche to plan the ideal station to fit those requirements. Working with the station's architects, J. Norman Pease & Company, Inc., he did just that. "Then," Tom says with a mixture of pride and awe, "they built it exactly the way I designed it." The happy result of this management experience plus engineering planning is described in the following pages.

FIG. 4. Another view of the WBT-WBTV Building showing the front and east sides. Built at the top of a slope, it has two floors above ground at the front, and three floors above ground level on the east side, where there is a landscaped patio opening off the cafeteria.

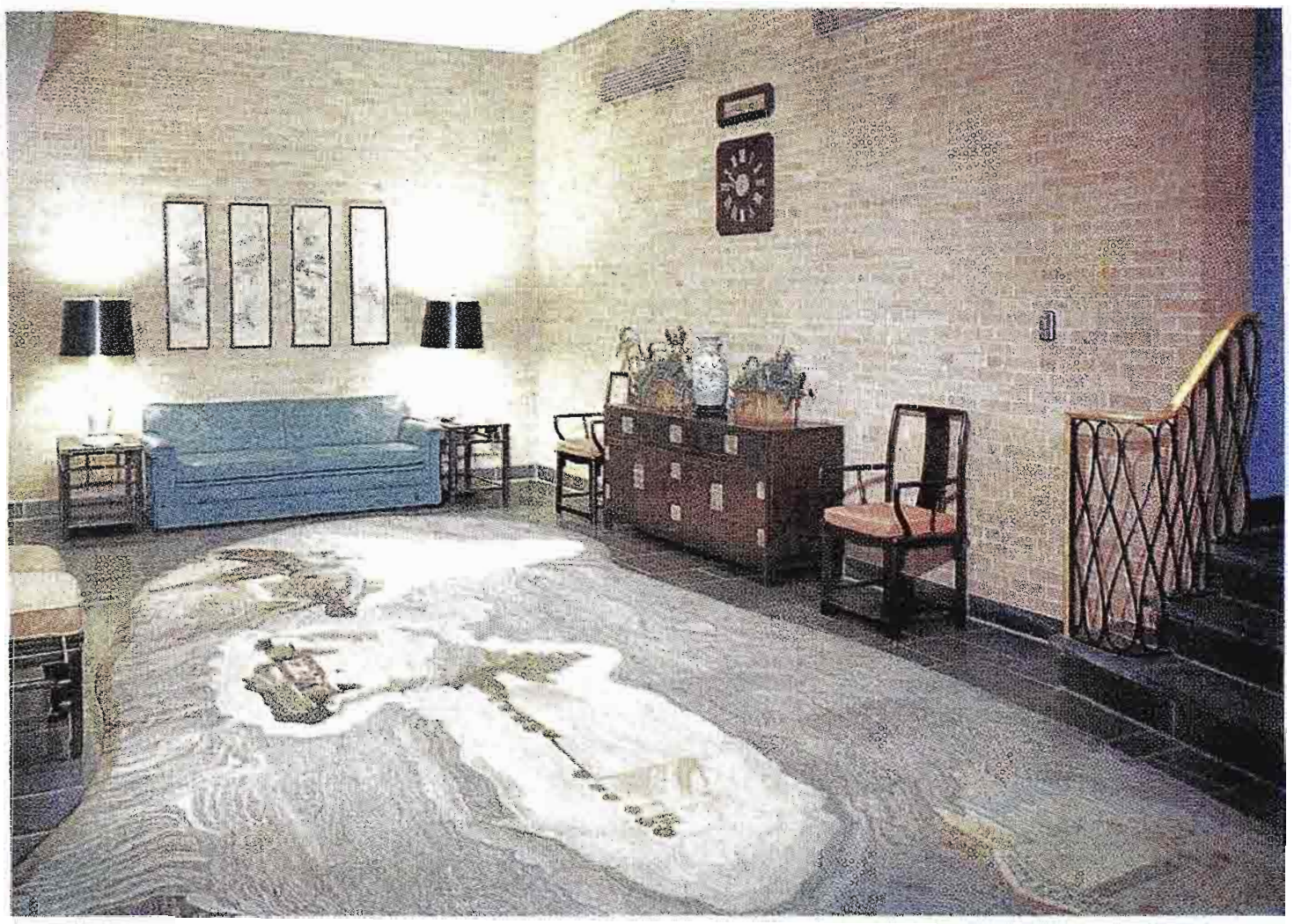


FIG. 5. Lobby of the WBT-WBTV Building features a huge handmade rug depicting all of the company's studio and transmitter buildings.

WBT-WBTV Building

WBT-WBTV's modern-style, functionally designed building is located on a beautifully landscaped six-acre plot at the top of a sharp elevation in southwest Charlotte. The site has the advantages of height for microwave facilities, and space for parking areas while at the same time being only twelve minutes by car from the center of the city.

As seen from Morehead Boulevard, on which it faces, the building is an impressive sight. The exterior is of textured brick, except for one half of the front side facing the street, which is blue porcelain enameled steel panels (see picture on cover). All trim, the station call letters, door and window frames, etc., are stainless steel and aluminum. The over-all design is extremely

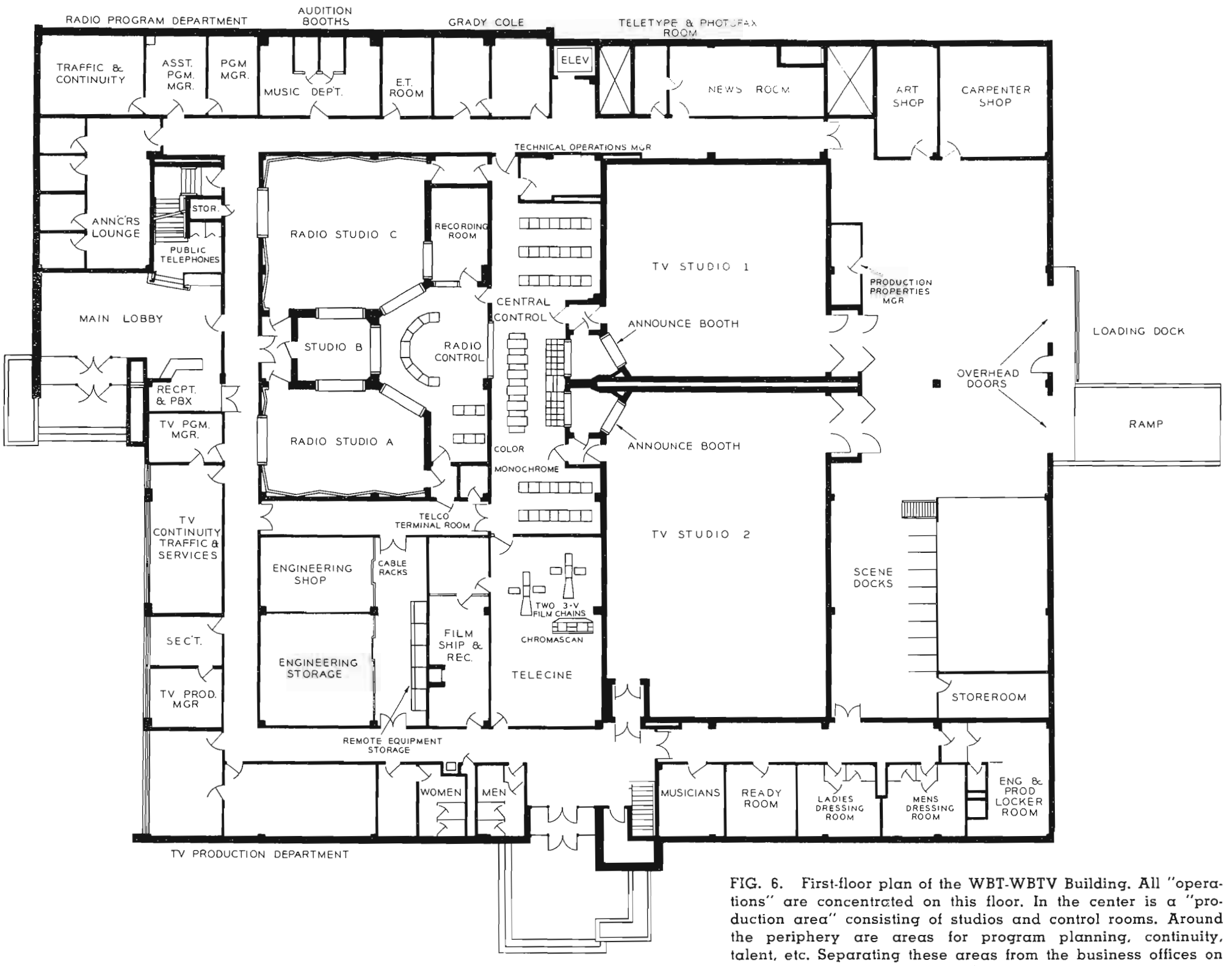


FIG. 6. First-floor plan of the WBT-WBTV Building. All "operations" are concentrated on this floor. In the center is a "production area" consisting of studios and control rooms. Around the periphery are areas for program planning, continuity, talent, etc. Separating these areas from the business offices on the second floor helps "traffic" flow.

functional, and yet unusually attractive. It has the distinguished air of quiet but unmistakable success.

The building, which is 181 feet by 141 feet, has two main floors plus a basement level extending under one-third of the building. The first floor is devoted entirely to broadcasting-telecasting operations. All administrative functions are located on the second floor.

A floor plan of the first floor of the building is shown in Fig. 6. There are two entrances. The "main" entrance, which is on the street side and opens into the lobby and waiting room, is directly adjacent to the "radio area" of the building. The "west" entrance, which faces toward the parking lot, is adjacent to the "tv area." The division is not emphasized but employees and regular talent automatically use the most convenient entrance, thereby substantially helping the traffic problem.

The center section of the building is a "production area" in which are located the radio and tv studios, the radio and tv control rooms (back to back), film projection room, engineering shop and parts storage room. Around three sides of this area is a corridor off which (on the exterior side) are office areas for production, news, talent, etc. On the fourth side of the production area (actually the back of the tv studios) is the prop construction and storage area which opens onto the loading dock and ramp (Fig. 6).

Planning a unified production area in this way has several advantages: (1) it simplifies equipment installation problems and makes equipment changes easier, (2) it improves co-ordination in technical operation and makes it possible to work with minimum-size crews, (3) it helps to keep visitors and nontechnical employees out of operating areas.

The second floor of the building (see Fig. 9) contains all of the business offices including executive, sales, promotion, accounting and engineering areas. Also on the second floor—overlooking the studios—are the two tv studio control booths and the clients' two viewing rooms.

The basement, or "Terrace Floor," contains the photo lab, the air conditioning and locker rooms, maintenance and lounge rooms, garage, and a fine cafeteria-dining room which opens out onto an open terrace-patio (Fig. 50) where station employees enjoy their lunch periods in favorable weather.

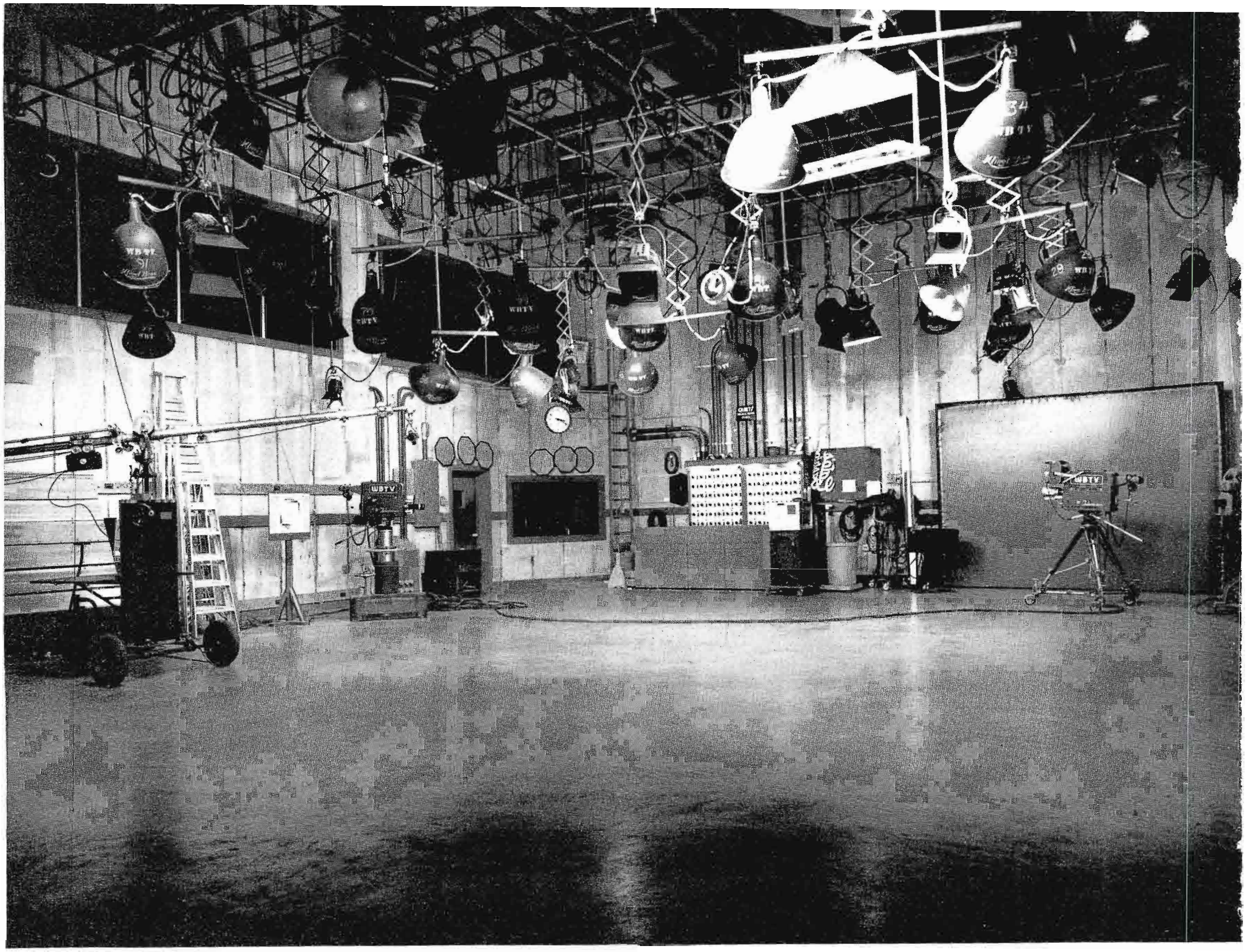


FIG. 7. WBTV's Studio TV-2 is 40 feet by 60 feet, has a ceiling height of 27 feet. Windows of clients' booths and control booths on second floor are at top left. Window of announcer's booth is in center, with lighting control board just to the right of it. Both studios have "prestressed, post-tensioned" concrete floors poured as single slabs. Walls and ceiling are covered with two-inch thick, rock-wool blanket. Outlets are provided in the two studios for both monochrome and color cameras.

WBTV Studios

WBTV has two studios used exclusively for tv (Figs. 7 and 8). Studio No. 1 is 40 feet by 40 feet; Studio No. 2 is 40 feet by 60 feet. Both are two stories high with ceiling heights of 27 feet. The two studios are very similar in construction and are located symmetrically with respect to the tv central control room—from which it is possible to look through the individual studio announce booths into the two studios (see floor plan, Fig. 6).

In the construction of these studios unusual precautions were taken to insure maximum acoustical insulation. The walls of the studios are "shells" which are completely separate from the rest of the building frame. There are no rigid connections between the two studio walls that abut—or between the studio walls and the walls of surrounding areas such as the control rooms. Wherever rigid members would ordinarily come in contact, such as at windows and door frames, pads have been inserted. Sound locks, missing in much recent tv construction, are used at all entrances. Microphone, camera and power connections are brought in through flexible connections. As a result, the background noise level in these studios is much lower than in most present-day tv studios.

Another very interesting feature of the studio construction is the use of "prestressed post-tensioned" concrete floors. These floors, 1600 and 2400 square feet, respectively, are single slabs, 4 inches thick, and without a single joint. They are poured over a grid of "post-tensioned" 3/8-inch steel cables which are encased in fiber tubes. Three years after pouring there is not a sign of a crack in them. This, together with the fact that they are perfectly level, greatly facilitates camera action—as well as movement of wheeled props.

Wall and ceiling treatment is the same in both studios and consists of a 2-inch-thick, rock wool blanket covered with "chicken wire" in the standard manner. A 16-foot-high cyc made of unfinished muslin covers two sides of Studio 2. A permanent, and operable, kitchen set is installed in one corner of Studio 1.

Each studio is facilitated for three monochrome and two color cameras. All necessary outlet boxes and cabling together with necessary switching and control equipments have been installed. At the present time the station's live camera complement consists of two TK-10 and two TK-30 Monochrome Cameras and one TK-41 Color Camera. They plan to add color cameras as the local color set count justifies. (See Color Programming, Pg. 55).

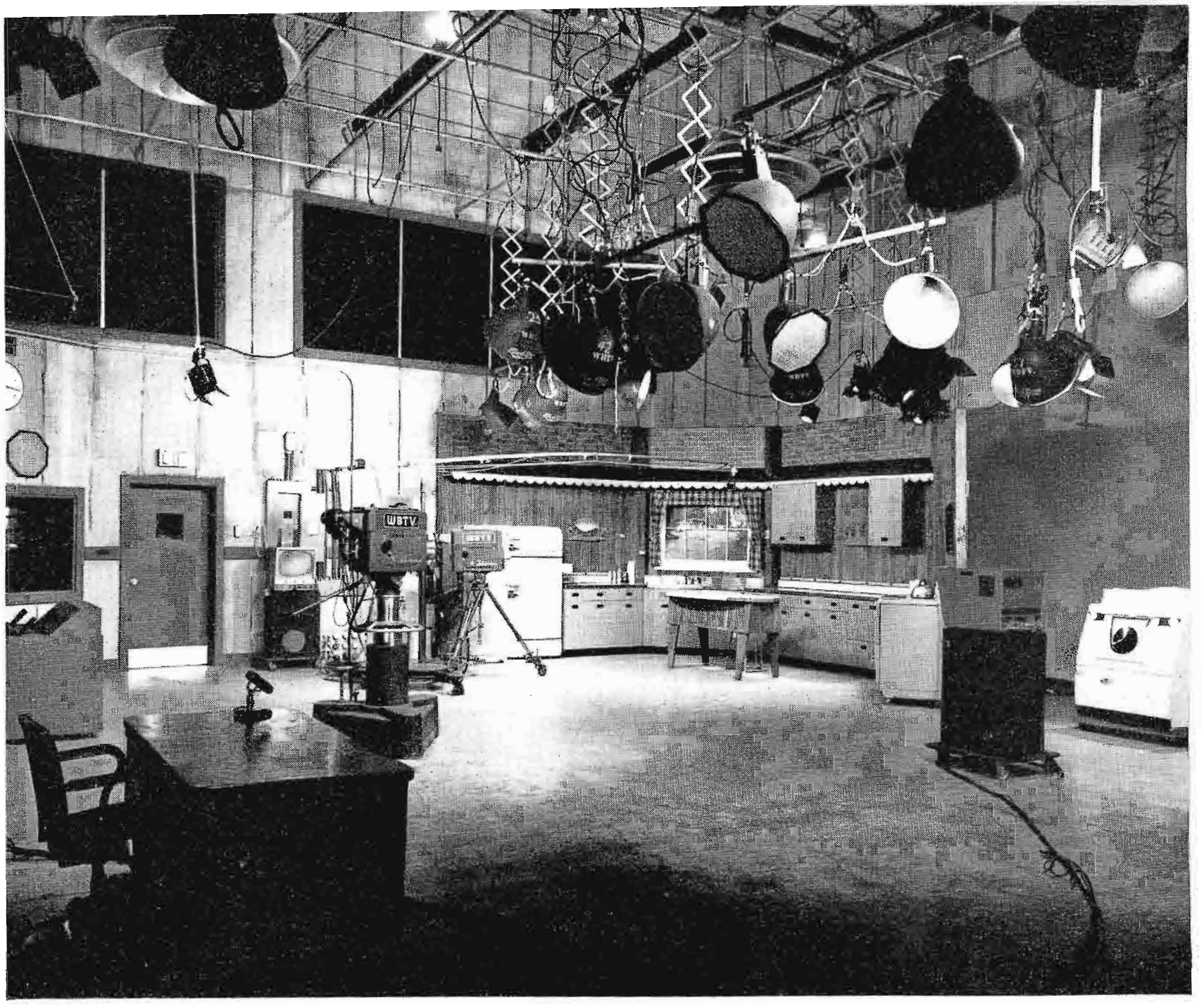


FIG. 8. WBTV's Studio TV-1 is 40 feet by 40 feet with same 27-foot ceiling height. Announcer's booth window is at left. A permanent, and operable kitchen set is installed in one corner.

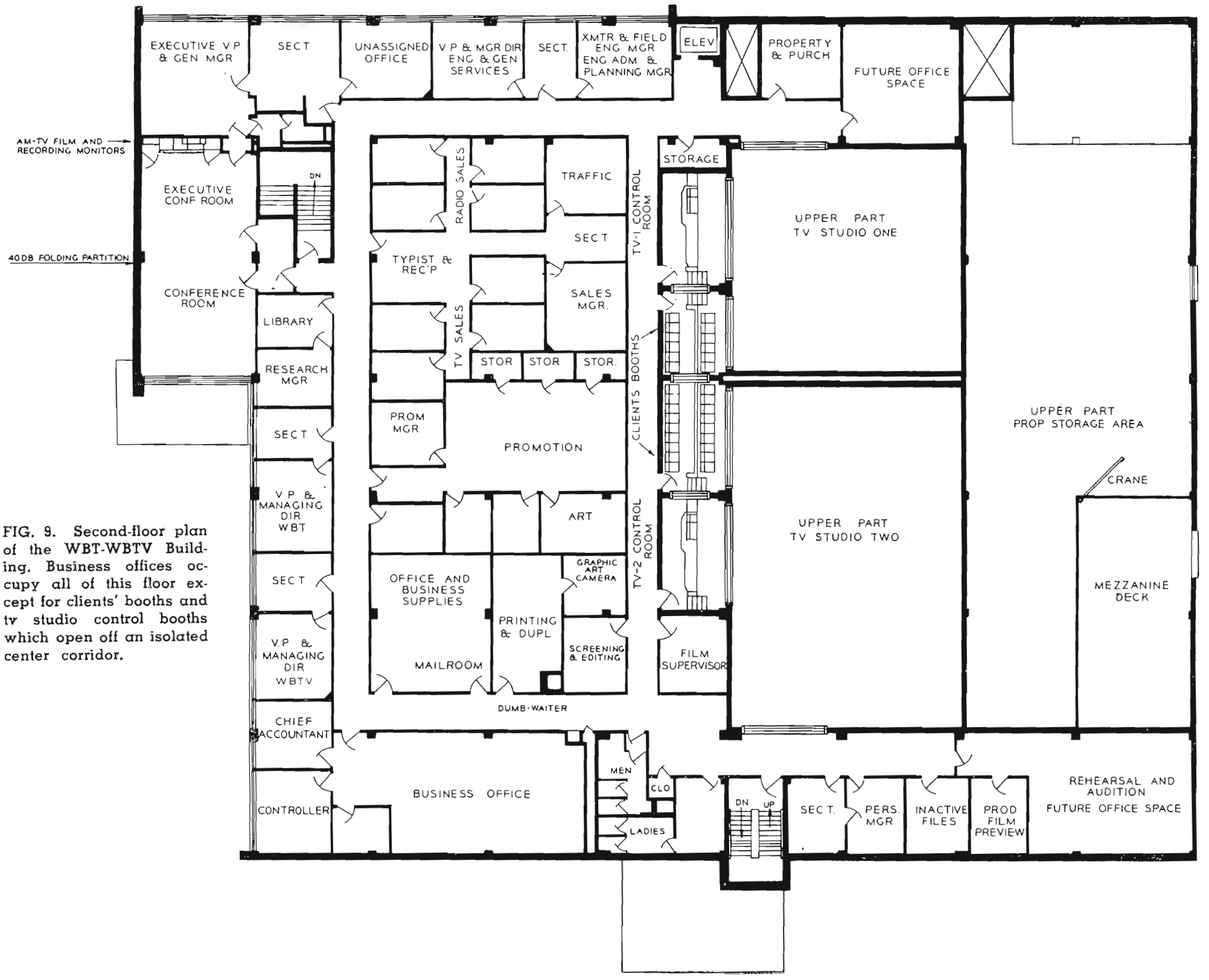


FIG. 9. Second-floor plan of the WBT-WBTV Building. Business offices occupy all of this floor except for clients' booths and tv studio control booths which open off an isolated center corridor.

FIG. 10. This large (40-foot by 120-foot) prop construction and storage area is a feature of the WBT-WBTV Building. Large folding doors, at the right, open directly into the two tv studios. Overhead doors, at the left, open onto a loading dock and ramp. This area has the same ceiling height as the studios. Footings, which can be seen in the floor of this area, make it possible to enlarge either or both studios in 20-foot increments by moving non-load bearing studio wall to use part of present prop area.

FIG. 11. Carpenter shop, art shop, and painting booth, together with prop manager's office, are located in one end of the prop area.

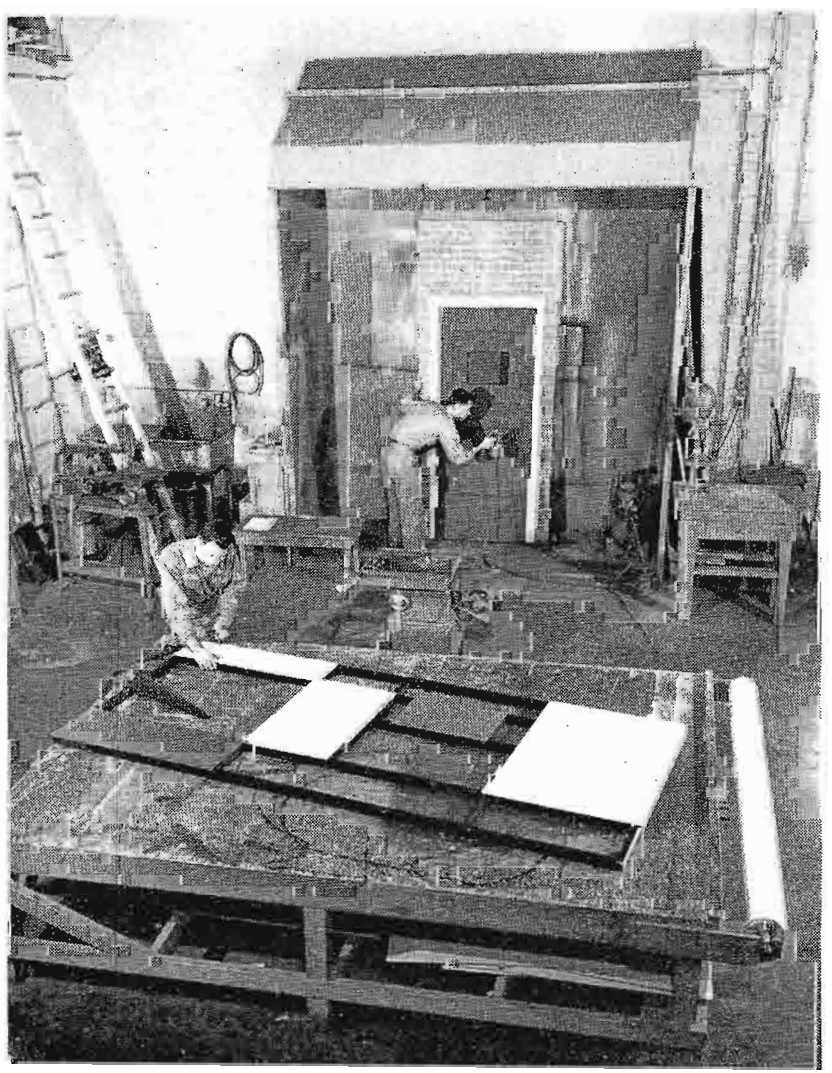
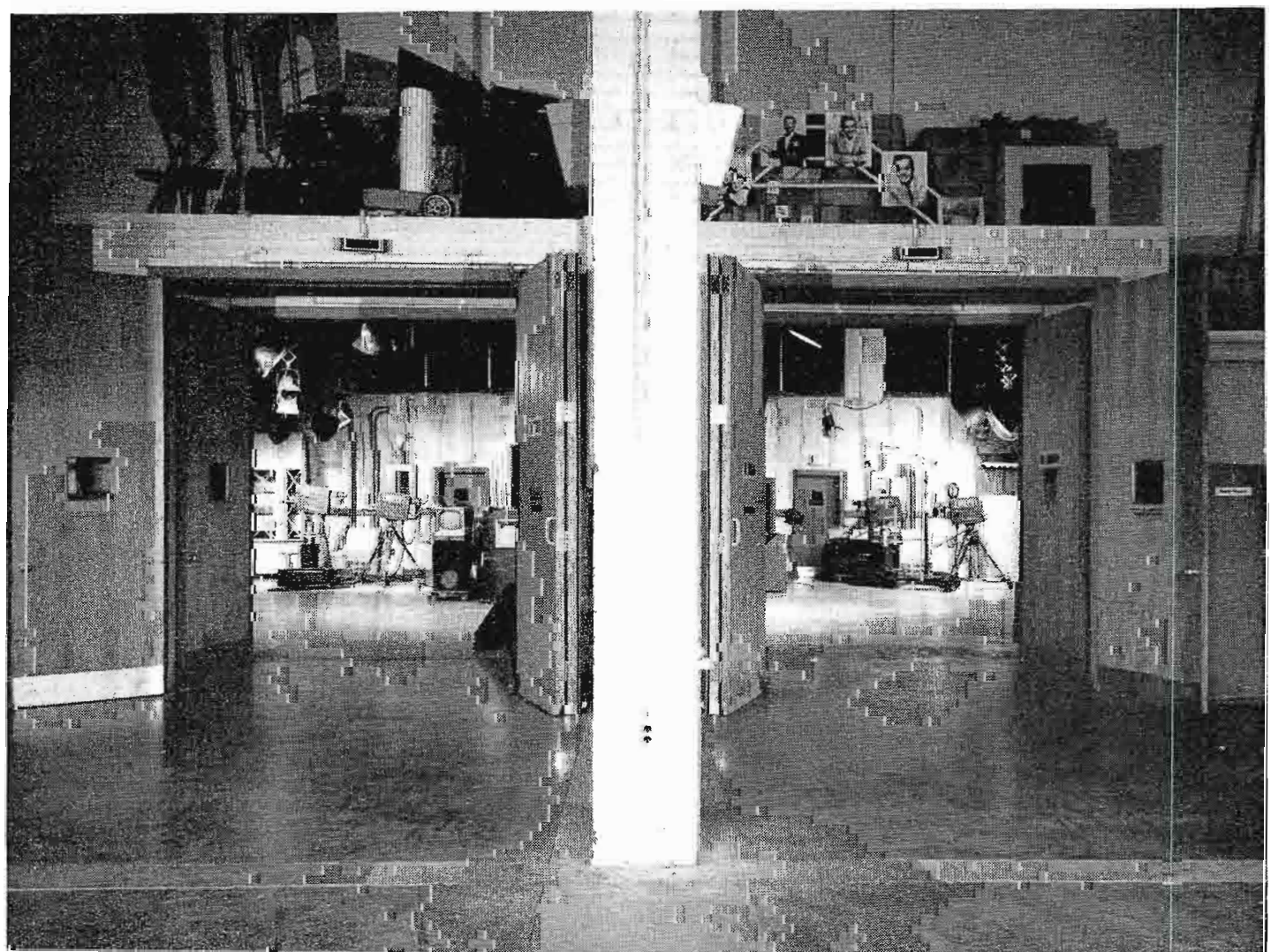


FIG. 12. The doors from the prop area into the studios are ten feet high by ten feet wide. There are two sets of doors to each studio with a "sound lock" between. This keeps noise from the prop area from getting into the studios during programs.



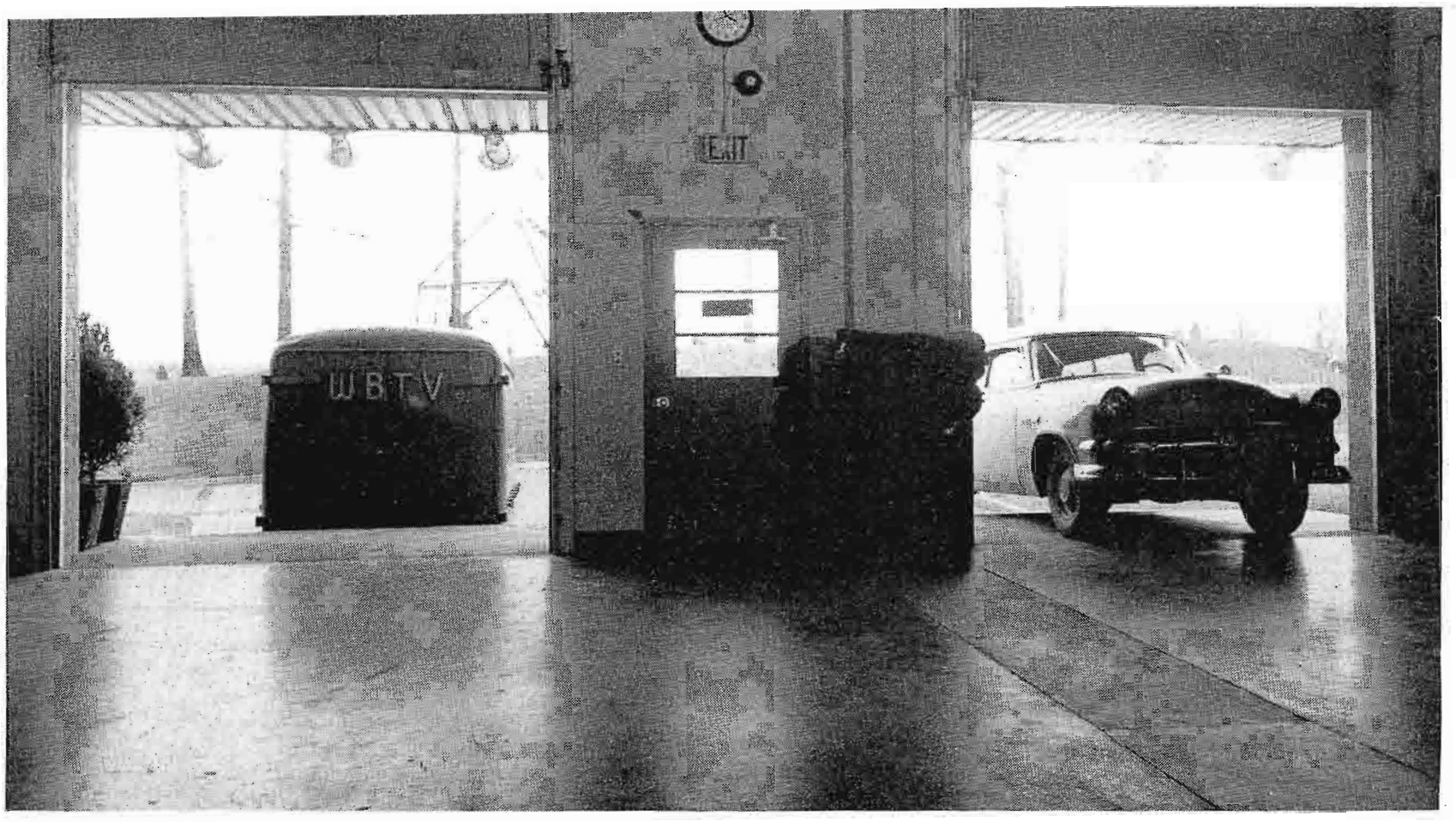


FIG. 13. One of the overhead doors from the prop area opens onto a loading dock which enables props to be rolled from a truck floor to the studio floor without lifting. The other door leads to a ramp which allows cars to be driven directly onto the floor of the studios.

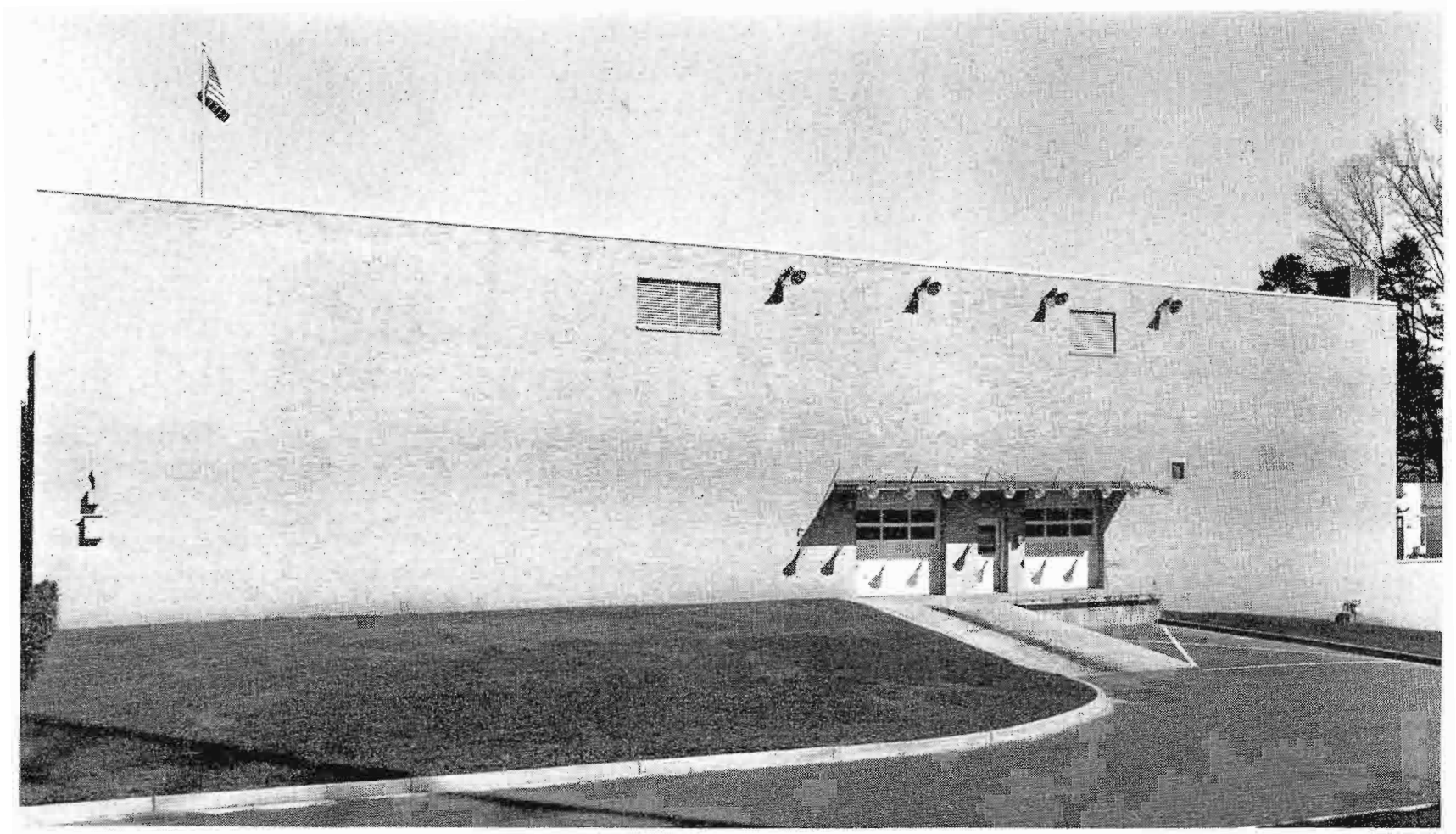


FIG. 14. Exterior view of the rear of the WBT-WBTV Building showing the ramp and dock leading into the prop area. Flood-lights installed at the top of the building and on the canopy, together with power outlets (left center) make it convenient to use the paved area or the large parking lot as an "outdoor studio."

WBTV Prop Area

A feature of the WBTV layout is a large (40-foot by 120-foot) area, directly off of the tv studios, which is used for construction of sets, and for storage of sets and props. The area includes an art shop, a carpenter shop, a paint spray booth, scene docks, a mezzanine storage deck and a locked storeroom area. Between this area and the two studios are sound locks—another example of the unusual precautions taken to keep extraneous sounds out of the studios. Folding doors which open to provide an entrance ten feet wide and ten feet high are provided on both sides of the sound locks (Fig. 12).

Directly opposite the doors to the studios are two large garage-type overhead doors which open onto the outside loading dock and ramp. The dock, which faces one door, provides for rolling props directly from a truck floor to the floor of the storage area without lifting. The ramp which leads to other door (Fig. 13), makes it possible to drive a car up the ramp, through the storage area and directly into either studio.

The entire storage area has the same 27-foot ceiling height as the studios. In addition footings have been provided in the floor of this area so that the depth of either or both studios can readily be expanded by either 20 feet or 40 feet by moving the nonload-bearing rear walls of the studios. Space to make up for the storage area lost by the move could be gained by adding a low wing on this side of the building. This provision is typical of the careful planning for the future which is incorporated in this building.

Just beyond the loading dock and ramp is a large paved area (Fig. 14) which is used frequently as an "outdoor studio." Flood-lights mounted in two levels on the building make it possible to use this area at night as well as in the daytime.

FIG. 15. WBTV's main control room. Master audio and video switching facilities are concentrated in the low console at the right (just in front of the windows which look into the announcers' booths and the studios). Camera control operations are performed at the console, at the left, which contains controls and montiors for all live cameras, film cameras, and Chromascan units. Equipment racks are located at the two ends of the control room. The floor plan of this control room is shown in Fig. 16, on the opposite page.

TV Control Rooms

The "production" area (Fig. 16) of the WBT-WBTV Studios occupies the entire center area of the first floor and is more or less isolated by a corridor from the auxiliary areas located around the outer rim of the floor (Fig. 6, Pg. 37). In the center of the production area is a "technical core" consisting of the a-m control room, the tv control room, the announce booths, and the recording room.

Surrounding this technical core are the tv studios, the a-m studios, the film room and the engineering shop. These are the areas to which the engineers need quick access—and this plan provides for it. Other doors to the studios provide entrance for talent and non-technical personnel, so that they do not need to enter the technical area at any time. The whole arrangement is one which provides maximum convenience for engineering work with minimum likelihood of distraction.

The tv and a-m control rooms are back to back and there is a large window between them.

The tv control room straddles the dividing wall between the two tv studios (Fig. 16). The windows in this room look into the two tv announce booths and through them into the studios. This arrangement is particularly suited to the method of operation used by WBTV.

The master switching console is located in front of the windows looking into the booths (right side, Fig. 15). The audio section of this console is an RCA BC-2B Console. It is used for master audio switching and announce booth control. The video section of the console includes a WBTV-built switching panel, a TM-5B Monitor and three TM-5A Monitors. These are, respectively, transmitter line, preview No. 1, preview No. 2, and monochrome system line. There is a TM-10 Color Monitor on the cabinet at right for monitoring the color system line.

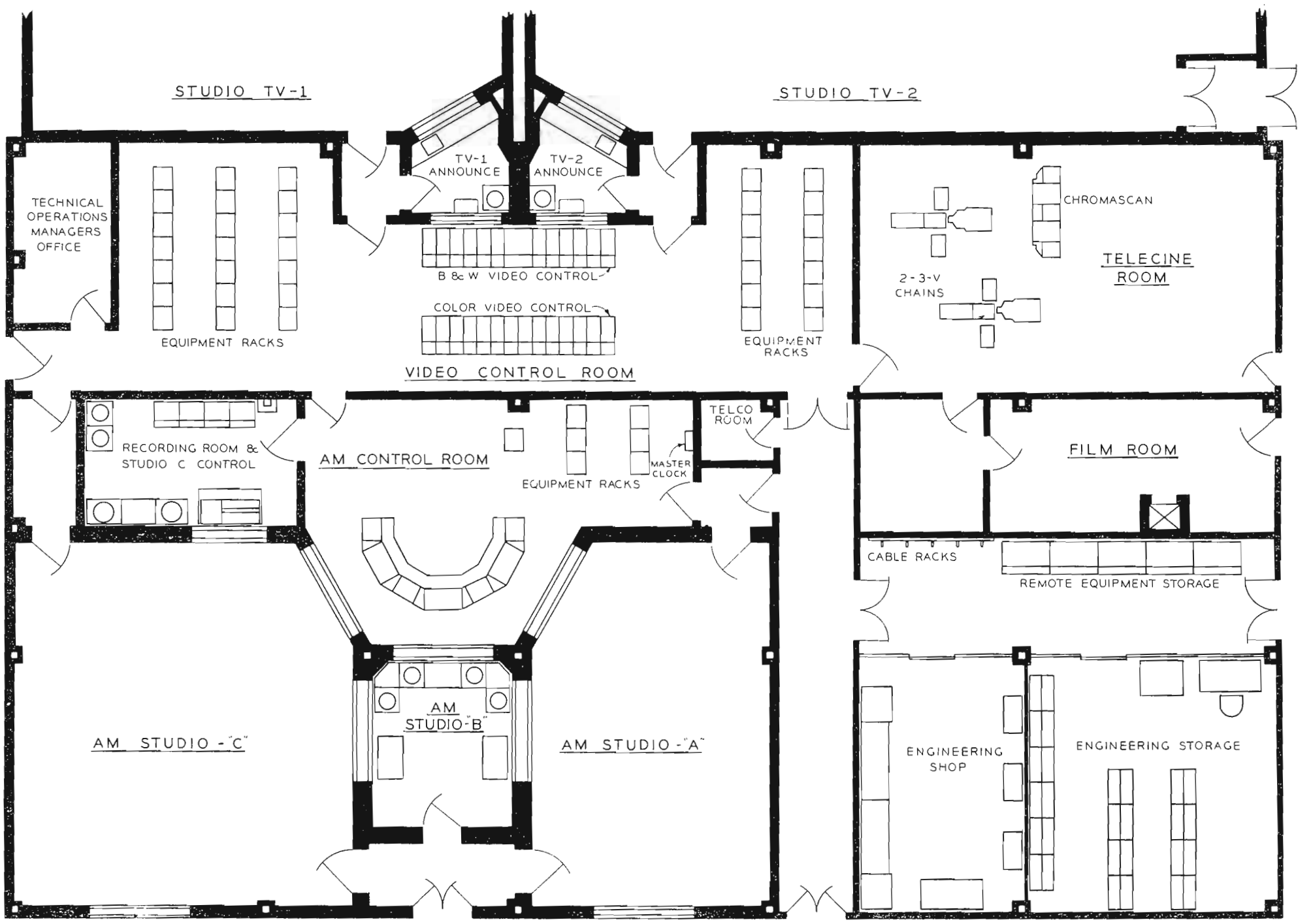


FIG. 16. Floor plan of the "technical core" of the WBT-WBTV Building. Arrangement of various areas was carefully planned to provide maximum operating convenience. There is a window between the video control room and the a-m control room which is not indicated in this drawing.

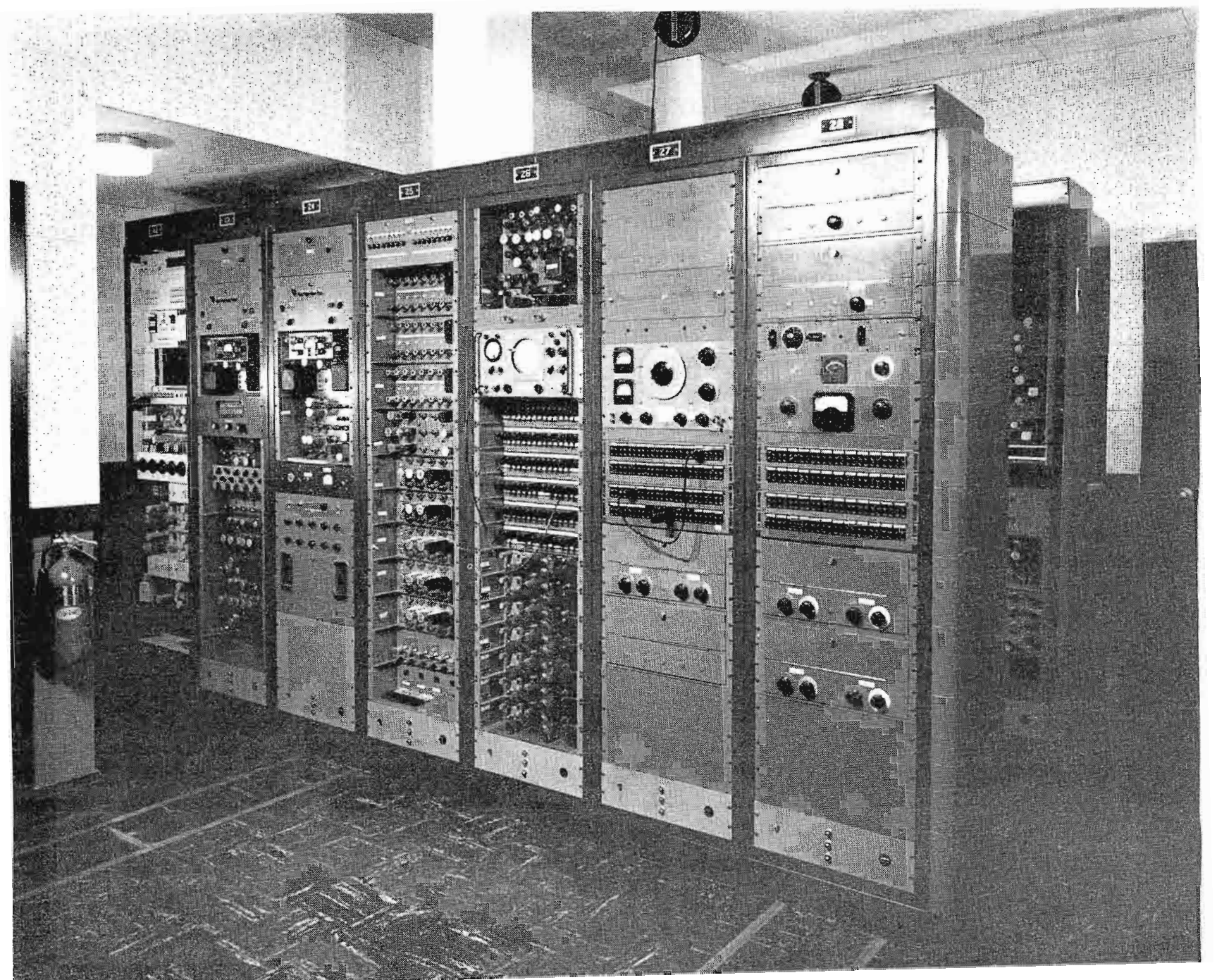


FIG. 17. These racks, at the right side of the video control room contain microwave and Telco terminal equipment, test equipment and audio equipment.

FIG. 18. WBTV's video control console as seen through the window from the a-m control room (see floor plan, Fig. 6). Camera control for four monochrome studio cameras, one color studio camera, two 3-V color film cameras and two color Chromascan units are incorporated in this console. Monitors are provided for both monochrome and color operation. Location of the various units in this console is shown in Fig. 19. Video operators at this position make all necessary camera adjustments. Camera switching is done by the director in the studio control booth.

Video Operating Console

In a line behind the switching position is the "video operating" console containing all of the camera controls. All told there are nine camera chains, including: two TK-30 Monochrome Cameras used in TV-1, two TK-10 Monochrome Cameras used in TV-2, one TK-41 Live Color Camera, two TK-26 Color Film Cameras and two "Chromascan" Color Opaque Cameras. WBTV engineers have assembled the various control and monitor units which go with these nine cameras into a neat and conveniently arranged console. The identification of the various units is shown in Fig. 19.

Equipment racks are located in rows of seven at each end of the control room. In all there are 35 racks—some of them reserved for future expansion. There are many other minor features—such as LC-1A Speakers on the walls, small powerstat controlled spots which can be directed on controls (and away from monitors), reel-type trouble lights over racks, etc.—which make the WBTV control room an engineer's dream.

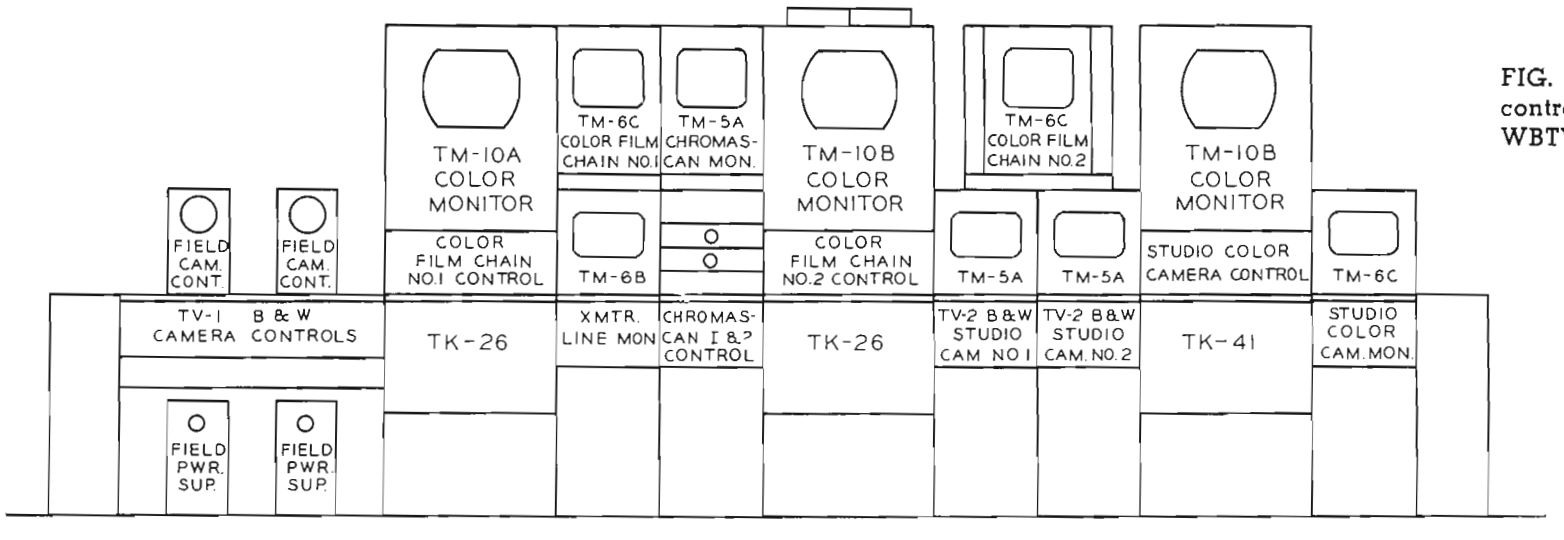


FIG. 19. Arrangement of the camera control and monitoring units in the WBTV video console shown in Fig. 18.

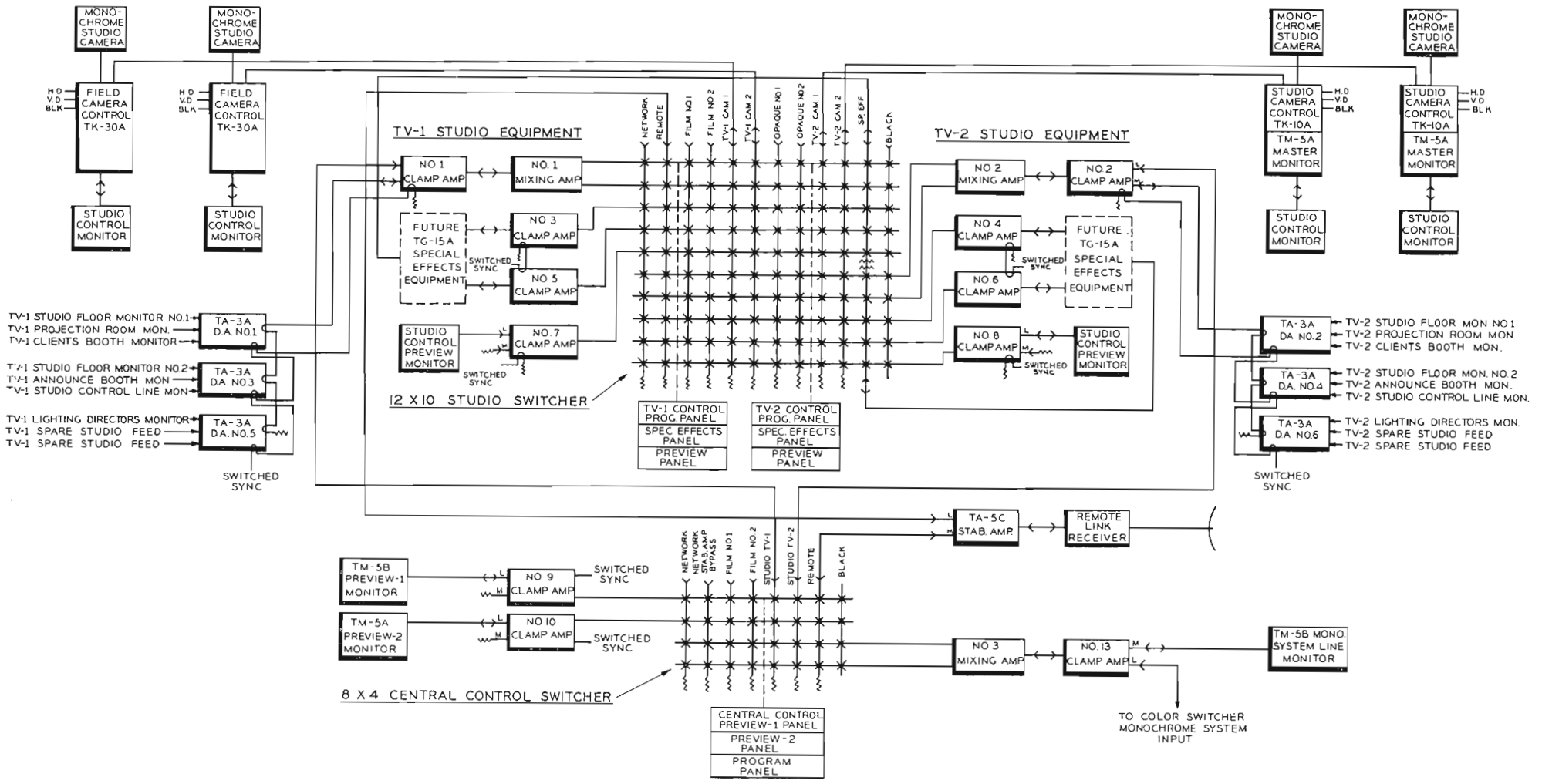


FIG. 20. Simplified block diagram of the monochrome video system in use at WBTV.

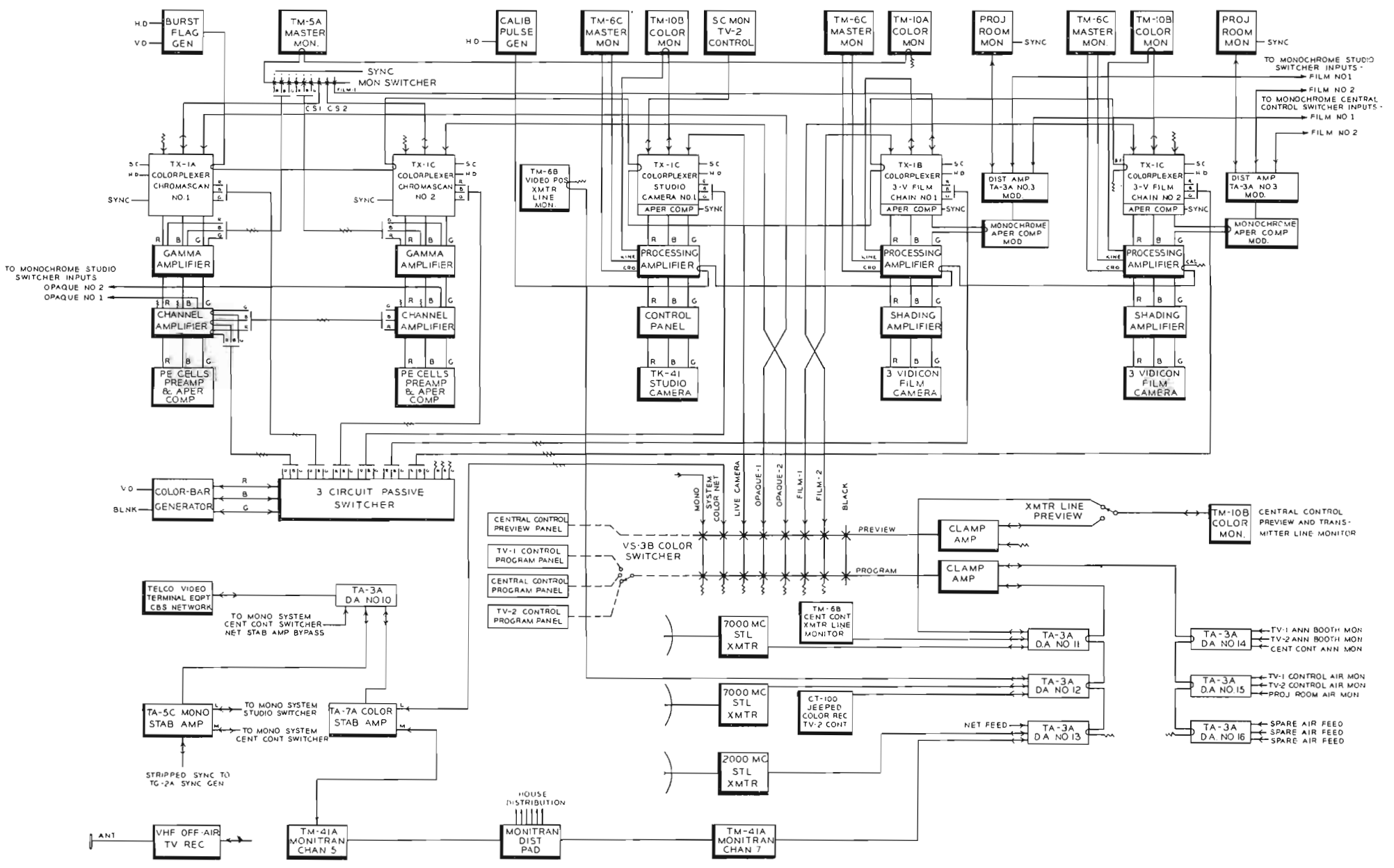


FIG. 21. Simplified block diagram of the color video system in use at WBTV.

FIG. 22. TV studio control booths and clients' booths are arranged in a line on second floor (see Fig. 9, Pg. 39). Director sits at near position, does his own switching. This view is from TV-1 control room and looks through three double-glazed windows into TV-2 control room 74 feet away.

TV Control Booths

The tv studio control booths at WBTV are located on the second floor—so that they look down into the studios (Fig. 9). This arrangement has the advantage that sets can be arranged on all four sides of the studio without blocking the view from the control booth (Fig. 23). This is particularly important where shows using a multiplicity of sets are produced in a single studio—or where local shows must be done back-to-back from the same studio.

The two studio control booths are identical in arrangement and equipment. Each has a long console (designed by WBTV engineers) at which there are positions for an audio engineer, the director, and an assistant director (Fig. 22). The audio position has an RCA BC-2B Audio Control Consolette, an RCA BCM-11A Microphone Mixer Consolette, two RCA BQ-70-B Transcription Turntables, a line patching panel and a convenient cabinet for holding transcriptions to be used during the day's programming. Two RCA de luxe-type LC-1A Speakers are mounted overhead. The director's position has convenient switching panels set flush with the top of the console—so that the director's view of the studio is not obstructed in any way. Using the push-buttons at his finger tips the director can select the camera picture he wishes to transmit, switch or fade from studio cameras to film room or net as required. He has a microphone directly in front of him which he uses to give directions to his production crew on the floor of the studio.

The position at which the director and audio man sit is on a floor level approximately 3 feet above the bottom of the window into the studio. Thus the table top where the switches are located is about 5½ feet above the bottom of the window. This allows the director to look sharply downward into the studio (Fig. 23). Viewing is further facilitated by the use of special filter glass in the windows which look into the studios. This glass, used here for the first time anywhere, admits only 25 per cent of the light intensity—but causes no material change in color rendition. This effectively prevents the high-intensity lamps in the studio from blinding the observers in the control booths. How-

FIG. 23. Because of his elevated position, director has this very good, commanding view of studio floor.

FIG. 24. View of a control booth from clients' booth. Audio position includes RCA BC-2B Audio Consolette and RCA BCM-11A Mixer Consolette, and two RCA BQ-70B Transcription Turntables.

ever, it does not change the color of sets or costumes as does ordinary tinted or darkened glass. This is, of course, very important on color shows as it enables the director to correctly judge color values.

Observation of the various camera pictures—and upcoming net or remote programs—is provided by monitors in the wall above the studio window (Fig. 24). Here again the relatively low-set window is of great advantage in that it allows the monitors to be at almost eye level (instead of high up as in some installations of this type). At the present time six monochrome monitors are mounted in position. Normally these are "On Air," "Preview," "Studio Line," and Cameras No. 1, No. 2 and No. 3. The space for mounting the monitors has been made large enough so that eventually up to eight color monitors can replace the monochrome units. WBTV plans to add these as their color programming increases.

Lighting in the control booths, as in the main control room, is provided by overhead adjustable, low-intensity powerstat-controlled spotlights. These can be positioned to throw light on controls and script while keeping direct light off the monitors.

Clients' Booths

Graciousness and hospitality are long suits at WBTV and nowhere is this more evident than in the accommodations they have provided for sponsors and client agencies. The "clients' booths" at WBTV are distinctly more than the poorly located cubbyholes provided in less well-thought-out installations. They are good-sized (12 feet by 20 feet), they are located in prime space adjacent to the tv control booths, and they are entered directly from the center corridor of the business area (second floor) of the building. These clients' booths have the same two-level floor construction as the control booths, so that clients sitting here have the same good view of the studio floor as the director. Also, the studio windows have similar light-reducing filter glass so that the floor operation can be viewed in comfort. De luxe, theatre-type chairs are permanently mounted in two rows, one at each level. Every seat has a good view and there is room for people to move in and out without climbing over those nearer the door.

FIG. 25. Clients' booths have de luxe theatre-type chairs arranged on two levels.

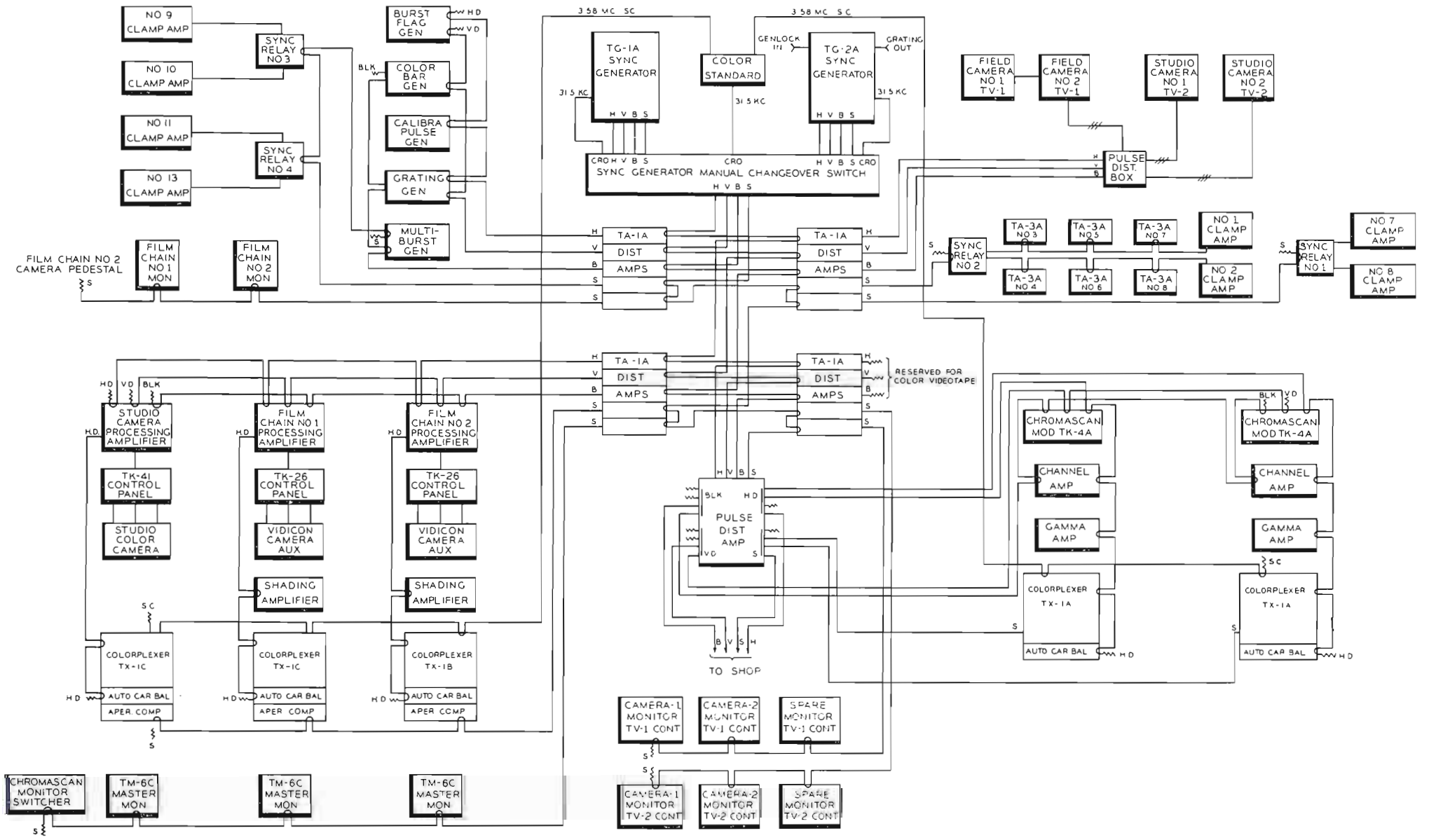


FIG. 26. Simplified block diagram of the pulse distribution system in use at WBTV.

FIG. 27. Simplified block diagram of the tv audio system in use at WBTV.

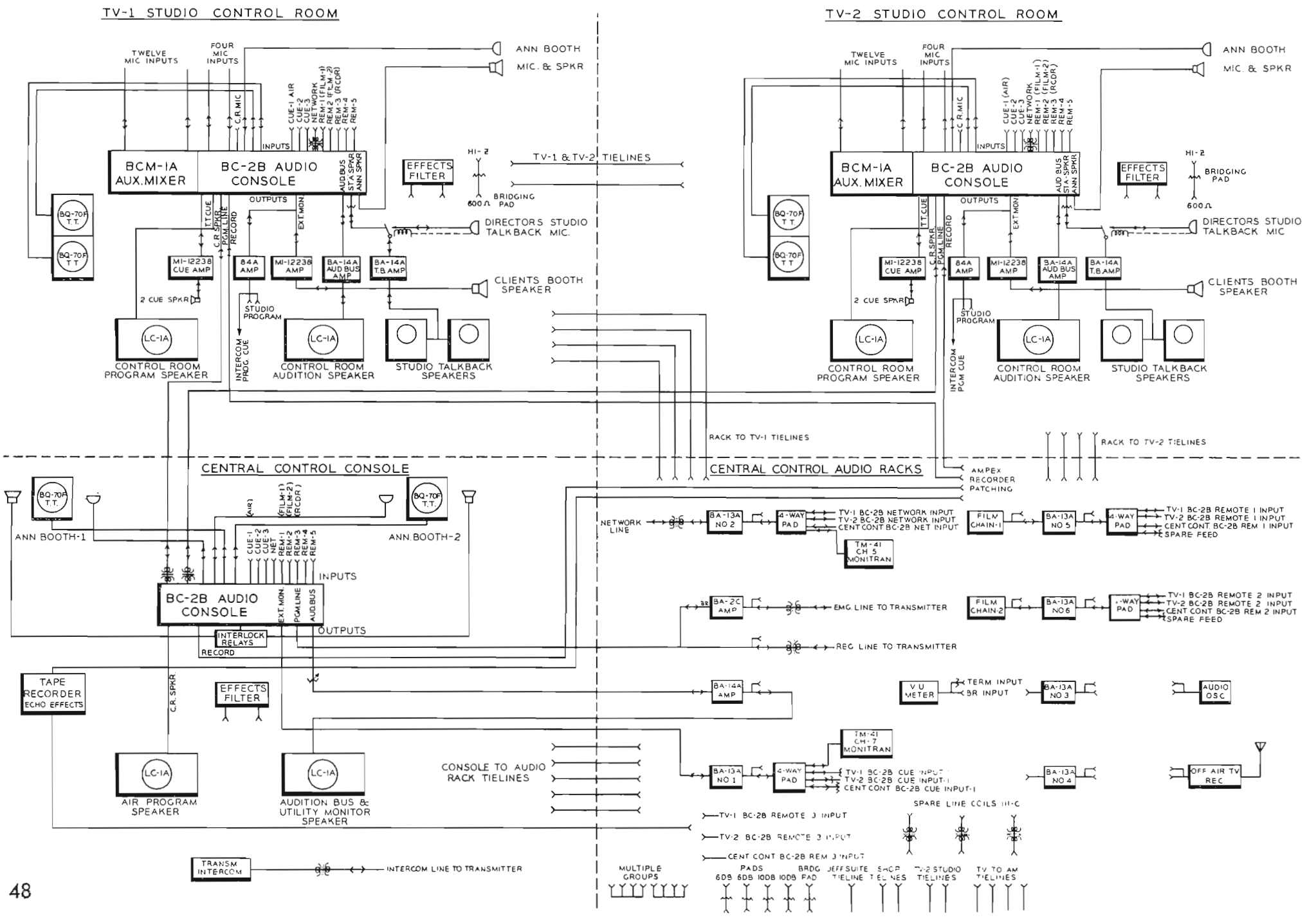
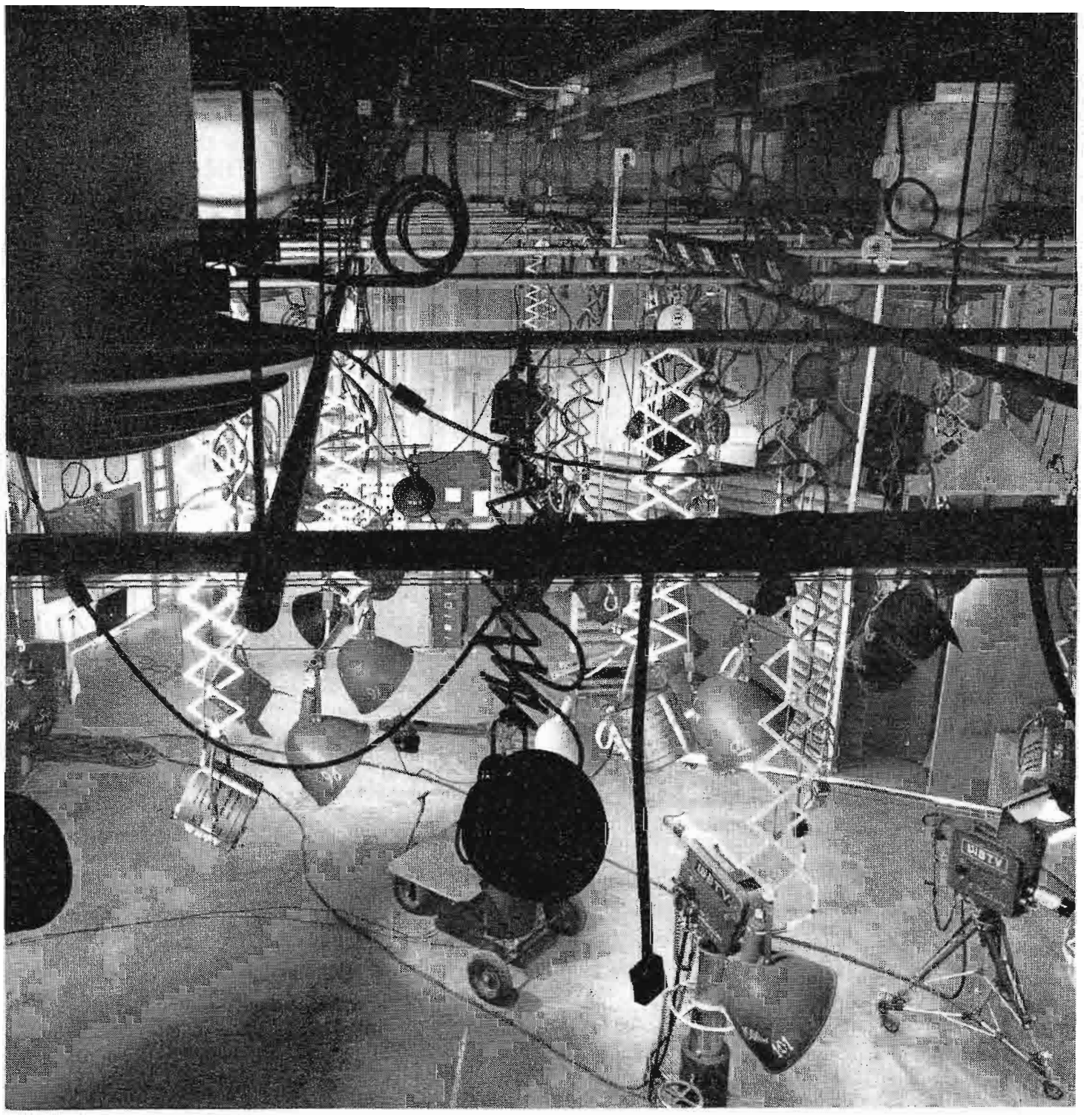


FIG. 28. All lights in WBTV's studios are suspended on pantographs from an overhead pipe grid, thereby keeping floor clear for camera movements.



Lighting

Both of WBTV's television studios are equipped with lighting control facilities designed to combine maximum flexibility with relative simplicity and convenience of operation. In accordance with the most up-to-date concepts the lighting control position is directly on the studio floor. This is a great convenience during setup in that the lighting director can go back and forth from the floor to the lighting position at will.

The light control position in Studio TV-2 (which is the larger of the two) includes a Kliegl Rotolector Cross-Connecting Board with one hundred and twenty 20-ampere, 24-point rotolectors (Fig. 29) and a dimmer console which has 12 dim and 12 no-dim 50 amp circuits fed from two main switches with 1200 amperes total capacity. The lighting director has a monitor in front of him so that he can check his lighting during operation.

The smaller Studio TV-1 has a similar lighting control position except that the dimmer console has six dim and six no-dim circuits and one main switch.

All lights in both studios are suspended from overhead on pantographs—an arrangement which allows easy adjustment of height and direction and keeps the studio floor free for camera movement. This is particularly important when airing a show using five or six sets arranged around the room with the cameras in the center. It is a necessity when using a single color camera for the whole show!

The pantograph fixtures are hung by clamps on a pipe grid of the standard type (Fig. 28). Lights are about evenly divided between scoops and Fresnel spots with the former used mostly for base light and the latter for back and mood lighting. Lights are connected to Kliegl Type 619G/10 Connector Strips mounted on the grid at convenient locations.

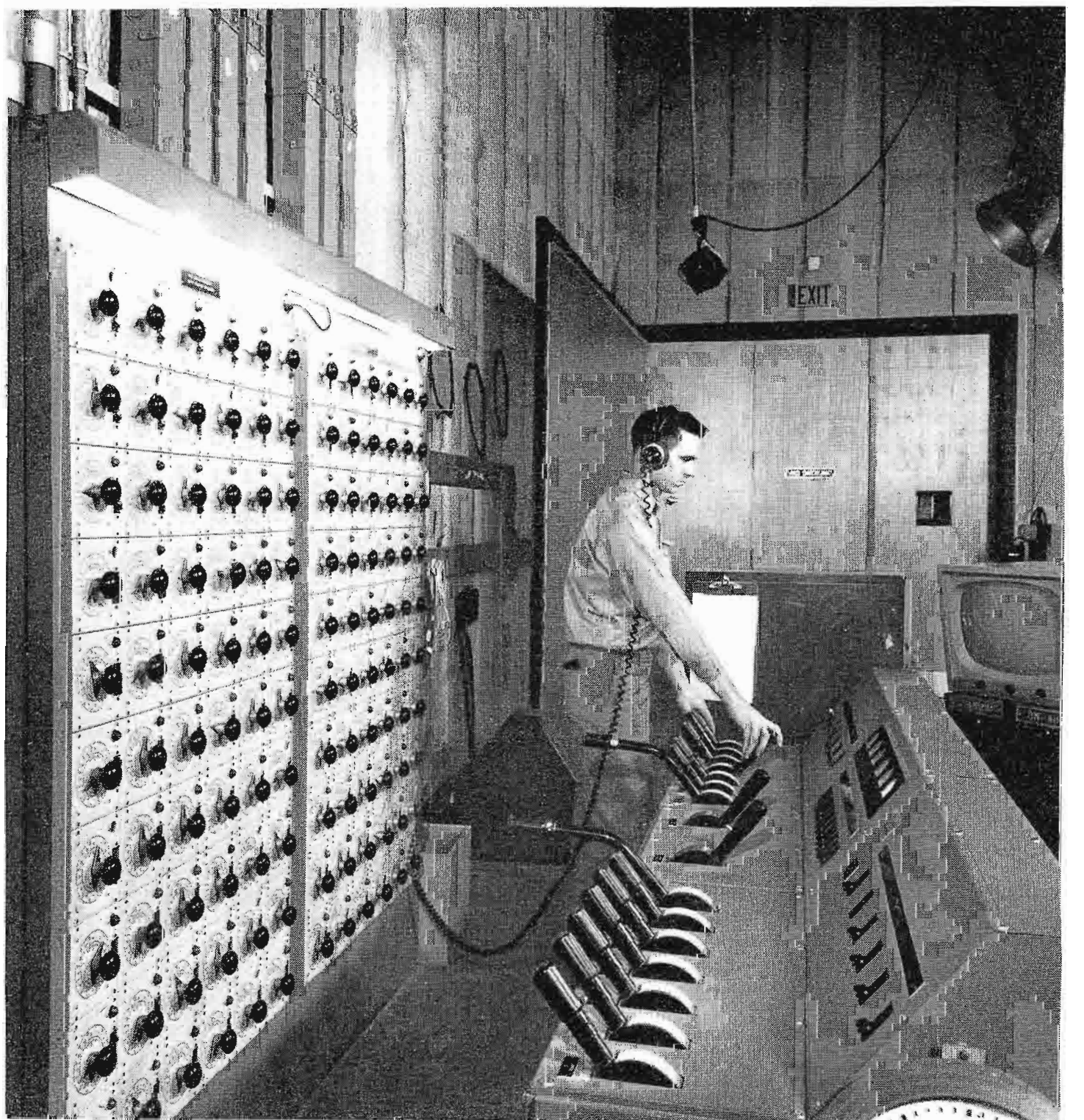


FIG. 29. Lighting in Studio TV-2 is controlled by this Kliegl Rotolector Board, containing 120 rotolectors and a Kliegl Dimmer Console having 12 dim and 12 no-dim 50-amp circuits fed from two 200-amp main switches.

FIG. 30. WBTV's film room contains two RCA 3-V Color Film Cameras, four TP-BC Film Projectors, two TP-7A Slide Projectors and two Chromascan units. Space has been reserved in this room for future installation of color video tape equipment.

FIG. 31. Another view of WBTV's film room showing film handling and monitoring equipment.

WBTV Film Room

An outstanding feature of the WBTV plant is its film room—probably the most modern-equipped in the country. Entirely "colorized," it includes two complete film equipment groupings each consisting of a TK-26 3-V Color Film Camera, two de luxe-type TP-6BC Film Projectors and one of the brand-new TP-7A Slide Projectors. In addition there are two Chromascan units (see next page) for projecting color opaques and small package items. With this setup WBTV is equipped to transmit color films, slides, opaques or "live" product shots. It can put on its color commercials in whichever manner seems best fitted to the product and message. Moreover, the completely dual setup allows great flexibility in continuity since it is not necessary to follow fixed sequencing patterns.

The film room also contains complete audio and video monitoring facilities, intercom, rewind equipment, and film storage racks. With all this equipment only about half the space in the 20-foot-by-40-foot room is presently used. The rest is "reserved for color video tape equipment." If WBTV follows its tradition of being the "first with the newest," it may not be too long before this space is filled.

WBTV Chromascan Equipment

A feature of the WBTV film room which is unusual and which always excites the interest of visiting telecasters is the pair of impressive looking "Chromascan" units. Tom Howard is a great believer in the advantages of color opaques and "live" product commercials. He had his mind set on having the best possible equipment for the purpose. The solution he arrived at was to buy two RCA TP-4A Scanners and convert them for the purpose. These units are flying spot scanners which were originally proposed for color slide pickup but became obsolete for that purpose when the 3-V camera was developed. Since they included complete color scanning circuits and accessory equipment to form the equivalent of a color camera chain, they supplied all the basic parts needed. WBTV engineers designed and built a new mounting arrangement for the scanning system (Fig. 33), a new optical system, and several alternate arrangements for mounting and moving copy or product. The arrangement works perfectly and makes it possible to reserve the 3-V cameras exclusively for slides and film.

With the Chromascan WBTV can use color opaques, such as standard advertising and promotion pieces, simple artist's drawings, wrappers, cartons or the like to illustrate its color commercials. Small objects —such as cigarette packages, lipstick, etc., can be shown "live."

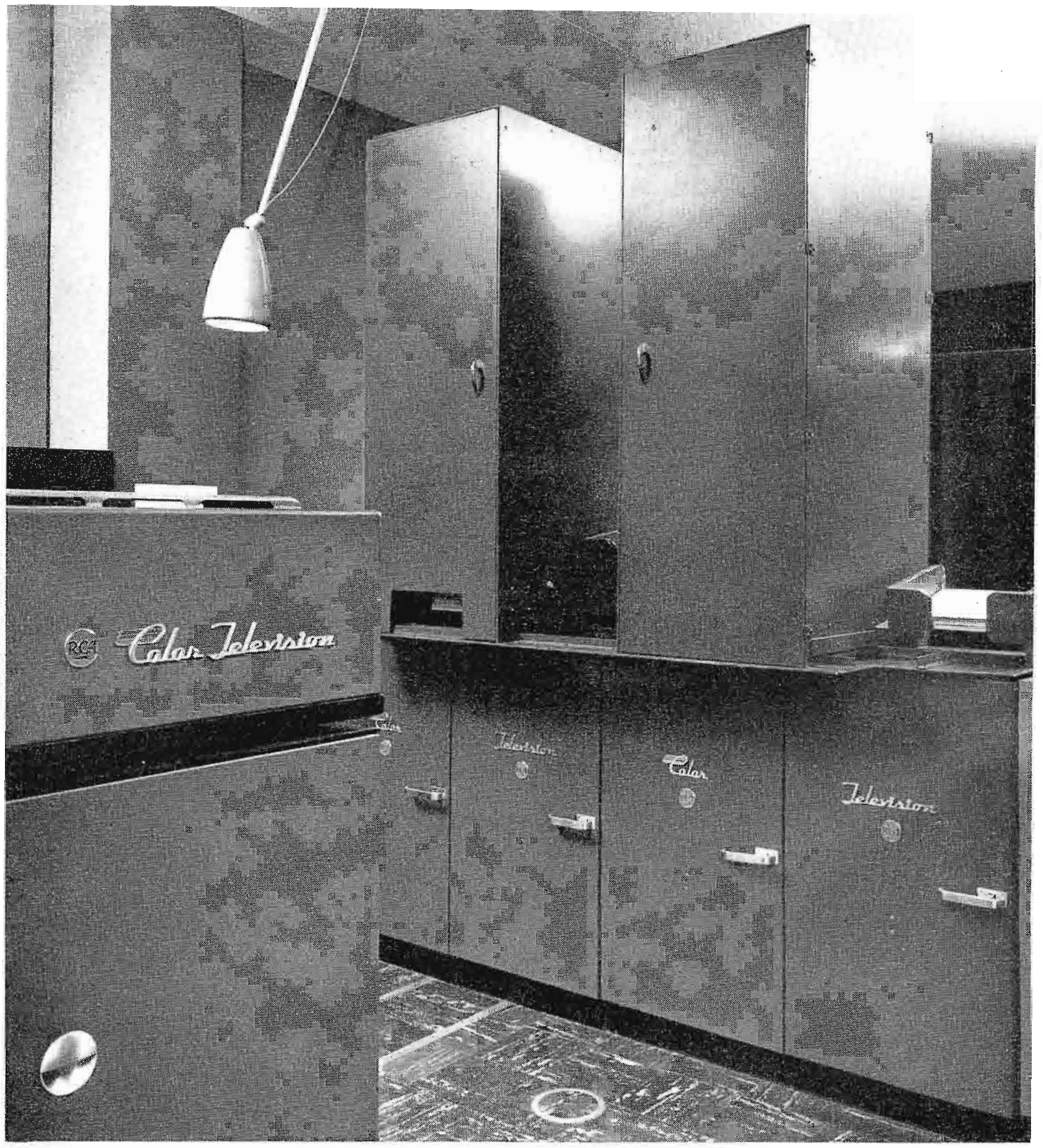


FIG. 32. Another view of WBTV's film room showing the two Chromascan units used for projecting color opaques.

FIG. 33. Chromascan units with doors open to show scanner (in box at top) and the three photo-cell pickups.

FIG. 34. Cigarettes or other small articles can be placed on moving belt to produce "live" commercials.

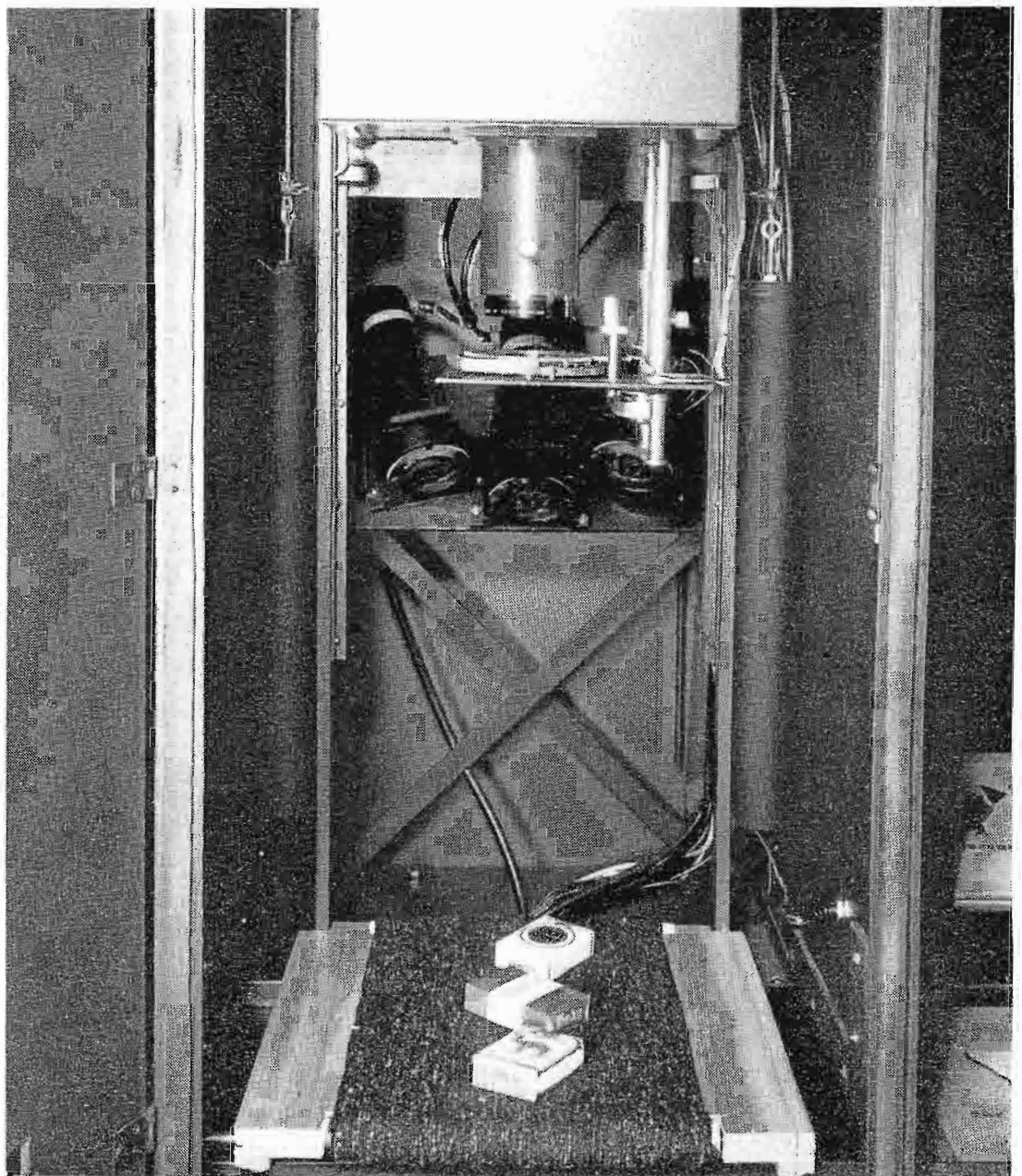


FIG. 35. Hank Warren (right), photo lab supervisor, and assistant in the mixing room which is a part of WBTV's efficiently arranged photo-lab facilities.

Film Production Facilities

Any station which undertakes to do a strong local programming job must have extensive and efficient facilities for producing its own news films. WBTV is rightfully proud of its ability to shoot and develop film on an extremely fast schedule. Unusually fast-moving mobile camera crews plus fast-developing equipment make it possible.

WBTV can put three camera crews in the field simultaneously; when necessary, they can be at separate locations ready to film events in a fast-breaking news story. Using radio-equipped cars they can talk to each other to co-ordinate their efforts and —equally important—can advise the station when they will be back with a hot story. This allows the program director to plan his news programs to incorporate the hot films, to write continuity for them, and to warn the photo lab that a rush job is on the way.

In addition to the cars, WBTV maintains its own Cessna twin-engined plane at the nearby Charlotte airport. Film crews, transported by this plane, can shoot film anywhere in the Carolinas and have it back to Charlotte and on the air in two or three hours.

The photo lab—under the direction of Hank Warren—is unusually well arranged and equipped. The over-all setup includes four rooms. One is a central office. The others are the dark room, the mixing room and the film processing room.

Since WBTV uses an average of 1000 feet of film a day, the film processing equipment is of considerable interest. This equipment is a Model 16HT Filmatic which Mr. Warren has modified somewhat to adapt it to WBTV's particular needs. He has also worked out a technique which saves considerable time on rush jobs. One part of this is to keep a leader (about 275 feet long) in the machine at all times. This saves threading time. When a hot film comes in, he puts it on a reel, staples it to the already-in-place leader and he is ready to go. Every time he runs a piece of film through, he puts a leader on the

FIG. 36. Dark room in WBTV's photo lab which is equipped to produce glossy prints for promotion as well as films for programming.

FIG. 37. WBTV uses this Filmatic to get pictures on the air minutes after the undeveloped film is brought in by the station's camera crews.

FIG. 38. WBTV can put three camera crews in action simultaneously. Using radio-equipped cars and the station's own Cessna twin-engine plane they can shoot film anywhere within several hundred miles of the station and have the pictures on the air within two or three hours.

end of it so that he will have one in place for the next film.

The developers in the machine take about 20 minutes to warm up to the 90-degree temperature at which film is usually run (speed is 50 feet per minute at this temperature). In the case of very hot stories, the camera crews call in from their location to say when they will be in. This allows Warren to have his machine warmed up and ready to go. In this way WBTV has, on occasion, had film on the air within 8 minutes after it arrived at the photo lab.

The ability of WBTV to shoot film anywhere in its area and have it on the air within hours is one of the factors which has given the station an unusual identity with the interests of the community.

FIG. 39. The engineering team at WBT-WBTV—124 years of communications experience. From the left, M. J. Minor, Transmitter Field Engineering Manager; Thomas E. Howard, Vice-President and Managing Director, Engineering and General Services; Frank Bateman, Technical Operations Manager; and T. G. Callahan, Engineering Administration and Planning Manager.

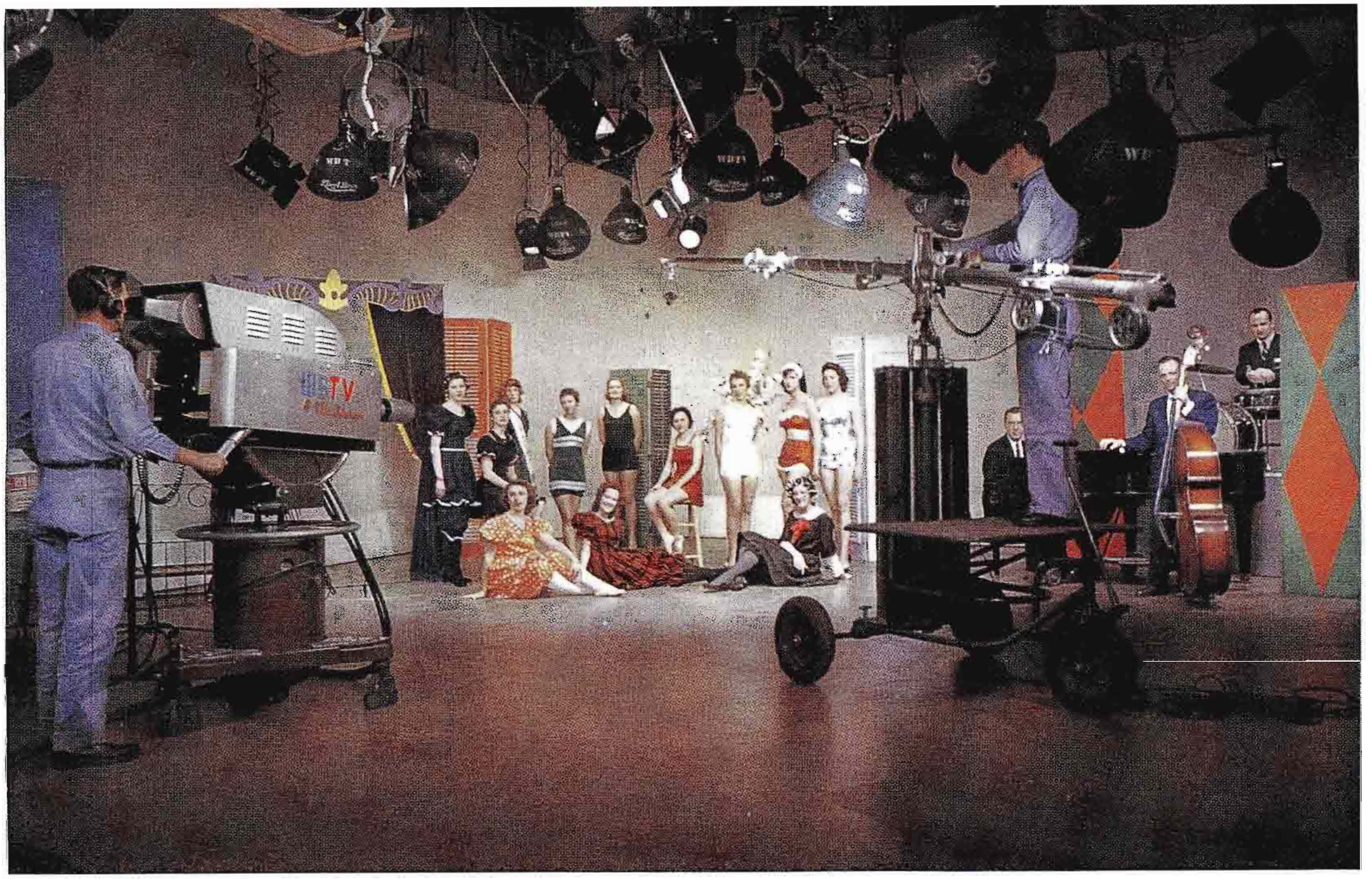


FIG. 40. The WBTV Studios, which were designed "from the ground up" for color, presently have live color equipment in Studio TV-2 in addition to complete film, slide and opaque color camera equipment. Using this equipment in flexible fashion, they have been producing several local color shows a week since May of 1956.

Color Operation

WBTV people like to describe their studio building as "the first built from the ground up for color operation." The claim seems merited. Some stations have "made provisions for color" in their original planning. Other stations have adapted monochrome studios for color. Some have renovated their whole plants for "all-color." But WBTV has gone farthest. In their original planning and building they have (a) designed the whole building for all-color programming, (b) provided all the cabling, switching and control circuits for all-color, (c) installed initially color equipment for all types of color telecasting (films, slides, opaques, lives) and (d) provided space for the several additional live color studio camera chains which are the only extra items they will need for 100 per cent color programming.

It is also noteworthy that they have not installed any strictly monochrome film cameras (see below) and that they have provided in their film room a large space which is marked "reserved for color video tape equipment."

Color Situation

WBTV's management is enthusiastic about color television and they have long been of the opinion that *all* television will be in color in the not too distant future. They are ready for this transition. Up until the present time they have proceeded at a deliberate and moderate pace and without fanfare. They have taken the stand that they will not actively promote color and ask their viewers to buy color receivers until the public can be assured that they will be able to receive a reasonable number of their favorite network shows in color and on a regular and continuing basis.

Despite this lack of promotion many of the WBTV viewers have seen WBTV's color programs and based on what they saw they *are* purchasing color receivers. The latest set count shows 934 color receivers in the WBTV service area.

Color Equipment

The WBTV studios, as previously noted, are not only completely air conditioned, lighted and wired for color, they are also equipped right now for all types of color operation.

Each of the two tv studios has two color-camera outlets installed and wired to central control. One complete RCA TK-41 live color camera chain is in operation. This can be used in either studio or, by use of extra camera cable length, in the "outside studio" area.

WBTV has two RCA TK-26 3-V Color Film Camera Chains. One of these is presently used for monochrome and hence is operated with a single vidicon. It can be quickly changed for color, when required.

With each of these film cameras is a pair of RCA TP-6BC de luxe-type Film Projectors and one of the brand-new RCA TP-7A Dual-Drum Projectors. The latter adds greatly to the flexibility and efficiency of the system—as well as the quality of projection. WBTV was the first to have them.

WBTV also has another unusual feature in color equipment—a pair of color opaque scanners. Called "Chromascan" by the station engineers who developed them (see story, Pg. 51), they enable WBTV to transmit color prints or other opaques directly and also to pick up "live" various merchandise packages.

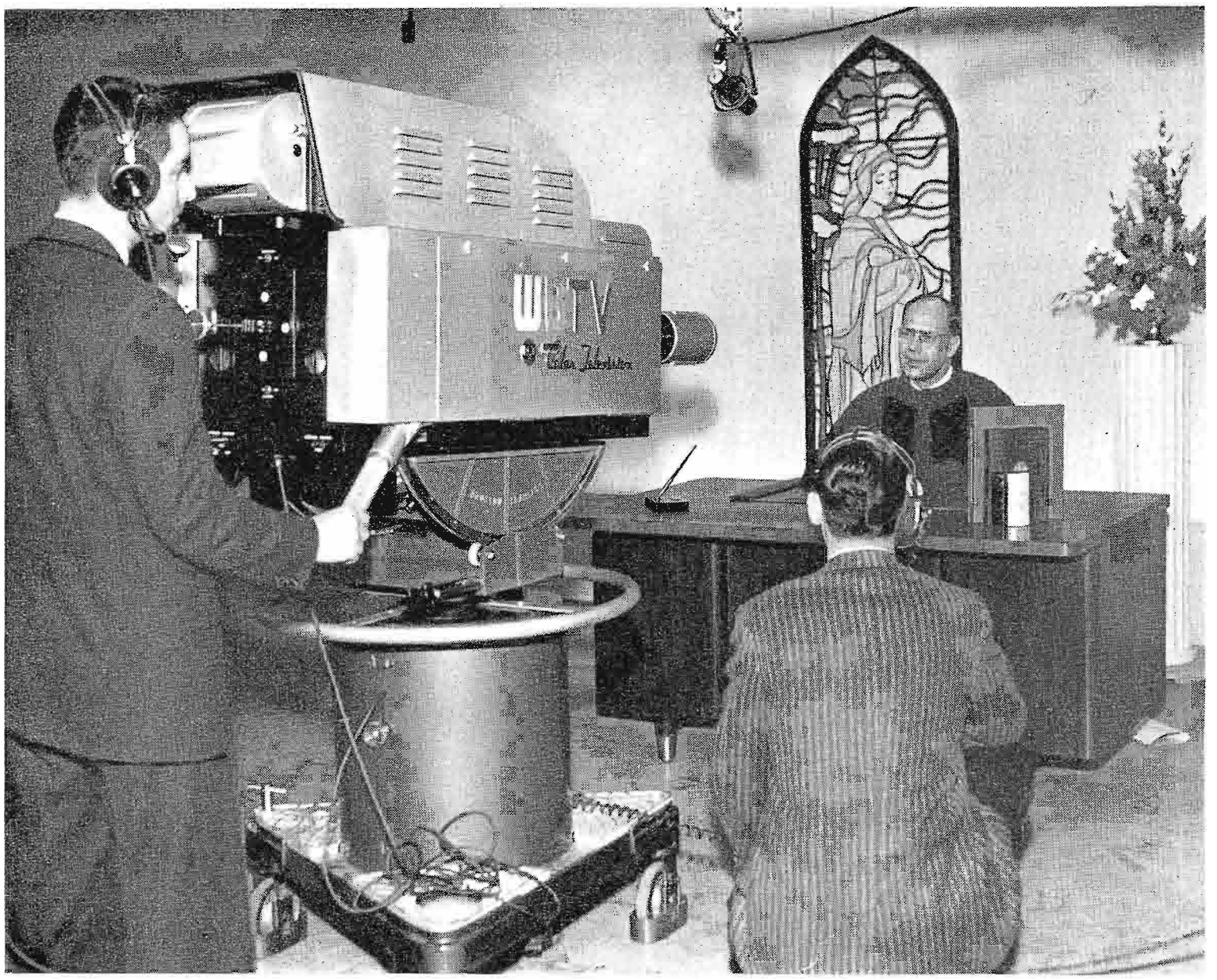


FIG. 41. WBTV's first live color program, produced in December 1955, featured Dr. George Heaton, Pastor of the Myers Park Baptist Church.

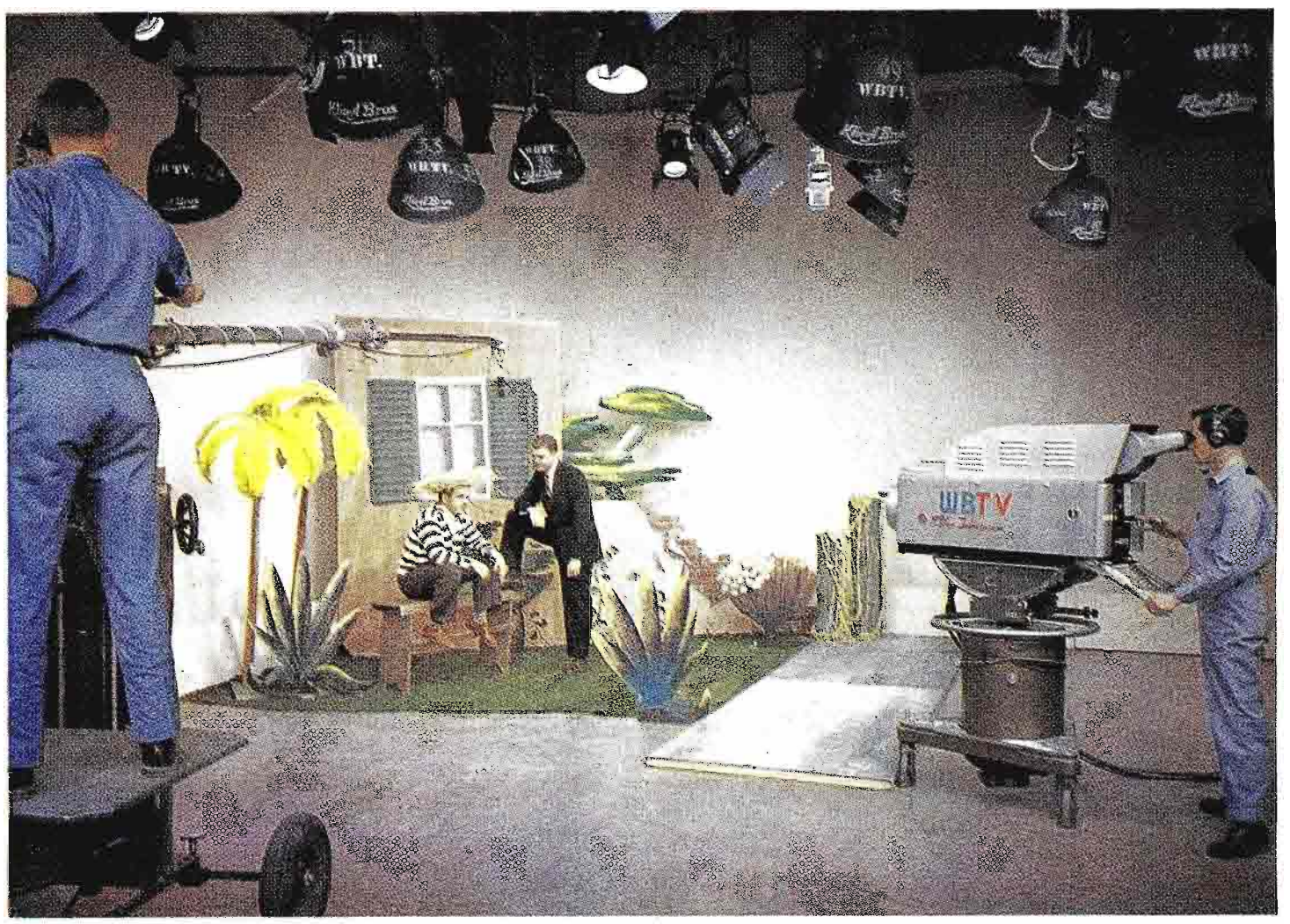
Color History

WBTV's color history is similar to that of other stations who are pioneering in this new field of visual communications. In order to provide servicemen in the area with a means of checking color receiver installations, the station started transmitting color bar "patterns" in May 1954. Color slide and film programs were aired beginning in August of 1954, and the first color network programs were transmitted in August 1954. At this time the pace of color started picking up and the station began telecasting live color programs in December 1955. In May 1956, regular telecasting of two locally originated color shows a week was started, and has continued to the present date.

Present Color Programming

At the present time WBTV is producing a half-hour live color show called "Spectrum" on a regular twice-a-week basis. Spectrum is a simplified variety-type show with four to six participating local sponsors. It is produced in Studio TV-2 using WBTV's live color camera. Chromascan artwork is used for some commercials (others are done live) and for breaks to cover periods when the camera is panning from one set to another.

FIG. 42. WBTV's live color programs are produced on small color sets, arranged around the periphery of the studio, with the center floor area reserved for camera movement (see Fig. 43, Pg. 57).



WBTV producers and engineers have been developing the Spectrum show for some time and it is astounding how much variety they are getting into it with their one-camera setup. On a typical day's show, for example, they used, by actual count, no less than seven sets. These sets were arranged in a circle around the color camera located in the center of the studio floor (Fig. 43).

Three of the sets were fairly large—on the order of 25 feet wide. One of these (set No. 1), which is used regularly as the opening and closing theme, consists of a black velvet drape in front of which is placed an open framework on which are mounted small panels in various colors. The announcer stands in front of this set in opening and closing the show. The second large set consisted of three neutral colored flats (see diagram, Fig. 43) on which a color gel projected a light blue cast. Flowers on a stand completed this simple set against which a parade of girls modeled large-brimmed summer hats. For a simple set it was surprisingly effective. The third large set was considerably more complicated. It simulated the outside of a small railroad station—complete with hedge and street lamp. The background for this was a city sky line at night. The latter was provided by rear-screen projection using a cutout pattern to cast the shadowy outline of buildings. This, of course, was plain black and white—but, for a night scene, it seemed realistic.

In between these larger sets were placed four small sets. These were: Set No. 2, an artist's easel; Set No. 3, a piano; Set No. 5, a refrigerator (sponsor's product); Set No. 6, a kitchen table (for bread commercial). A neutral cyc which runs around two walls of the studio provided background for most of these. Others used available flats of simple types. As a rule only one of the sets used (in this case Set No. 7) is made up especially for this show.

Part of the reason this relatively simple WBTV show is so effective is due to the use of the Chromascan units. A colored opaque, the "Spectrum Title Chart" is used alternately with live shots in order to give the cameraman time to swing his camera from one set to the next. Colored "opaques" are also used for some commercials. This use of the Chromascan is similar to the way some stations are using color slides. WBTV personnel feel that opaques are easier to make—more convenient to use. Without some such arrangement it is difficult to do a multiple-set show with a single camera.

Table I

WBTV COLOR SPECTRUM PROGRAM
SIMPLIFIED CONTINUITY

Scene Transmitted	Picked Up By	From
Spectrum Title Chart	Chromascan No. 1	Artwork
Girl Announcer	Live Camera	Set 1
Spectrum Title Chart	Chromascan No. 1	Artwork
Man Announcer	Live Camera	Set 1
Spectrum Title Chart	Chromascan No. 1	Artwork
Male Singer	Live Camera	Set 3
Spectrum Title Chart	Chromascan No. 1	Artwork
Refrigerator Commercial	Live Camera	Set 5
Commercial	Chromascan No. 2	Artwork
Spectrum Title Chart	Chromascan No. 1	Artwork
Girls Modeling Hats	Live Camera	Set 4
Spectrum Title Chart	Chromascan No. 1	Artwork
Girl Singer	Live Camera	Set 4
Spectrum Title Chart	Chromascan No. 1	Artwork
Bread Commercial	Live Camera	Set 6
Spectrum Title Chart	Chromascan No. 1	Artwork
Cartoon Artist at Easel	Live Camera	Set 2
Spectrum Title Chart	Chromascan No. 1	Artwork
Musical Skit	Live Camera	Set 7
Commercial	Chromascan No. 2	Artwork
Girl Announcer	Live Camera	Set 6
Spectrum Title Chart	Chromascan No. 1	Artwork

Color Production Crew

WBTV produces its color shows with the same size crew as used for local live programs in monochrome. The production crew consists of the producer, a floor manager, one cameraman, one boom man, one lighting man, and a utility man (who handles props). The technical crew consists of a technical crew chief at the video switching position in central control, a video operator at the camera controls, a projectionist and an audio engineer in the tv studio control booth.

At WBTV the producer does his own switching; he also directs the setting up of props, and lighting of sets, previous to going on the air. It is the station's intent that eventually all of its producers as well as other personnel will have the requisite experience to handle color shows. However, to date some specialization has been necessary. Production on most color shows has been handled by Norman Prevatte and the experience he has gained is quite evident in watching the Spectrum Show. Despite the difficulties of operating with one camera, he manages by careful planning and timing to produce a surprisingly variegated show with the smoothness of a network production.

Warmup Schedule

Warmup time for color should be carefully planned so that valuable tube life is used to the best advantage. WBTV, like most stations presently using color, does this by combining warmup time with scene check-out and "on-camera" rehearsal time. A typical schedule is as follows:

9:00 A.M.—11:30 A.M.
Camera warmup and initial setup
11:30 A.M.—12:30 P.M.
Studio lighting setup using camera to check
12:30 P.M.—1:00 P.M.
Engineering setup
1:00 P.M.—1:50 P.M.
Rehearsal on camera
1:50 P.M.—2:00 P.M.
Final camera check
2:00 P.M.—2:30 P.M.
Air time

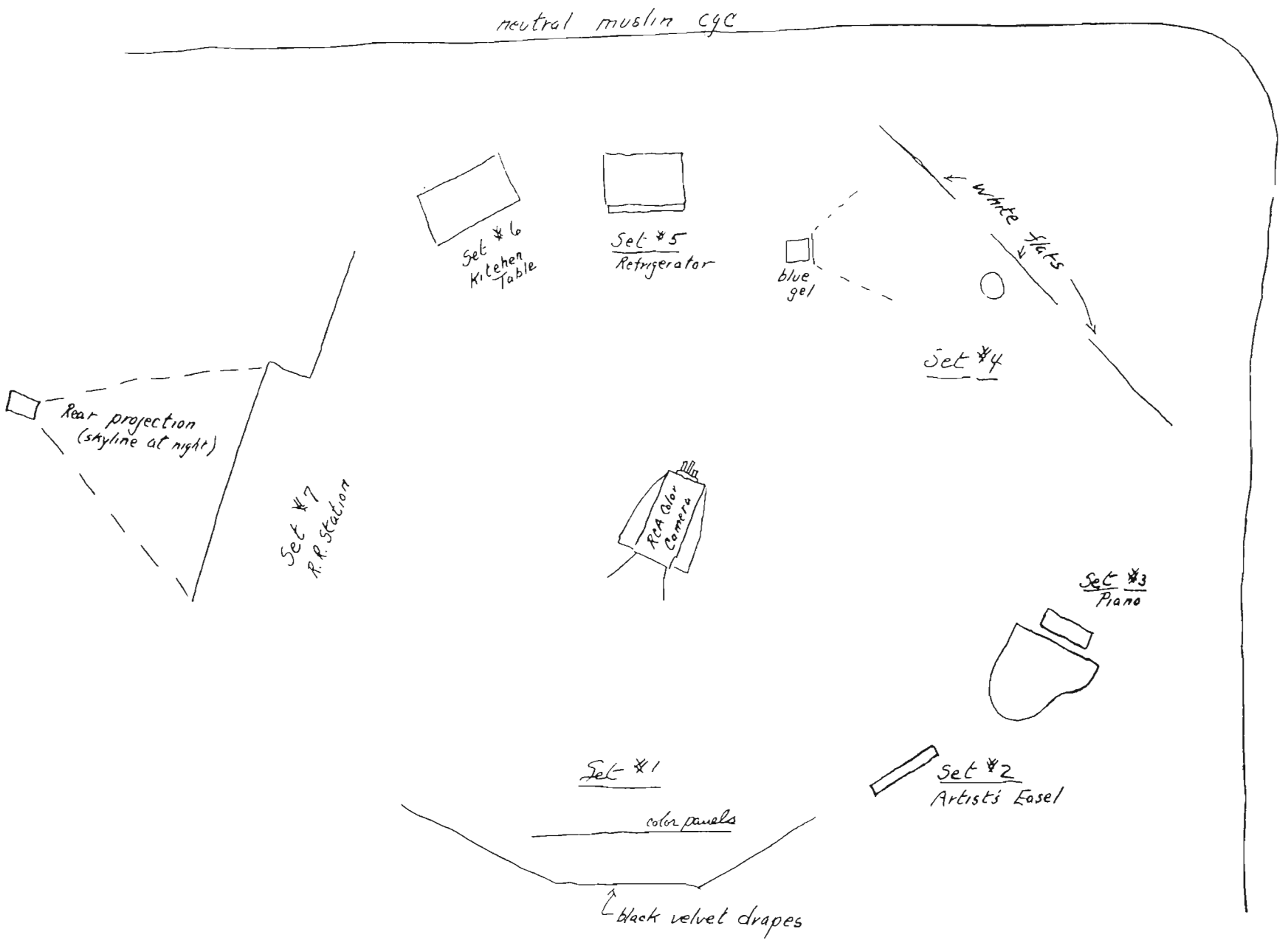


FIG. 43. Floor-plan arrangement used by WBTV in producing the "Spectrum" program described in the text (see continuity Table I). Three fairly large sets and four small ones are arranged in a circle about the live color camera which can easily pan from one to another. During transitions color slides or opaques are used.

In practice these time intervals are flexible and in most periods several things go on at once. Usually the floor man gets his plan around 10:00 A.M.—starts bringing in sets around 11:00 A.M. Preliminary on-camera checks are made during this period. Around 11:30 announcers and singers start arriving and informal rehearsing and checking of costumes, make-up, etc., on-camera begin. As in most local programs of this type, only the commercials are rehearsed completely. Talent is usually checked only for placement, lighting and sound pickup. Since all these things are done during the so-called "warm-up" period, the camera time cannot be counted as wasted. Most of it would be necessary even though the cameras did not need a warm-up period.

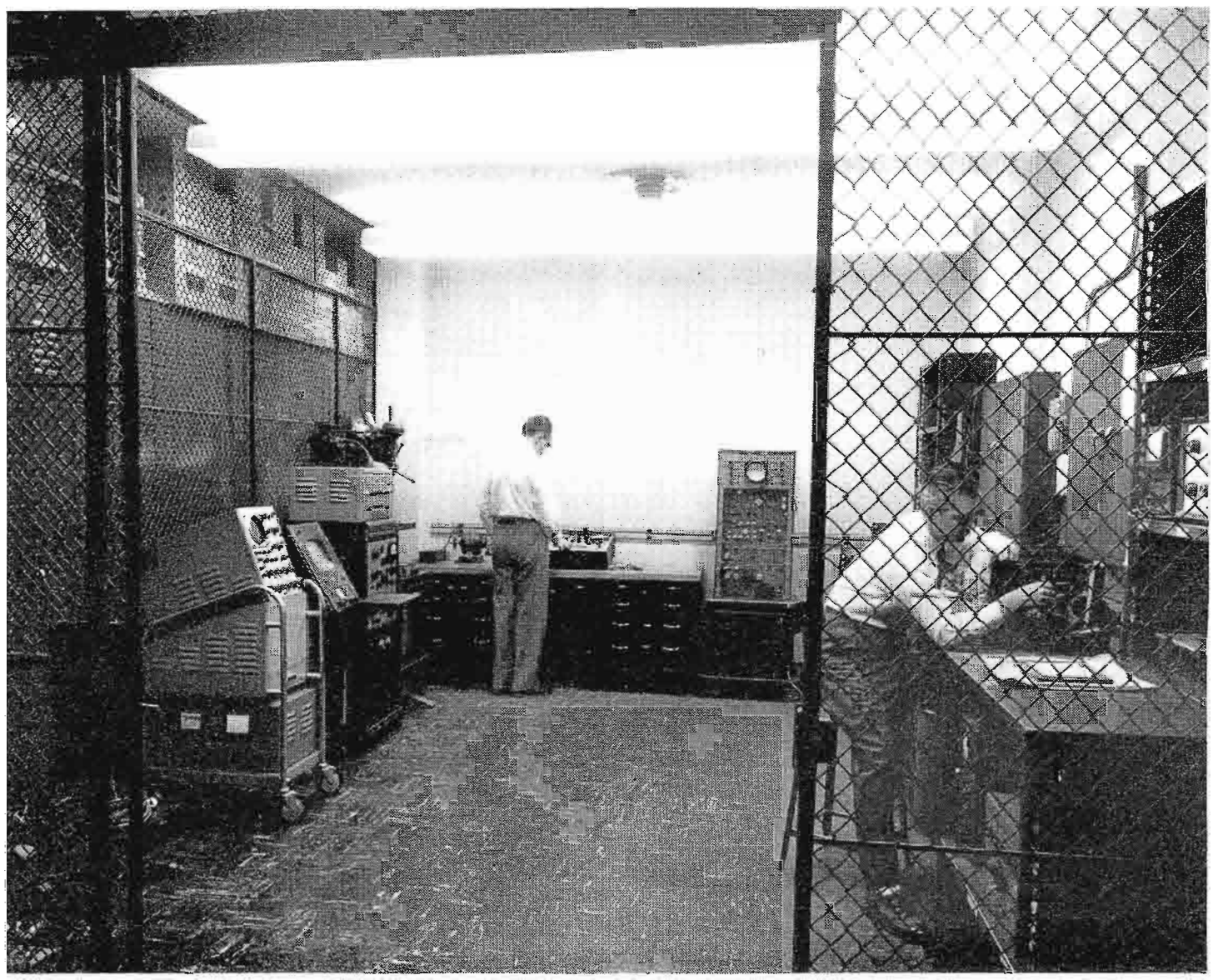


FIG. 44. A well-equipped engineering shop is conveniently located within the "technical core" of the building (see Fig. 16, Pg. 43). Next to this is an engineering storage room. Remote equipment is stored in cabinets in passageway just outside this room.

FIG. 45. Master control room of WBT looks into the three radio studios through conveniently placed windows. Master console includes a separate control panel for each studio plus terminal and switching facilities. Studio B (center) is a d.j. studio, equipped with four RCA Type 70-D Turntables and one announcer's control box.

FIG. 46. Not only are the technical operations of WBT-WBTV centered in one area but, for convenience, the whole area is made visible by conveniently placed windows. In this view, from Studio C, can be seen the recording room (left); the radio control room, and beyond it the tv control room (center); and Studios B and A (right).

WBT Radio Studios

Although the tv studios in the WBT-WBTV Building occupy the largest space, the radio operation has not been neglected. In fact the space given to radio, and the care with which the facilities have been planned, is fresh evidence of the resurgence of radio broadcasting.

The studios and control facilities of WBT have been arranged to provide maximum convenience and efficiency for the type of radio operation which has come to the fore in the past few years. This means emphasis on d.j. and news-type programs, centralized operating control and maximum provision for recording.

WBT has three radio studios which are grouped around a central control room (see Fig. 16, Pg. 43). Studio C, the largest, is 26 feet by 28 feet; Studio A is 18 feet by 28 feet. Studio B, a strictly news and d.j. studio, is 11 feet by 14 feet. All three studios have isolated floors and floating walls and ceilings, affording a high degree of sound isolation. Sound locks are provided at all doors. Entrance to all studios is directly from the corridor so that talent or announcers need not enter the technical area.

The WBT radio control room is built so that an operator sitting at the master control position can see into all three studios (Fig. 45). The radio master console was designed by WBT engineers and custom-built by another manufacturer. It is U-shaped and has a separate control panel for each studio. An operator sitting at any of these three control positions faces directly into the studio with which that panel is associated.

Recording of programs, both for auditioning and for delayed playback, is an increasingly important aspect of radio station operation. WBT engineers planned their recording facilities with this in mind and the resulting installation is a model of convenience and flexibility, providing for almost any conceivable requirement.

The recording room is located directly off of the master control room (Fig. 47) and adjacent to Studio C, which it looks into through a conveniently placed window (Fig. 16, Pg. 43). In the recording room is an audio control panel (similar to those in the master console), which can be used to control operations in Studio C. This makes it possible to produce a program in Studio C and record it completely independent of master control. Recording equipment includes two RCA Type Disc Recorders and four console-type tape recorders. Each recorder has its own monitor for playback.

FIG. 47. Another view of WBT radio control room, showing direct access to recording room (top right). Recording equipment can be operated independently or by push-button control from master.

FIG. 48. Interior of the WBT recording room. Control console, at left, faces into Studio C and may be used to control a program originating in this studio independent of master control.

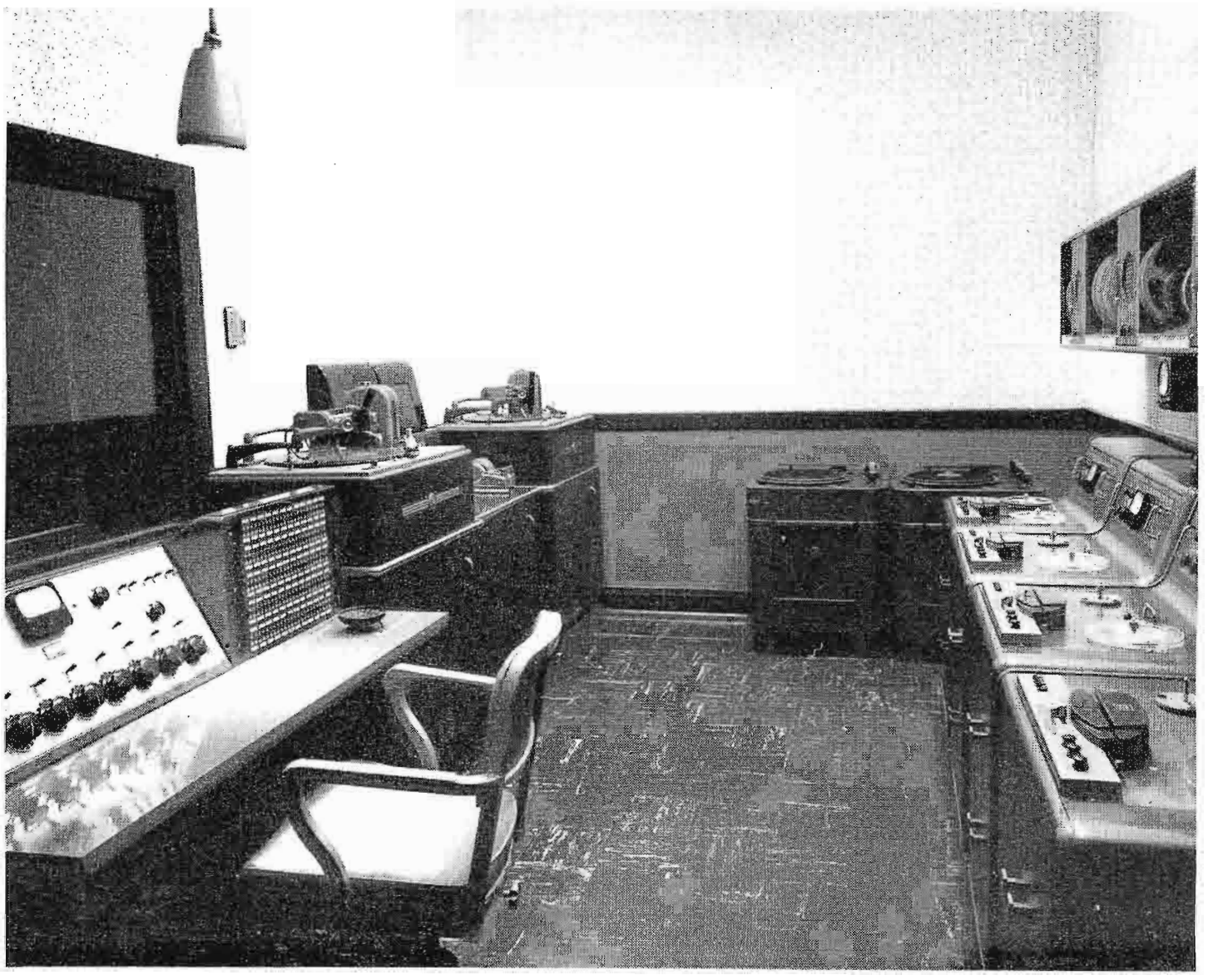


FIG. 49. The "Jefferson Suite" conference room in the WBT-WBTV Building can be used for meetings or for auditioning of air or film programs in color or monochrome.

FIG. 50. In nice weather employees enjoy this beautiful dining terrace, which opens off the indoor cafeteria-dining area seen through the glass panels at rear.

WBT-WBTV Office Areas

This article has been primarily concerned with the technical facilities of the WBT-WBTV Building, because these are the features which most interest the engineering-minded readers of BROADCAST NEWS. It is worth noting, however, that the business areas of the building have been planned with equal care, both overall and in detail.

While functionalization has been the key consideration, and this is evident in the use of movable partitions in most office areas, the factors of appearance and comfort have not been overlooked. Furnishings and decoration in the building are, for the most part, traditional in styling, enhanced by the soft colors and contemporary textures of fabrics and wall coverings—offering the kind of settings in which harassed executives can relax and conduct their business affairs surrounded by an atmosphere of tranquility.

One unusual area is the magnificent conference room which is aptly called the "Jefferson Suite." The carefully planned conference room actually serves as two rooms. Covering an area of 800 square feet, the room can be divided by means of a special folding partition which rests unobtrusively in a mahogany column when not in use. A conference table is set up at one end of the room, while furnishings in the other half are arranged in a conversational grouping for the use of clients. A built-in cabinet covers the entire east wall and houses black and white and color television sets, radio, 16 mm film projector, tape recorder and phonograph, all of which can be operated by a master control panel. Another section provides storage space and conceals a small refrigerator. Grass cloth with an olive green cast is used on the walls which are paneled to dado height in mahogany finish to match the conference table.

Other areas of the business section of the building have been treated with equal care, if somewhat less lavishly. The whole building is air conditioned—with the overall system being divided into seven essentially separate systems each with individual controls. Employee comfort has been considered and areas for relaxation and dining are provided. The cafeteria-dining room, with its adjoining outdoor terrace is an eye-catcher (see Fig. 50).

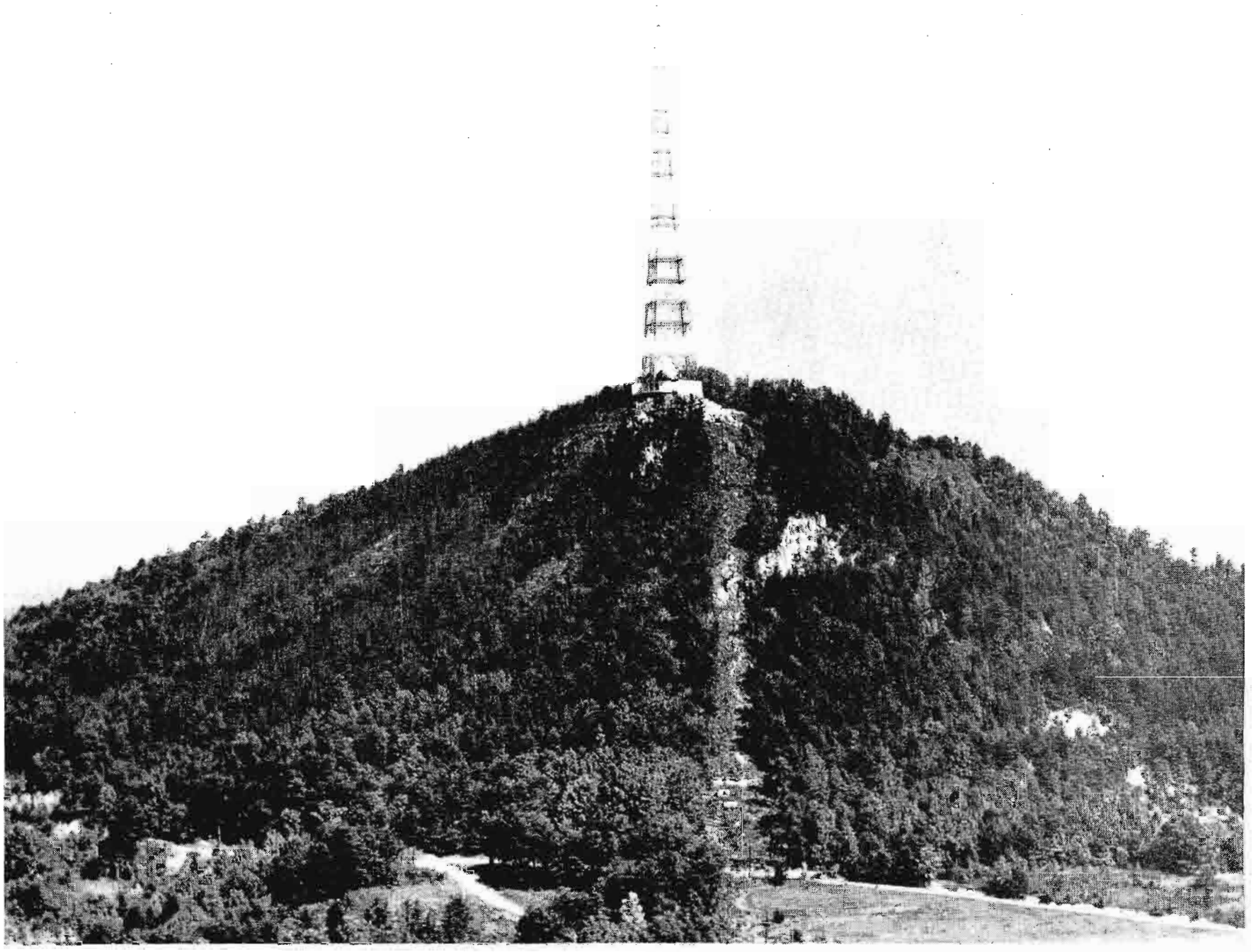


FIG. 51. WBTV's transmitter is located on top of Spencer Mountain, sixteen miles from downtown Charlotte.

WBT-WBTV Transmitters

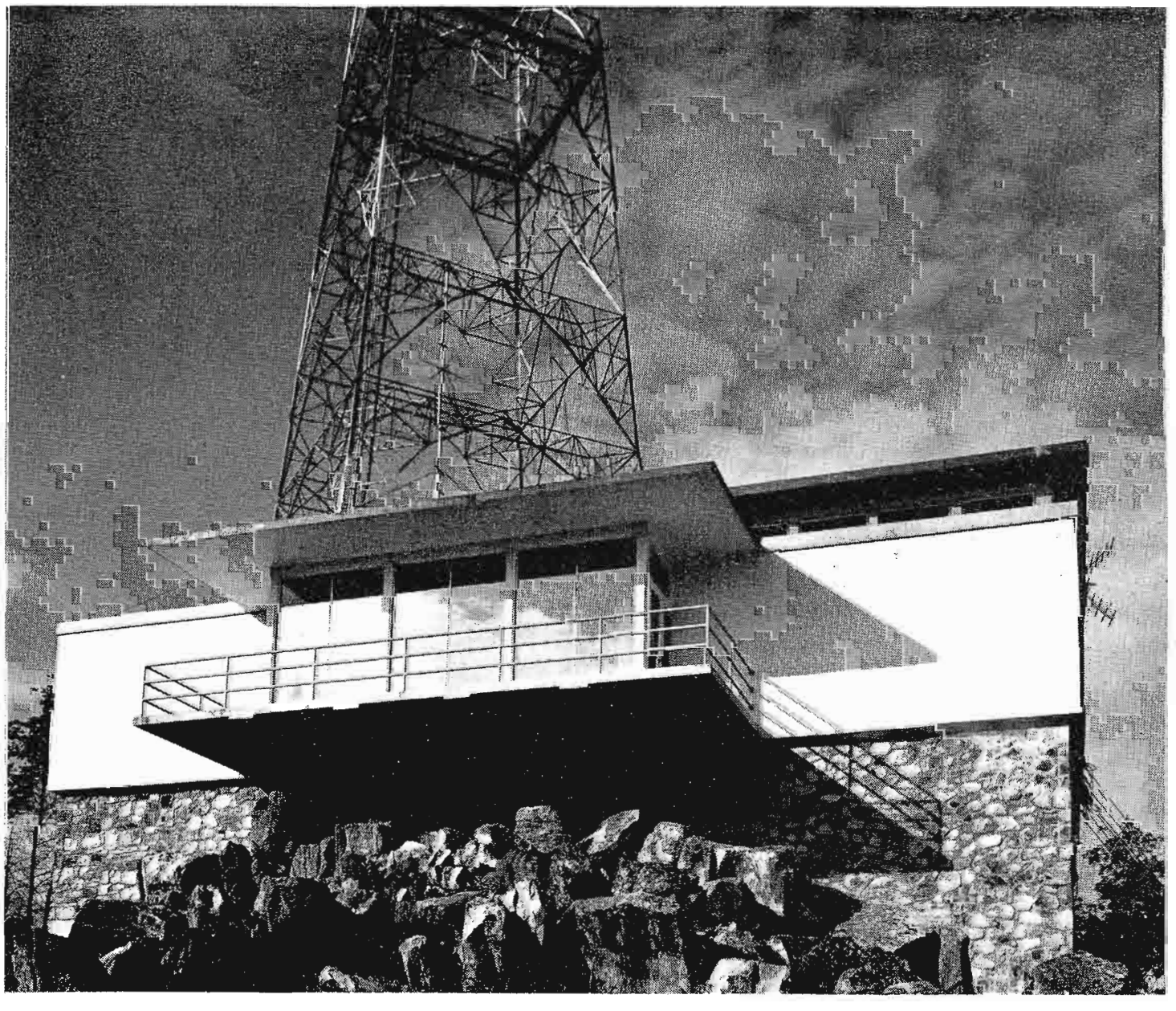
The WBT transmitter (50 kw-1110 kc) is located seven miles southwest of Charlotte. (For the story on the radio transmitter installation see BROADCAST NEWS, Vol. No. 71, Sept.-Oct., 1952.)

WBTV's transmitter is located on Spencer Mountain—a chocolate-drop-shaped peak which rises above a gently rolling countryside—approximately sixteen miles west of Charlotte. A 450-foot tower surmounted by a six-section RCA Superturnstile Antenna provides a total elevation of 1090 feet above average surrounding terrain.

The Spencer Mountain site was actually purchased by Jefferson Standard in 1947, as a site for an FM transmitter—but with hopes that it would, as it actually did, become a TV site as well.

When the FCC granted the CP for WBTV, an RCA Type TT-5A Transmitter was moved into the strikingly modernistic building on the mountain, the TV antenna installed, and the station was ready to go on the air. In June, 1953, a new RCA 25 kw amplifier was installed and the station increased its effective radiated power to 100 kw—the maximum permitted by the Federal Communications Commission.

FIG. 52. WBTV's transmitter building on Spencer Mountain.



The 3-V System Is Easy to Set Up and Maintain, Simple to Operate

HOW TO GET HIGH QUALITY PERFORMANCE FROM THE TK-26 3-VIDICON FILM CHAIN[1]

Part Four of a Series:

How to Get Best TV Picture Quality From Films and Slides

by T. J. SHIPFERLING
and H. N. KOZANOWSKI,
Broadcast and Television Engineering

The TK-26 (3V) Color Film Chain consists of three monochrome vidicon chains registered optically and electrically—one channel for the red, one for the green and one for the blue portion of the visible light spectrum. The three color channels (R-B-G) are identical electrically.

The TK-26 and the TK-21 equipments use the same optical principle of projecting an image of a film frame in focus in a field lens plane. This image is then picked up by the camera lens and appears on the vidicon photoconductor surface.

In the TK-26 system, the light information from the field lens image is separated into red, blue, and green components by suitable color-selective dichroic mirrors. These red, blue, and green components of the film frame and field lens image are projected on the red, blue, and green *designated* vidicon photoconductive faceplates. See Figs. 2 and 3.

[1] No attempt is made to repeat here the type of detailed material contained in instruction books, which has direct interest only to the specialist. This discussion covers the important highlights of recommended procedures.

FIG. 1. The 3-Vidicon Film System shown includes the TK-26 camera, TP-15 multiplexer, and two TP-6 film projectors.

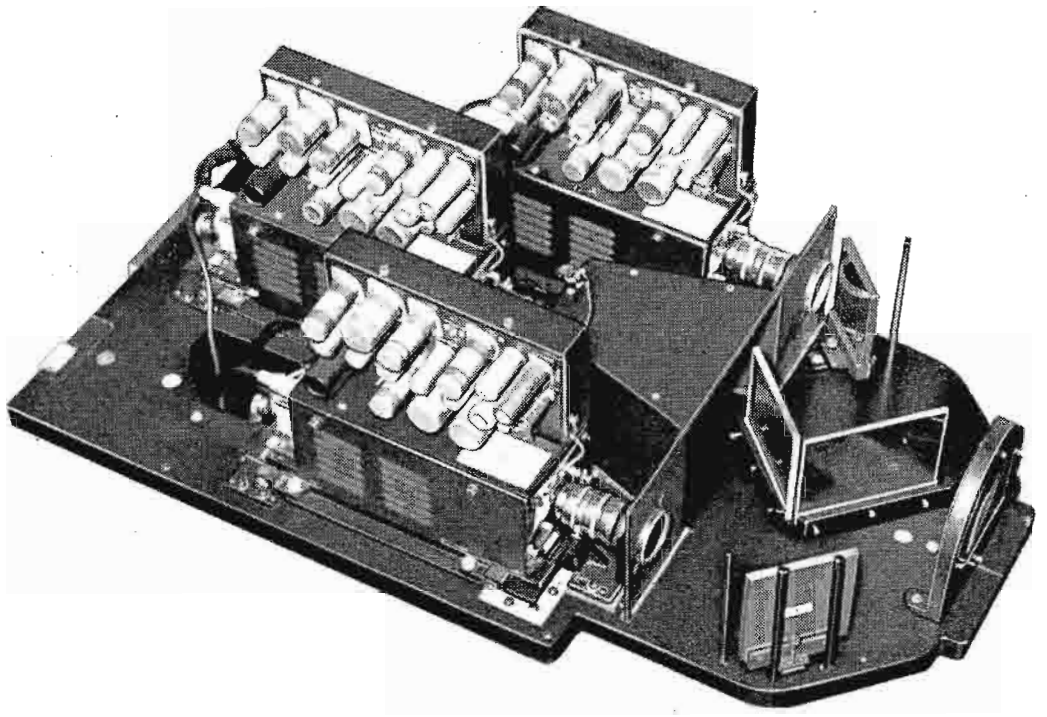


FIG. 2. Closeup of the top of the TK-26 pedestal showing the three vidicon camera chassis and the optical assembly.

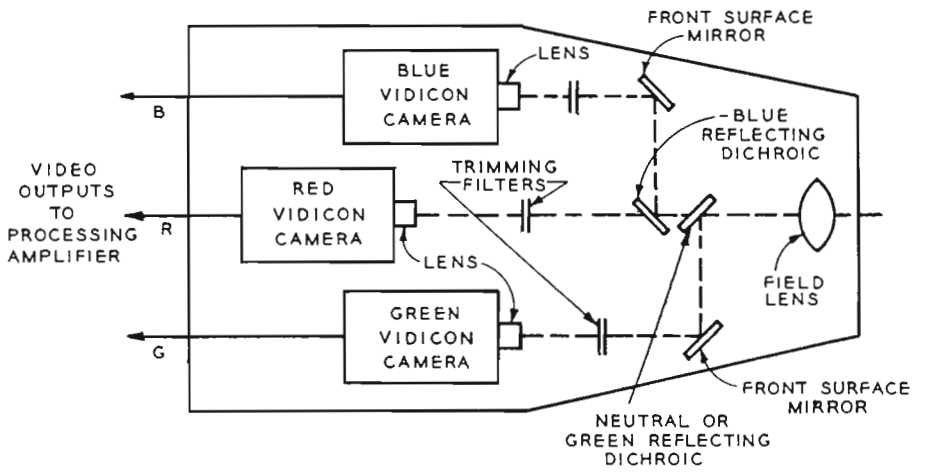


FIG. 3. Diagram outlining the optical path of the 3-Vidicon Film Camera.

Optical Alignment[2]

The TK-26 Color Film Camera provides accurate fixed alignment of the color-splitting dichroics. The front surface mirrors are aligned when the equipment is installed. The removal and replacing of mirrors for cleaning will not disturb this alignment, if care is exercised to avoid reversing dichroic mirrors when replacing them after cleaning. (The mirror alignment procedure is covered in detail in the instruction book.)

The vidicon camera lenses are mounted rigidly in a fixed position and are mechanically independent of the vidicon camera mounting. The three camera-lens positions are accurately located on the 3-V bedplate for the proper magnification (0.625 inch diagonal image on the vidicon tube). The camera lens focus is set at infinity. Lens focus setting and lens position should not be changed after installation.

Optical focus of each vidicon camera is obtained by moving the camera back or forth on a precision mount with respect to its lens by means of an adjusting screw. See Fig. 4. It is important to point out that the procedures on optical alignment outlined in the instruction book should be followed carefully. Field experience has shown that most of the difficulties encountered in set up of the equipment have been due to a lack of appreciation of the role of optical alignment.

The high points of the general optical alignment procedure follow: First, stop down the slide-projector lens iris and the camera lens iris to minimum aperture. The spot of light from the projector lens iris can then be seen and centered on the iris of the camera lens. Now remove the color trimming filters directly ahead of the camera lenses so the light spot on the lens iris will be more clearly defined. The field lens (5.5 inch diagonal aperture) mask should be installed permanently. This mask can be used for convenient check on visual image size and alignment. The slide-projector position should be adjusted to align the spot of light formed by the projector lens iris in the center of the red channel camera lens iris when the field lens image is centered in and fills the field lens mask aperture. The field-lens image must also be in focus at the field lens. See Fig. 5. The projector lens iris must be *open* when adjusting the centering, size and focusing of the projector image in the field lens, and *closed* when centering the light spot on

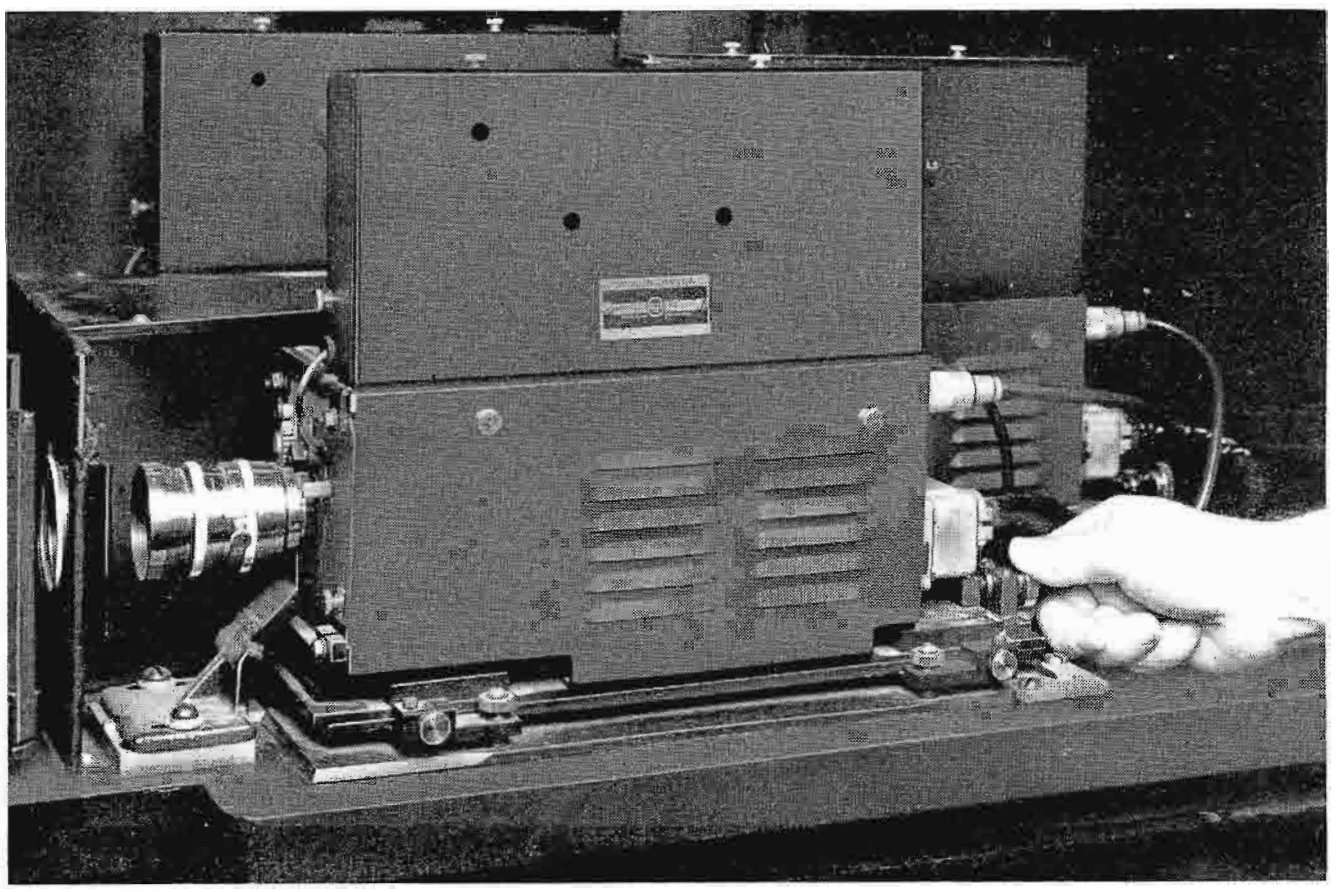


FIG. 4. Optical focus of each vidicon camera can be achieved mechanically by moving the camera on a precision mount by means of the adjusting screw shown above.

[2] The foundation for these recommended procedures was established in a previous article, "How to Get Top Performance From the TK-21 Vidicon Film Chain" (BROADCAST NEWS, Vol. No. 94, April, 1957). The fundamental recommendations made for optical alignment in the first article should be studied thoroughly and carried out before turning to the more specialized procedures applying to color.

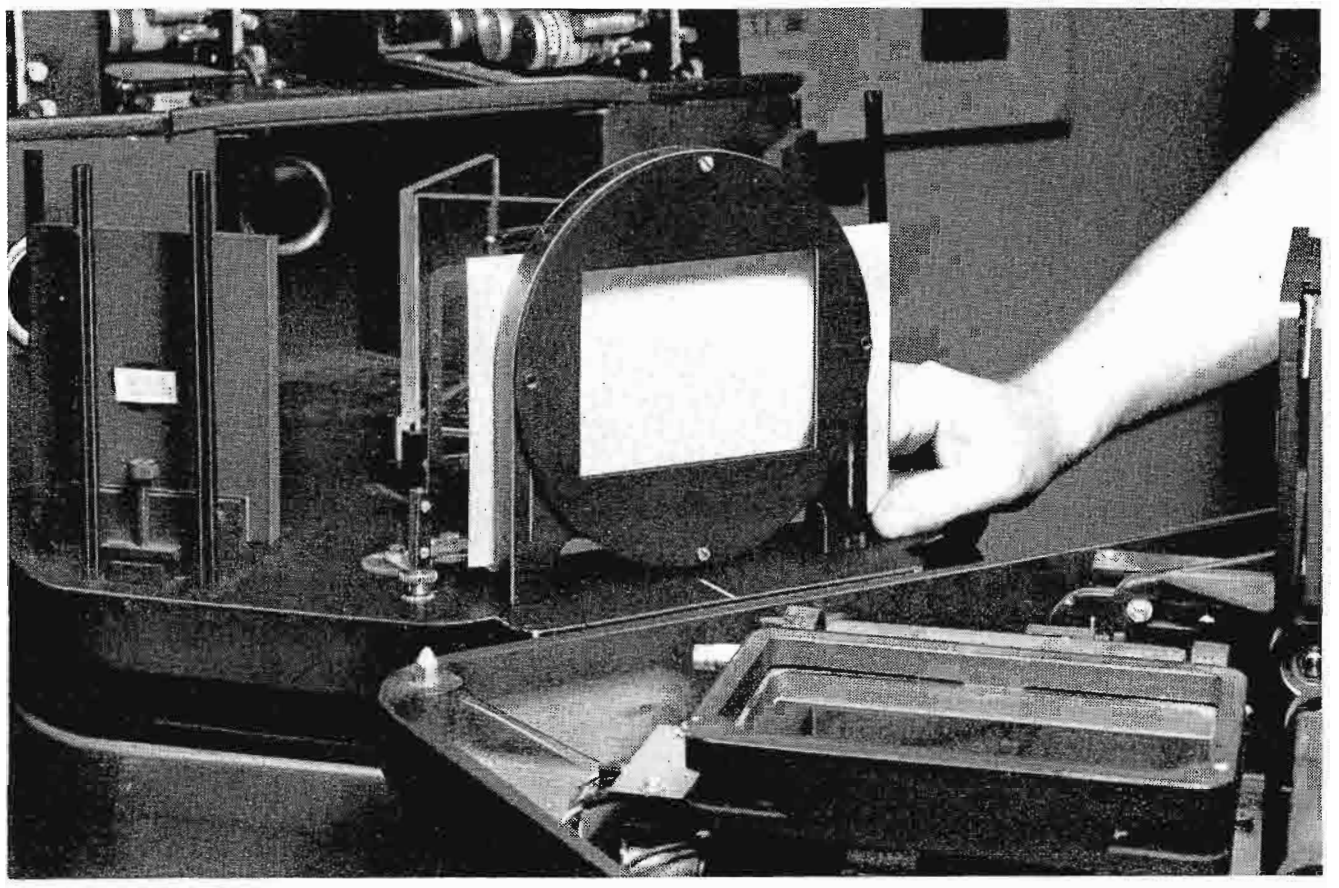


FIG. 5. The field lens image is focused at the field lens using a white card as shown. The image is focused at both front and rear of this lens and final focus can be compensated so that it falls at the center of the lens.

the camera lens iris. The projector should first be aligned to optimum using the red channel camera lens and field lens as the reference. This avoids any error in possible misalignment of reflecting mirrors for the blue and green channels.

Now, with the red optical channel aligned, inspect the centering of the light spot on the iris of the blue and green camera lenses. The spot of light from the stopped down slide projector lens iris should fall in the center of the red, blue, and green camera lens irises. Off-center spots on the blue or green channel lens irises indicate mirror misalignment errors in the channels. Correct any misaligned mirror and optically align all projectors to give identical results.

After the alignment procedure, *the camera lens irises must all be opened to maximum aperture*. The cone of light from the field lens is intended to fill the camera lens aperture. Stopping down the lens will result in vignetting or porthole shading of the output signal.

Projector lens irises should always be wide-open at maximum aperture when focusing images.

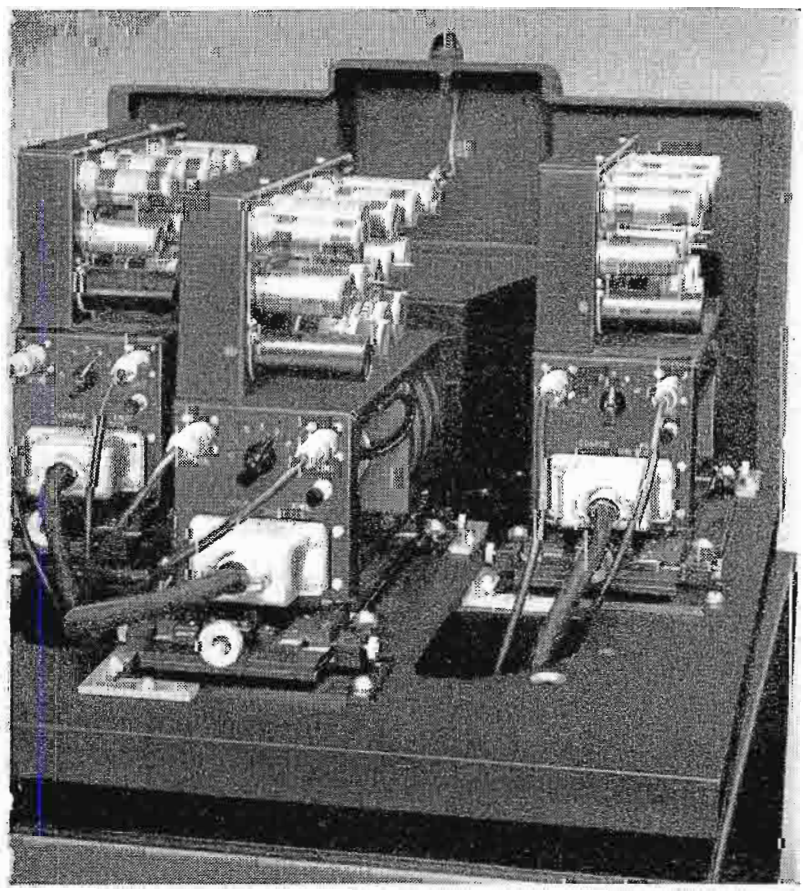


FIG. 6. The three vidicon cameras shown above are identical and can be interchanged as desired.

Vidicon Cameras

The three vidicon cameras (see Fig. 6) comprising the TK-26 color camera are identical and can be interchanged if so desired. Each vidicon camera is equipped with mechanical adjustments for aligning the vidicon with respect to the optical image. The individual camera positions are keyed to permit rapid removal for vidicon replacement or service and later replacement without disturbing camera alignment; thus, only minor adjustment is necessary to reregister the vidicon images. The mechanical mountings and alignment controls of the camera should be tightened after adjustment, because free motion might result in loss of image registration if the installation is accidentally bumped or jarred.

The vidicon camera amplifier has a feedback output stage. A cascode amplifier input stage gives excellent signal-to-noise ratio. The amplifier output level is 0.5 volt peak-to-peak. Low camera filament voltage may result in poor signal-to-noise ratio. The filament voltage should be measured at the WE417A input stage tube socket, and should be maintained between 6 and 6.3 volts. Frequency response compensation for the vidicon load capacitance (high peaking) is accomplished entirely in the camera.

TK-26 Video Level Control

Various operational methods of video level control and their merits were covered thoroughly in a previous article.[2] A brief summary of the procedures are given here:

1) Varying the amplifier gain only will result in variable signal-to-noise ratio, overloaded video amplifier, the possibility of undischarged vidicon target, and decreased resolution caused by the need for excess signal electrode current capabilities. This method is highly unsatisfactory.

2) Varying the vidicon signal electrode voltage may result in (a) constantly varying electrical image shading, (b) will shift the black reference level. This method is operationally unsatisfactory.

3) Varying the intensity of the incandescent lamp source over the required range by varying the filament voltage varies the color temperature of the light. This method of light control is very good for monochrome but results in noticeable color balance variation when used with color film or slide equipment.

4) Varying the source of light with a variable neutral density disk (Fig. 7) is an ideal method of video level control. This system permits all equipment adjustments to remain fixed at the optimum value.

The TK-26 was originally supplied to broadcasters with a reactance dimmer for varying the projector filament voltage to control the video signal level. The variable neutral density disk control under development was not available for delivery at that time. Modification kits[3] have since been

[3] A complete list of modifications which have been completed in TK-26 chains is available. It will be furnished on request.

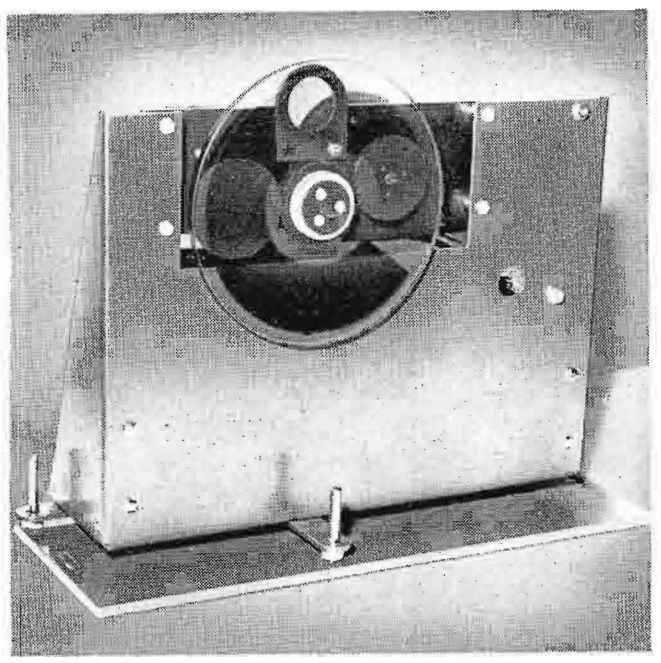


FIG. 7. A variable neutral density disk used in front of the projectors is the ideal method for video level control.

made available to convert from reactance dimmer to neutral density disk control.

Preliminary Vidicon Adjustment

The electrical adjustment procedure for the vidicon camera has also been covered thoroughly in the previous article.[2] It is also discussed in detail in the instruction book, which should be the *primary* reference. The techniques can be summarized as follows:

1. Select a *test* condition of 25 volts on the vidicon signal electrode.
2. Adjust the "open gate" projector light output to obtain 0.25 microamp signal current, allowing adequate reserve to handle dense film.
3. Overscan vidicon horizontally and vertically sufficiently to see the target perimeter of the tubes.
4. Center the target perimeters of all tubes using electrical centering controls.
5. Use registration chart slide in projector and center image on vidicon face using *mechanical* centering controls, maintaining faceplate perpendicular to optical axis.
6. Adjust vidicon horizontal and vertical deflection amplitudes to get proper size of slide display on monitor (filling field lens aperture mask).
7. Check optical focus for optimum value, using knurled screw drive at back of each camera, with projector lens wide open.
8. Align electron beam of vidicon to obtain swirl around center of raster as wall focus is varied. Some compromises may be required in terms of shading, flicker and registration.
9. Make behavior of all color channels as symmetrical as possible.
10. Adjust signal electrode voltage so that *dark current* (Vidicon beam "on" and light "off") is less than one half of one scale division on the beam current meter—less than 0.01 microamp. Check meter zero with beam "off."

Linearity Adjustments

The TK-26 is capable of achieving deflection linearity to within 2 per cent. The procedure for adjusting deflection linearity is covered in the instruction book for the equipment. Some TK-26 equipments have developed differential linearity difficulties which have been traced to aging of circuit components. Differential linearity problems are apparent when it is impossible to register two images in the center and at both extremes at the same time. A modification kit[3] has been made available to correct this condition. This should be installed at the earliest convenience.

Choice of Signal Electrode Voltage

The optimum signal electrode voltage for a vidicon is the one giving the flattest field output signal with a dark current of less than 0.01 microamp. However, one must be sure that the illumination on the faceplate is uniform to begin with, in order that the signal display is representative of the vidicon tube characteristic only. It is important to point out that similarity of output in the three tubes is more important than *absolute flatness*. A slight amount of similar shading in all three tubes will produce a much more pleasing display than absolute flatness in two channels and a departure in the third.

Image Registration Techniques

The registration of vidicon images is covered in detail in the equipment instruction book. The following comments will help the operator to do the work with greater precision and less effort:

1. Optical and electrical focus should be adjusted before precise registration is attempted. The vidicon image rotates slightly as the beam is focused electrically.
2. Always adjust projector lens iris to *maximum* aperture before focusing.
3. Vidicon beam-splitting may occur if beam current in excess of 0.3 microamp is used in discharging the signal-electrode. Beam-splitting under normal operating conditions is indicative of a *defective* vidicon; one whose thermionic cathode emission characteristic has deteriorated or one whose G2 voltage has too low a value. Beam-splitting, when observed using the registration slide, appears as double lines in certain portions of the image.
4. Image geometrical distortion can result either from excess vidicon beam current or the use of excess vidicon alignment coil current. Photograph taken from a monitor, showing registration of a typical well-adjusted TK-26 film system, is shown in Fig. 8.
5. Varying or trimming individual vidicon beam focus by varying wall focus control after registration will rotate the image slightly and may cause some misregistry.

Vidicon Shading Procedures

Shading is introduced into the three video signal channels to make possible a much higher degree of uniformity or flatness of field than can be obtained by relying only on the characteristics in commercial vidicons. Shading is *purely a set up control procedure which is never varied during program operation.*

Even the highest quality present-day vidicons show some departures from flat output signal such as porthole, flare, or tilt—both horizontally and vertically—when the light on the tube is perfectly uniform. These departures are "well-behaved" and can be corrected rather completely by suitably introducing a small amount of parabolic or sawtooth shading to the original output at horizontal and vertical scanning rates.

The set up procedure for shading is very straightforward. The vidicons are exposed to "open-gate" white light at normal, full operating level, and each vidicon signal is in turn compensated with the required shading waveform input to produce the flattest, or most nearly identical field for all three signals. Under these conditions the color monitor display for "ideal" adjustment will give a completely white field. If shading compensation is removed, the field will show areas of color where the characteristics of the three vidicons are not matched. For example, if red and blue outputs are perfectly matched at all points in the raster, and green output is matched with red and blue everywhere except at the edges, the raster will be white with *green* edges when the green vidicon output has *edge flare* or *excess green signal.* It will have *magenta edges* when the green vidicon output has *porthole* characteristic or *deficiency* in green signal amplitude at the

edges, because magenta is red plus blue minus green. By examination of the "white" raster display itself one can determine directly what corrections are necessary, and can use the final display itself as a precision tool for fine balance of shading of the raster field.

Axis Shading and Modulation Shading

In motion-picture techniques, the "fade-to-black" is widely used for many artistic and psychological reasons and is therefore common to all monochrome and color films. In live TV programs switching at full level is widely used and "fades-to-black" are comparatively rare. This has direct bearing on requirements for shading and how it must be carried out. In our discussion about producing a flat white field, no mention was made about how the shading or "compensating signal" is introduced. However, it is quite apparent that axis or "additive" shading, once introduced, is independent of the signal amplitude. Thus, even though a perfectly flat field is set up at full white, a "fade-to-black" with *no* vidicon output signal, will contain *the full amplitude* of the *shading signal* introduced. Thus, axis shading produces *maximum error in raster color contamination* at "fade-to-black", exactly when motion-picture recording practices demand *zero* error.

Since the vidicon as used for film reproduction has essentially *constant* black level, a modulation *shading circuit technique* was developed for use with 3V systems. In this process the *video* gain of a "modulating" amplifier is changed in a bridge circuit in accordance with the shading waveform requirements. Thus, the circuit *maintains complete compensation* at "white" or set up condition and *also introduces no distortion at black level.* It is difficult, if not impossible to use axis-shading operationally in film reproduction.

Vidicon Shading Procedures

The TK-26 equipment was originally delivered with additive or "axis-shading" of the video signal. A modification[3] has been made available to convert from axis shading to modulation shading of video signal in the TK-26.

The modulation shading modification uses the same source of horizontal and vertical parabola and sawtooth correction signals from the process amplifier as the original axis shading circuits.

The modulation shading amplifier (see Fig. 9) is provided with R, B, and G channel *modulation balance* controls. The balance should be checked at regular intervals to insure freedom from drift errors.

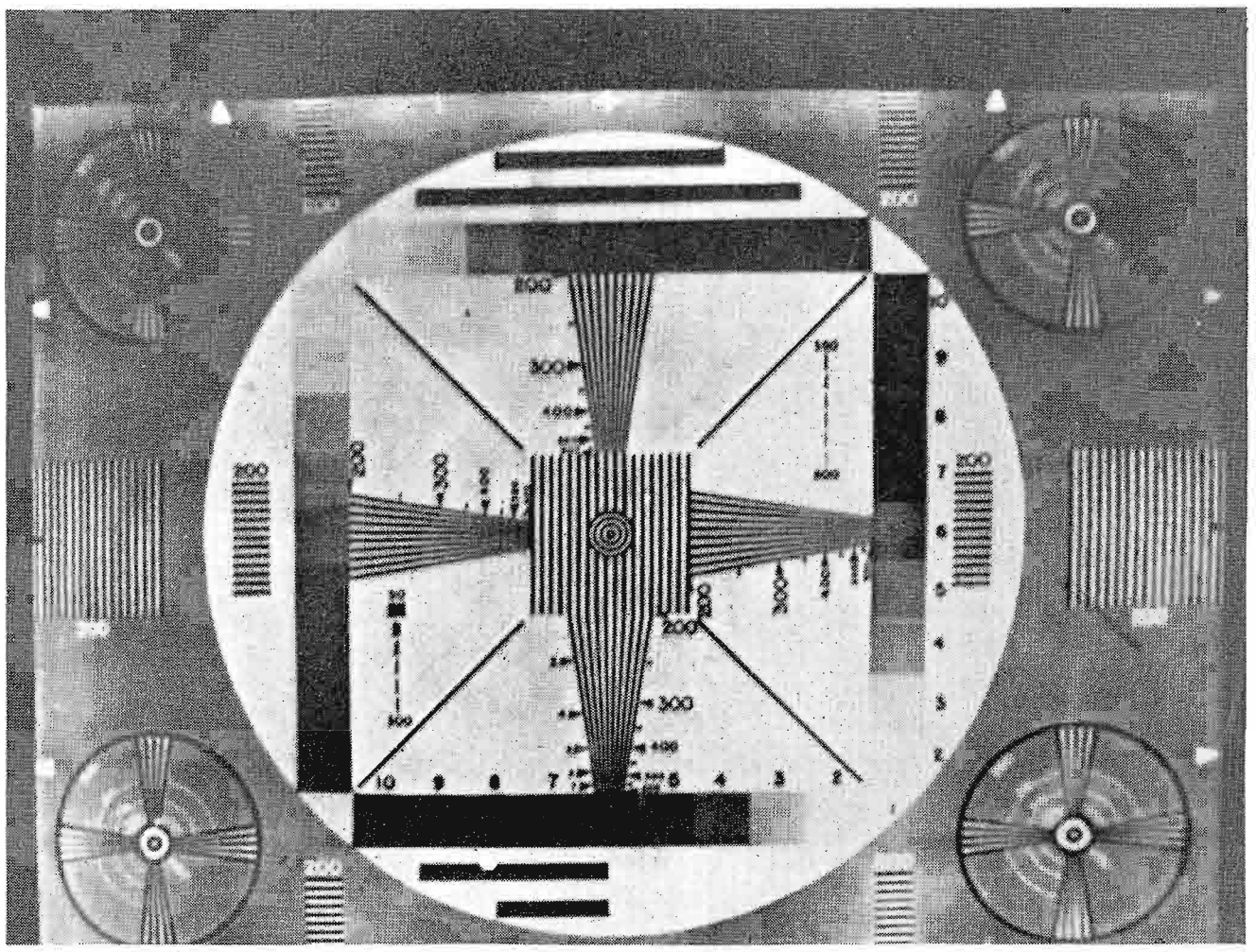


FIG. 8. Photograph taken from a monitor, showing registration of a typical well-adjusted TK-26 film system.

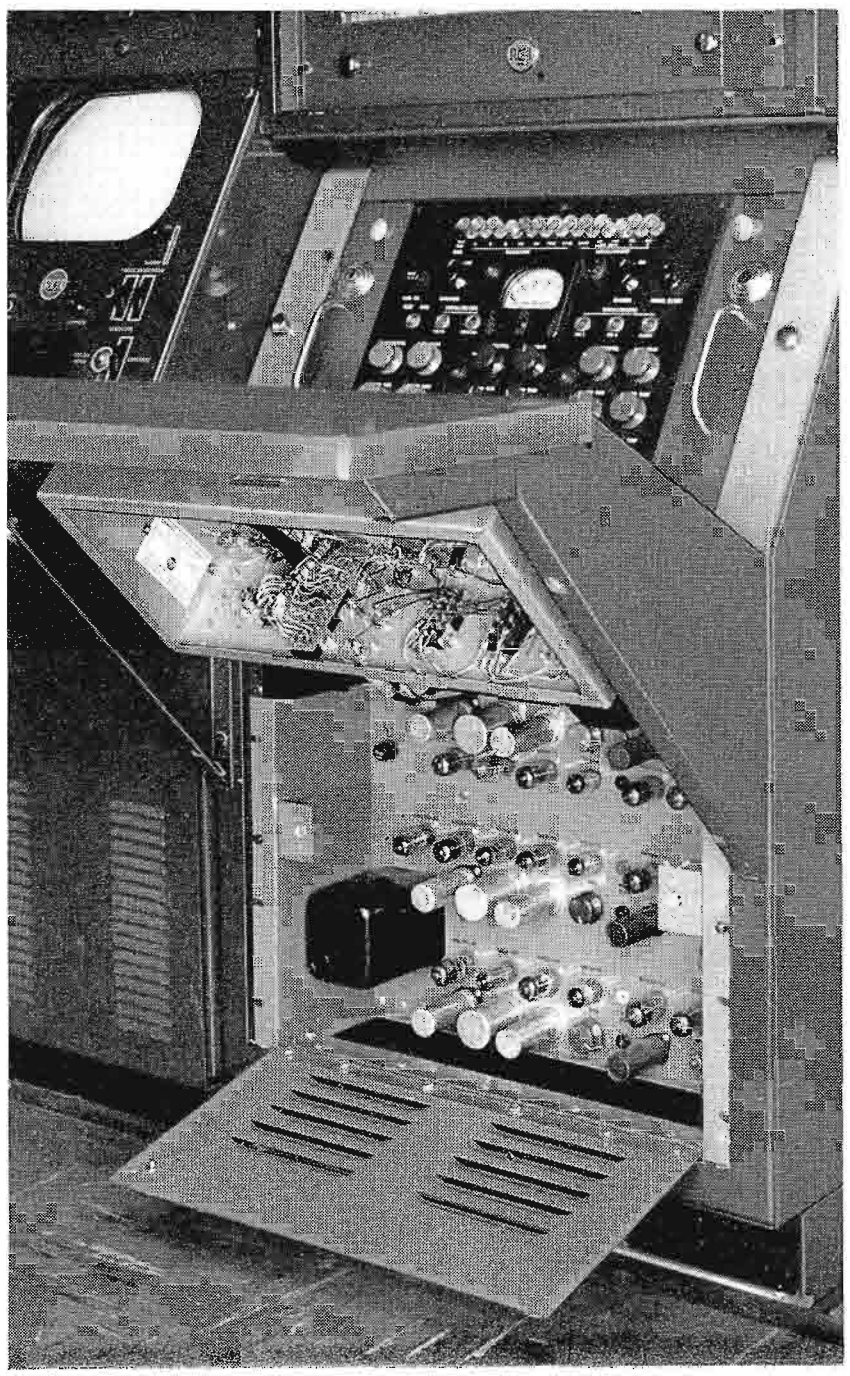


FIG. 9. The modulation shading amplifier is mounted beneath the desk section of the processing amplifier console.

The shading signals are inserted and removed from the shading modulation circuits by the shading "in-out" switch on the processing amplifier control panel. The shading modulation equipment is provided with three switches to bypass the red, green, and blue video signals from the modulation circuits in case of technical difficulties. The adjustment and maintenance procedures for shading amplifiers are covered in the equipment instruction book.

Gamma Compensation

In addition to an amplifier gamma of unity, the TK-26 is equipped with a plug-in gamma compensation unit (Fig. 10) having a gradient correction of 0.7, which can be switched in-or-out at the control panel. This with the vidicon gamma of 0.65 gives an over-all transfer characteristic slope of 0.65 or 0.45. It will be found that the additional gamma correction is desirable for best reproduction of film, but the 0.65 slope will produce higher color saturation, particularly with cartoon abstracts.

Color Temperature Balance of Projectors

In a typical color installation any one of three or more film or slide projectors can be selected to operate with a TK-26 film chain, using the TP-12 or TP-15 multiplexer arrangement. For good control of film or slide reproduction the "color" temperatures of all sources should be the same. In general, this means that the operating temperature of all tungsten filament incandescent sources should be identical. If there are substantial differences, identical color subjects placed in each of these projectors will be reproduced with different color balance in projectors differing from the standard. With too low a filament voltage the red output rises rapidly as compared to blue, and the image reproduction will be too red.

It is *not* necessary to operate a projection lamp at its *top rated* voltage. To obtain longer life, it may be operated at lower voltages, which are sufficient to give adequate light reserve for dense film and adequate signal-to-noise in the blue channel (which will show light deficiency first as the lamp is operated at lower or "redder" color temperature). The color system itself can be "white-balanced" for almost any useful projection lamp voltage.

It is possible in some cases to detect substantial differences in color temperatures between the two outputs of a TP-3 slide projector. This is due to small color-selective departures from complete optical symmetry in the neutral density light-splitting mirrors and other transmission elements. A color temperature balancing kit[3] for minimizing this discrepancy has been made available.

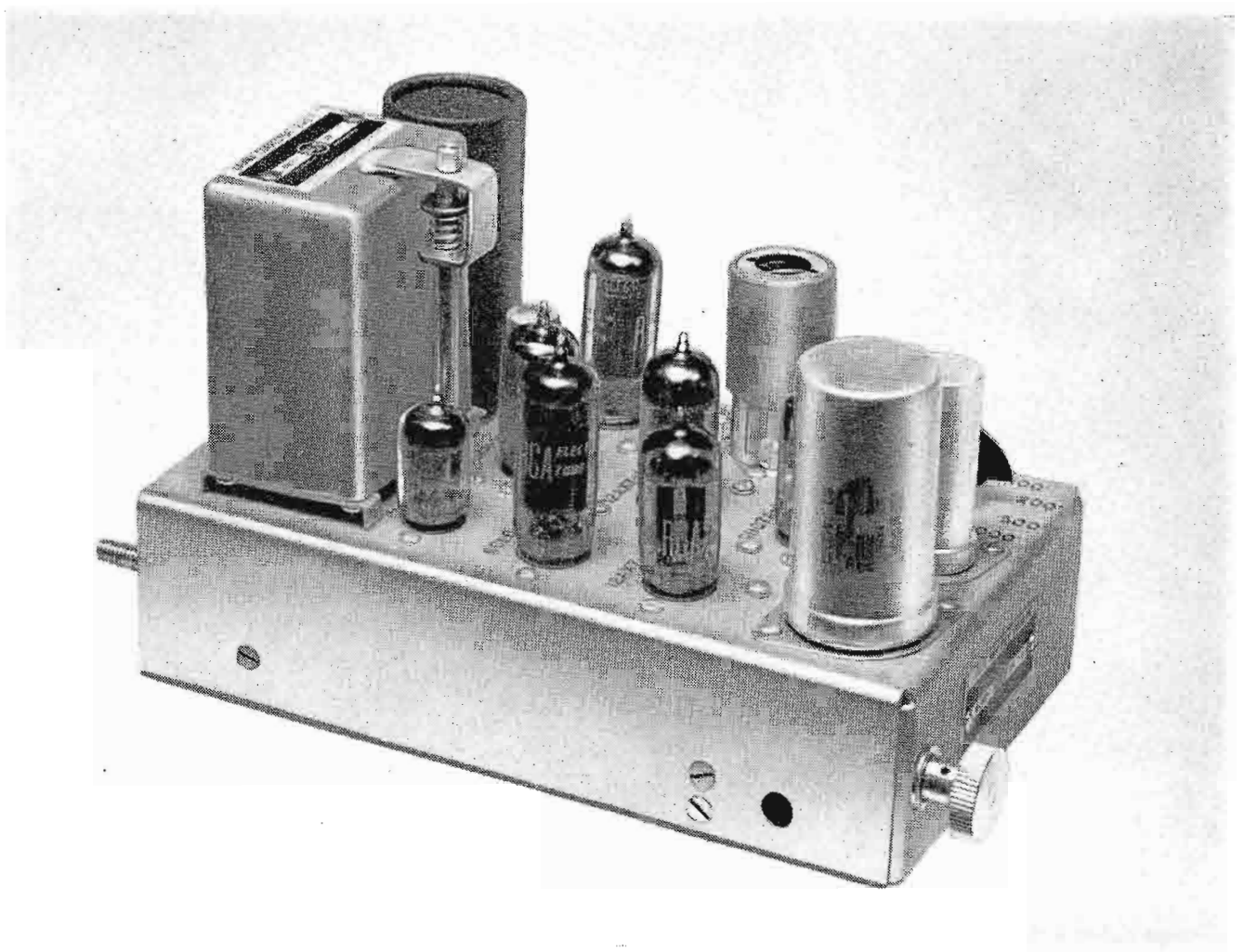


FIG. 10. Video amplifier in the processing amplifier contains a plug-in gamma compensation unit (front left). Unit has gradient correction of 0.7 which can be switched in-or-out at the control panel.

General Hints for Final Adjustment Procedure

1. Signal electrode voltage for each vidicon is chosen for flattest field at a low dark current.
2. The slide projector is used for "open-gate" light source, with light level set to give 0.25 microamp signal current, with signal electrode fully discharged. Light level control should be set to give adequate reserve for dense film.
3. A beam current meter should first be "zero-balanced" with no light on vidicons for red, blue, and green vidicon channels. With "open-gate" illumination source all vidicons will probably have different signal-current values.
4. Select the channel with *lowest* signal current and raise the light level to obtain 0.25 microamp signal under conditions of "open gate", 100 per cent light transmission. This gives standardized "ideal" operating condition on the vidicon.
5. "Pad" the light level on the other two vidicons using appropriate neu-

tral density filters until they also have 0.25 microamp signal. This gives identical operating parameters in all three channels.

6. *Do not attempt to pad by stopping down a camera lens iris* as serious vignetting and optical shading errors will be produced.

7. "Dark current" is current which flows through the photoconductive layer of the vidicon *when no light is on the vidicon*. Zero-balance the beam-metering circuits with beam off and light off. Measure dark current with beam *on* and light *off*. Dark current with present TK-26 techniques should be negligible compared to signal currents. It should be maintained at very low values, below 0.01 microamp, for minimum smearing of motion and minimum scene retention.

8. Use a resolution chart test slide (Fig. 11) in slide projector and open projector iris to maximum opening. Verify image focus position within field lens, using a white card placed alternately before and behind field lens position as in Fig. 5; next, check the optical focus of each vidicon camera as seen on display monitor pattern; then stop the iris down by two stops.

9. Verify individual vidicon R, G, B, electrical focus. *Since there is a small amount of image rotation as the wall focus voltage is varied* through its correct value, one should not be surprised to find that a *perfectly registered picture* can be degraded in registry merely by "trimming" the red, green, and blue electrical wall-focus voltages at slightly different values from those originally selected. It is good practice to use the green channel as a reference for resolution and registration and register and focus the red and blue channels with respect to it.

10. Once optimum registry and resolution have been obtained, the system should stay in focus and registry over long periods, although minor long-term variations in regulated currents and voltages will require compensation.

11. Experience indicates that modulation shading compensation based on about 70 per cent peak white signal produces better pictures than that based on full white raster.

12. Shading variations between projectors can be caused by: (a) misalignment of projector, (b) misalignment of condenser lenses, and (c) misalignment of projector lamp or reflector. Stopping down projector irises may result in peculiar banding caused by the increased depth of focus of the system and consequent imaging of the lamp filament in the raster.

Vidicon Flicker

Occasionally a pickup tube such as the vidicon or image orthicon will exhibit "flicker" in a small portion of the scanned area. Oscilloscope observation shows that the signal is generated in this region *only during alternate fields* and gives rise to a 30 cycle "flicker" component. While the mechanism of "flicker" generation is not completely understood, it is connected with the shape of the scanning spot and with the thermionic cathode activation. It can be produced in some cases by excess beam current; therefore, *use only enough beam to just discharge the highest scene highlights.*

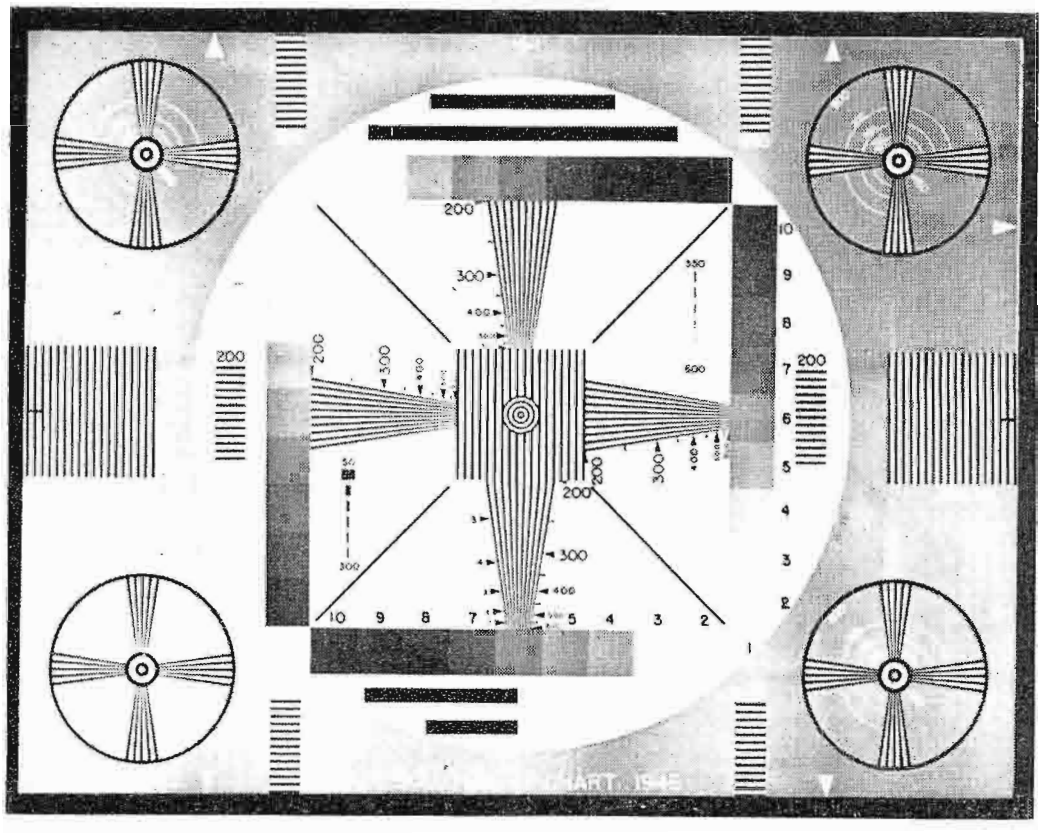


FIG. 11. RETMA resolution chart available as a 2 by 2 slide and used to expedite adjustment procedures.

In severe cases of flicker, it will be found that lowering the vidicon screen (G2) voltage from its nominal 280 volt value is effective for suppression. The vidicon screen voltage controls are located directly behind the handle of the "local" control panel on the TK-26 camera pedestal (see Fig. 12). Operate the screen voltage control at the *maximum position at which no flicker is evident. Too low a G2 screen voltage* may make it *impossible to obtain sufficient* peak beam current to discharge the highest scene highlights.[4]

Color Balance Adjustments

A standardized procedure for white balance adjustment and black level check of the TK-26 is recommended. The logarithmic step-wedge slide (Fig. 13) is used in the projector and a standard 100 per cent signal level at average light level is produced. The red, blue, and green channels are made equal by adjustment of video gain. Then decrease light to produce 5 per cent signal level and balance the three black levels. Alternate between 100 per cent and 5 per cent, trimming the gain and pedestal settings respectively *until black and white levels match in all three chan-*

[4] A Technical Bulletin outlining change to make it possible to operate over a wider range of G2 voltage is available.

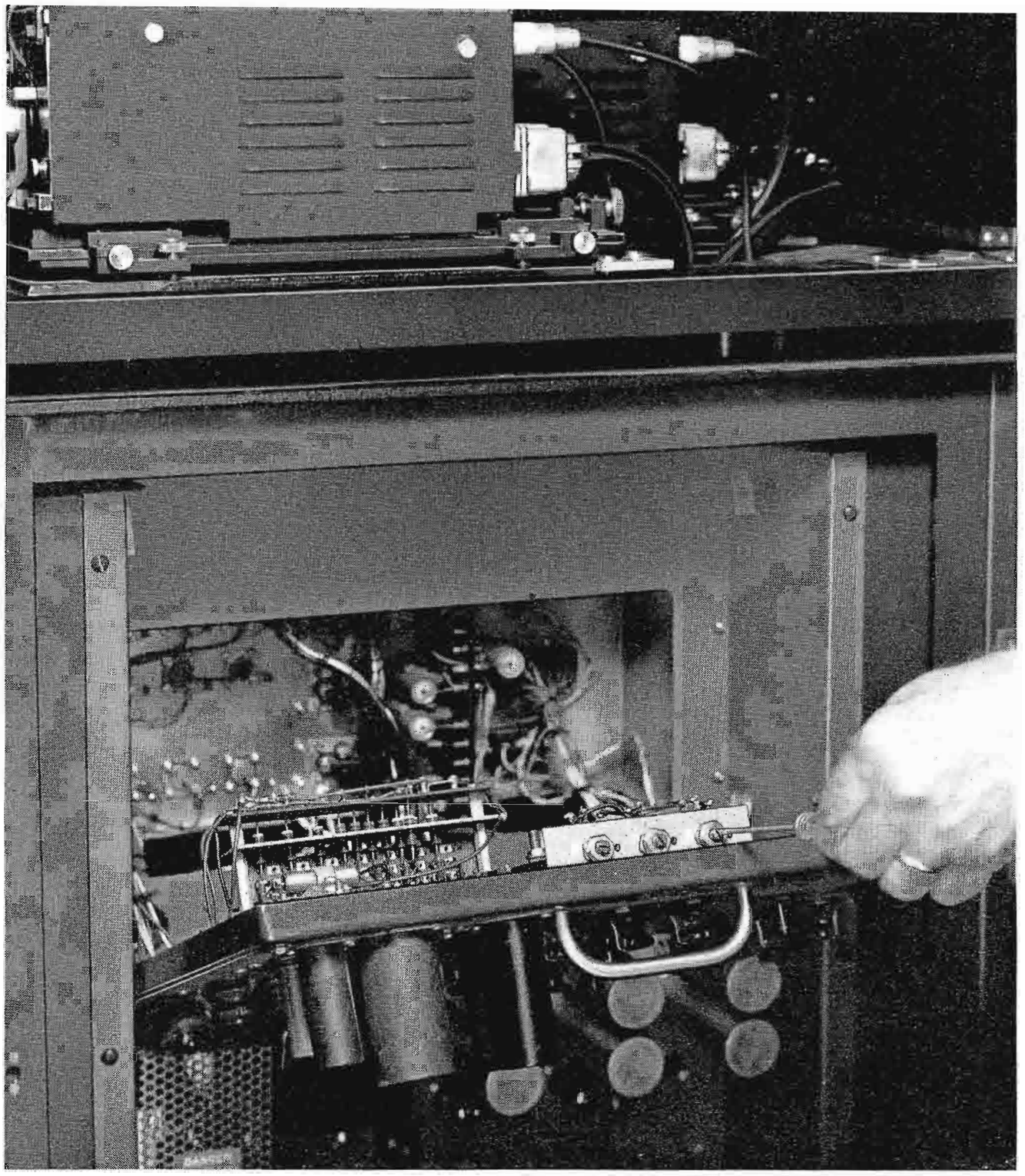


FIG. 12. The vidicon screen voltage controls are located directly behind the handle of the local control panel and may be varied by screwdriver adjustment.

nels. The use of 0.7 gamma, or "black stretch" at the 5 per cent level will aid in accurate setting of black levels.

Stability of the TK-26 (3V)

The red, blue, and green images will remain registered over long periods of time. However, it is good practice to check registration two or three times a day. Drift in registration and image size is generally traceable to poor and variable contact resistance in potentiometers, while differential linearity errors in scanning are generally due to "aged" components.

Opaque Pickup

The 3V film equipment can readily be equipped with an auxiliary lens system which will produce excellent pictures from opaque art and live commercial subjects. This development is covered in a previous article.[5] An increase in optical efficiency by more than a factor of 2, using a green dichroic instead of the original 50/50 neutral density mirror is possible. A modification kit can be purchased.

Electronic Color Masking

A masking amplifier has been developed for use with the 3-V system. It is intended for use in controlling the saturation of the reproduced color pictures, in correcting the hue of skin tones due to color film errors, and for compensation of system colorimetric limitations.[6]

Masking is not to be considered as a magic device to correct poor film. It is a vernier which can be used to make good film and slide reproduction better.

Evaluation of Color Performance

One of the most accurate methods of evaluating color TV performance at present is direct comparison with duplicate film or slides projected on a screen adjacent to the color receiver or monitor. When the film chain is correctly adjusted and operated the results are startlingly close to each other. However, the viewing conditions must be arranged to fulfill several fundamental requirements.

The color temperature of the average color receiver screen is 6500 degrees K (illuminant "C"). The usual slide or film projector operates at a color temperature of 3000 degrees K. In order that it match the color receiver it is necessary to insert a Wratten 78AA filter in the optical path to raise the color temperature to the illuminant "C" level. The projector image brightness should also be reduced by iris or neutral density filters to the same level as that of the color receiver.

Color Test Slides

It is important to remember that even the best color slides available today will fade quite rapidly if exposed to high light and high temperature. For this reason it is advisable to hold a set of standard SMPTE, or equivalent, slides in reserve as a primary comparison source.

Monochrome Operation of TK-26

In many broadcast installations the 3V film equipment is used both for color and

[5] "How to Make Live Commercials Using RCA 3-V Color Film Chain", BROADCAST NEWS, Vol. No. 87, February, 1956.

[6] "Electronic Masking for Improved TV Reproduction of Color Film", BROADCAST NEWS, Vol. No. 90, August, 1956.

monochrome reproduction of slides and film.[7] While there are many possible arrangements of TK-26 components for monochrome, the use of one camera for monochrome operation eliminates the necessity for all registration and shading match. The basic approach is generally to alternate between red, blue, and green camera heads in order to get approximately the same hours use from each vidicon. In this case it is preferable to remove the heater voltage from the unused cameras and preamplifiers by easily installed switches. This eliminates cathode emission slump which can be caused by operating with heater voltages alone. Deflection and focus field voltages are always applied to all cameras. An alternation schedule of one camera per week has been found to be generally convenient.

The system of monochrome operation used by most stations is one using the red, green, and blue output terminals looped through the inputs of a switcher and terminated in the colorplexer. This system requires an aperture compensator (MI-40414), a delay line (29 feet of RG-65/U) and a TA-3A distribution amplifier. A gain of 2 times in the TA-3A is necessary to compensate for the losses in delay line and aperture corrector. The RG-65/U delay line termination into the TA-3A is shown in Fig. 14.

The video signal from either the red, blue, or green camera can be selected for monochrome operation, and equal operating time can be scheduled on the vidicons.

The vidicon cameras not in use can be placed on standby by switching off filaments. The filament voltage should be measured on the camera in operation when the other two camera filaments are off. This test is made when installing filament switches to be certain the filament voltage does not exceed 6.3 volts ± 10 per cent.

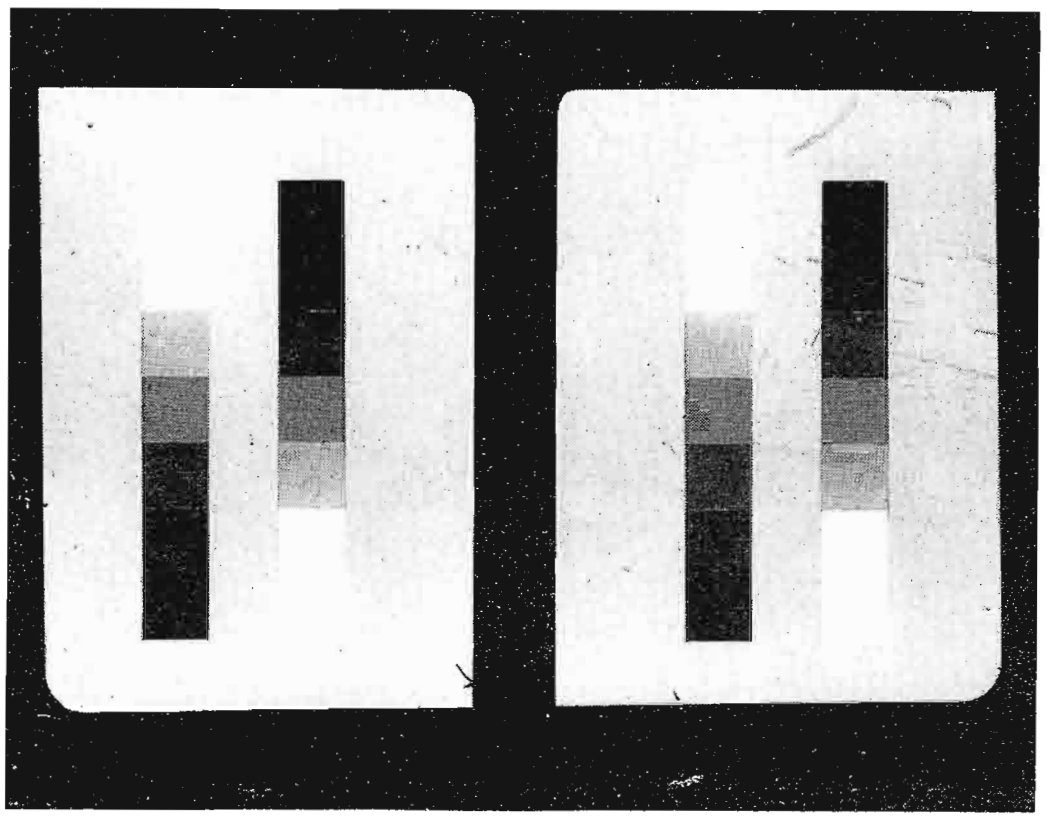


FIG. 13. A two by two inch logarithmic step-wedge test slide, made from two frames of SMPTE 35 mm gray scale test film.

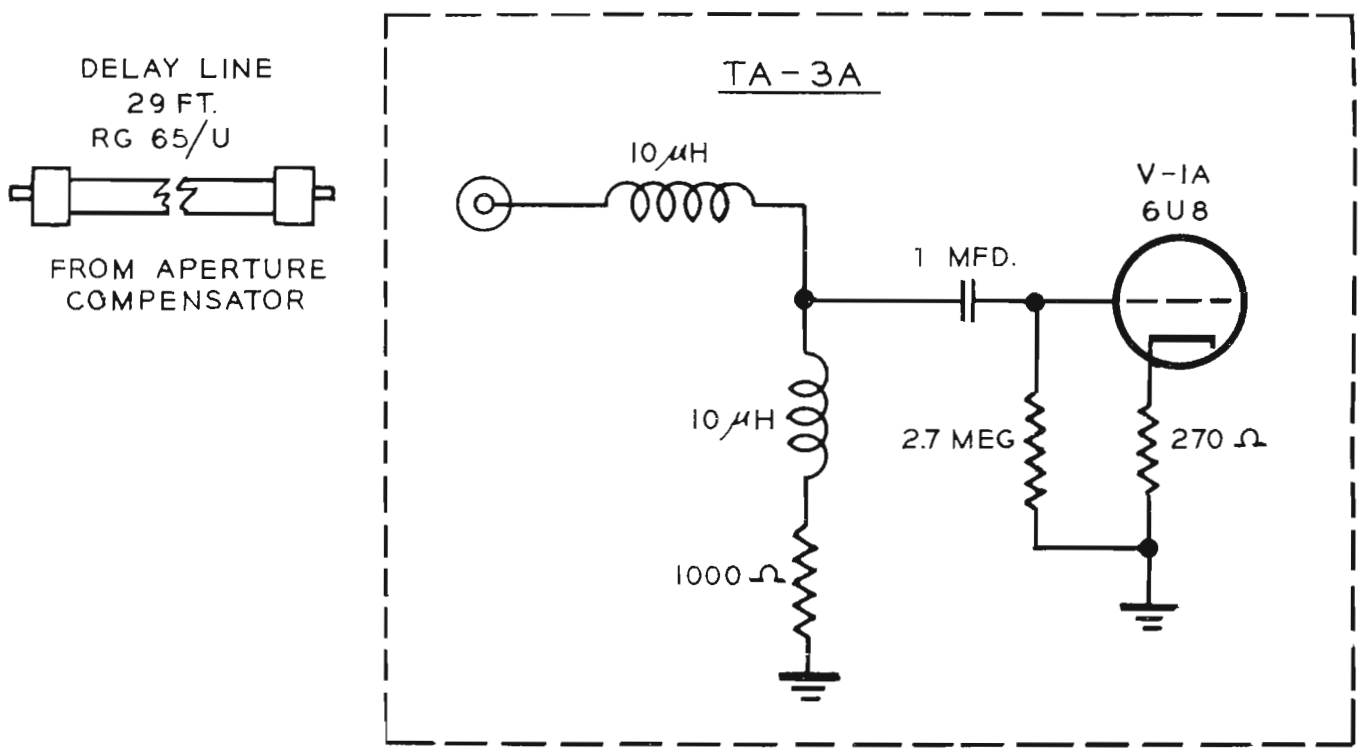


FIG. 14. Circuit diagram of the system for monochrome operation used at most stations with TK-26 cameras. Red, green, and blue output terminals are looped through the inputs of a switcher and terminated in the colorplexer.

Conclusion

The foregoing discussion has outlined the most important considerations in getting top performance from the TK-26 3-Vidicon Film Chain. The specific suggestions and recommendations presented here will help provide improved stability and best possible performance with a minimum expenditure of effort in day-to-day operation.

Editor's Note: *This is the fourth of a series of articles on how to get best picture quality in television film operations. After this series is completed it is planned to publish the material in one pamphlet as a service to broadcasters.*

[7] Detailed information on the operation of the TK-26 (3V) equipment for monochrome film and slides is found in RCA Technical Bulletin, Code No. EB-149.

CORRECTION

We wish to correct the impression given in our recent article "How to Get Top Performance From the TK-21 Vidicon Film Chain," BROADCAST NEWS, Vol. No. 94, April, 1957, that Aperture Test Charts are available from RETMA. We referred to a *proposed* RETMA aperture test chart which was *not* approved for standardization by RETMA. However, we do have a very limited number of special RCA Aperture Test Slides as shown in Figure 15 of the TK-21 article.

All other slides cited in this article have been copied photographically in a 2 by 2 inch size by RCA from available standard RETMA Resolution, Linearity and Registration Opaque charts and are obtainable from RCA. Address all inquiries to: Broadcast Equipment Sales, Bldg. 15-6, Camden, N. J.

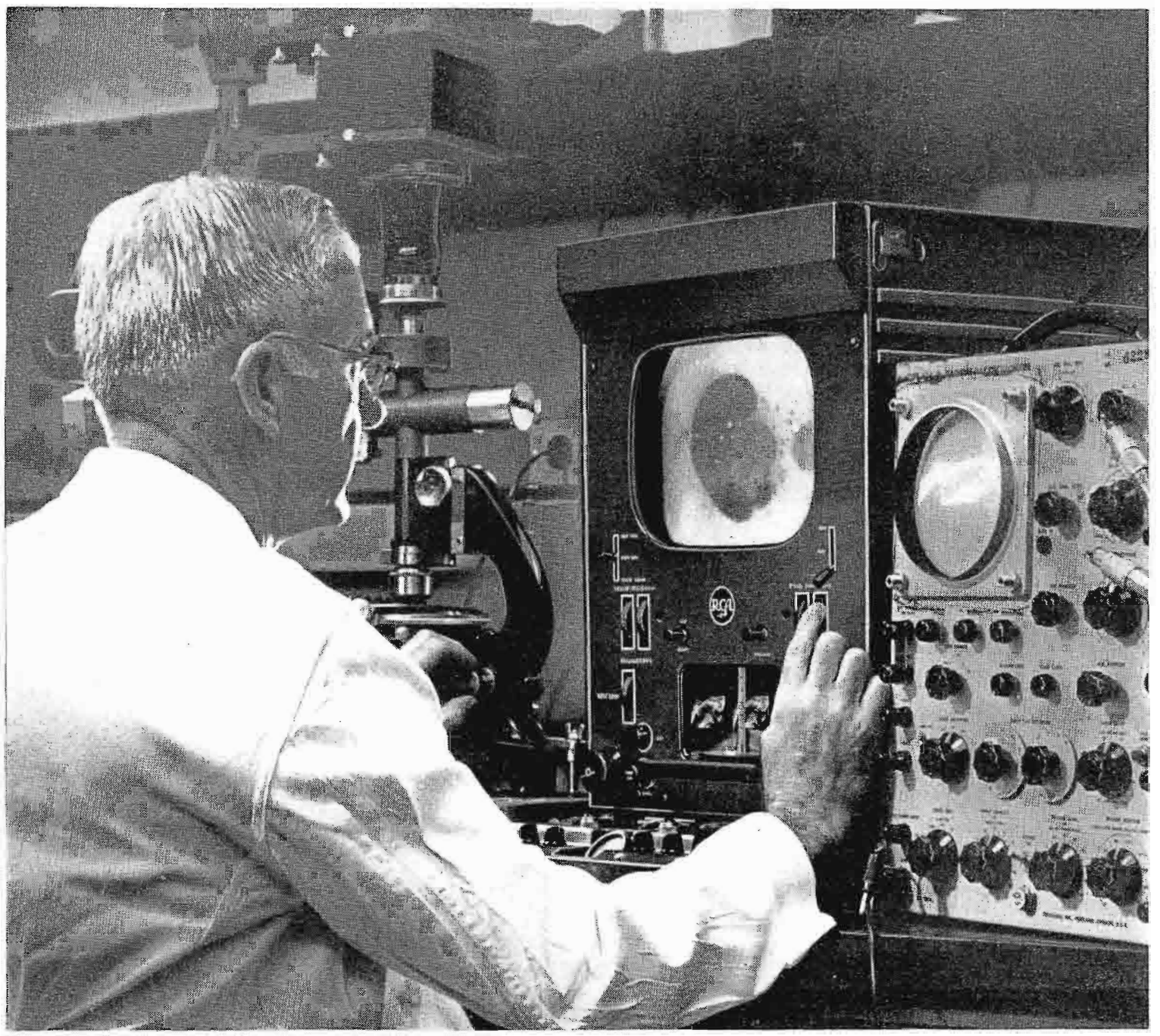


FIG. 1. New application of Closed Circuit Television provides immediate comparative data of chemical activity within live normal and cancer cells. This technique, made possible by developmental RCA ultraviolet-sensitive TV camera tube, is undergoing an experimental examination at National Institutes of Health, Bethesda, Maryland. Closed-circuit television system enables researchers to simultaneously observe and take motion pictures of chemical activity within living cells. Dr. George Z. Williams, chief of the NIH Clinical Pathology, and research pathologist of the National Cancer Institute of NIH, examines a televised experiment on system's TV monitor.

ULTRAVIOLET TV PROVIDES DATA ON CANCER CELLS

Closed-Circuit TV System Enables Researchers to Observe and Film Chemical Activity in Live Cells

Development of a new RCA ultraviolet-sensitive TV camera tube has led to a new application of closed-circuit television that provides immediate comparative data of chemical activity within live normal and cancer cells. This new technique is undergoing experimental evaluation at the National Institutes of Health, Bethesda, Maryland. The National Institutes of Health is the principal research arm of the United States Public Health Service. It embraces seven research institutes, each devoted to a specific medical study, and a clinical center which provides patient care.

Advances in Cell Research

According to Dr. George Z. Williams, Chief of the NIH Clinical Pathology Department and Research Pathologist of the National Cancer Institute, the ultraviolet TV is being used with a high-power microscope and an oscilloscope to obtain

direct observations and measurements of the metabolism of living cells. The successful application of ultraviolet television to medical microscopy and oscillographic spectroscopy gives promise of new speed and facility in the analysis of cells and tissue.

The ultraviolet TV system introduces numerous advances in cell research:

1. For the first time, it enables researchers to simultaneously observe and make motion pictures of chemical activity within living cells.
2. It makes possible microscopic study and analysis of hundreds of living cells in only a fraction of the time formerly required.
3. It makes possible direct observation and rapid, accurate measurement and identification of certain chemical changes within the cells.

Components of System

The over-all ultraviolet equipment chain includes an untraviolet light source, a high-power microscope, an RCA broadcast TV camera with ultraviolet camera tube, a monitor, an oscilloscope, and various motion-picture cameras for filming images on both the TV monitor and the oscilloscope. The TV camera is the standard RCA black-and-white, Type TK-21, which is widely used throughout the television broadcast industry. However, the camera's standard monochrome vidicon tube has been replaced with the experimental ultraviolet-sensitive vidicon camera tube. The pickup tube and its circuitry were developed by A. D. Cope and L. E. Flory, under the supervision of Dr. V. K. Zworykin.

Theory and Application

Ultraviolet rays are absorbed in cells in specific and measurable quantities by different chemicals. This characteristic enables the medical researcher to:

1. Identify the nature and scope of several cellular chemical substances by exposing the cell to ultraviolet light and measuring the absorption ratio,
2. Introduce foreign chemicals and study their reaction with the cell's normal chemicals, and
3. By ultraviolet exposure, to maintain several studies of disease-suspected cells and tissues and detect and identify chemical changes which may develop.

The ultraviolet absorption image, viewed by the TV camera through a microscope, is converted to an electronic signal by the ultraviolet tube. The signal is amplified and then viewed on the screen of the TV monitor, a few feet away. Any one of the 525 horizontal scanning lines can be selected and analyzed by a special oscilloscope, which produces on its cathode ray tube, in two ordinates, a tracing of the absorption characteristics of the specimen.

Conclusion

The ultraviolet TV system has proven of value in studies of living cellular material and possesses definite advantages over other available techniques. The shortened exposure to the narrow bands of ultraviolet reduces cell damage and avoids artificial absorption changes. The direct observation facilitates rapid search of large numbers of cells and other material, and provides better selection of desirable specimens for oscillographic and other studies.

In its present stage of experimentation the ultraviolet TV system must be considered as a developmental technique, but one which holds important implications for future medical research. In addition, it offers a significant possibility also as an important diagnostic medium, for rapid determination of the nature of a diseased cell by direct ultraviolet TV observation and measurement of the rate, scope and shape of abnormal chemical changes.

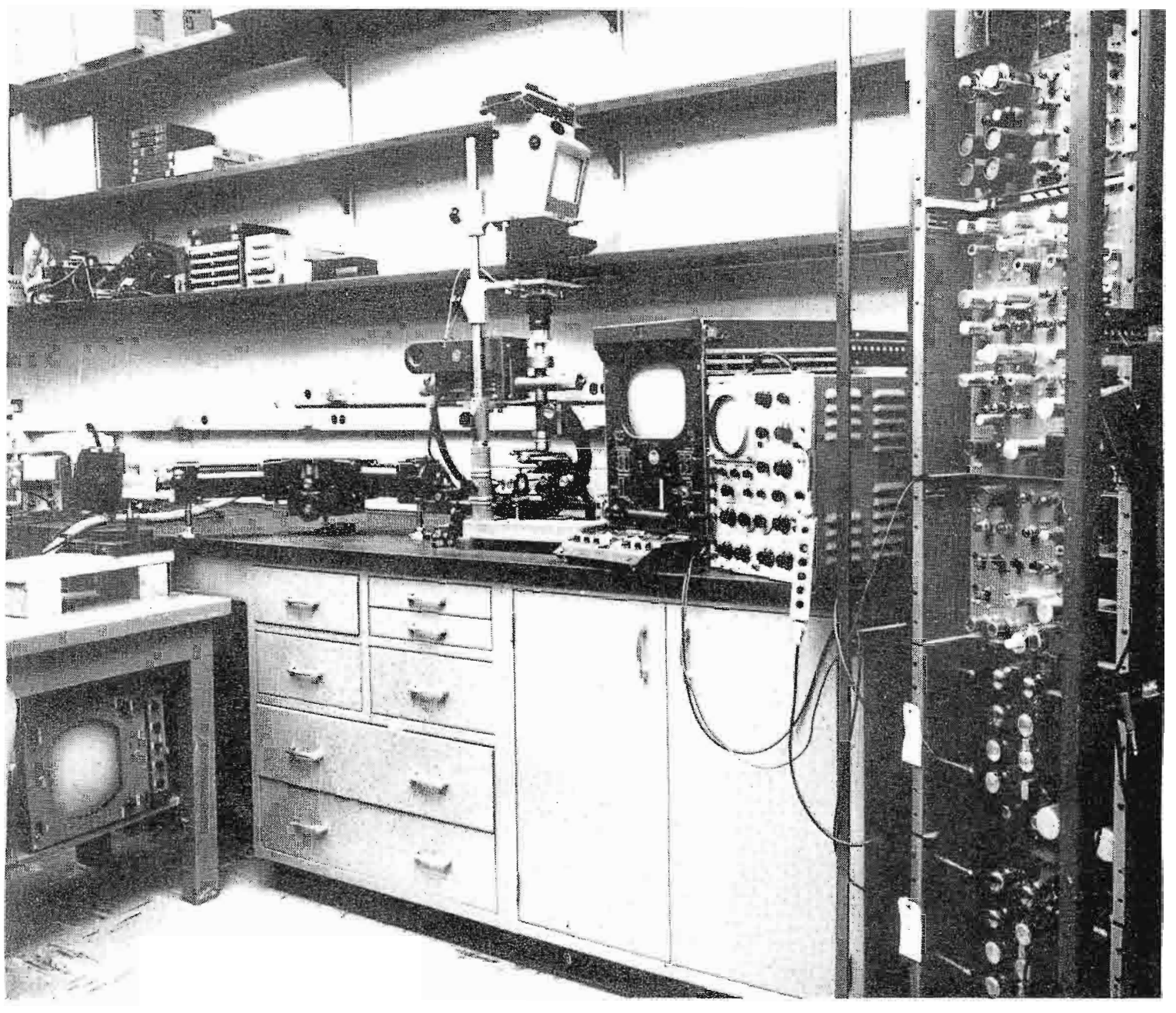


FIG. 2. Closed Circuit TV equipment setup at the National Institutes of Health laboratories includes an ultraviolet light source, a high power microscope, and a TK-21 Vidicon Camera Chain with ultraviolet camera tube. Picture presentation is observed on a TM-6 Master Monitor; selected waveform presentation on a TP-524D Oscilloscope. Both picture and oscilloscope presentation may be recorded on motion picture film for future reference.

FIG. 1. TV education courses. Workshop for TV courses is the main studio professionally equipped with RCA TK-11 Studio Cameras, microphone and lighting equipment.

STATE UNIVERSITY OF IOWA USES RCA EQUIPPED STUDIO AS HUB OF TV TEACHING CENTER

Three Studio Cameras, Audio and Video Control Equipment Provide Closed-Circuit Facilities for TV Education Courses and for Evaluation of Teaching Via TV

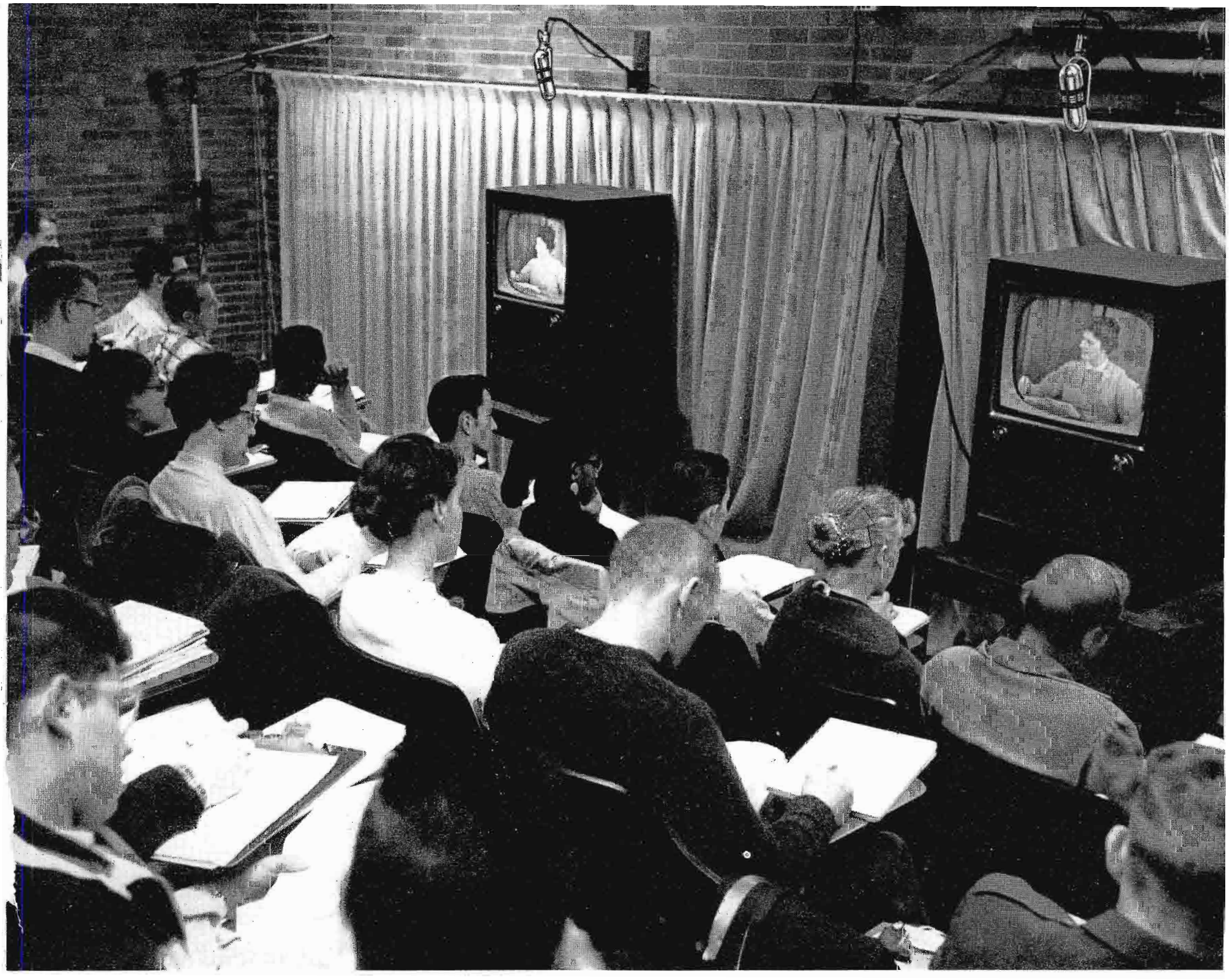


FIG. 2. Evaluation of teaching via TV. Students in American Government participate in TV discussion class. Shown on the receivers is a member of the studio discussion group.

by DR. SAM L. BECKER, *Director of Television*
As told to
MILES G. MOON, *Broadcast News Editorial Staff*

Hub of the State University of Iowa Television Teaching Center is a fully equipped television studio used for TV education courses and for evaluation of teaching via TV. While the Center's operation is confined to closed-circuit applications, standard broadcast equipment is used throughout. The studio is equipped with three RCA studio cameras, type TK-11, and serves as a working laboratory where students can learn to handle every phase of television production from script writing and operation of equipment to directing. Here and in the RCA-equipped studio control room students in television gain familiarity and working experience with the latest electronic equipment in preparation for their careers in television broadcasting.

These facilities, originally set up for TV courses, have been ideally suited to the University's present research in teaching via television. Aware of the rising student enrollment problem, an Iowa University group is conducting studies of the discussion method of teaching to large groups—utilizing closed-circuit television as the medium of communication between a teaching studio and viewing classrooms.

TV Center Facilities

A section of the old Iowa field house provides quarters for the TV Teaching Center. Layout of facilities is shown in Fig. 3 on which the principal teaching areas are labeled. Other rooms provide office, storage and miscellaneous work space.

Main Studio

Center of television instruction at Iowa is the main studio. One of the largest in the nation, measuring 45 by 90 feet, the studio is equipped, as shown in Fig. 4, with three TK-11 Studio Cameras (mounted on a 12-foot crane, a panoramic dolly and a pedestal), a microphone perambulator and boom, and complete lighting equipment. The large floor area accommodates many sets for student productions, for kinescope productions and for a television teaching studio.

Classroom and University productions as well as TV-discussion classes are serviced by student crews in the main studio. Each week students rotate jobs—one week serving as floor manager, the next week as cameraman—and so on until each student learns to operate every piece of equipment.

Control Room

In learning to operate all phases of production for class projects, students also rotate assignments in the control room, shown in Fig. 5. Here they take over directing and video, audio and lighting control jobs.

The control room is located a full story above the studio floor and has a full view of the studio. An elevated platform at the rear of the control room provides the program director with a clear view of all control room operations as well as the studio floor. The RCA-equipped control room includes a BC-2B Audio Consolette and BCM-11A Auxiliary Mixer, TS-5A Switcher, control equipment for three TK-11 Studio Cameras, four TM-6 Master Monitors and five TM-2 Utility Monitors. A TG-1A Sync Generator, power supplies and other terminal equipments are mounted in five BR-84 Cabinet Racks. Lighting terminal boxes, patch panels and dimming controls are also installed in the control room.

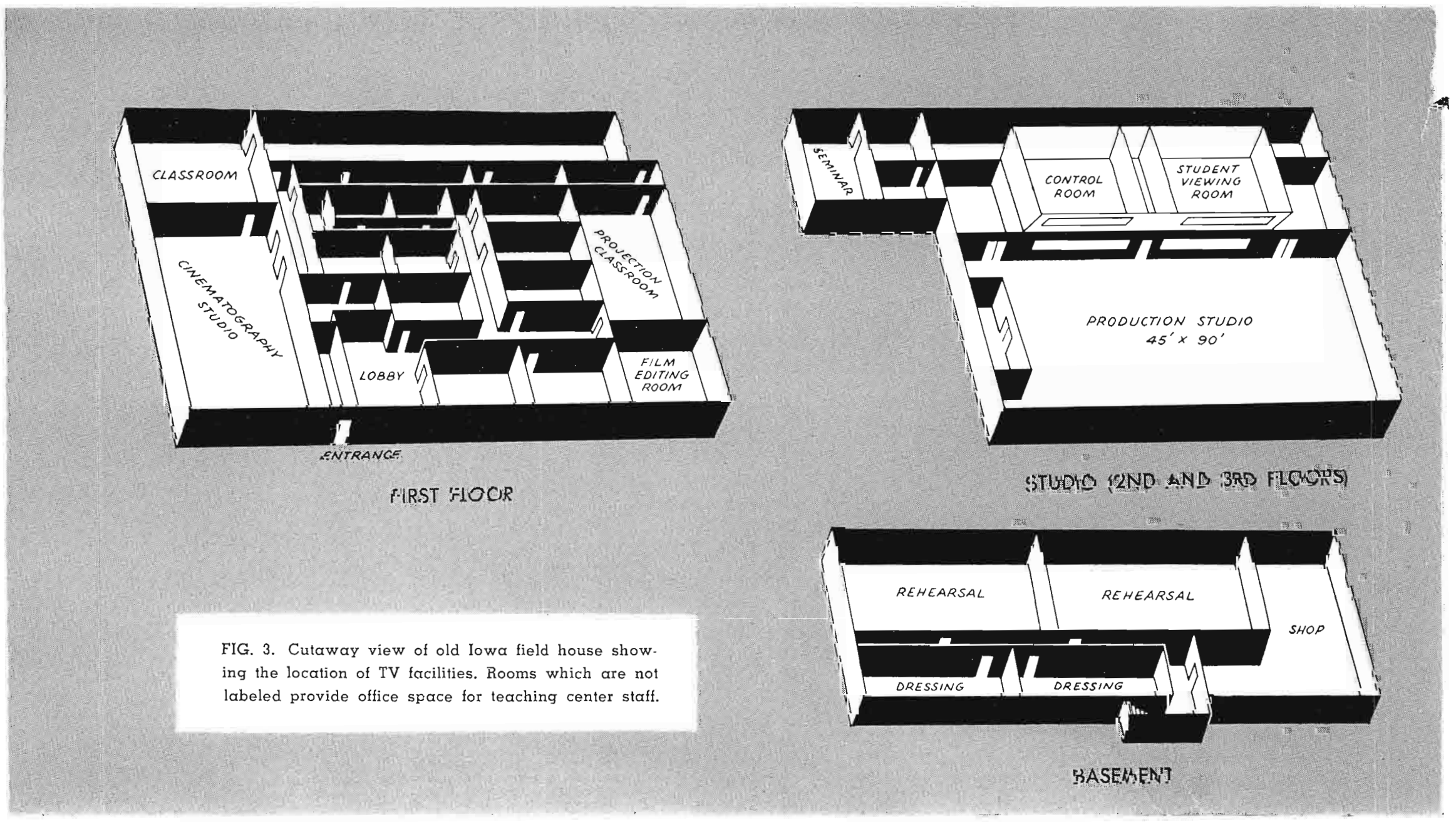


FIG. 3. Cutaway view of old Iowa field house showing the location of TV facilities. Rooms which are not labeled provide office space for teaching center staff.

FIG. 4. View of the 45 by 90 foot television studio. By using various types of professional equipment on dollys, booms, and pedestals, students gain working knowledge of broadcast station operations to aid them in their future careers.

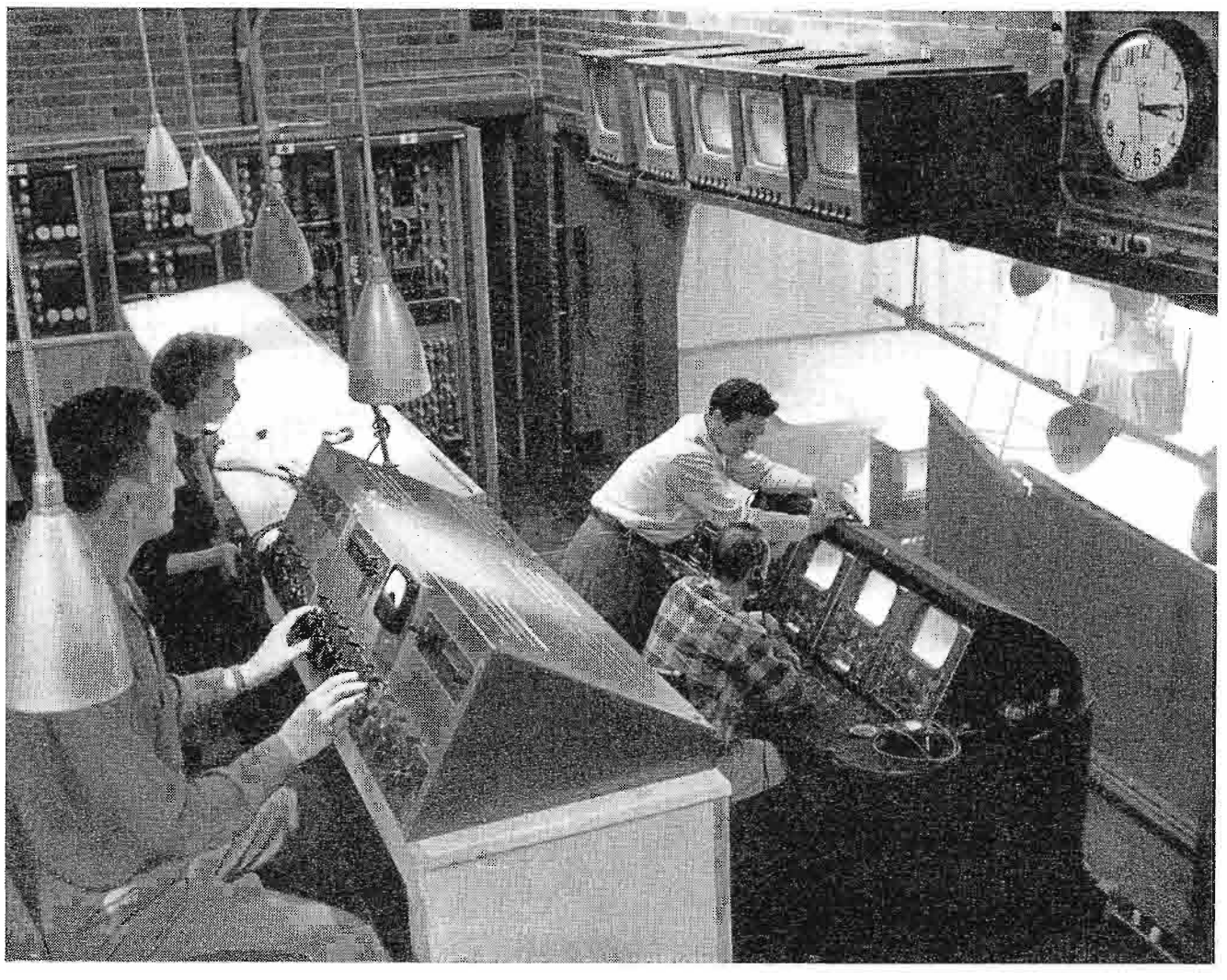


FIG. 5. Television control room overlooks the studio area. Camera, audio and switching controls are located here. Platform at the rear of the control room gives program director and audio operator full view of the studio.

FIG. 6. Cinematography studio where students are schooled in basic movie techniques. One of the projects of the cinematography staff is the production of film sequences for University produced TV programs.

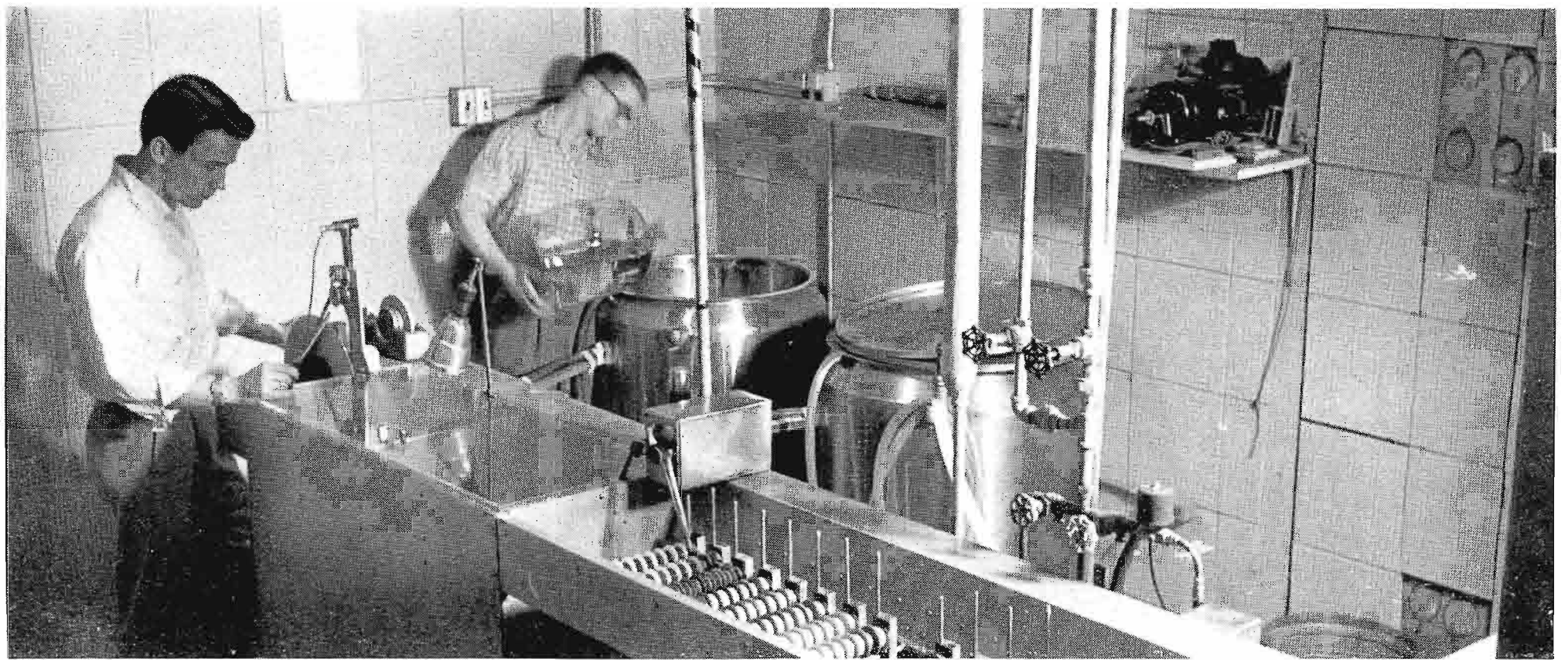


FIG. 7. Film processing lab. Both kinescope material and film sequences are processed here.

TV Education Courses

Television majors at Iowa enroll in the Division of Television-Radio-Film of the Department of Speech and Dramatic Art. They devote most of their first two years to Liberal Arts courses such as history, literature, political science, and natural science. Thus prepared, their final two years are concentrated to a greater extent upon television planning, production, and performance. Not only do students receive training in their specific television courses, they also receive a solid background in the closely allied areas of speech and theater, including directing, lighting, design and costuming. In addition, they learn to operate all studio and control equipment.

Writing and Acting

Television writing is emphasized in a practical manner. Students write the programs, and in many cases see them actually produced for television. Scripts that are assigned are used in particular programs which the University is producing. The student follows his script through its various stages of production until the finished program is ready for kinescoping.

Acting training is offered by the Department of Speech and Dramatic Art and is one of the finest theater plants in the country. The student who is particularly interested in acting for television has an opportunity to appear in both classroom and University television productions as well as stage productions.

Cinematography

Students in cinematography are introduced to all phases of motion-picture making. They learn to operate various motion-picture cameras including sound-on-film types. Students prepare shooting scripts for class movie projects, and are instructed in directing, film editing, and lighting techniques. Practical experience is gained in preparing film sequences for University produced television programs.

Set Design and Lighting

Technical courses in dramatic art are planned to prepare students interested in this work for either the legitimate theater or television or both. Instruction can be received in set design and construction, costuming and lighting. Students with a special interest in television apply and practice their technical knowledge in the Television Center.

University Productions

The students real laboratory is working on the production of weekly programs for release to commercial stations. Student writers work on many of the program scripts and student production crews operate cameras and equipment.

Since 1952, the State University of Iowa Television Center has worked in co-operation with other Iowa educational institutions in producing one of the nation's first sustaining daily educational TV series. Called "TV Schooltime" the series has been viewed by thousands of students from the elementary grades through high school. Series is still going on. Other production projects have included a series of programs for the Iowa State Medical Association and "The Scientist on the Corner" series for the Iowa State Pharmaceutical Association. Current production activities include a weekly series of geography programs directed to students in the elementary grades, and a series on "The Secret of Flight" for the Educational TV and Radio Center.

Graduate Work

Specialization in the fields of television writing, direction, lighting, design, cinematography and communications research is available at the graduate level. Work toward M.A. or Ph.D degrees may be completed in all of these fields.

Graduate programs are built to individual student requirements. Courses are selected from television, speech, theater and allied fields to meet the specific needs of each student.

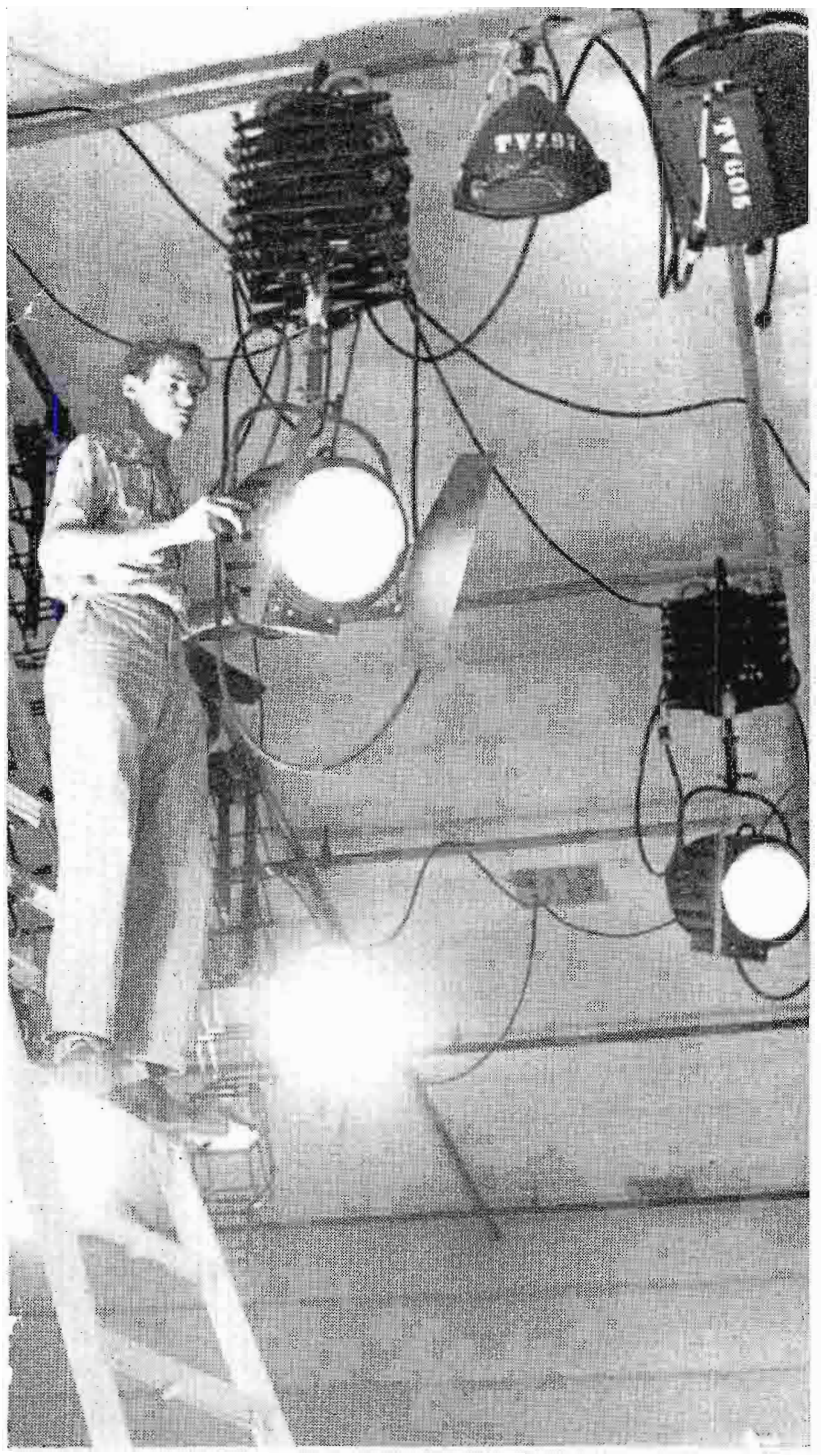


FIG. 8. Students in lighting classes with a special interest in TV have an opportunity to practice their technical knowledge in the TV studio.

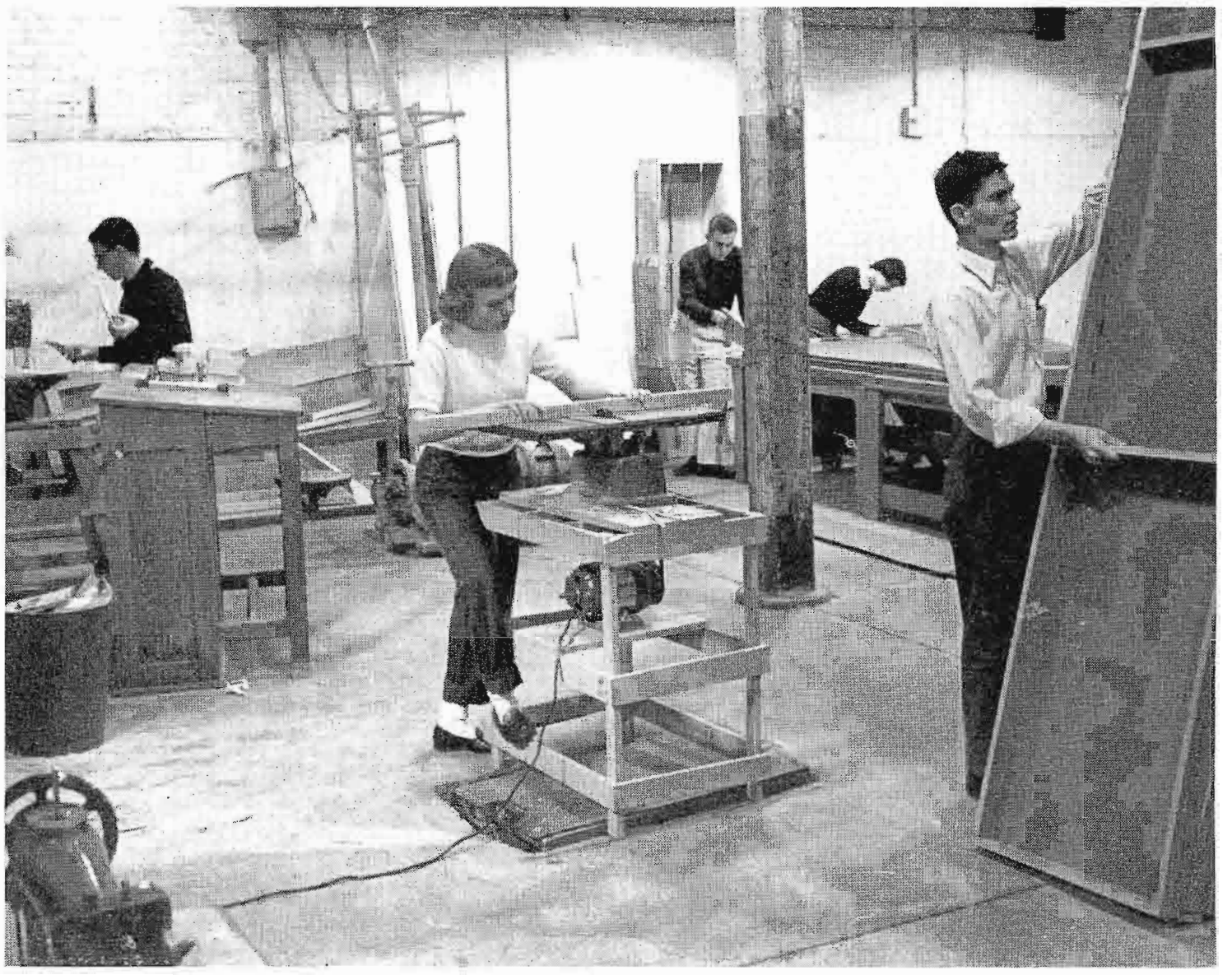


FIG. 9. Workshop in which students in set design build their own sets for TV production.

FIG. 10. Current geography series, kinescoped and distributed to commercial stations, is directed to students in the elementary grades.

FIG. 11. Students handle assignments in both University productions and courses taught on closed circuit TV.

FIG. 12. Studio discussion group is seated at a V-shaped table with the instructor at the apex. Two cameras are used for this presentation.

TV Discussion Classes

In February, 1955, the State University of Iowa instituted a research program designed to study the application of the discussion method of teaching to large groups, utilizing the medium of closed-circuit television as a means of communication between a TV teaching studio and one or more "viewing" classrooms. This research program was inaugurated to study a variety of problems in the field of teaching via television. The basic questions for which answers were sought were as follows: Do students who observed (by listening to and viewing) a discussion get more or less vicariously the same sort of educational experience as do those who are physically present in the discussion room (and presumably participate more extensively in the discussion)? Do students who are taught by this method learn as well as those who are taught by more conventional methods such as lecture, lecture-discussion and small group discussion methods? To date more than six courses have been taught by the "closed-circuit television discussion" method. Results have shown this method both possible and practicable, and continuing studies are being conducted to determine its most effective use."*

How Closed-Circuit Classes Are Set Up

The production studio, student viewing room, projection classroom of the TV Center (see Fig. 3) are used for discussion classes. Fourteen students are in the studio, seated at a V-shaped table with the instructor at the apex. The remainder of the students are divided between the observation room and the projection room where they view the discussion on standard 21-inch television sets and can enter into the discussion by means of microphones located to the front of each room. All groups hear each other but only the studio group can be seen.

The discussion begins with the studio group and is led by the instructor. When a student in one of the viewing groups wishes to enter the discussion or ask a question, he raises his hand, whereupon the proctor in that room presses a switch activating one of the two small lights mounted on the instructor's table in the studio. This indicates from which viewing group the question or comment will come. When the instructor is ready for the comment, he asks for it and the proctor activates the microphones in that room. The student speaks from his seat announcing his name and making his point. Students are periodically rotated between the studio and the two viewing rooms. These shifts generally coincide with the completion of a unit of course work.

Two cameras and five microphones are used to pick up the activity of the studio group. Two 77-D microphones, suspended from the ceiling at the front of each of the viewing rooms, pick up the sound from these locations. These microphones are "open" only when the proctor presses his key, thus giving him complete control of the discussion. The instructor has a personal microphone, a BK-6B, which hangs around his neck. He uses this to answer a student speaking from a viewing room or to intersperse comments. The studio group hears the sound from the viewing rooms through loudspeakers on the back walls of the studio set. The loudspeaker for each of the viewing rooms is in a different location so that the studio group and the instructor can identify the source of the sound. Each viewing group hears the other through the sound from these loudspeakers

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* Copies of the complete report on the "Iowa Closed-Circuit Television Teaching Experiment" are available from Dr. Sam L. Becker, Director of Television, State University of Iowa, Iowa City, Iowa.

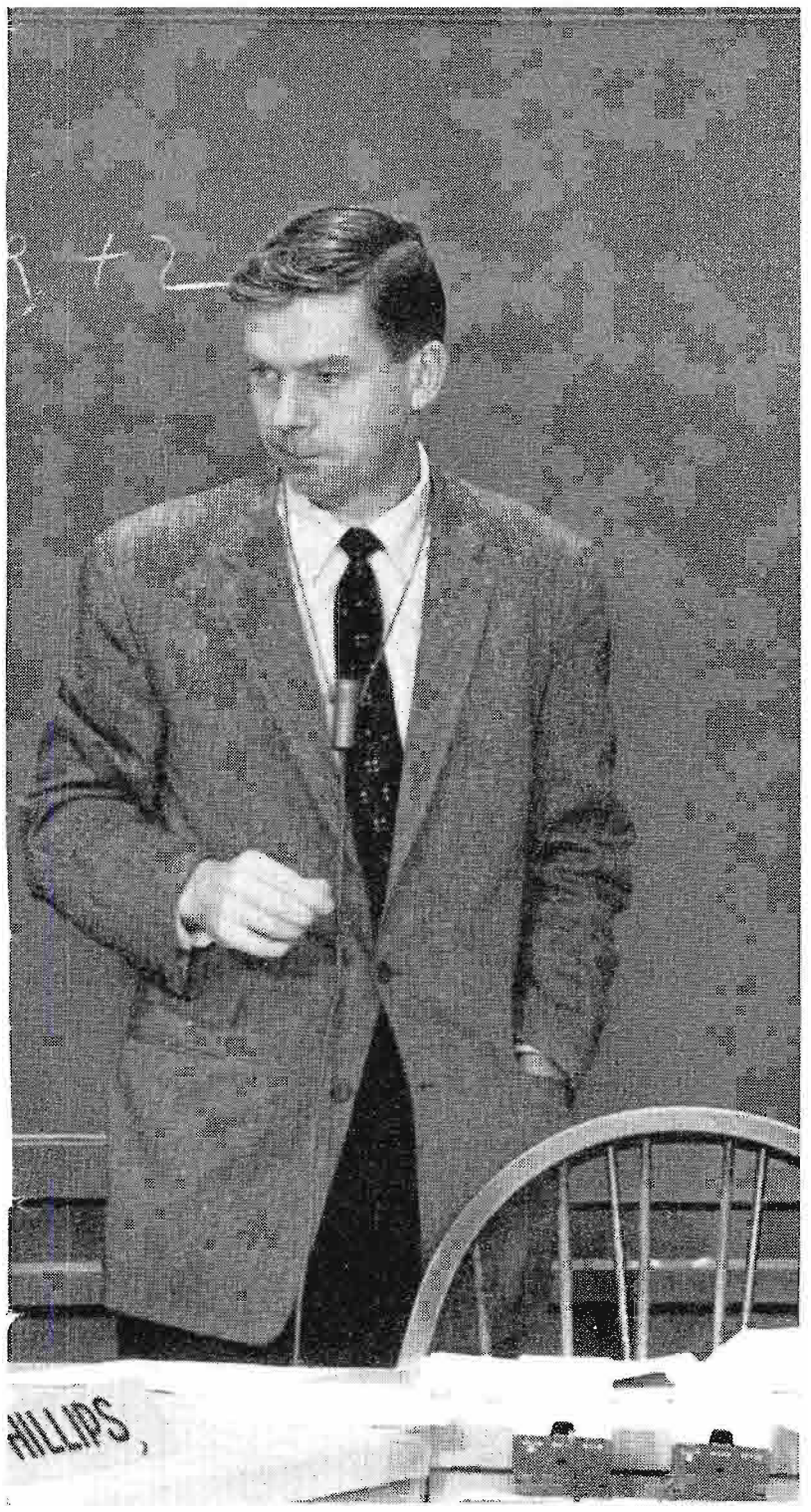


FIG. 13. Personal Microphone allows instructor mobility in his presentation. Note two small boxes in front of the instructor's chair which indicate, by means of lights, where students' comments are coming from. Shown here is James N. Murray, Jr., Assistant Professor, Political Science.

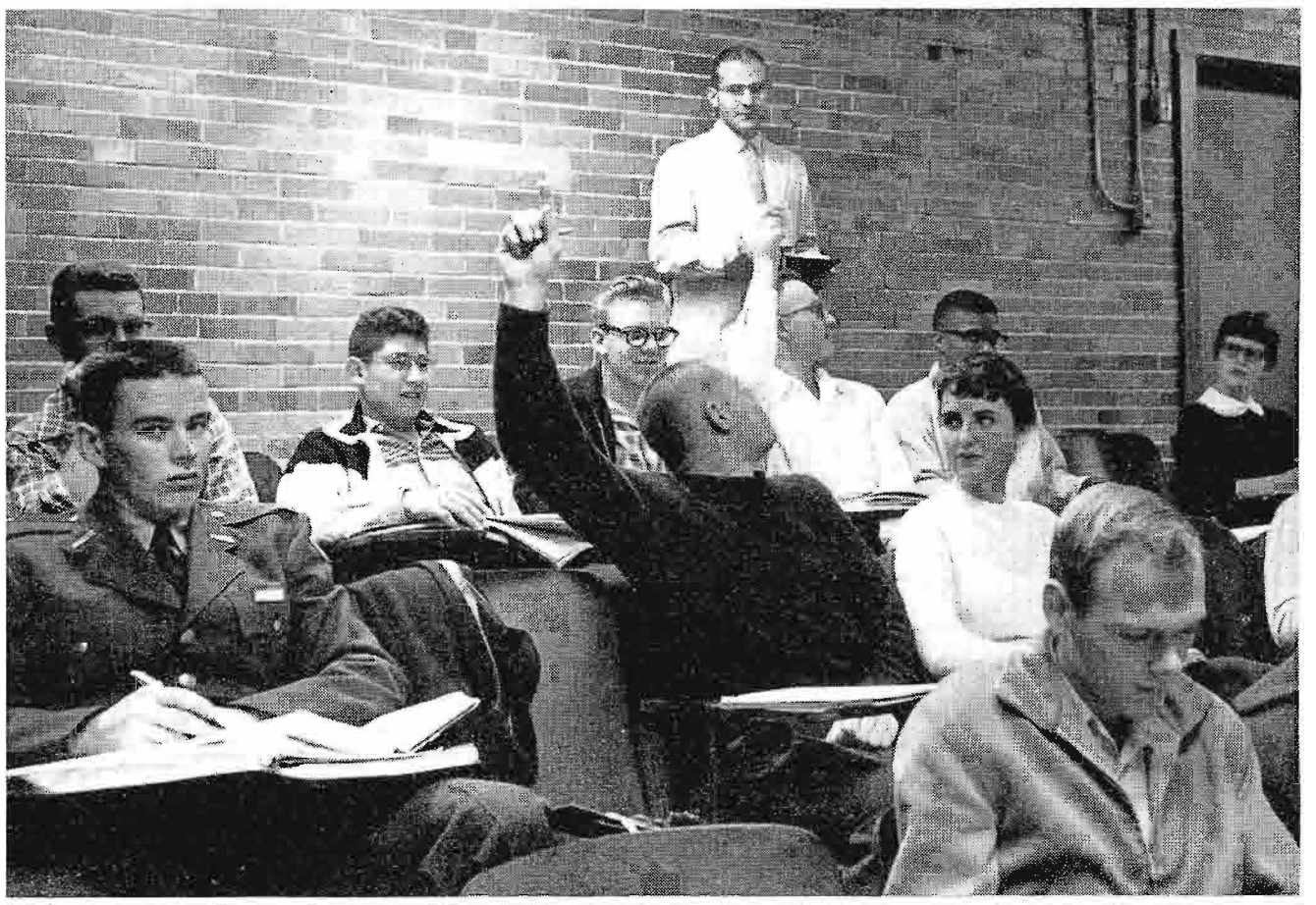


FIG. 14. Students in viewing rooms participate in the discussion by raising their hands. Proctor in the rear of the room signals the studio that there are questions directed to instructor of discussion group.

being picked up by studio microphones and thus transmitted.

The television presentation is under the control of a TV program director. He directs camera movement and selects the picture which is to be sent to receivers. Visual aids, charts and demonstration material, are preselected by the instructor and introduced at key points in the presentation. Students from TV courses are assigned duties as cameramen and control operators for the presentations.

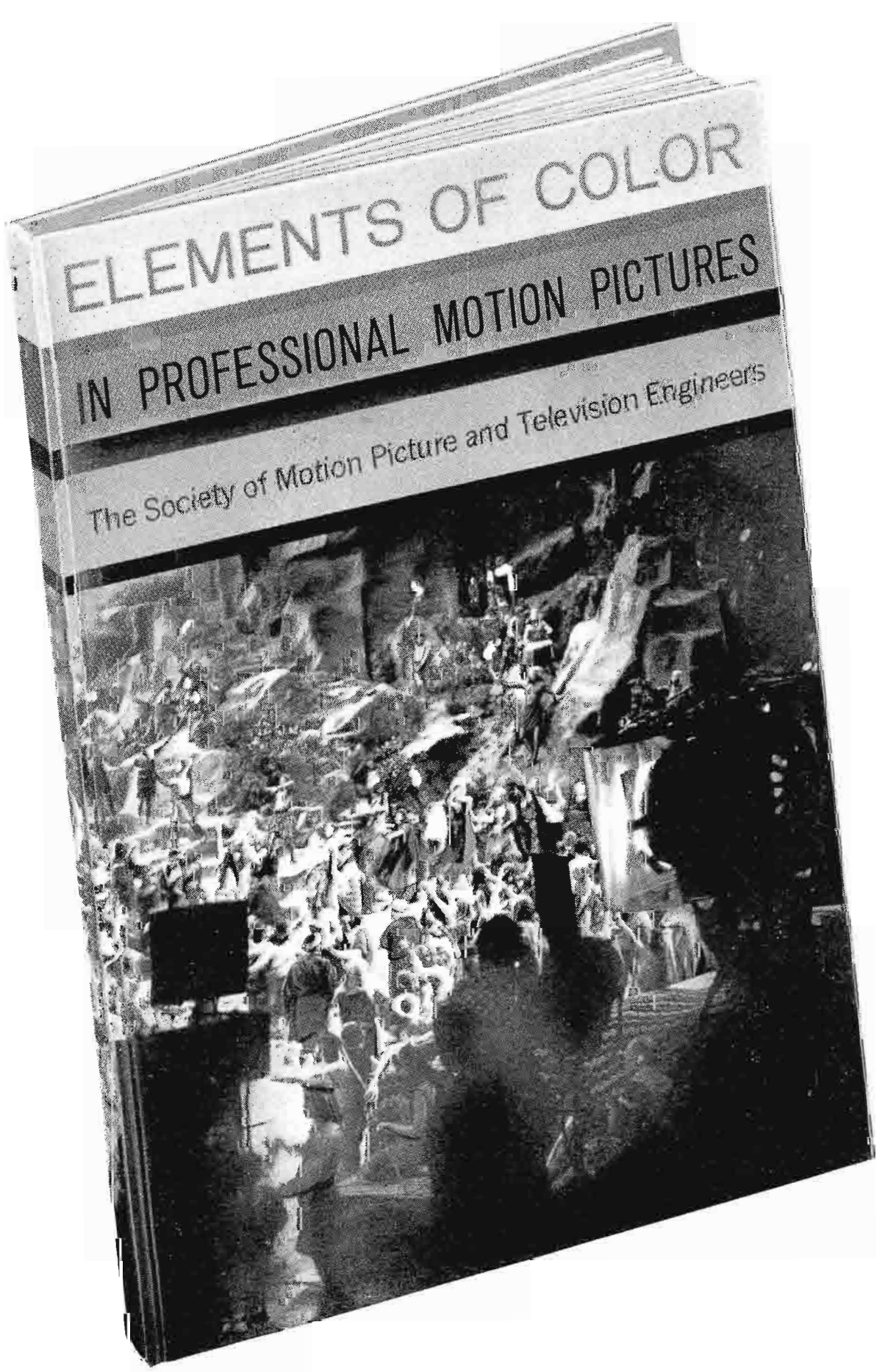
Conclusion

The use of standard broadcast equipment has provided the State University of Iowa's Television Center with several major benefits in television education courses. Students can work with the same type of equipment used in TV stations throughout the country and thus be better equipped to fill positions in television broadcasting. This equipment also aids the University in preparing TV kinescope productions released to commercial stations. Finally, the equipment has enabled the University to conduct evaluations of teaching via TV and to study educational problems which confront colleges and universities at the present time.

FIG. 15. Questions and comments in the viewing room are picked up on RCA 77-D Microphones (encircled) above each TV set. These microphones are activated by the proctor in the viewing room.

BOOK REVIEW:

ELEMENTS OF COLOR IN PROFESSIONAL MOTION PICTURES



Edited by Wilton R. Holm. Published (1957) by Society of Motion Picture and Television Engineers, 55 W. 42d St., New York 36, N. Y. 5¾ by 8½ in., 104 pp., 27 pp. in color.

This book will prove to be of interest, especially to television station personnel who are concerned with the production and reproduction of motion pictures for color TV. Approaching its subject via the basic scientific principles of color, the book emerges into a broad consideration of the problems posed by color. Numerous full-color illustrations illuminate the various points that are made. Representatives of the television industry have assisted in the compilation of the book. Although essentially covering the production of the motion picture, one chapter deals exclusively with "Motion Pictures and Color Television." Over-all, the book will prove helpful to station personnel in the common problem of procuring good motion pictures for color television.

Elements of Color reflects the experience of 20 specialists from many areas of the motion picture and television industries. A vast amount of authoritative information is highly condensed and is as simplified as the subject matter allows. The 12 chapters take up such topics as: characteristics of color; color films and processes; photographing a motion picture in color; special effects; color processing and printing; and the relationship of motion pictures and color television.

Twenty-seven pages of color illustrations, well printed on good paper, supplement the text and add artistic meaning to the contents. A two-page spread showing 12 steps in facial make-up is a feature typical of the book.

Members of a special committee under the SMPTE Color Committee contributed their specialized knowledge from the whole range of motion-picture and TV production. Then all the parts were organized and made consistent in style and emphasis by the project's Chairman and Editor, Wilton R. Holm.* Mr. Holm's contribution to the book also included the original writing of a large part on photographing in color, in addition to his services as Editor.

Copies have been distributed to all members of the Society in good standing. The book is available to the public at a price of $3.50.

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* Technical Associate, Photo Products Dept., E. I. du Pont de Nemours & Co., Parlin, N. J.

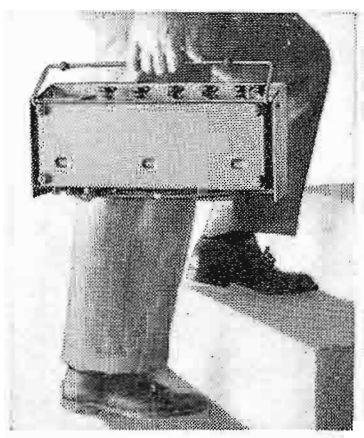
Transistorized

Portable Remote Amplifier

COMPACT!

LIGHTWEIGHT!

CONVENIENT!



Take the BN-6A with you to the ball park, the boxing bouts, and enjoy new convenience and performance! Also ideal for use in department store promotions, parades and other remotes. Designed and functionally styled especially for remote radio and television use, this amplifier is fully transistorized and the lightest equipment of its type, weighing only 15 pounds. Completely self-contained for either battery or AC power operation, it assures amplification and control facilities needed for high quality transmission to studio via telephone lines.

The BN-6A provides four separate input channels that can be operated either single ended or balanced. It is capable of greater output level with less distortion. This provides for normal level with ample reserve. Cueing and monitoring facilities are included, and plug-in transformers are used for balanced operation. Comes complete with portable carrying case, equipped with carrying handle adjustable for stacking.

Ask your Broadcast Representative for complete information about this advanced Amplifier. In Canada: write RCA VICTOR Company Limited, Montreal

These wanted Features!

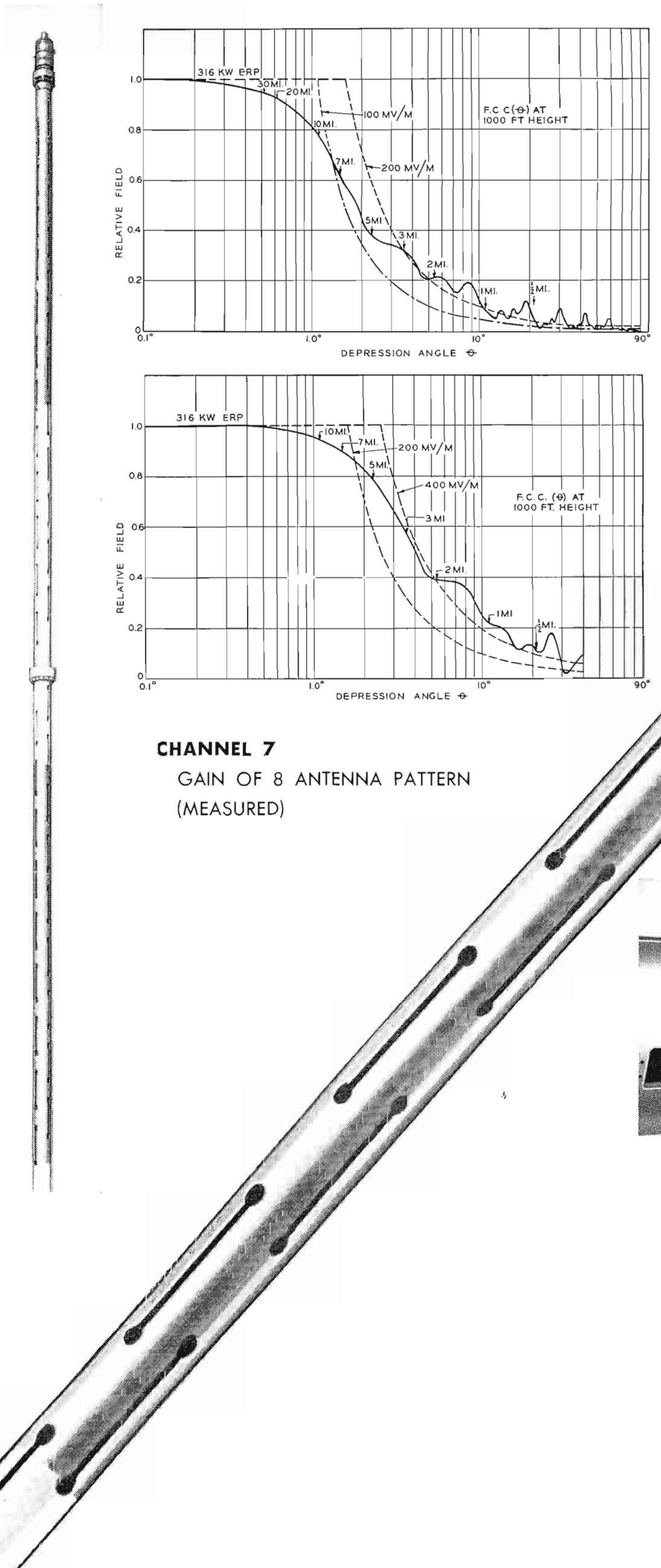
- All controls located on front panel, including illuminated VU meter, mixer controls, master control, phone jack, cue switch and power switch.
- Long-life Mercury batteries.
- Alternate germanium rectifier power supply.
- High-level mixing—four separate channels.
- New RCA Type 2N175 low-noise transistors which serve as input amplifiers.
- Amplified cue signal from studio.
- Functionally styled package.

Tmk(s) ®

RADIO CORPORATION of AMERICA

BROADCAST AND TELEVISION EQUIPMENT • CAMDEN, N. J.

New "Traveling



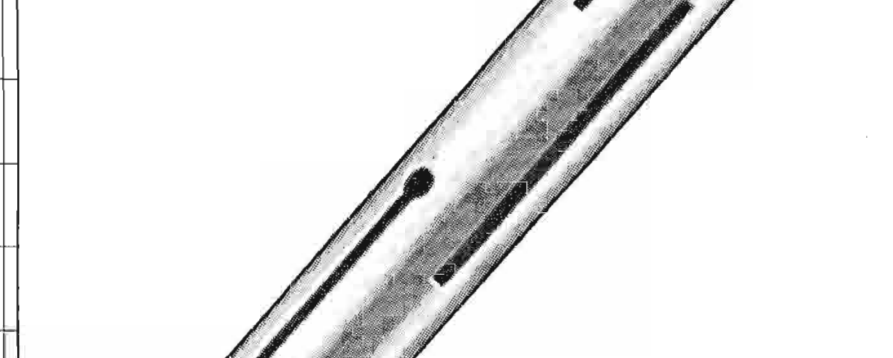
CHANNEL 10

GAIN OF 18 ANTENNA PATTERN
(CALCULATED)

CHANNEL 7

GAIN OF 8 ANTENNA PATTERN
(MEASURED)

FOR HIGH-BAND VHF OMNIDIRECTIONAL SERVICE



CLOSE-UP OF ANTENNA SHOWING
UNIQUE SLOT RADIATOR DESIGN

RCA RADIO

Tmk(s) ®

Wave" Antenna

Combines Improved Electrical Characteristics with Mechanical Simplicity and Economy . . . for High Power TV Applications

Here is a VHF high-band antenna that has an inherently low VSWR and produces better patterns. A new design, based on slot radiators, results in improved circularity. This new antenna also features low wind resistance and better weather protection.

INHERENTLY LOW VSWR

The traveling-wave nature of the feed results in a low VSWR along the antenna. This characteristic inherently gives the antenna a good input VSWR without any compensating or matching devices. The input tee has been broad-banded to provide a smooth transition from the transmission line to the antenna.

ALMOST IDEAL VERTICAL PATTERN

A vertical pattern is obtained which is an extremely smooth null-less pattern—see accompanying patterns. This provides the service area at most locations with a uniformly high field strength. Gains from approx. 6 to 20 at VHF high band can be obtained.

IMPROVED CIRCULARITY

The individual patterns produced by slot radiators when added in phase quadrature result in an over-all pattern with improved circularity. In addition, there are no external elements in the field. This design combines radiating elements, feed system and antenna structure in one unit, giving excellent horizontal circularity.

LOW WIND RESISTANCE AND WEATHER PROTECTION

The smooth cylindrical shape of the antenna is ideal for reducing wind load and has high structural strength. It is designed to withstand a wind pressure of 50 psf on flats, or 33⅓ on cylindrical surfaces. In addition, the absence of protruding elements minimizes the danger of ice damage. The steel outer conductor is hot-dip galvanized for better conductivity and protection. The inner conductor of the antenna is rigidly supported at the bottom end without having to rely on any insulator type of support to carry the dead weight. The pole is designed for tower mounting with a buried section extending into the tower. The pole socket carries the dead weight of the antenna. Polyethylene slot covers are fastened to the pole over every slot.

SIMPLIFIED FEED SYSTEM

The feed system is completely inside the antenna, hence any effects on the pattern have been eliminated. The feed system is a simplified one consisting of a large coax line and coupling probes.

The RCA "Traveling Wave" Antenna can provide you with the answer to your need for a VHF High Band Antenna which combines mechanical simplicity and economy, especially in high-gain, high-power applications. Your RCA Broadcast Representative will gladly help with TV antenna planning. See him for details on this new antenna. In Canada: RCA VICTOR Company Limited, Montreal.

CORPORATION of AMERICA

BROADCAST AND TELEVISION EQUIPMENT · Camden, N. J.

Unlimited system

plus superb picture quality...make RCA best

Improved technical quality in your film programs need not require a big investment

ICONOSCOPE CONVERSION

You can start simply and build gradually, if you prefer, first by converting iconoscope film cameras to RCA vidicon film cameras. You'll get marked improvement in gray scale, tremendously increased signal-to-noise ratio, improvement in resolution, and provision for automatic black level control . . . all with a minimum of operating attention. The "snap," clarity and live effect will be immediately reflected in advertiser preference.

MONOCHROME SYSTEM EXPANDABLE TO COLOR

Or, you can start with the superior vidicon film system expandable to color. Using the RCA TP-15 universal multiplexer, color and monochrome film equipment can be completely integrated—by adding a TK-26 color film camera at any time. This new multiplexer accommodates up to four projector inputs, all of which are available to two film camera outputs.

COLOR FILM SYSTEMS

To go to color *now,* you can select from various equipment combinations which use the RCA TK-26 three-vidicon film camera. In TV stations where superb picture quality and operational simplicity count, the TK-26 is the preferred system for color film programming. It has been selected after careful comparative evaluation with other systems and found to produce finer quality film pictures in both monochrome and color. Superior results are achieved at minimum cost with maximum operational simplicity.

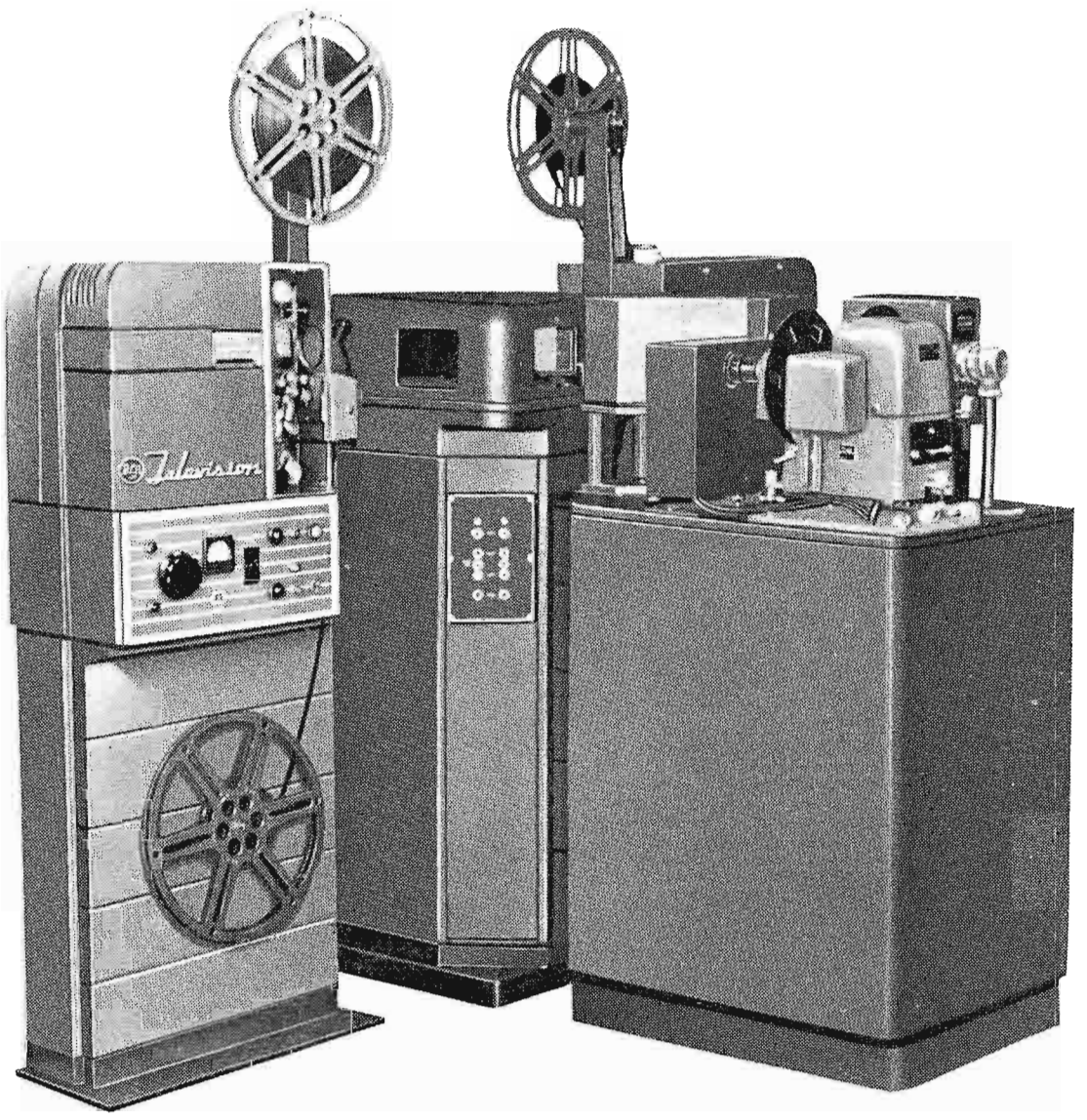
LIVE COLOR, TOO

It is possible to use the RCA three-vidicon film system for pickup of opaques, live commercial products and demonstrations within a limited area.

See your RCA Broadcast Representative for more details on Vidicon Film Systems. He will be glad to answer your questions. Let him help plan a film system that can start you on the road to the new and additional revenue that will come from color!

NEW STANDARDS OF QUALITY

The RCA Vidicon Film System has established a standard of film reproduction by which all other methods are judged. You can expect and get the highest quality reproduction, with protection against obsolescence for years to come. To give some idea of the wide range of system possibilities with RCA equipment we submit four diagrams, at right, from the very simplest equipment to a Dual Color Film System.



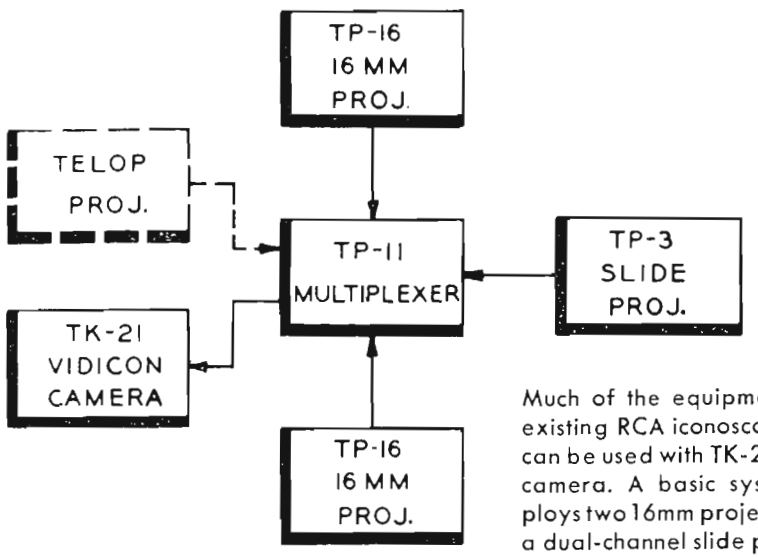
Monochrome film system expandable to color.

RADIO CORPORATION of AMERICA

BROADCAST AND TELEVISION EQUIPMENT **CAMDEN, N.J.**

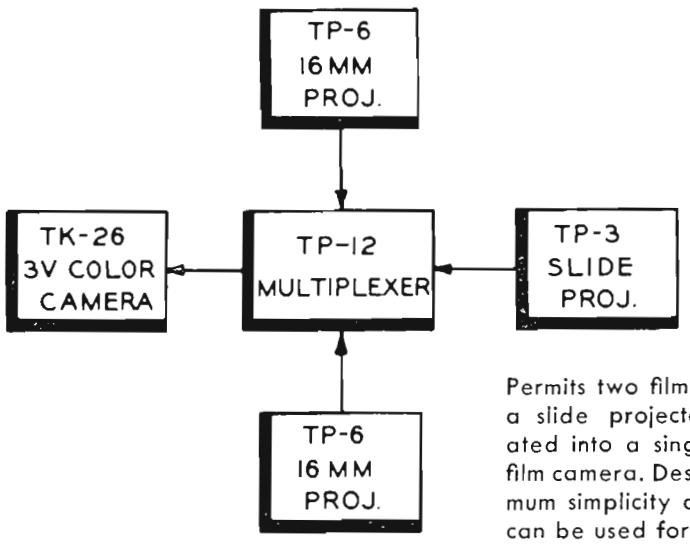
possibilities . . .
buy in film equipment—monochrome and color

1. CONVERSION OF ICONOSCOPE FILM SYSTEM TO VIDICON



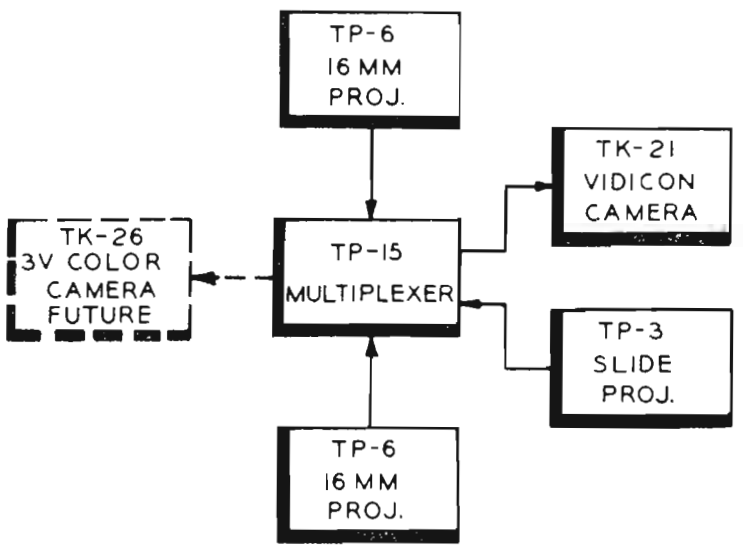
Much of the equipment in an existing RCA iconoscope chain can be used with TK-21 vidicon camera. A basic system employs two 16mm projectors and a dual-channel slide projector.

3. BASIC COLOR FILM SYSTEM



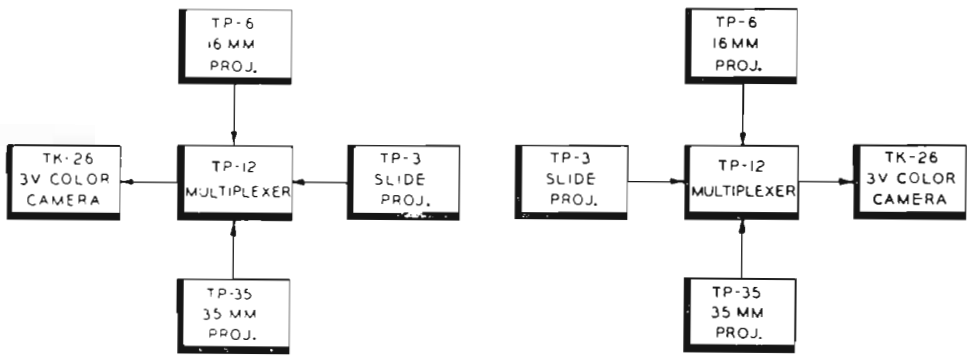
Permits two film projectors and a slide projector to be operated into a single TK-26 color film camera. Designed for maximum simplicity and economy, it can be used for both color and monochrome film.

2. MONOCHROME FILM SYSTEM EXPANDABLE TO COLOR



Combines a TK-21 monochrome film camera with projectors and multiplexing equipment, which are usable in color as well as monochrome. At any time a TK-26 color film camera can be added, retaining the TK-21 for the monochrome channel.

4. DUAL COLOR FILM SYSTEM



Will handle a large number of inputs and therefore provides maximum program protection. Two completely independent program channels provide the ultimate in reliability and assure continuous programming. Permits previewing in color.

Best for color and monochrome because it uses proved-in components !

VIDICON TUBE . . . . RCA development

Vidicon storage tube is outstanding from standpoint of high signal-to-noise ratio, reliability and low-cost operation. It produces a sharp lifelike picture—equally good in monochrome or color. Replacement involves minimum of equipment readjustment.

STANDARD-TYPE PROJECTORS FOR 35 and 16MM

Standard of the motion picture industry, the intermittent projector produces a beautiful steady picture. It involves none of the critical mechanical tolerances of the continuous projector for 16mm. RCA now offers the TP-6 series projector designed from the beginning for professional 16mm television use. Provides maximum video and audio quality with operating convenience and dependability. RCA neutral-density-filter light control makes it possible to achieve satisfactory results with practically all kinds of film.

NEW TYPE TP-15 MULTIPLEXER

Provides for complete integration of color and monochrome. Offers flexibility and protection of two-camera system without the necessity of buying separate projectors for each camera. Permits preview of one program while another is on-air.

OPERATING CONVENIENCE AND SIMPLICITY

Only two simple controls are employed in "on-air" operation. Pedestal level and Master Gain. For assuring picture perfection, all controls, together with waveform and picture monitors, are located at the operating position.

IT'S GOOD BUSINESS TO INVEST IN RCA BROADCAST EQUIPMENT

RCA engineering combines quality and long-range economy

Because there's more to radio equipment than its initial cost, economy minded broadcasters prefer RCA equipment...their best insurance for safeguarding their investments and building profits. They realize that many RCA broadcast transmitters with more than 25 years of service are operating today because RCA has engineered and manufactured its broadcast equipment to meet the highest standards.

FROM THE STATION LOGS

Here are a few of the many station reports from all over the world, describing long tube life in RCA Broadcast Equipment. When these reports were received, the tubes were still going strong:

94,613 hours: RCA final amplifier triode in RCA 10 KW medium wave transmitter, at KPOJ, Portland Oregon.

62,000 hours: RCA final power triode, in RCA 50 KW medium wave transmitter at KDKA, Pittsburgh, Pennsylvania.

46,115 hours: RCA final power triode in RCA 1 KW short wave AM transmitter at DZMB, Manila, Philippines.

33,738 hours: RCA mercury-vapor rectifier, in RCA 50 KW short wave transmitter at Canadian Broadcasting Corporation.

Why RCA Broadcast Equipment Reduces Operational Expenditures

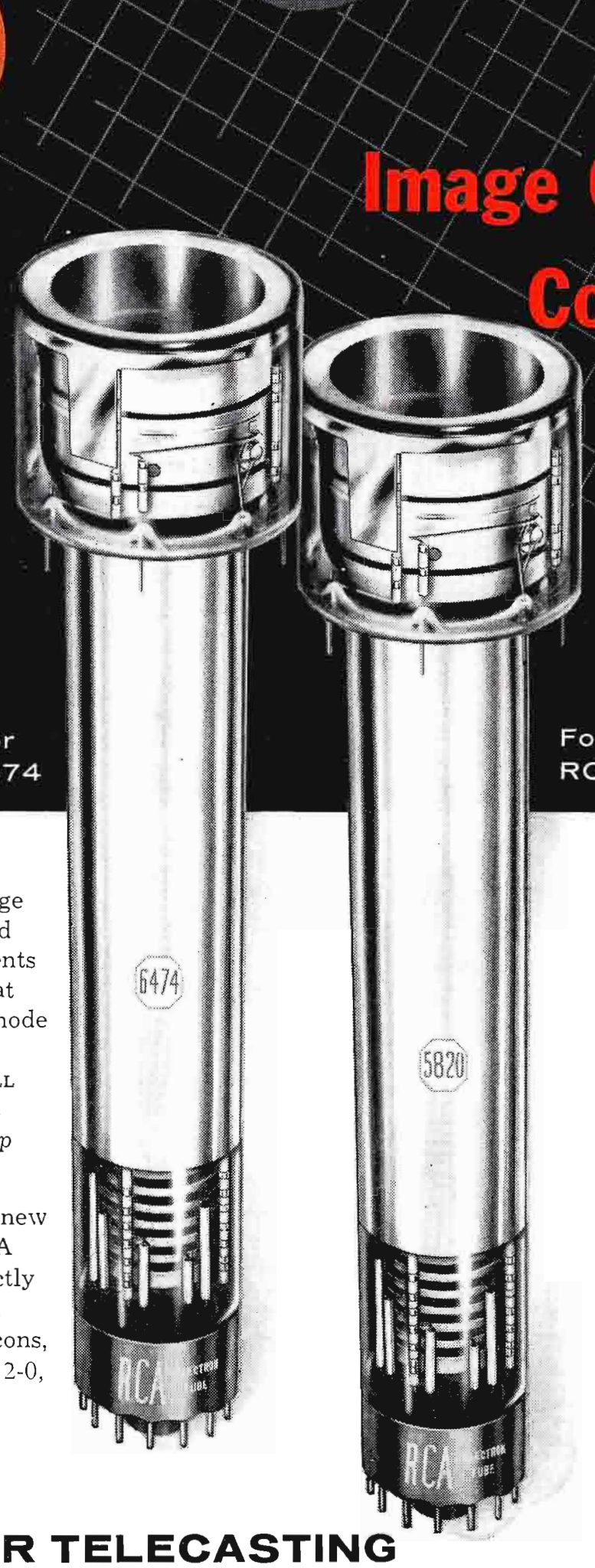
- RCA uses the highest quality circuits and components—gives you a wide safety margin of operations, minimizes costly, time-consuming replacement.
- Superior specifications include superlative wiring—for longer service without re-wiring.
- Long tube life in RCA Broadcast Equipment often saves more money in the long run than the initial cost of less carefully engineered equipment.
- Higher trade-in value for RCA equipment.

RCA offers a complete line of Broadcast Transmitters ranging from 250 watts to 250 kilowatts. Consult your RCA Distributor or write Dept. BE-12-H at the address below for complete information.

RCA INTERNATIONAL DIVISION
RADIO CORPORATION OF AMERICA
30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y., U. S. A.

SUPER-DYNODE and MICRO-MESH

Now RCA Image Orthicons Combine BOTH



For Color
RCA-6474

For Black-and-White
RCA-5820

If you are not yet in operation with new RCA Image Orthicons—which now combine SUPER-DYNODE and MICRO-MESH designs—get set for new improvements in picture quality and camera chain operation that will surprise you. Now you can say good-bye to dynode burn. No need to defocus anymore to kill mesh pattern and moiré. AND EVERY TV STATION MAN WILL LIKE THIS GOOD NEWS: *RCA Image Orthicons with Super-Dynode and Micro-Mesh design deliver top quality performance longer than ever before.*

RCA-5820's and -6474's with MICRO-MESH and the new SUPER-DYNODE design are available from your RCA Industrial Tube Distributor. Both types are directly interchangeable with all previous RCA-5820's and -6474's. For technical details on RCA Image Orthicons, write RCA Commercial Engineering, Section G-12-0, Harrison, N. J.

FACTS ABOUT RCA SUPER-DYNODE

For black-and-white

- Less dynode texture in "low-key" scenes

For color and black-and-white

- Easy to adjust dark-shading
- More uniform picture background
- Decelerator-grid voltage can be set at optimum value for highlight uniformity—throughout tube life
- Minimum undesirable background texture in low-light areas
- Cleaner colors in the dark areas

FACTS ABOUT RCA MICRO-MESH

- Eliminates mesh pattern and moiré effect without defocusing
- More than meets all technical requirements of 525-line TV system
- 750-mesh tube used with aperture-correction circuits can provide 100% response for 350-line information. 500-mesh tube without aperture-correction circuits produces only about 60% response for 350-line information. Although correction circuit can be used with 500-mesh tube, such use emphasizes moiré and beat-pattern problems
- Micro-Mesh minimizes beat pattern between color subcarrier and frequency generated by the beam scanning the mesh-screen pattern
- Improves detail of color pictures

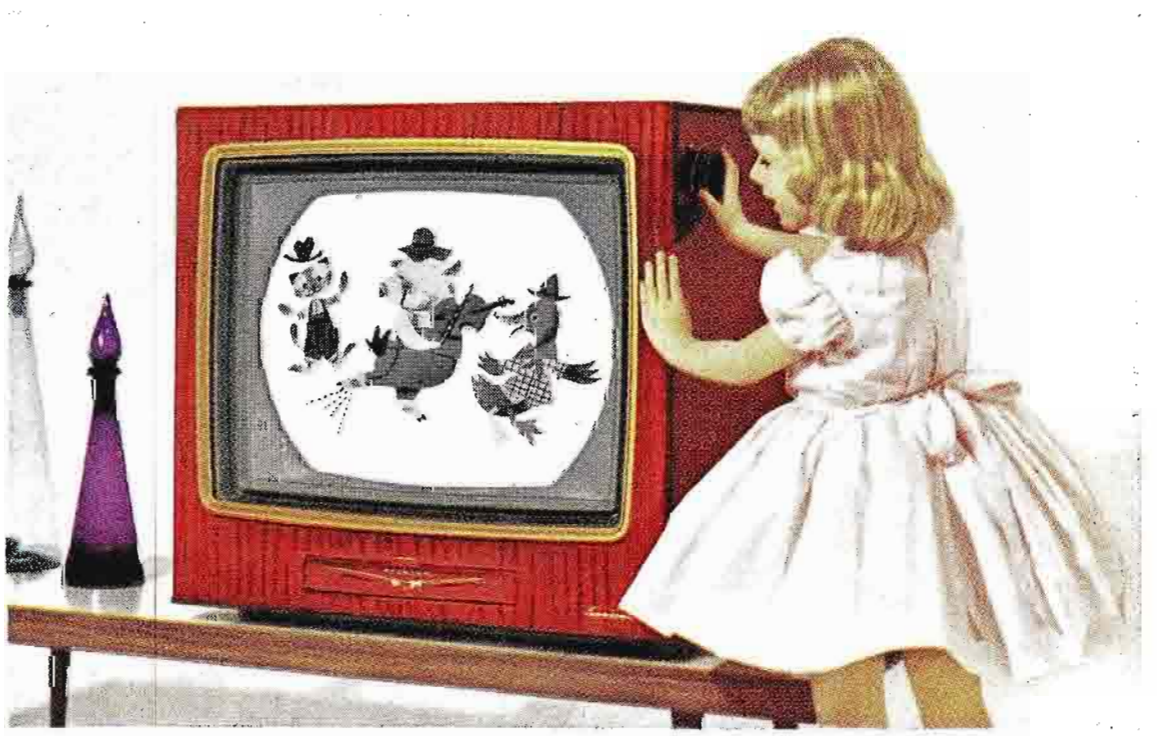
CAMERA TUBES FOR TELECASTING

RADIO CORPORATION OF AMERICA · Electron Tube Division · Harrison, N. J.

RCA VICTOR BIG COLOR IS BIGGEST BUY IN TV!

COLOR EVERY NIGHT. See color every single night in the week! More shows than ever before with something for everyone—dramas, comedies, Spectaculars, children's shows, local telecasts. And to every show, "Living Color" adds a *beauty* and a *naturalness* you must see to believe.

DEPENDABLE PERFORMANCE you can rely on. Big Color is *practical* color. And to RCA Victor owners, Factory Service is available in most areas at new low cost . . . as little as $39.95. VHF *Stanwyck* in limed oak grained finish. (21CT783) $550. (UHF model shown is slightly higher.)



LIKE 2 SETS IN 1. Because Big Color is *Compatible* Color, you see all color shows in beautiful "Living Color" . . . all regular programs in crisp, clear black-and-white. With Big Color you see *everything*. (Shown) *Aldrich* in mahogany grained finish. (21CS781) $495.

EASY TO TUNE. Even a child can tune RCA Victor Big Color TV. It's quick, accurate, easy—tunes in seconds. You simply turn two knobs and right before your eyes *the screen blossoms out in all the colors of life!* And once you set it, RCA Victor Big Color *stays* just the way you like it.

EASY TO OWN. (Shown) *Asbury Deluxe* in walnut. (21CD791) $750.

No other television gives you the enjoyment—the satisfaction—the 2-sets-in-1 value of Big Color TV!

For as little as $495 you and your family can get everything you want most in a TV set. You see regular programs in sharp, fine black-and-white—color shows in "Living Color." You get easy "Color-Quick" tuning, and famous RCA Victor performance with day-in, day-out dependability.

Why not join the satisfied owners of Big Color TV—see the full line of sets now at your RCA Victor dealer's. Ask him for a free demonstration—get the details on his easy payment plan. See your dealer soon.

RCA VICTOR Tmk(s)® RADIO CORPORATION OF AMERICA

Manufacturer's nationally advertised VHF list prices shown. Slightly higher far West, South, Canada. UHF optional, extra. Prices and specifications subject to change. All sets shown have 254 square inches of viewable picture area.

3J3160

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