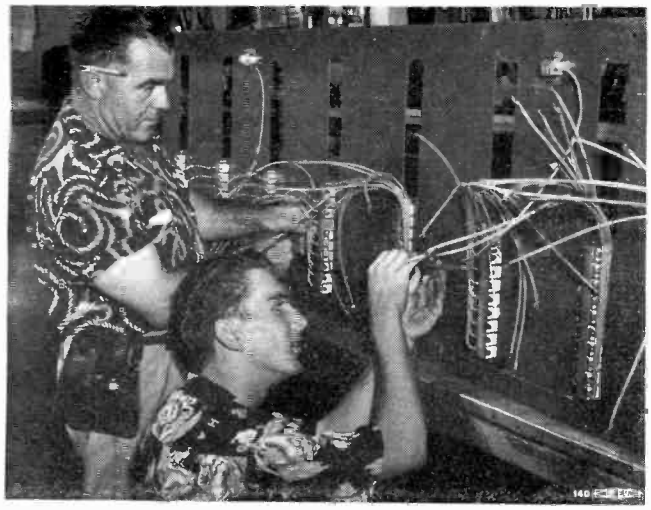
RADIO, TV and RECORDING

TECHNICIAN-ENGINEER

SEPTEMBER, 1952

International Brotherhood Of Electrical Workers (AFL)



• Gil Triggs, station electrician, and an assistant install lighting control panels in a KLAC-TV studio. The Los Angeles station has a highly-experienced construction and maintenance crew. All are members of IBEW Local 45 of Los Angeles.

• A KLAC-TV remote operation. A camera crew, complete with make-shift smudge pot covers the "Hometown Jamboree". Left to right, Rick Welch of the stage crew; Nick DeMos, cameraman; Larry Klingenberger and Dick Miller, both of lighting.

• In the KLAC-TV production film department Irving Gushin, film technician, prepares a reel for the station's excellent local and foreign news coverage.

• In the maintenance department, John DeMuth, supervisior in charge of maintenance, puts some intricate equipment in order. All KLAC-TV engineers have equally distributed overtime under present contract.

• Bill Haas, artist in the station's scenic art department, is an IBEW expert with the brush. Here he makes with the imitation wood grain for a studio show.

KLAC-TV on Cue

Staff Artists, Carpenters, Technicians, Engineers, and Others Make Up This 100-Per-Cent, Local 45, IBEW-Contract, TV Station

THE COVER

Manning audio control in Studio Two at KLAC-TV is Local 45's Assistant Steward Ray LaViolette. Studio Two is a 33' by 63' layout; it has switching and dissolving facilities for film and space for permanent sets on live commercials.

STARTING with the fact that all production and engineering employes at the station are IBEW card holders, and going down through the list of conditions under which they work, any IBEW broadcasting local might well envy the accomplishments of the members of Local 45 at Hollywood station KLAC-TV.

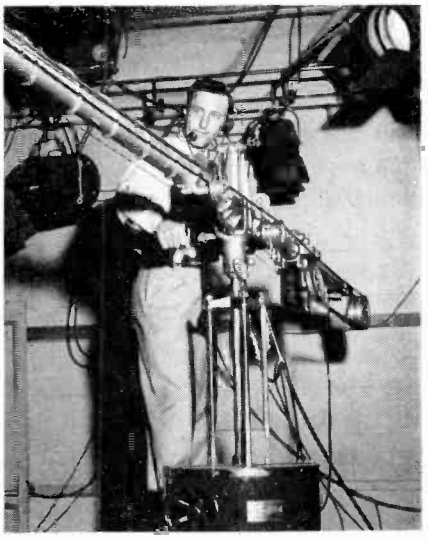
This progressive California local has jurisdiction over scenic art, makeup, carpenters, stage hands, all lighting, all projection, all film including live shooting of film, assistant directors, and, of course, all technicians. All cable handlers and dolly pushers are full technicians and members of the Brotherhood.

• In KLAC-TV master control—Earl Stevens, checking video levels in the rear; Don Peck, video supervisor; Al Browdy, steward; and Wally Getze, film supervisor.

• Something new in crows' nests. Chuck Franklin, Local 45 cameraman, covers a Los Angeles baseball game from high in the grandstand. The station covers a full schedule of remotes.

• Members of the KLAC-TV carpentry department preparing scenery. George Nelson, with the rule, and with him is Norman Houle, assistant scenic artist.

• Another camera on "Hometown Jamboree". Rudy Behlmer is stage manager, and Bill Lohnes is cameraman. A large audience watches each performance.



• Richard Burns, Local 45 technician, handles a boom in Studio One. Behind him a network of studio lights are ready for any special lighting problem.

The station contract, fully approved by the Wage Stabilization Board, calls for $82.50 to start, $90.75 after six months, $100 after one year, $110 after two years, sliding up to $145 after five years. This is for all engineering and lighting department employes.

Some highlights of the working conditions at KLAC-TV are:

• One extra hour of overtime each week guaranteed to all transmitter employes.

• If a meal period is changed with less than 24 hours notice falling outside of the prescribed period, a penalty of one extra hour at time and one-half plus one extra hour at straight time is given in addition to the day's pay.

• Car expense is 12 cents per mile.

• After 10 hours worked in any day, an allowance of $1.10 for a meal is given. Overtime, of course, starts after eight working hours.

• Overtime is distributed equally wherever it is practicable to do so.

• Four weeks vacation after three years.

• Senior employes given preferable assignments.

The station feeds a full schedule of programs to the Los Angeles area. Both studio and remote shows are top quality. Its business offices and studios are located on Cahuenga Blvd. in Hollywood, and its transmitter is atop Mt. Wilson, which overlooks the city. Operating on Channel 13, it has an effective radiated power of 31,400 watts in video and 15,750 watts in audio. The station was established in 1948.

Thanks to Al Browdy of Local 45 for supplying the story and pictures for this article. All photos are by Dusty Rhoads, KLAC-TV staff photographer.

ON THE LEGAL SIDE

NLRB Rules That Union is Not on Strike When it Refuses to Furnish Workers

The National Labor Relations Board ruled unanimously that a union is not on strike when it refuses to furnish workers to an employer.

Noting that the Taft-Hartley Act defines a strike as a "concerted stoppage of work," the board said workers cannot quit before they are hired—"they cannot stop work before they start."

The strike ruling came in a case involving secondary boycott charges brought by the Joliet (Ill.) Contractors Association against Glaziers Local 27 of the AFL Painters Union.

But a 3-man board majority also held that the union violated the secondary boycott ban by using a union rule to "encourage" workers already on the job to quit.

The majority ruled that the union acted illegally in "inducing" glaziers to stop working for one member of the association who had preglazed glass installed in his building project.

The union by-laws forbid a member from working for a contractor who does not do all glazing work on the job site.

Right of Unions to Charge Higher Rate For Reinstating Former Member Upheld

The National Labor Relations Board upheld the right of unions to charge a higher rate for reinstating a former member than the normal initiation fee for new members.

In a 3-2 decision, the board held that so long as the larger reinstatement fee was not "excessive" it was not an illegal fee simply because it was higher than the original initiation fee.

The Taft-Hartley Act forbids a union from charging a membership fee under a union shop agreement "in an amount which the board finds excessive or discriminatory under all the circumstances."

The NLRB decision was in a case brought against the AFL Machinists Union and the Chemical Corporation of San Jose, Calif., by an employe who was discharged after he refused to pay the $60 reinstatement fee required by the union's by-laws.

The employe, Roy E. Bauer, had been a member of the Machinists Union before at another plant, but dropped out. When he got his job at the San Jose company, he offered to pay the standard new member initiation fee of $30.

Some unions set higher reinstatement fees in order to discourage "scabbing."

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Puzzle: Which one of You Fellows Has an Aspirin?

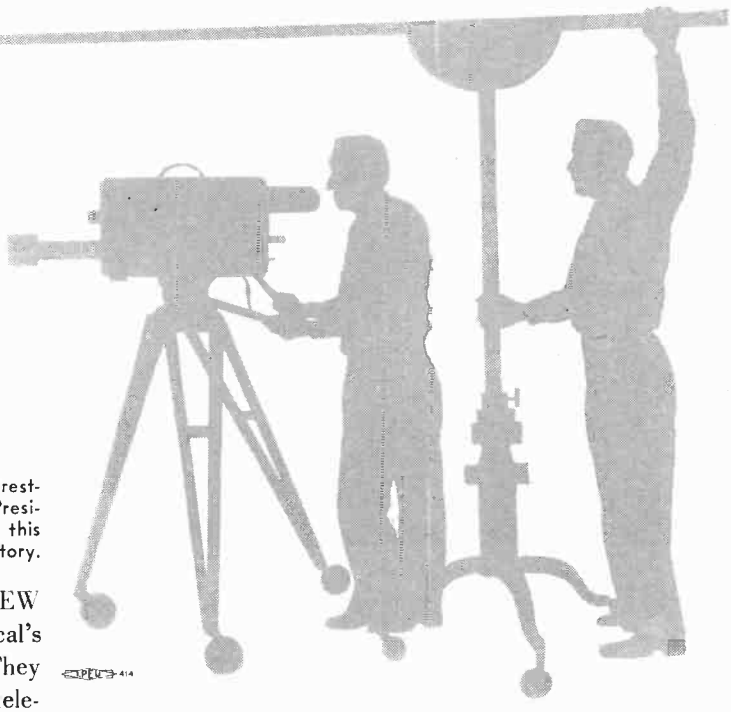
AN audio control man, a video control man, a cameraman, a projectionist and a stage hand decided to have their picture taken in a control room. Can you identify each man and his job with the following information.

The stage hand is at one end of the picture.
The video control man is not named Conway.
Brown is in the center, between the audio control man and the projectionist.
Adams is the projectionist's cousin.
There is nobody to Edwards' right.
Conway, who is nearest the audio console, lost to the stage hand in gin-rummy yesterday.
Adams stands to Edwards' left.
Daniels' wife just had a baby.

Answer at Bottom of Page 16

They're Looking Ahead In

KANSAS CITY



BY LEN BRANN

Vice President, IBEW Local 1259

EDITOR'S NOTE: Here are the details of one of the most interesting reports to the National Progress Meeting in Memphis. President Roy Barron of Local 1259 gave an inspiring report on this activity of his local union, and we are happy to repeat the story.

Engineer drives 75 miles each way; non-union men ask to join; as IBEW Local 1259 launches enthusiastic television training school for its member engineers.

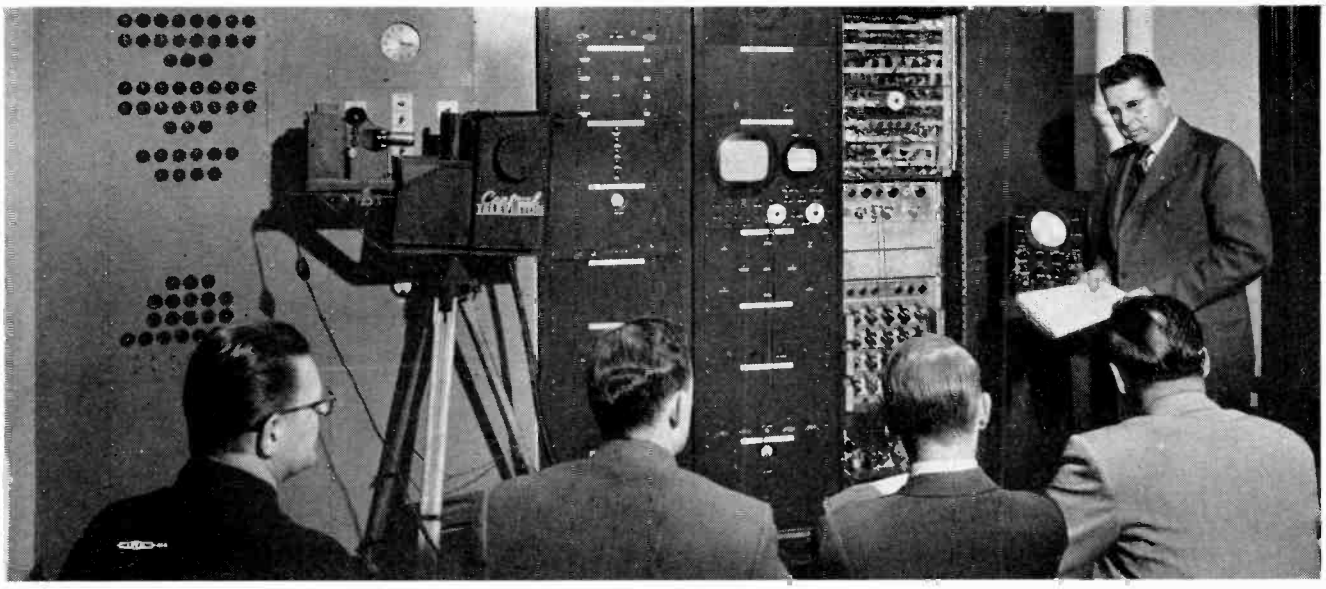
EARLY last fall, Roy C. Barron, President of IBEW Local 1259, Kansas City, called in the local's newly elected vice president, Len Brann. They discussed the sudden need for operational trained television people when and if the freeze on new TV stations cracked around the edges or thawed slightly. They realized that the problem of training licensed and experienced radio operators in television techniques was becoming acute.

Committee Named

In an effort to forestall having the local caught short in such an event, Vice President Brann was designated chairman of an educational committee of three members. The other two members appointed were Fred Cole and E. H. Walker.

This committee then polled the rank and file of the local. The desire for some form of television training was well-nigh unanimous. Among those members in favor interest was intense. The committee then concentrated on getting pledges of attendance from members staffing the stations in contract with LU 1259.

Officers Barron and Brann then entered into negoti-



N. E. Vilander, Central's chief TV instructor, demonstrates five necessary functions of the sync-generator to T. A. Lantz of Station WDAF; Fred Cole, KMBC; Ray Brophy, WHB; and Bob Lawson, KCMO.

With schematic drawings, Ed Hall and Bob Earsom, both of Station WHB, study the set-up controls on a master camera mixer and monitor control unit as described by Instructor Vilander.

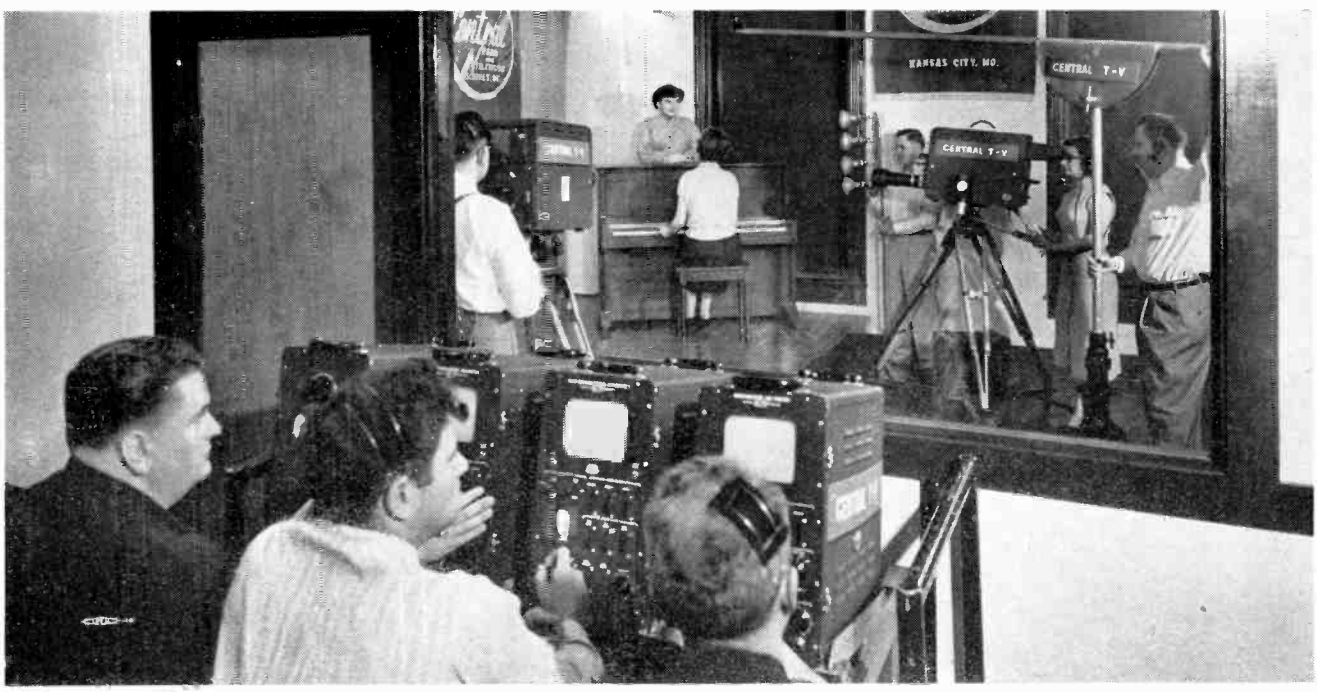
ations with C. L. Foster, president of the oldest and largest electronic training school in Kansas City—Central Radio and Television Schools, Inc.

Several conferences and many phone calls followed. Details emerged slowly. Expected attendance by local members was close to 50. Mr. Foster set the class minimum at 10 and maximum at 15 students. These limits were to insure top efficiency and greatest personal contact in leveling to a common plateau of background knowledge the starting point for this new training. It was decided that instruction was to be for a total of 25 hours, ten weekly sessions of two-and-a-half hours each. The intent was to provide a minimum, "short-horn," course of necessary basic theory, coupled with familiarization of controls and cabling and as much operational practice as can be crowded into such a course.

School personnel and equipment were available only on the five weekday afternoons and three nights per week. In a three-way conference between Mr. Foster; N. E. "Vi" Vilnder, Central's chief television instructor and Local 1259's Vice President Len Brann, a course of study was selected. The TV camera and video input equipment operation were the first subjects for study. There were lecture sessions as well as practice work in the school laboratory. School and union officials agreed that the training should be mechanical rather than theoretical, in order to give the students the most practical results for the amount of time they spend in training.

Three classes were started. The first class kicked off on Wednesday night, January 30. This No. 1 class began at seven in the evening and, after a ten-minute break at mid-point, was released by nine-forty.

Local 1259 regularly meets on the second Wednesday of each month. It was not surprising, thus, that Wednesday night was the one most free from conflicts with work schedules, and fixed social commitments. Due to union meetings, Class No. 1 would fall back



Local 1259 members completely man the audio gear and camera chain on a practice telecast. In the control room—Don Thomas, KCMO, at the audio mixer; Bob Earsom, WHB, at camera control; and Ed Hall, WHB, at master camera control. In the studio—Milt Ruble, KCKN, at Camera 2; Bob Lawson, KCMO, at the light bank; June Robinette, KCKN, the local's only lady member, at Camera 1; and Charles Nonemaker, WHB, on the mike boom. The talent at the piano are Central Airline training students.

one session per month, and for this reason was started early.

The second class was an afternoon one. Its initial date was Tuesday, February 12. Hours were two until four-forty. The course of study was completed by No. 2 class on April 15.

Friday, February 15, Class No. 3 got under way. It was the second night session. Hours were the same as for Class No. 1. The last lesson of the group was finished on April 18.

Finally the early starting No. 1 class finished on Wednesday, April 23. This completed the activities for the spring and summer months. Proposed start of two additional sessions is tenatively set for September 15, after vacation problems at both the stations and school are on the wane.

The members of the educational committee of Local 1259—Cole, Walker, and Brann—are proud that not more than three or four conflicts were unresolved. These few members, who were omitted, will be picked up in the fall sessions. The committee shall then approach management for shifts in work schedules, so as to enable staff-men to attend classes, emphasizing that they are are of primary importance to both parties; this despite the fact that all the expense was borne by the union and its members, the latter giving up portions of free time to an activity that will benefit management greatly, if only in a secondary manner. No greater proof is there of the desire of staff-men to keep abreast of developments in their chosen field is needed, management being aware or appreciative notwithstanding.

Training at Central is on DuMont remote field gear. This is a two camera chain. Students are taken step-by-step through a laboratory model sync-generator. The school furnishes each union member attending with a 30-page mimeographed booklet, which contains five essential schematic wiring diagrams. Similarities and differences from RCA and DuMont gear are emphasized in the course. Central awards certificates to all who finish the course with an average of 70 per cent or better in grades and attendance.

During preliminary negotiations between the union and the school, officers of both were besieged by radio and television service men desiring to attend. Reluctantly these people were shunted away from this particular set-up. The desire was to slant the entire course toward the operational end, which is of primary importance to the local union members. Due to the limited time and money of staff-men all tinges of receiver servicing information were weeded out of the sessions. Perhaps the future will allow this desirable angle to be covered.

Central's management cut prices to the bone to enable Local 1259 to institute this basic training. The total cost to individual members was $12.50 for the ten sessions. This cost is only $1.25 per two-and-a-half hour lesson or 50 cents per hour. Operational television training at 50 cents per hour is truly a great bargain!

Local 1259 members examine a TV camera horizontal drive amplifier, as N. E. Vilander lectures. The students: Carl Bliesner, chief engineer, WREN; Raqmond Brophy, WHB; Len Brann, WDAF.

Due caution was taken in setting up the course. This was training for professional radio operators actively engaged in the field, but both the local union officers and those of the school had the distinct sensation of feeling their way through the course, as very little was known of the educational background of the members attending. Where to start so that no one was left behind was one of the problems. How fast and far to progress in 10 class meetings was another. We now feel that the material used, although a compromise between two extremes, was very successful as a preliminary starting point. All who completed a majority of this work now have a common reference point in theory and terminology on which to build more advanced and useful knowledge.

Due to emphatic demands from the membership, Local 1259 undertook this endeavor. It was a collective action, taken to avoid lagging behind in the electronics industry. The advent of television most surely represents a huge, and demanding step forward. Once members were aware that plans were being made, they became impatient to get under way. They were very helpful and flexible with the committee as it attempted to schedule the three sections in such manner as to accommodate the greatest number. To a man they realized that their greater availability for these lessons would bring the starting day nearer. Almost all gave triple or quadruple choices of days and times that they could attend. Indeed, member's interest was so great that three of them attended faithfully, although it meant a weekly drive of 75 miles each way. Two

IBEW staff men from five stations train in TV. In the foreground, George Egli, WREN, audio mixer; Fred Cole, KMBC, camera control; and David Reed, KCLO, master camera control. In the background, Len Brann, WDAF, at Camera 2; T. A. Lantz, WDAF, at the light bank; two Central Airline students; Everett James, WREN, at Camera 1; and Leo Kallenberger, KCMO, at the mike boom.

others came in from their place of employment 40 miles northwest of Kansas City.

There were two interesting and very important sidelights to this program. One was the great interest displayed by staff-men and management of non-organized stations in the area. Several non-union operators from these stations made application to attend. They were told that they would be most welcome. As a result two or three of these men came. They were highly pleased with both the union and the school. The reasons why many more of those who professed interest did not enroll have not yet come to light.

Commented one of the area's non-union staff-men: "Look what Local 1259 is doing for its members now, insuring job security by education above mere competency . . . and all at such a low rate!" After such a statement, he, nevertheless, did not accept the union's invitation to attend.

One facet of the training resulted in an immediate benefit to the union. For many months previously the union had been actively trying to organize a local station in a neighboring small city. The three staff-men of this station were invited to join the TV classes. Two of them did so. Within a week Local 1259 had secured an initial contract with their employer. The possibilities along this organizational line are, thus, unlimited, as the school is more than willing to negotiate reasonable rates and times with a group as large and responsible as 1259.

Now, for a summing up of results. In the three initial classes there were 43 enrollees, who, in the main, were from eight different stations. Stations represented included KMBC, KCMO, WDAF, and WHB of Kansas City, Mo.; KIMO of Independence, Mo.; WREN of Lawrence, Kans.; KCLO of Leavenworth, Kans.; and KCKN, Kansas City, Kans. Three enrollees were chief engineers at their stations.

During the ten-week course two of the students moved from the city. Despite this and the heavy calendar of spring remotes in force at many of the stations, 35 of the enrollees finished the work. They were awarded an official certificate by Central, attesting to their completion of the course.

Pointing up results is the fact that three of these enrollees are now working in television, whereas, none were previous to this training. In addition, two of the above three that are in television are engaged at network level.

One of the local's members taking the course was out of work. Upon completion of the schooling, and almost as a direct result of it, he was immediately employed in a progressive regional radio station. The whole program has been most worthwhile to Local 1259 and its members.

At the conclusion of negotiation between union and school officials, a handshake between J. L. "Len" Brann, Vice President of Local 1259, and C. L. Foster, President of Central Radio and TV Schools, sealed the deal.

As to the local union's plans for the future . . . for the fall one class of 12 to 15 students . . . same curriculum as the three spring classes. This will pick-up those omitted in the spring sessions. Several non-union operators from out of town are to be included. Three or four of 1259's members, who lack a class or two of completing their work, can make up the needed sessions. They are entitled only to the sessions missed. If they are alert and attend during the proper weeks, they also will receive their certificates.

For those who have completed the initial training, more intense work is in the offing. There are six lessons on basic circuits used in television. These deal with square wave voltages, R-L, R-C circuits, and Limiters. DC restorers, clampers, and clippers will be included. This is a necessary preliminary course of study, upon which a thorough grounding of Sync-Generator information must be based.

Post-Graduate Lessons

In these post-graduate six lessons, two classes will probably be held—one at night, the other an afternoon class. As there is no maximum class limit, all 35, who have completed the preliminary study, should be in these two classes. Furthermore, nearly equal classes of from 15 to 17 members are sought.

By approximately November 1, the six lessons should have been completed. Our plans are complete for all who have come this far.

Later, 10 lessons of vital importance to the useful understanding of television are planned. The Sync-Generator will be thoroughly and intensely covered. This unit is the heart and soul of television, for without it there can be no television as we know it.

Thus, Local 1259's fall plans are for 16 more sessions in two units. A series of six, followed by one of 10 lessons, priced as a package deal. Again Central has pared costs down to a minimum, as the tenative quoted price per individual is only $22.50.

All operators progressing this far have spent in the neighborhood of $35.00. For that, they will have received training enabling them to operate video gear of camera chain and associated equipment and contribute to the set-up of the same. These members can be of great value in routine maintenance in a television installation, and can be of better-than-average value in trouble shooting on the same.

Hence, definite plans are formulated through, approximately February 1 of next year. Local 1259 does not plan to halt there. Some educational activity shall be a continuing effort by the local. Where to go next, is now an unanswered question. As the members' greatest educational needs are made known and their interests expressed at the conclusion of these plans, new endeavors can be plotted.

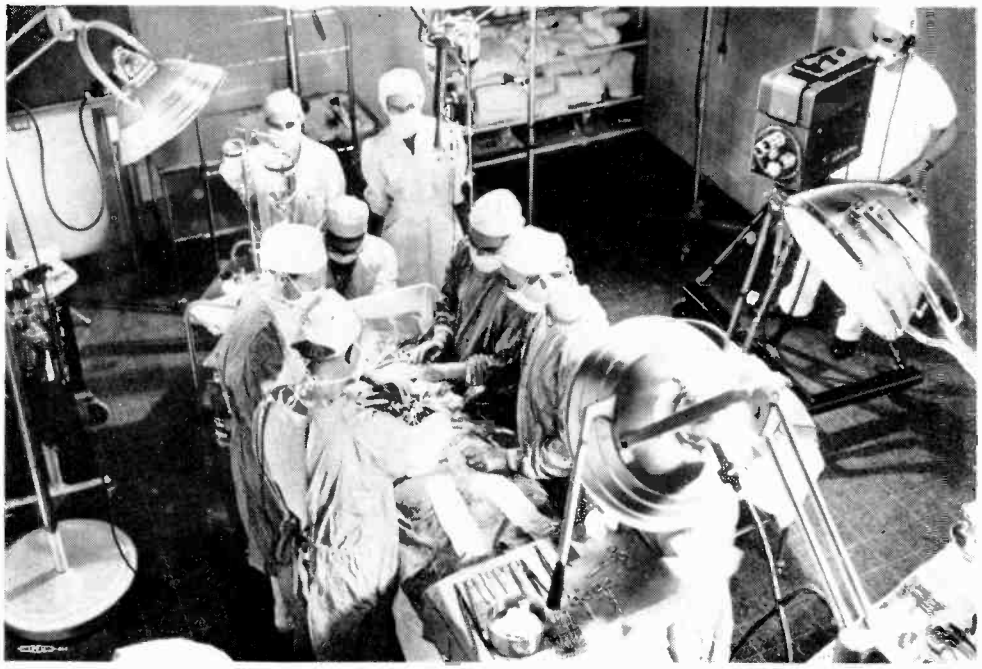
One Moment Please . . .

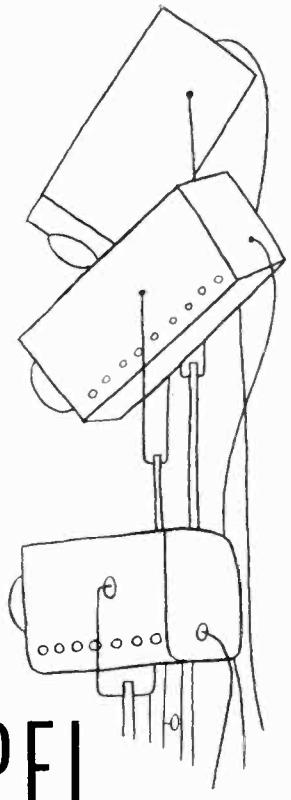
A Chicago electrical worker was determined to see his first American political convention. He had tried for weeks before the Democratic convention came to his home city, but he hadn't been able to obtain a gallery pass.

Came the week of the convention, and, in desperation, he remembered something he had seen on a tavern TV screen during the Republican convention. What he recalled was a relatively new invention—RCA's walkie-lookie—a small camera and transmitter strapped to the back of a technician.

That night he went to work in his basement. By 1 a. m. he had completed a small metal box with so many protruding gadgets that it looked like a Space Cadet nightmare.

Next morning he found to his delight that he could walk freely into the convention hall and onto the floor, with the phony box strapped to his chest. He became so confident that he even interviewed a number of delegates who thought their faces and statements were being televised across the country. Later, he confessed to a fellow union member that his metal box contained only one thing—an envelope containing $75 for bail in case he was arrested. (LPA)





LIGHTS--CAMERA--SCALPEL

Skilled Technicians and the Wonders of Color Television Are Making it Possible for Every Medical Specialist and Family Physician to Keep Abreast of Latest Medical Knowledge

AN audience of about 30,000,000 Americans watched part of a major medical operation on their TV screens last June. While four tireless physicians removed half of the stomach of an elderly patient, a coast-to-coast audience caught a glimpse of the antiseptic mysteries of major surgery. (The picture above shows an NBC camera on this special event.)

Commercial television scored a "first" that Tuesday night in Wesley Memorial Hospital, Chicago. For the first time, the American Medical Association, meeting in convention for four days, permitted public telecasting of two half-hour live programs of their convention activities.

TV coverage of medical operations was not new to the physicians assembled in Chicago. Smith, Kline and French pharmaceutical laboratories in Philadelphia have exclusively sponsored closed-circuit color telecasts of surgery (for physicians and nurses only) since 1949. At state and national medical meetings the firm sets up its 20 receivers in a convention viewing hall, arranges several rows of folding chairs, and doctors busily pacing the hotel corridors and attending convention sessions, many drop in any time during the scheduled telecasts and watch everything from a major heart operation to a clinical discussion of skin diseases.

The use of television in teaching medicine and surgery was recognized as a possibility before World War II, but the first formal attempt to use the medium didn't come until the winter of 1947, when at Johns Hopkins in Baltimore five operations were transmitted by TV to receivers in classrooms during a meeting of the Johns Hopkins Medical and Surgical Association.

For several months thereafter, other black-and-white

• Members of the staff of Johns Hopkins Hospital watch a color-televised operation on the screen of a special receiver installed in the hospital during a demonstration for an AMA Session.

presentations were made at medical meetings, and the response was encouraging.

In the fall of 1948 Smith, Kline and French discussed with the Research and Engineering Laboratories of the Columbia Broadcasting System, the possibility of manufacturing color-television equipment adapted for hospital use. As a result, a color camera and a camera chain were custom-produced by CBS and color receivers were built to CBS specifications by Zenith in cooperation with Webster-Chicago. This equipment, owned by the pharmaceutical house, has been used in all of the subsequent telecasts sponsored by SKF.

After two weeks of preliminary testing in the Hospital of the University of Pennsylvania in May, 1949, it was installed in convention hall at Atlantic City, and the American Medical Association saw color TV for the first time.

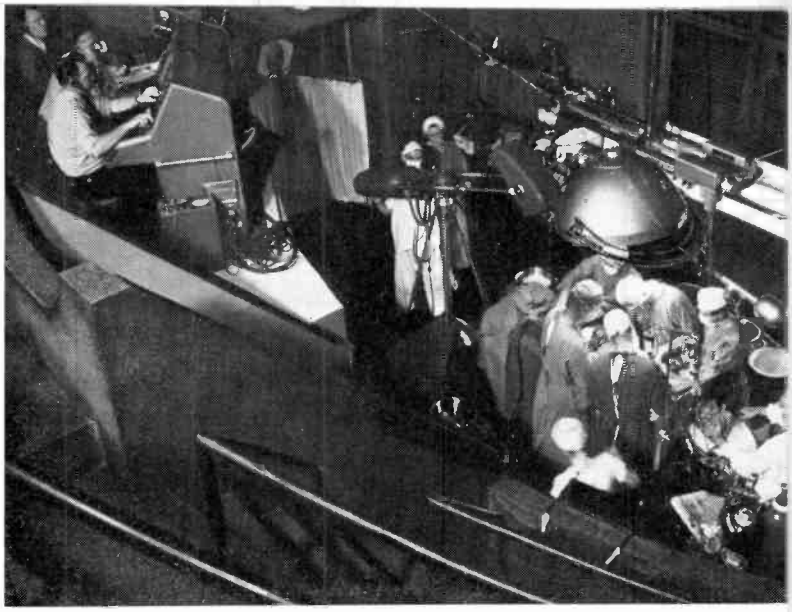
The equipment used is the CBS field sequential system. It consists of a special camera set on a high tripod and a six-foot boom for surgical operations (There is too much risk and no time in major surgery for angle shots, etc.) plus a regular CBS color camera for clinic demonstrations, control and audio equipment, and 20 receivers. The cameras are made spark-proof to insure safety in operating rooms. Dollies permit the cameras to be moved easily. Ordinary operating room lighting is usually fine for surgery. Fluorescent light banks are used for clinic demonstrations.

Transmission of the programs from the hospitals in almost all cases have been over a closed circuit via microwave. When transmission distance is less than one-quarter mile, coaxial cable suffices.

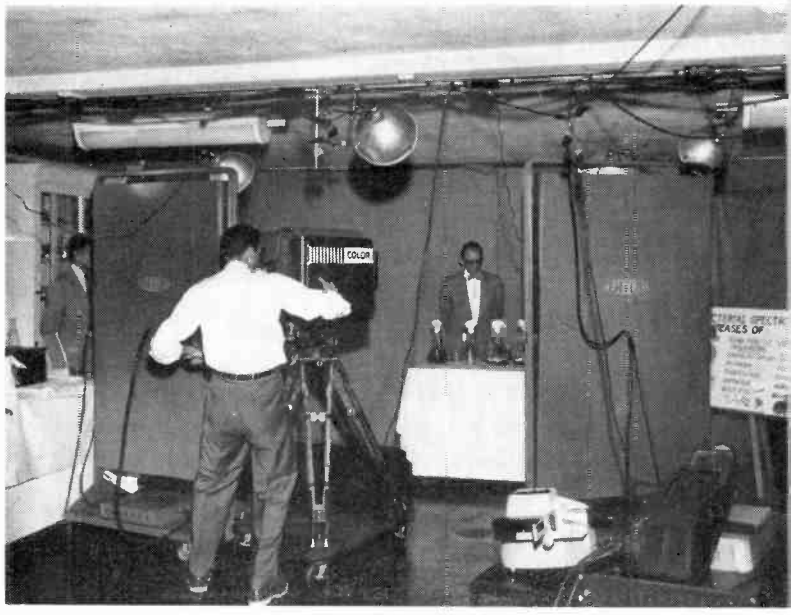
Three technicians are needed at the transmitting site —one man each at the camera, control panel, and audio equipment. When all 20 receivers are used, three technicians are required at the receiving point—two men to adjust receivers and one to monitor the signal. Six to eight engineers and technicians comprise the usual SKF crew.

For the first year and a half of its color venture, the SKF laboratories used CBS men out of New York City. Later, it acquired its own full-time crew. The units has a manager, who acts as director, and a staff physician, Dr. Kendall Elsom, a professor at the University of Pennsylvania Medical School, who often handles the narration. For demonstrations in Milwaukee and Philadelphia the pharmaceutical house has used outside technicians, but it now sticks pretty much to its own crew.

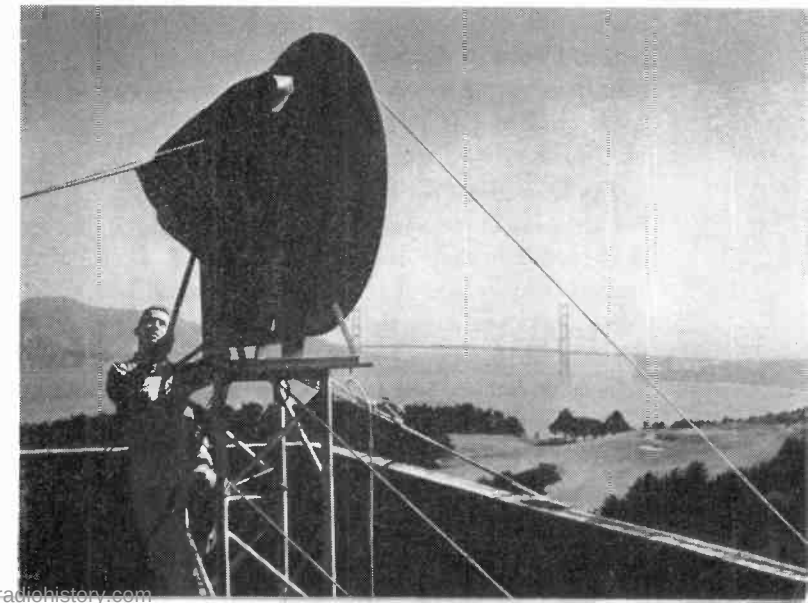
Color TV of medicine and surgery is opening up vistas for educators and scientists. It may not be many years before other fields of knowledge take up the trend. TV engineers of IBEW may someday find all manner of jobs on special closed-circuit crews at universities and other teaching centers, because of the example set by the medical colorcasts.



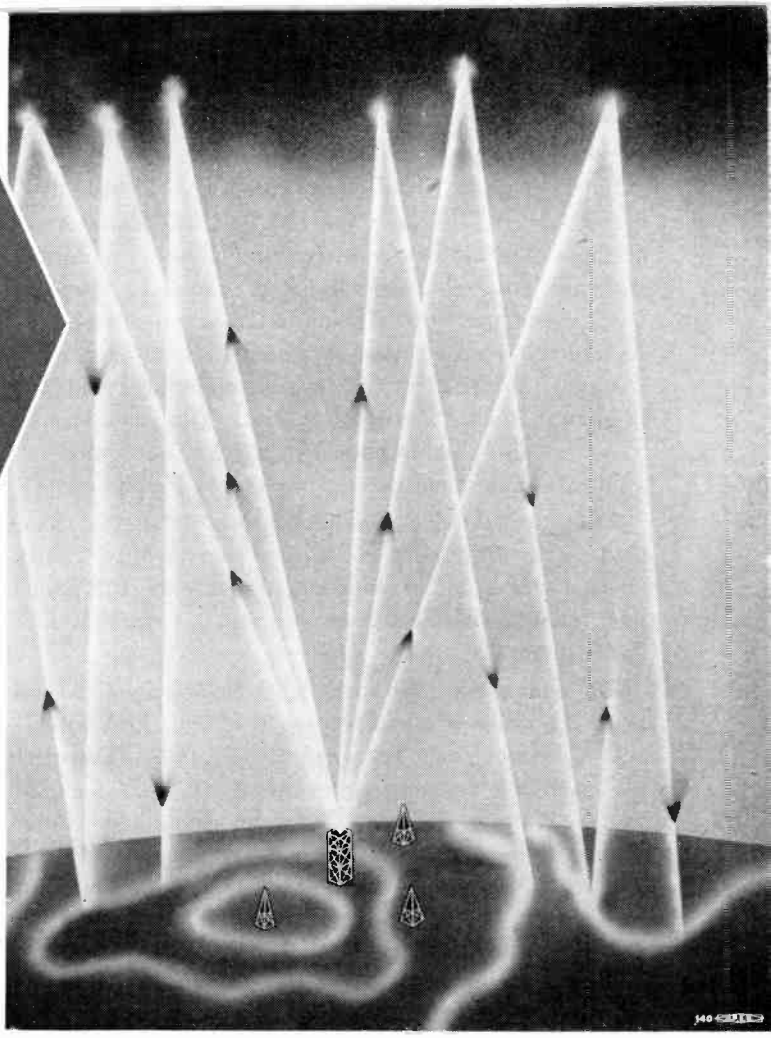
• Technicians of the Smith, Kline and French TV staff televised a surgical operation at St. Luke's Hospital, Chicago, during a Clinical Congress of the American College of Surgeons. The color camera, like a large teardrop, mounted on a levered tripod, can be seen poised over the operating table. Engineers at control desk, upper left, monitor the colorcast.



• Above: Last month SKF colorcasters presented a "clinic" program during the Centennial Convention of the American Pharaceutical Association in Philadelphia. Below: A parabolic reflector installed atop Fort Miley Veterans Hospital in San Francisco, transmitted a program to AMA members surrounding receivers at the Masonic Temple downtown.



The Mysterious IONOSPHERE



● Pictorial representation of the systematic technique used at the National Bureau of Standards to study the movements of the winds in the ionosphere. A transmitter (center) sends out signals which are reflected back to the earth by the ionized layers in the upper atmosphere. "Single-hop" reflections are detected by three receiving antennas and their associated receivers surrounding the transmitter. The ionosphere, made up in part of patches of ionized matter, scatters and reflects the signals, producing a "diffraction pattern" of signal intensities at the ground (foreground). As the overhead layer moves, the ground pattern also moves, and the fading sequence appears first at one antenna and then the other. Three antennas are used to obtain the direction and velocity of the motion by triangulation methods. This motion of the patches is partly responsible for the fading experienced by so many operators in long-distance communications.

ABOUT 60 miles above good old sea level the ionosphere begins. To the average person this fact would hold no more interest than the knowledge that he himself lives in the troposphere, which extends 10 miles up at the equator and six miles up at the poles.

But to the broadcasting engineer it has a special, if academic, appeal, for without the ionosphere there would be no broad, worldwide radio signals and communications, and because of the ionosphere he may one day be able to spread television hundreds of miles farther than his present horizon.

Nothing was known about this turbulent region of solar radiation way out in space until radio was invented. It was discovered because radio waves were reflected back to earth when they struck it. Back and forth bounce the waves between the ionosphere and the earth until at last they reach their destination in the form of dot-dit or voice.

The ionosphere is still part of the earth's atmosphere, but this aerial domain of the rocket ships is highly electrified by solar radiation, or ionized, as we say, and its temperature changes from 27 below zero at 50 miles above sea level (where the stratosphere ends and the ionosphere begins) to a plus-1898 degrees and unbelievably hot at 250 miles up, which is the highest altitude reached by a Wac Corporal (i. e., a special research rocket and not a pinched female).

Actually, the ionosphere varies in height from 65 miles or less above the earth to four times as high, and it has three recognized layers—the E, the F1 and the F2. The E region is about 62½ miles up. In the daytime the F1 approaches 125 miles, and the F2 layer reaches 250 miles above the ground. These layers move up or down. At night the F1 layer disappears, and the F2 layer drops 60 miles or so and is renamed F.

That's fine, you say, but how does that affect the status quo?

Well, this E region—the bottom layer—puts up a formidable front to high frequency radio waves and causes a television viewer in West Virginia to pick up Cotton-Eyed-Joe music from Fort Worth's WBAP-TV, and it even causes the veddy austere productions of the BBC to hop, skip, and jump across the North Atlantic and wind up on a TV screen in a cold-water flat in Brooklyn. It does not happen often, of course; but radio men at three American research institutions want to find out exactly why it happens and how they can put this freak of nature to an unfreakish everyday use. What they especially hope to do as a result of their discoveries about the ionosphere is to send TV programs 1,000 miles or more without microwave, cables, or any-

thing but the E layer and some high frequency transmitting gear.

The phenomenal propogation of VHF radio waves (i. e., frequencies between 30 and 300 Mc) to distances well beyond the horizon has been observed for many years. These curious, temperamental outbursts of the heavens can nearly always be blamed on one of two causes—(1) at short and intermediate ranges, special conditions in the troposphere like low pressure areas, etc. and (2) at greater distances, ionospheric reflections. The very high values of the F2-layer critical frequency (above which frequency radio waves will not propogate) account for occasional cases of fairly strong fields at distances of several thousand miles, while sporadic E-layer ionization often accounts for erratic but strong fields out to about 1,200 miles.

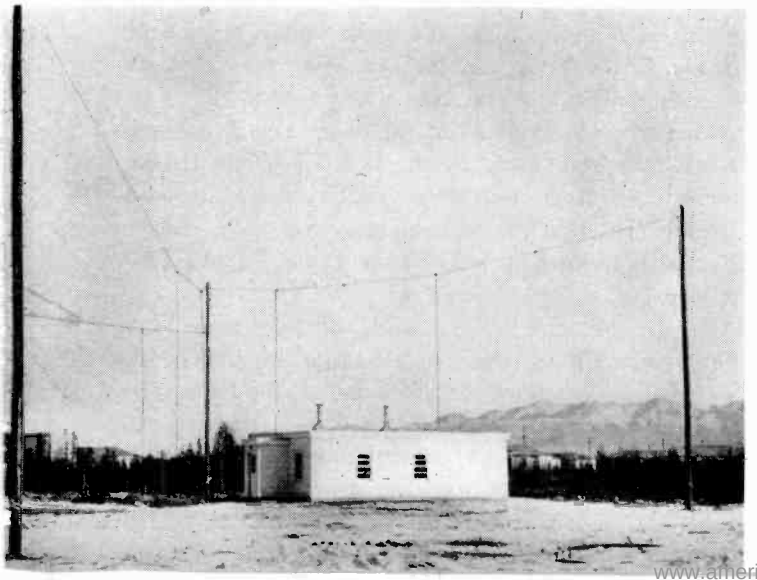
Cosmic Havoc in the Sky

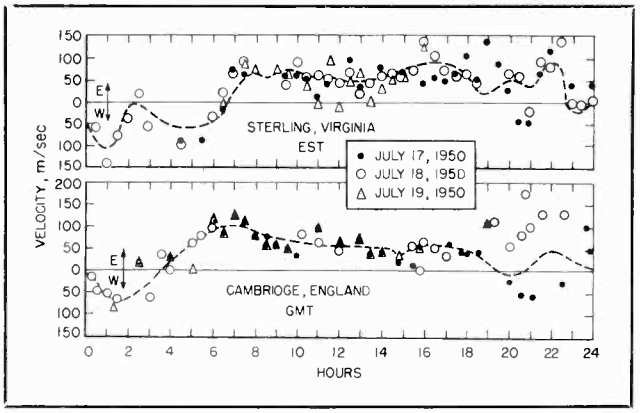
These cosmic disturbances not only add a bit of novelty to radio and TV reception, but they play quite a bit of havoc with communications as well. Normal trans-Atlantic communication which allows you to phone London as successfully as you call in your home town becomes impossible at times due to abnormal conditions in the sky. Short wave radio propagation in the North Atlantic and Pacific is interrupted so regularly by ionospheric turmoils that the National Bureau of Standards of the Department of Commerce has had to establish special radio warning services in Alaska and at Washington, forecasting such disturbances.

The National Bureau of Standards has been issuing radio disturbance warnings for about 10 years. It takes information obtained from a world-wide network of geophysical and solar observatories and prepares a forecast for regular distribution.

Their forecasts are issued regularly each day at 0500, 1130, 1700, and 2300 Universal Time. Each forecast is broadcast by the Bureau's radio propagation field station WWV, at Sterling, Va., for six hours, until the next forecast is issued. To add to the coverage and the warning service, a second warning center has been established at Anchorage, Alaska, to assist shipping, airlines, and communications, in the North Pacific.

• Site of the National Bureau of Standards new North Pacific Radio Warning Service at Anchorage, Alaska. The building houses the forecasting center and transmitting, receiving and recording equipment. The antenna system shown is used in monitoring the field strength of long distance radio signals. In addition to standard ionospheric-sounding equipment, the station also has a visually recording magnetograph for observing the variations of the earth's magnetic field and radio direction finders.





• Comparison of winds-of-the-ionosphere data recorded at the NBS radio propagation field station at Sterling, Va., with those recorded at the Cavendish Laboratory propagation station at Cambridge, England. The data show a good agreement between velocities of winds measured over the British Isles (lower) and over the United States (upper). Most investigators believe that the ionospheric winds belong to a world-wide circulatory system.

Magnetic disturbance periods can often be forecast several days or weeks in advance. Likewise, remarkably successful predictions of the gross characteristics of the ionospheric layers many months in advance have been made by the NBS Central Radio Propagation Laboratory for almost a decade in a form convenient for calculating the utilization of the ionosphere for communications.

The negative approach to the quirks of the ionosphere has long plagued radio research men. They grew tired of merely warning of disturbances. They began to seek some method of overcoming the disturbances for good. Instant and sure communications at all times is greatly to be desired for many reasons.

In an investigation cooperatively conducted by the National Bureau of Standards, the Massachusetts Institute of Technology, and the Collins Radio Company, a group of scientists feel that they have at last found radio signals which will penetrate the ionosphere barriers under any and all conditions. Their early results reveal the uninterrupted presence of weak, but *constantly observable*, very high frequency signals over a 774-mile test path time after time—signals which come through even when all other reception is out.

Beyond the Horizon

As you know, VHF waves can be transmitted not much farther than the line of sight. They won't bend around the curve of the earth. Since television is transmitted by VHF, it has been limited to little more than the line of sight from the antenna under normal

conditions. Under abnormal conditions, as we have mentioned, these VHF waves sometimes cause English signals to bounce over to America. During such conditions, which last only a few hours each month, VHF can be used for any form of communication.

Ordinary radio waves of lower frequency, on the other hand, can be sent long distances because they are reflected or bent back by the ionosphere and returned to earth.

You might think it would be wonderful if TV, too, could be bounced off the ionosphere. However, the interference from other transmitters would produce chaotic results.

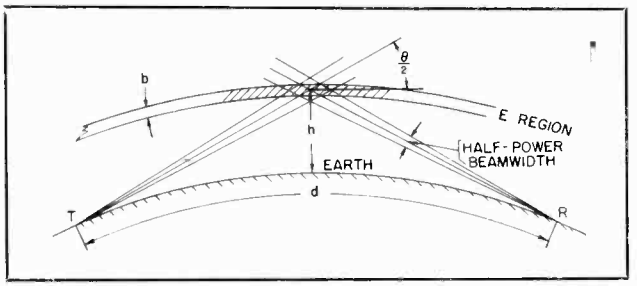
VHF Goes Through

Anyway, instead of bouncing, VHF waves generally go right on through the ionosphere. They scatter like some many tiny fragments through a sieve as they reach the finely-distributed ionization of the E-layer.

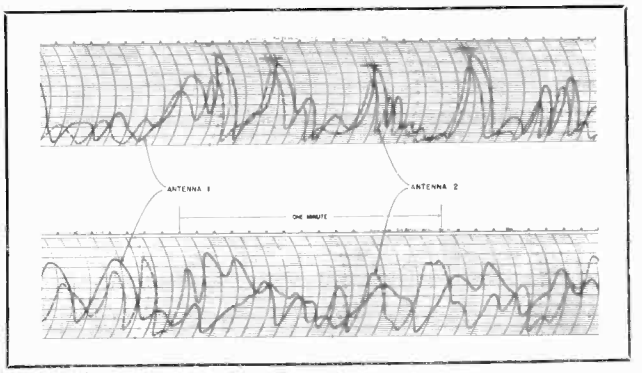
The men considering the problems of long distance communications worked a number of formulas and figured that a weak and scattered radio signal could be picked up at distances up to as much as 1,250 miles, but that at distances under about 625 miles, these weak signals would be masked by low frequency radio waves near the earth.

The scientists set about finding out exactly how VHF waves act in the upper atmosphere. A transmitter, operated by the Collins Radio Company at Cedar Rapids, Iowa, radiated continuous-wave signals at a frequency of 49.8 Mc, which were directed toward NBS receivers at Sterling, Va., 774 miles away. The RF power to a horizontal rhombic antenna was an estimated 23 kw. Similar antennas were used at both the receiving and transmitting locations, each 41.2 feet high, having 500-foot legs and a tilt angle of 83 degrees.

The scientists had planned to conclude their study in a few days. But when the hoped-for signals were



● Drawing showing the geometry for E-region scattering. Very high frequency signals are transmitted from Cedar Rapids, Iowa, (T) and are directed toward the E region of the ionosphere, about 50 to 70 miles above the earth's surface (h). The radio waves are reflected in a region about three miles thick, and directed back to the earth to the receiver at Sterling, Va., (R). The total distance (d) between Cedar Rapids and Sterling is 774 miles. The transmitted power was an estimated 23 kw, and the received power was of the order of 10-14 watt.



● Automatic record of fading radio waves measured at the NBS radio propagation field station at Sterling, Va. The graph shows the output voltages of two antennas detected as a function of time. One voltage record is superposed on the other. The time scale runs from right to left; the pegs at the top of the graph are 4-second markers. The ground diffraction pattern is first intercepted by antenna No. 1 and about 2 seconds later, by antenna No. 2, which is placed approximately 200 meters from No. 1.

picked up—and picked up *continuously*—they knew they must continue their experiments.

They soon discovered a characteristic of these weak, scattered VHF waves that can be of immeasurable military and civilian value: When ordinary radio signals faded out, as inevitably happens from time to time, the scattered VHF signal grew stronger.

It was true that the intensity of the received signal varied, sometimes three or four to one. But this compares with an ordinary radio wave variation of thousands to one—including many periods of just plain silence.

Practical drawbacks exist at present. To pick up these weak but unfailing signals requires the maximum power in transmission now possible, extremely good antenna, and the most sensitive receiving equipment. Consequently, the present cost is rather tremendous.

Limits Approached

Theoretical limits are nearly approached on efficiency of receivers. Practical considerations of size limit antennas. The most cheerful view for increased efficiency seems to be from increased power transmission.

As this method of wave transmission becomes practical in the television field, relay stations could be located 1,200 miles apart instead of at 30 miles. Once a way is found to make the weak signals consistently strong, TV will take up the new discovery. But, the experts predict, that may take a long time.

Recently, observations of the experimental transmissions have been made by the Bell Telephone Laboratories, by Cornell University, and by radio amateurs. During one short period, receiving tests were made in Bermuda, picking up waves from Cedar Rapids, 1,600 miles away.

Much more experimental work will have to be done, but is seems today that our scientists are well on the way to tracking down the mysteries of the ionosphere.

TECHNICAL NOTES

First High-Power TV Unit Shipped

RCA recently shipped the first major high-power TV transmitter unit since the ban on new television stations was imposed by the FCC in 1948. A 26-kilowatt amplifier, largest TV broadcasting transmitter unit yet shipped for commercial television use, left the RCA Victor plant at Camden, N. J., for Station WSAZ-TV in Huntington, W. Va.

The Huntington station, which now operates on Channel 5 with a standard 5-kw transmitter, is one of 30 stations in the United States scheduled to change channels as part of the FCC's blueprint for national expansion. Its application for a construction permit to operate on Channel 3 with an effective radiated power of 83.4 kilowatts is now pending, with a top priority rating from the FCC.

More Transmitters, More Technicians

There'll be plenty of jobs for broadcasting engineers during the coming years, predicts Leonard C. Lane, president of the Radio-Television Training Association.

He anticipates that from 10 to 40 technicians, exclusive of graduate engineers, will be needed to man each of the 2,000 possible new transmitters which may come now that the FCC freeze has been lifted.

Two Technical 'Firsts' for NBC

The recent Robert Montgomery production of "Of Lena Geyer" on NBC-TV marked the first use of two new technical devices for TV effects.

One item, the Telarc projector, is a rear-screen projecting device which flashes a slide on a huge screen, thus creating a backdrop setting. It was designed by NBC's special effects department and reportedly gives off three-and-one-half times more light intensity than previous rear-screen projectors.

The second device, the Flexitron, is a device causing the picture to wave and thereby creating a montage effect. It was invented by NBC Engineer William Klages and further developed by the networks special effects department.

New Portable Broadcast Amplifier

GE has announced a new portable broadcast amplifier with flexibility for use in studio and in remote operation. The unit (Type BA 6-B) has four built-in preamplifiers, master mixer, AC power supply, plus battery provisions. The manufacturer claims that the amplifier practically eliminates "hiss, hum, and microphonics" through low-noise miniature tubes. Its output transformer is so equipped as to permit the broadcast program to be fed to public address system or other amplifier. A new cue amplifier gain control facilitates its operation in noisy areas and high-low level plug-in headphone connections are provided.

Manufacturers Conserve Scarce Metals

The Radio-Television Manufacturers Association reports that conservation techniques instituted by radio-TV manufacturers have resulted in substantial savings of critical materials "without reducing quality, life, or reliability of the products."

Ten critical metals—aluminum, cadmium, cobalt, copper, lead, nickel, iron and steel, tin and zinc—came in for conservation study, RTMA reports. As a result, receiving tubes today, in most instances, use less than 50 per cent of the nickel used in tubes before 1950. The use of the electro-statically focused TV picture tube is saving metals once needed in the electromagnetically-focused tube. Copperweld wire has replaced copper wire for hook-up purposes in many receivers. Less steel is being used in chassis, brackets, etc., by the use of thinner gauge materials and more economical designs.

Said to Be First U. S. Radio Tube

Carl W. Mitman, former curator of Engineering at the United States National Museum, Washington, D. C., holding what is believed to be the first radio tube. It was made in 1898 by D. McFarlan Moore of New York. Radio waves emanating from this tube ignited a bomb a city block away and blew up a miniature of the battleship Maine.

Station Breaks

Ham Radio is Homesick Cure

A ham radio station can be a powerful force against homesickness. Aviation trainees who come from abroad to the Aeronautical Center of the Civil Aeronautics Administration at Oklahoma City can vouch for that.

Several years ago, CAA employes at the Center organized a ham or amateur radio club. They set up their "shack" in the corner of one of the surplus military barracks at Will Rogers Airport, where the Center is located. Using surplus military radio equipment to fashion a "rig," members spend their spare time talking to ham all about the world.

When trainees in various aviation activties are sent to the Center, they react like any other boys away from home. CAA instructors know the symptoms, and at the proper time they ask each trainee if he would like to talk to his folks in Peru, Brazil, India or Australia.

A CAA employe works out a schedule; the trainee's friends back home gather around the radio of a local ham, and the air waves crackle with Spanish, Portuguese, Hindustani or Greek.

"It works wonders" according to Claude Gardner, veteran chief of the Facilities Branch. "This little corner of an old barracks building fitted with repaired and remodeled surplus radio equipment that has been thrown away, builds better morale than all the entertainment in Oklahoma City or all the hospitality we Americans are able to show to our foreign visitors."

Respite from the Picket Line

KWRN, in Reno, Nev., is owned in part by Kenyon Brown, a Texas investor who also owns part of KMBY, Monterey, Calif. IBEW engineers at both stations have been on strike since April 18 in a joint negotiation effort. (You may remember the picture in the July TECHNICIAN-ENGINEER showing picketers at KMBY and the picketing poster about "Bing's horses.") KWRN was almost settled with Local 202 during the last week of July, but negotiations were stymied when the station refused to return strikers to their jobs. With bargaining at a temporary standstill, Picketer Walter Rees took his placard and friend, Mary Mullen, above, to Lake Tahoe for a day's rest . . . Rees is behind the camera, in case you're looking for him.

Winning Results in Atlanta

After several years of negotiations, IBEW Local 1193 has scored a victory at WSB-AM-FM-TV, the 50,000 watt station in Atlanta, Ga. When the votes were tallied July 16, engineers at this old-time NBC affiliate, became full-fledged members of the Brotherhood.

More IBEW Engineers in Detroit

When the NLRB-sanctioned ballots were counted, July 8, at WJR and WJR-FM, Detroit, results favored engineer representation by IBEW Local 1218.

Local Union 1218's Business Manager Kurt Schmeisser reported another victory the same week in Detroit when WLDM (FM only) technician-engineers voted for IBEW representation.

First Community TV

Early this summer, Laconia, N. H., became the first city in New England to receive television with the RCA "Antenaplex" system of community reception. During installation ceremonies, a TV signal transmitted over mountainous terrain from Boston, 120 miles away, emerged as a clear and stable picture on receivers in Laconia. The "Antenaplex" system permits residents of Laconia to make cable connection to a central antenna installed atop Mount Belknap, six miles east of the city.

Answer to Puzzle, Page 4

Edwards is the stage hand
Adams is the audio control man
Brown is the video control man
Daniels is the projectionist
Conway is the cameraman.