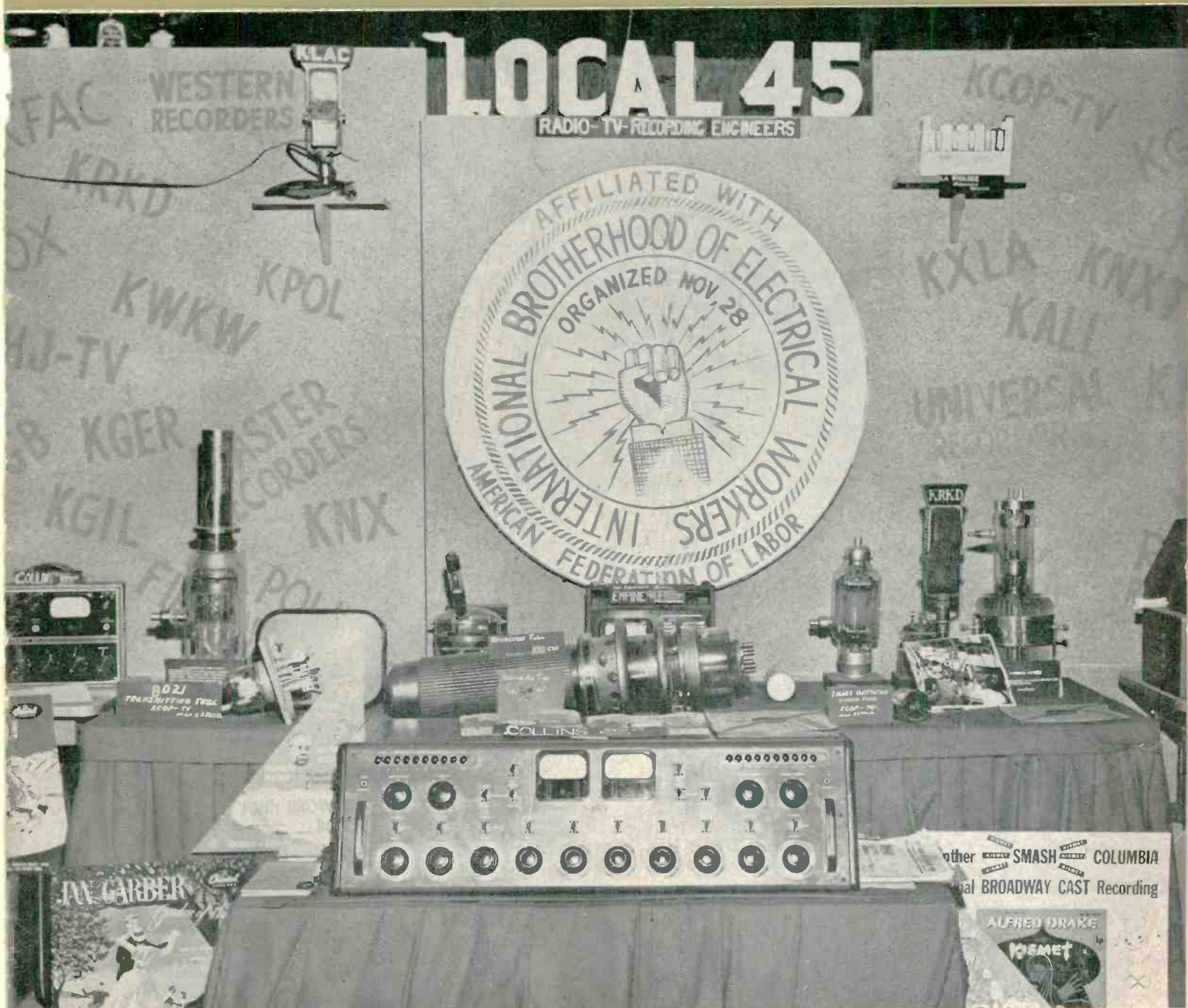




RADIO, TV and RECORDING

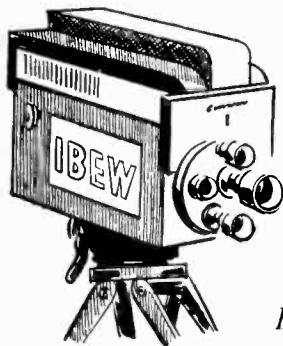
TECHNICIAN-ENGINEER

APRIL-MAY, 1954



International
Brotherhood
Of Electrical
Workers (AFL)

Progress Meeting, August 27, 28, 29
International Convention, August 30



The Time for Shilly-Shallying
Is Past, Says AFL President

Economic Mysteries

Reprinted from "The American Federationist," April, 1954

THE AMERICAN consumer is being taken for a ride in the current "rolling readjustment."

That becomes evident from the latest government figures showing the cost of living is still climbing at a time of overstocked inventories, curtailed production and shrinking employment.

Some economists profess to be encouraged by the fact that prices are not softening up under pressure. But this is small comfort to the millions of workers whose take-home pay has been slashed by a shorter work-week and especially to those millions who have been laid off or actually fired. They want to know what's happened to the law of supply and demand. They find it more than a little mysterious that prices keep going up when sales are going down. They can't account for the fact that their grocery bills continue to mount while the income of the nation's farmers has been drastically reduced.

To make matters worse, the government appears to be backing away from its pledge to take "emergency" action to combat unemployment if it continues to rise. The President first announced that unless conditions picked up in March he would seek to reduce taxes through higher personal exemptions and take other steps to prime the pump of purchasing power. Now, however, the deadline has been postponed to April, and the

President has ruled out any higher income tax exemptions.

The public should remember that March usually ushers in a period of expanding production and more jobs. If the rise in unemployment merely levels off, as Administration spokesmen expect, it would be far from encouraging, since it would mean the loss of about 300,000 new jobs normally to be expected at the start of the spring season.

THE first concern of the Administration still appears to be directed against the imaginary danger that the nation can be "talked into a depression." Because of that attitude the government thus far has failed to take the actual fact of a recession seriously enough. It has failed to go beyond the cold statistics and to consider the problem in terms of the human misery caused by widespread disemployment and layoffs. It has failed to budge from the mistaken theory that aid to business comes before aid to people.

We hope our national leaders will soon realize that the time for shilly-shallying is past, that the time for action is now rather than in the uncertain future and that the American people expect their government to have a heart.

—GEORGE MEANY, *President, AFL.*

RADIO, TV and RECORDING
TECHNICIAN-ENGINEER

VOLUME 3 17  17 NUMBER 4
PRINTED ON UNION MADE PAPER

Published monthly by the International Brotherhood of Electrical Workers, AFL, 1200 Fifteenth St., N. W., Washington, D. C., for the men and women in the recording, radio and television industries.

J. SCOTT MILNE, *President* • JOSEPH D. KEENAN, *Secretary*
ALBERT O. HARDY, *Editor*

Entered February 20, 1952 as second-class matter at Washington, D. C., under Act of August 24, 1912. Subscription Price: United States and Canada, \$2 per year, in advance.

CBS Negotiations Recessed After Deadlock

REPRESENTATIVES of the participating Local Unions met in the International Office at Washington on April 12 and spent a full week in the preparation of a proposal to CBS for a new agreement covering the network's approximately 1,100 employees in New York, Boston, Chicago, St. Louis, San Francisco, Delano and Los Angeles. On April 19 the first meeting with the representatives of the Company took place and from that time on, even more midnight oil was burned.

Despite the best efforts of the representatives, negotiations came to a deadlock on Saturday, May 1 following termination by the Union of the agreement written in 1952. The largest item of dispute was found to be wages with the Company standing on an offer of \$84 to \$158 per week on a four-year escalator. The IBEW's final proposal to the Company included a beginning wage of \$90 per week, running to \$165 in a two-year "package" and containing a provision for increases beyond that range for the second year.

Tentative agreement had been reached, by the time negotiations were broken off, on a definition of the authority and a substantial pay increase for Technical Directors, preferential consideration for previous industry experience for new employees, blanket accident insurance, commensurate pay for performance of work in a higher pay group, the elimination of uncompensated meal periods, provision for extended leaves of absence for Union business, protection against any loss in pay incurred because of jury duty, extension of additional severance pay and on a standard Union Label clause.

Shop meetings for consideration of the offers and counteroffers are taking place in all the Local Unions as we go to press.

The 1954 negotiations have been somewhat complicated by the uncertainties caused by the delay of the National Labor Relations Board in deciding the unit representation of some of the employees at WBBM-TV (formerly WBKB) and the filing of a petition during the week of April 27 by the IATSE for CBS Newsfilm cameramen in New York City, who have traditionally been represented by the IBEW.



L. U. 1220 Business Manager Walter Thompson, standing, listens to an argument in rebuttal. In the foreground, left to right, are Howard Rosenthal of WBBM-TV; Ray Wood, president of Local 1212, New York; George Cairns (back to camera), business manager of Local 1228. To Thompson's left, E. B. Servoss, L. U. 1212; Ed Harley, L. U. 1212; Howard Lester, L. U. 1212; Pat Finn, L. U. 1212.



Listening to a discussion are Denis Volas, business manager of Local 1217; Jack Dunn, business manager of Local 202; Bill Ketelhut of WB3M, Chicago, and George Cairns, business manager of 1228.



Participants in the sessions included Ed Harley of WCBS, at extreme left; and Pat Finn, WCBS-TV, to Harley's left. In the rear are Harvey Voss, KMOX; Stan Carr, KNX; Jimmy Williams, KNXT; Denis Volas, business manager of Local 1217, and Jack Dunn, business manager of Local 202. In the foreground, Howard Lester, CBS News Films, New York; and E. B. Servoss, WCBS-TV (back to camera).

Atomic Energy as a Source Of Electric Power Discussed

Labor editors hear report on atomic studies by private industry, eye-witness story of H-bomb blast, facts on Labor's political education, at annual session of Eastern Labor Press Association



Mr. Walker L. Cisler, president of the Detroit Edison Company, opens the press association lecture on peacetime uses for atomic energy.

THE electrical power industry is ready to begin pilot plant work on atomic energy as a source of electric power, a panel of Detroit Edison Company leaders told the Eastern Labor Press Association recently. The labor editors were assembled in Washington for their annual session of discussions of labor press problems and heard representatives of Detroit Edison Company cover the various facets and problems of the conversion of atomic energy to useful electric power.

Led by Mr. Walker L. Cisler, president of Detroit Edison, four representatives of the management of Detroit Edison spoke on subjects with which they were primarily concerned, covering plant design, engineering practicality, legal and governmental aspects and the overall coordination of the electric power industry. The editors were told that the United States possesses about 42 per cent of the electric power of the world; something more than 90 million kilowatts. Approximately three-fourths of the power generated in the United States is derived from burning conventional fuel with water power supplying the remainder. The industry predicts increasing use of thermal power with the present potential expected to increase the 80 per cent of our present power production by private industry and with a probable decline of the present 9 per cent which is

generated in plants owned and operated by municipalities. TVA and similar governmental facilities are presently generating approximately 11 per cent of all the power in the United States. Atomic energy, if proved practical, will be important to all three of these classifications but particularly important to those power generation facilities which will use approximately 184 million tons of coal this year.

Mr. Alton P. Donnel pointed out that 3.2 pounds of uranium can be expected to be the equivalent of some 4,000 to 4,500 tons of coal. Experts estimate that the total potential of uranium for power conversion purposes is equal to some 23 times the world reserves in coal, oil and gas. Present plans call for atomic energy generation to be in such quantity as to be able to produce heat 10 times as fast as any conventional system.

Mr. Robert Hartwell outlined some interesting figures on plant design and stated that the newest coal-burning plant cost about \$98,700,000. The physical plant cost per kilowatt of power produced is approximately \$158 with an efficiency of about 35 per cent and delivered product cost of between six and seven mills per kilowatt-hour.

On the other hand, the physical plant cost for atomic energy generation is about \$225 per kilowatt capability; the latest and most accurate estimates are unable to indicate whether by-product revenue from fissionable material and radio-active isotopes will be a source of revenue or a liability. It appears that if steam generation from the heat produced by atomic material can be made more efficient the increased cost of other elements can be discounted. Continuous exploration is being made of liquid metals for heat transfer purposes with intermediate heat exchangers being used to protect both operating personnel and the steam produced. An increase of efficiency in this respect will do much to



Charles Taft, brother of the late Senator Robert Taft and a prominent Mid-West citizen, was a featured speaker. At the left is J. Scott Milne, International President of the IBEW, and also president of the International Labor Press Association. On the right is Frank Powers of the Commercial Telegraphers, president of the Eastern Labor Press Association.

make atomic power practical. The actual production of electric power from atomic energy is estimated to cost seven mills per kilowatt hour—which is not competitive with coal since the total cost, including distribution, should run about seven mills per kilowatt hour.

In a fast breeder reactor the reactor will produce its own fuel. From 100 pounds of raw material about .35 pounds of fissionable material can be produced. Beginning with 3,500 pounds, 100 pounds of useful fuel can be made—the equivalent of 130,000 tons of coal, and will produce 260,000,000 kilowatt hours at a rate of .013 mills per kilowatt-hour. It can be seen that the very complicated atomic energy processes which currently use electric power are being attempted to reverse. Nothing but practical application and long experimental projects can prove their worth.

Mr. Harvey Fisher spoke on the legal and governmental aspects and dwelt on the Atomic Energy Act of 1946. This Act of Congress largely excludes private industry participation because of the primary interest of the Government in the security of the United States and the development of atomic weapons. However, the Act presents a very present problem because all fissionable material now or hereafter produced remains the property of the Atomic Energy Commission. While this assures governmental control it makes fissionable material ownership unavailable to private industry. Investors are available but money for capital investments can hardly be expected until the power industry can be assured that they can actually own the necessary facilities and raw materials; it would seem that Congress

should take another look at the Act so as to expedite the tremendous capability of this new source of power to the consumer.

Mr. Arthur S. Griswold concluded the session with remarks to the effect that some 26 privately-owned companies are now engaged in cooperative efforts to develop this new source of power. Eighteen of these companies are public utilities, representing about 30 per cent of the industry. Much research is going on, financed wholly by the cooperating companies in developing projects like sodium circulation systems, studies of corrosion effects, searching for equipment improvements and research in new techniques in fields relating to power generation. It is estimated that the companies are spending about two and a half million dollars a year for carrying on such work in facilities outside of government laboratories and their present hope is that within two years it can be proved that atomic energy is practical for industry development and public benefit.

A somewhat opposite view to that of Mr. Fisher's was taken by a following speaker, Representative Chet Holifield (D.) of California, who expressed his concern about the 12 billion dollar investment which has been made by the people of the United States. Government control, in his opinion, is necessary if only to assure protection of that investment. While sympathetic to rapid development of atomic energy, Representative Holifield stated that atomic and hydrogen power must not be exploited and that the public must be protected so that they may get the peace-time benefits at reasonable costs.

Correction: Right Place, Wrong Time

OUR announcement of the Third Annual Division Progress Meeting in the March issue of the *TECHNICIAN-ENGINEER* was as fouled up as a program director's work sheet. We'd like to correct our boners, by offering you the correct dates and times below:

The International Convention

The International Convention of the International Brotherhood of Electrical Workers will be held in Chicago, August 30, continuing until all business is completed, probably by the end of the week. The convention site is the International Amphitheater, famous convention structure in the stockyards of the Windy City.

Registration for the IBEW convention will begin on Friday, August 27 at the Palmer House, starting at 9 a. m. Registration facilities will be available from 9 a. m. to 9 p. m., on August 27, 28, 29.

The deadline for receipt of credentials by the International Office is July 1, 1954. If your local union is

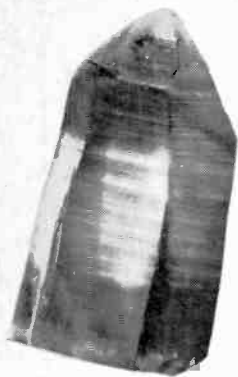
to be represented, it is not too early to set the necessary machinery in motion.

The Electrical Workers Benefit Association Convention will take place on September 2, beginning at 2:30 p. m. Credentials for this meeting must also be received by the International Office by July 1.

The Progress Meeting

The Third Annual Progress Meeting of the Broadcasting Division convenes at 9:30 a. m. on Friday, August 27 and runs for three days. This is the Friday preceding the opening of the International Convention. Further details on the progress meeting will be forwarded to all local unions concerned soon.

Arrangements are now being worked out for the meeting place. The date is definite; the city of Chicago is definite; now is the time for all local unions to make plans accordingly. Plan to send delegates to this important meeting!



Quartz Crystals

*... how they are
fashioned into
electronic controls*

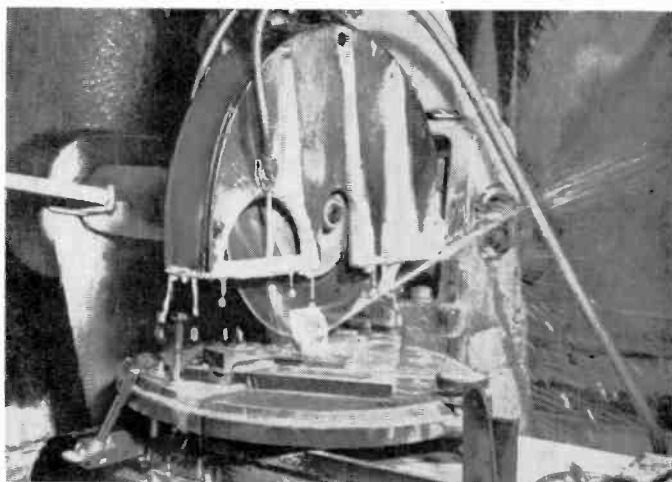
FROM the mountains and river beds of Brazil, shipments of natural crystalline quartz find their way to the United States where they are shaped to become the sentinels of communication. Without these crystals, the air would soon become a bedlam. These pictures, from RCA Crystal Engineering, show how they are fabricated.



1 The manager of Crystal Engineering for RCA operating an X-ray machine which determines the angle at which the quartz specimen should be sliced.



3 The correct sawing angle of the crystal, as determined by X-ray analysis, is assured by orientating the specimen on this machine prior to cutting.



4 The next step is to place the glass-mounted crystal under a diamond-edged saw. The saw table is tilted to slice the quartz along the desired plane.



6 After grinding a stack of segments to the proper diameter (see 7) they are brought to the desired thickness by a method called "lapping."



7 A collection of ground wafers ready for testing. At the upper right are two rounded segments of quartz crystal ready for wafer slicing.



2 Here the sections of mother quartz are cemented on individual glass plates for precision orientation during the later machine-sawing operation.



5 Wafers from the crystal are diced into segments by a smaller diamond-edged wheel. A transparent shield protects the machine operator.



8 A gage checks the accuracy of the lapping process to 1/10,000 inch. Finally, the frequency response of each crystal is compared to known standards over a wide temperature range.

West Coast NABET Leader Resigns Posts, Urges IBEW

Charging the CIO National Association of Broadcast Employees and Technicians with having "inner faults and weaknesses," KTTV, Hollywood, Calif., engineer Robert F. Goldman resigned last month from all NABET posts which he held and urged his fellow workers to "swing to the IBEW."

In a memorandum, issued March 15 to all KTTV engineers, Goldman said:

"For your information, I have, as of last Thursday, resigned my position as vice chairman of the Hollywood Chapter and as Executive Board member for the 5th Region of NABET-CIO-CCL. I, of course, remain at this time a member of NABET as required for my employment.

"I want you all to know why I have done this. After considering all the facts at my disposal concerning the merits of the union organizations available to us here at KTTV, I have come to the following conclusion. In the last two years, while we have been NABET, we have had a chance to see what NABET could do for us. Frankly and honestly, most of what has been done has not been done by NABET but by your own people representing you. On the other hand, we must look at the changes that have occurred in the IBEW in this same period of time. The organization has been cleaned up and they have gone to town, as witness the conditions at KCOP (KLAC-TV) in their new contract, and the job they are doing everywhere.

"In the larger picture, nationally, we should realize that one basic thing is necessary. We all need one union for all Radio-TV men. NABET will never be this union. Certain internal weaknesses leave me with this conviction, and NABET will never assimilate the IBEW.

"With all this in mind, I cannot justifiably continue as an officer of NABET. Along the same line, I also feel that at this time we stand to gain individually and collectively by swinging to IBEW. Use your heads, and think this out. We are at a point of negotiating a contract. We want to get the best possible contract. This is the way to do it.

"Please see me personally if there is any information I can give you on this subject."

Goldman was a member of NABET's Fifth Region executive board, vice chairman of its Hollywood chapter, and unit chairman of the station. He sent his letter of resignation from these posts to NABET's national president, Clifford Rothery.

After Goldman's blast, IBEW Local 45, through Harry Stillman, business manager, announced that it will petition the National Labor Relations Board for a collective bargaining agency election for KTTV engineers. The Local already has a similar petition on file for stagehand employees of KHJ-TV, Hollywood.



Local 45 Exhibits at the 1954 Union Industries Show

AT LEFT: Visitors show their interest in a two-meter ham rig at the Local 45 exhibit. Bob Garner is operating the portable transceiver, which is well adapted to civilian defense work, while Harry Stillman kibitzes.

LOCAL 45 of Los Angeles, one of the largest broadcasting locals of the International Brotherhood of Electrical Workers, proudly displayed some of the equipment used by members when it exhibited at the 1954 AFL Union Industries Show in Los Angeles, last month.

Approximately \$20,000 worth of equipment was on display, for the inspection of the 450,000 persons who visited the show during its week-long run in the Pan Pacific Auditorium.

On the backdrop of the Local 45 booth were displayed the call letters of the broadcasting stations and the names of the recording studios employing Local 45 members. On tables lining the booth walls, many interesting items of equipment were displayed. As an added attraction for show visitors, the local set up a two-meter ham rig and let booth visitors do a little shortwave broadcasting. Members of the union alternated in the job of manning the booth.

The AFL Union Label and Service Trades Department, which handles the show for the AFL, called the 1954 exhibition at Los Angeles one of the best in a string of more than a half-dozen annual shows. Last year the show was at Minneapolis. Before that, it was at Boston. Next year's show is scheduled to open in Buffalo, N. Y.

The men of the local union, as well as the AFL officials conducting the show, admitted that opening a show of such dimensions in Los Angeles presented a tremendous task of promotion. The city is famous for its searchlights and gala premieres. Nevertheless, Southern Californians flocked to the exhibition to see the various international unions of the AFL demonstrate their skilled craftsmanship and display union label products.



ABOVE: Master recorders donated a display which explained disc recording processes, and shared the interest of visitors in a standard TV camera.



ABOVE: A general view of approximately \$20,000 worth of equipment, typical of that operated by Local 45 members. Every hour on the hour a drawing for free records was held. More than 300 records were given away to show visitors.



FIGURE 1—The use of the Vidicon camera adapter does not impair the normal operation of the receiver in any way. The face of the model above is transmitted to the receiver on carriers corresponding to unused TV channels.

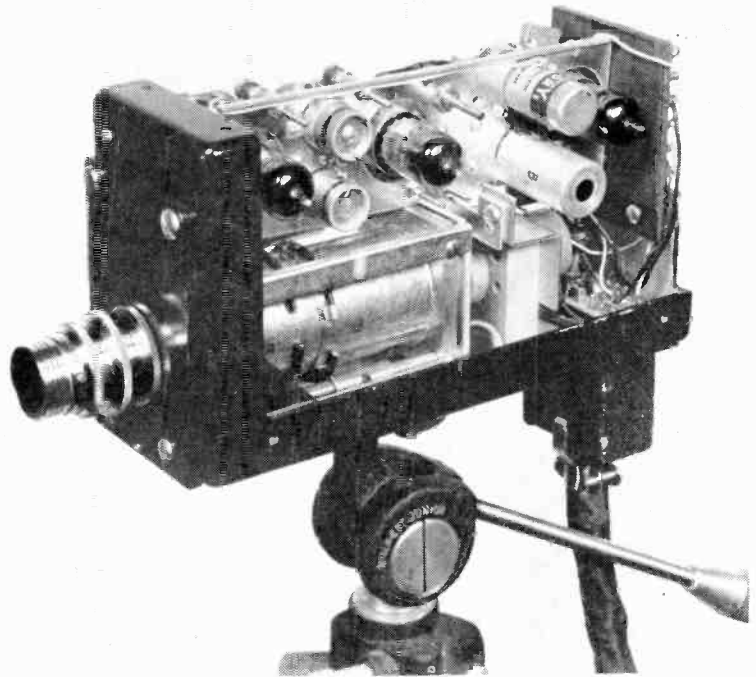
A Vidicon Camera Adapter for Television Receivers

L. E. FLORY, W. S. PIKE, and G. W. GRAY
RCA Laboratories Division, Princeton, N. J.

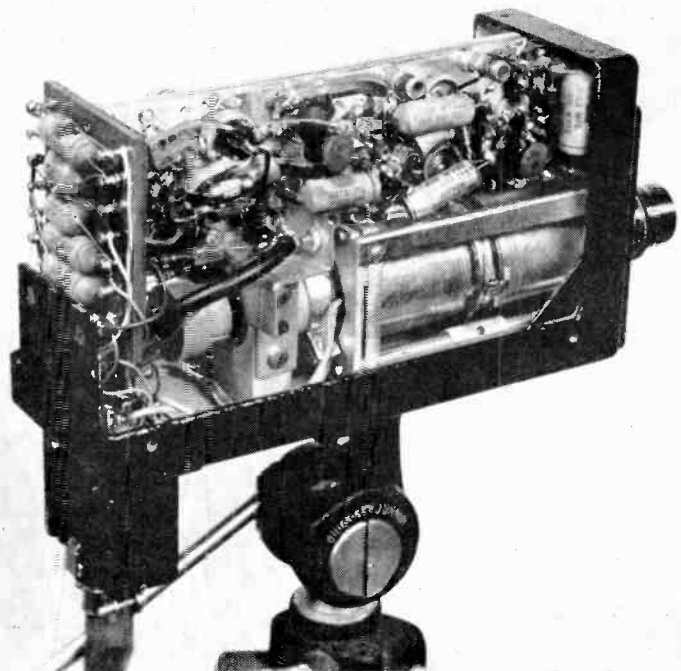
WITHIN a relatively few years television has attained a pre-eminent position in the American home. It has become a primary medium of entertainment and an important source of instruction.

These rapid strides have been accomplished by broadcast television which up to the present has far overshadowed all other television applications. Even so, closed-circuit, or industrial, television is finding increasing use in industry, research, and education.^{1, 2} Great progress has been made in simplifying the construction, improving the performance, and reducing the cost of industrial television equipment. The introduction of the compact Vidicon camera has been a major step in this development.³ Nevertheless, costs of all types of industrial television

The TECHNICIAN-ENGINEER wishes to particularly express its appreciation to Mr. L. E. Flory for supplying us with the text and the illustrations for the accompanying article.



FIGURES 2 and 3—Above and below we can see the simplicity and compactness of the Vidicon camera. Using standard components and a Quick-set tripod, the unit offers many possibilities.



equipment developed in the past have been too high to permit a distribution commensurate with its potential usefulness.

Hence it is not surprising that some of the greatest fields of application of closed circuit television have not been touched. The utility of television for classroom teaching is unquestioned. Its use with the light microscope^{4, 5} permits showing biological specimens, crystals and other materials to large groups with an ease heretofore unheard of. Televising of equipment used for lecture experiments in chemistry, physics and other subjects has been amply demonstrated to be of tremendous value. Interoffice or interbuilding television for communication and transmission of written or other visual information could save large amounts of time. In small shops where the family living quarters and the shop are often in the same building, a television camera can "watch" the store and transmit the information to the living quarters. Home use of closed circuit television has never been seriously considered because of the complex and expensive equipment required.

THIS paper describes a device which is aimed at the fullest realization of these potential uses of television pickup equipment. This device is a camera adapter which makes every existing television system a potential closed circuit television system. It takes the form of a simple Vidicon camera which transmits video signals over a cable to the receiver on carriers corresponding to unused television channels. Its use does not impair the normal operation of the receiver in any way, Fig. 1.

The camera attachment is so simple and easy to adapt to the receiver that the applications we mentioned as well as many others become immediately feasible.

As in the standard RCA Industrial Television Equipment, the Vidicon pickup tube forms the heart of the camera unit. Its small dimensions, high-quality performance, and simplicity of operation contribute materially to the success of the system. In it the photoconductive target on which the picture is projected is scanned directly by a magnetically deflected low-velocity beam. The video signal is obtained from the target electrode.

In other respects considerations of economy have led to distinctly novel design features. It was realized that in many ways the circuitry required to operate a closed circuit television system using the Vidicon pickup tube is quite similar to that already in use in television receivers. This circuitry has been highly developed for mass production and represents a very high value in terms of cost for the functions performed. Therefore, it seemed logical to investigate the possibilities of using these highly developed circuits to perform the additional functions necessary to complete the system.

FIGURE 4—The control box, with the adaptors necessary for connecting it to the receiver. The nearly-square box houses the units shown below.

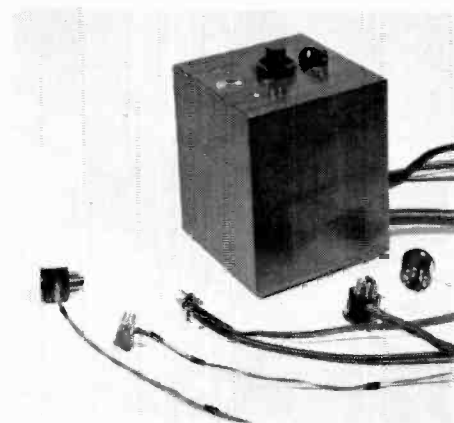


FIGURE 5—An interior view of the control box, tilted for your inspection. You can orient the chassis by noting the corresponding positions of the adaptor wires.

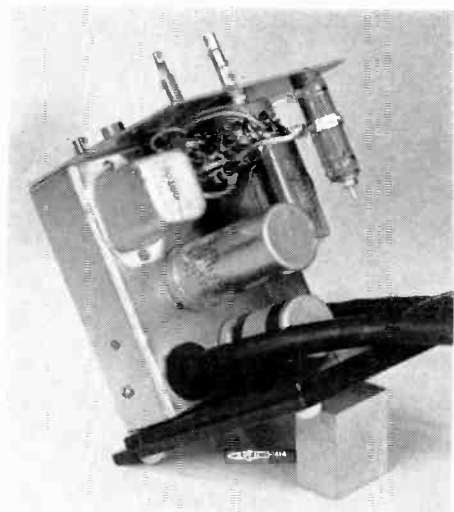
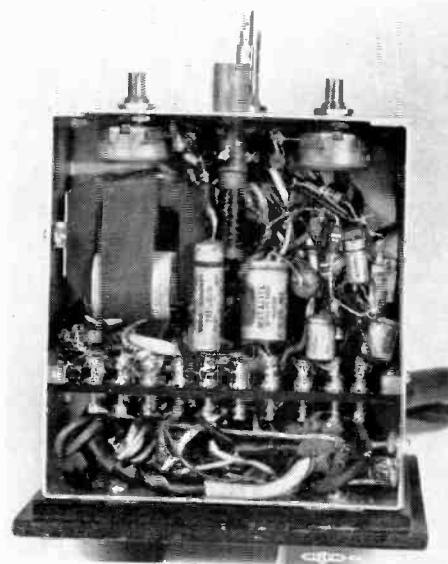


FIGURE 6—Another interior view of the control box; this time from beneath the chassis. A switch is provided on the control box for switching from normal receiver operation to camera.



IN general there are four functions necessary to operate a Vidicon camera closed circuit system. First, there must be provided a monitor kinescope on which to view the picture. This of course is already available in the receiver. Second, the relatively weak signal generated by the pickup tube must be amplified to a

level suitable for modulation of the kinescope. Amplification of a high order is accomplished in the receiver. This amplification is, however, performed at radio and intermediate frequencies, while the signal generated by the pickup tube is usually at video frequencies extending from near dc to several megacycles. Third, voltages must be supplied to the pickup tube to generate and focus the scanning beam. In the case of the Vidicon these voltages are in the range of those present in the receiver. Lastly, signals of proper waveform must be supplied to deflecting coils to cause the pickup tube beam to scan the target in synchronism with the beam in the monitor kinescope. Since the Vidicon requires about one-tenth the number of ampere turns for deflection as does a 70-degree kinescope operating at 15 kilovolts the necessary deflecting power for the camera can be taken from the receiver with negligible effect upon its operation.

IN accomplishing these functions the second operation mentioned, that of proper amplification of the weak signals from the Vidicon pickup tube, required the greatest amount of attention. A typical highlight signal current from the Vidicon is one-tenth microampere. It has been found in practice that an input resistance of 50,000 ohms is the maximum that can profitably be used and still allow for adequate high-frequency compensation. This means a maximum low-frequency signal input of 5 millivolts. Two methods of handling the amplification are possible. First the signal may be amplified directly as a video signal to a level to operate the video portion of the amplifier in the receiver. In most modern receivers this is a level of a volt or more. Alternatively, use can be made of the existing r-f and i-f amplifying circuits in the receiver by converting the video signal to a modulated carrier at some point in the camera. The latter method was chosen because the signal can be transmitted over a low-impedance line to the receiver at a low power and because of the convenience of coupling the signal level requiring little power output from the camera to the receiver at r-f frequency. In multiple unit setups considerable flexibility can be achieved by tuning the several cameras to different receiver channels and making use of the channel selector to select the desired camera signal.

Figure 7 is a schematic diagram of the camera. Dual tubes are used to conserve space, the 6U8 triode-pentode being chosen as offering the most video gain in a single envelope. The circuit consists of a four-stage video amplifier driving a modulator section electron coupled to a VHF oscillator. $V_{1a, b}$ are conventional single-peaked video amplifiers. V_{2a} is a frequency compensating stage to compensate for the loss of high frequencies at the input to the amplifier. L_3 is an inductance whose natural resonance in the circuit is adjusted

to be above the normal pass band of the amplifier. The gain of this stage can be made to increase with frequency from essentially zero gain at low frequencies to a gain limited by the impedance which can be achieved in the coil and associated circuitry at the top of the pass band. The low-frequency gain is then adjusted by insertion of a variable resistor R in series with the inductance. By adjusting this resistor the shape of the gain characteristic of this stage can be made to match closely the attenuation characteristic of the input circuit. V_{2b} is a conventional double-peaked stage. V_{3b} is connected with its cathode, grid and screen in a Hartley type oscillator. The plate of V_{3b} is coupled to the cathode of V_{3a} which has r-f impedance but essentially none at video frequencies. This circuit thus provides an electron coupling between the oscillator and the modulator V_{3a} so that there is a negligible amount of frequency modulation of the oscillator as the output signal is amplitude modulated. The video signal from V_{2b} is applied to the grid of V_{3a} and effectively modulates the plate current. The plate of V_{3a} is coupled directly to a 75-ohm line which carries the r-f signal to the receiver. A crystal diode on the grid of the modulator maintains an approximate dc level and stabilizes the black level of the picture. Pulses from the blanking circuits are inserted at the screen V_{2b} and the plate of the same tube to provide synchronizing pulses in the signal which can then be used to operate auxiliary receivers if desired.

The amplifier has a bandwidth of four megacycles and a reasonable light level on the Vidicon (about two-tenths microamperes photo current) will provide 80 percent modulation of the carrier. An r-f signal level of about 100 millivolts can be supplied to the 75-ohm line. A heater current of 1.35 amperes at 6.3 volts and a plate supply of 50 milliamperes at 150 volts are required.

WITH an accelerating voltage of 300 volts and a magnetic field of 40 gauss a deflecting field produced by 40 ampere-turns with the particular yoke construction used is required to deflect the cathode ray beam in the Vidicon pickup tube.

A typical receiver (RCA 17250 DE) provides a 1-ampere peak-to-peak deflecting current in the horizontal yoke. If the deflection coil for the Vidicon pickup tube is placed in series with the receiver deflection coil, then a camera coil of 40 turns is sufficient. Such a coil has about 0.1 mh inductance compared to 10 to 13 mh in the receiver coil. Thus it can be seen that the presence of the Vidicon deflection coil in series should have negligible effect upon the receiver deflection. This has been found to be the case.

The same was true of the vertical circuit, adequate deflection of the scanning beam of the Vidicon camera tube being obtained with its deflection coils in series with the receiver deflection coils. In the receiver men-

Normal B supply voltage in receivers is usually between +220 and 280 volts. This can be dropped by means of an RC decoupling filter to supply the 150 volts for the camera amplifier. The axial magnetic field of about 40 gauss necessary for focusing the Vidicon is provided by a permanent magnet structure made up of four alnico rods set at the corners of square iron pole plates, the entire cage surrounding the Vidicon as can be seen in photographs of the camera.

The physical and electrical connection of the camera to the receiver was given considerable attention. The camera contains the Vidicon pickup tube and the amplifier-modulated oscillator unit. At the end of 50 feet or more of cable and near the receiver is a control box containing the necessary controls to operate the camera, the horizontal transformer, vertical blanking circuits and miscellaneous dropping resistors, plus a heater transformer for the camera, which is necessary since sufficient heater voltage must be provided to compensate for drop in the cable. A schematic diagram of the control box is seen in Figure 8. There are no tubes and only a few components in the control box.

IN order to make the adaptation of the camera to a receiver as simple an operation as possible, wherever possible all connections to the receiver are made by means of adaptors which are placed under tubes and in the deflection plug in the receiver. In practically all receivers in which the deflecting coil is connected to the chassis by means of a plug the adaptation can be made with no alteration of the receiver since invariably all the other voltages appear at some of the tube pins. In receivers without a deflection plug the necessary wires to the deflection coils can be cut and a connector inserted without removal of the chassis. The camera has been adapted to several models of 1951, 1952 and 1953 RCA receivers, as well as other makes of standard receivers. As with the RCA receivers some others require no alteration, it being necessary only to obtain proper blanking polarity and dc voltages and to provide proper adaptors. All these adjustments are made in

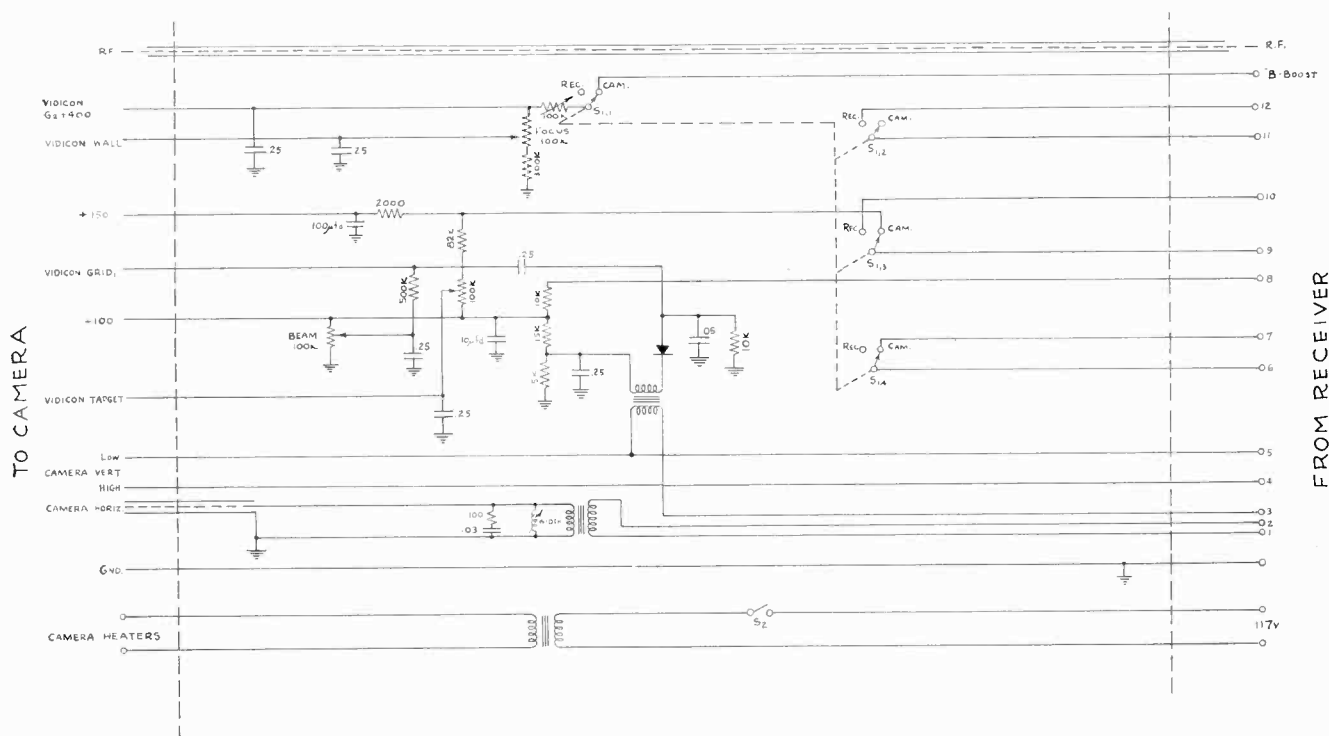


FIGURE 8—A schematic diagram of the control box.

the control box. In the case of yet other receivers, in addition to the adaptors for voltages, it was necessary to open the deflection coil circuits to insert the camera circuits since these receivers were not provided with a deflection plug. A study has been made of many current receivers and no difficulty is anticipated in adapting the camera to any of them.

A switch is provided on the control box for switching from normal receiver operation to camera. As shown on the diagrams and on the diagram of the control box, this switch, when in the camera position, applies voltage to the Vidicon and plate voltage to the amplifier. It also removes the load of the audio output tube to compensate for the load of the camera. A 60-cycle signal is inserted into the sync amplifier to lock the vertical deflection to the power line in the camera position.

Figure 4 is the control box with the adaptors necessary for connecting it to the receiver. Figures 5 and 6 show interior views of the control box.

In Figures 2 and 3 are seen interior views of the camera.

Operation of the adaptors has been quite satisfactory. The bandwidth of 4 mc provides adequate response to utilize the full capabilities of the receiver.

As was mentioned before, the r-f signal from the camera contains synchronizing information which permits auxiliary receivers to be operated merely by con-

necting the signal output line to the antenna input of the receivers. Two cameras and receivers tuned to complementary channels and linked by an inexpensive coaxial or in many cases twin lead line immediately become a two-way television communication system for inter-room or inter-building use for transmitting visual information. Even a larger number of pickup points may be included in a network with a single cable connection, the observer at each receiver selecting the camera whose picture he wishes by the usual channel selector switch.

The authors wish to acknowledge the continued interest and inspiration of Dr. V. K. Zworykin under whose direction the work was done. They are also indebted to J. M. Morgan of RCA Laboratories for his help in the design of deflection components and to Frank Janda of the RCA Victor Division for his work in building early models of this equipment.

REFERENCES

- ¹ Simplified Television for Industry, R. C. Webb and J. M. Morgan, Electronics, June, 1950.
- ² Television in Medicine and Biology, V. K. Zworykin and L. E. Flory, Electrical Engineering, January, 1952.
- ³ The Vidicon, A Photoconductive Camera Tube, P. K. Weimer, S. V. Forgue and R. R. Goodrich, Electronics, May, 1950.
- ⁴ The Television Microscope, L. E. Flory, Cold Spring Harbor Symposium on Quantitative Biology, Vol. XVI, 1951.
- ⁵ Ultra-violet Television Microscopy, V. K. Zworykin, L. E. Flory, R. E. Shroder, Electronics, Sept., 1952.

Congress Should Collect Tickets . . . BY BEN ATLAS

IT wouldn't have surprised us if gallery spectators had been charged admission (with or without tax) the other day when the Senate voted a final excise bill. The vote was preceded by a side show that amazed the august senators themselves. At one juncture, Republican Senator Eugene Millikin of Colorado remarked that his chief Democratic adversaries, Senators Paul H. Douglas of Illinois and Hubert Humphrey of Minnesota, reminded him of Gallagher and Shean. A bit later, Millikin allowed as how the Democratic pair reminded him of "a bicycle act, with the gentlemen jumping back and forth shouting 'allez-oup!'" Senator Humphrey retorted by comparing the G. O. P. tax program to a Mexican bean game ("If someone happens to get the right cup over the right bean at the right time and take the kewpie doll as a prize, the Administration will say, 'See, it is a fine game; you always win.'")

Then Senator Millikin said the Democratic duo reminded him of a pair of nodding pigeons, and he added that he could have made a harsher comparison with "a monkey climbing a pole" ("the higher he goes,

the more he exposes his posterior"). Then they really got mad. We heard the gentlemen characterize one another as alligators, crocodiles and various other animals until Senator Humphrey mournfully concluded they'd "done adequate honor to the zoo" and suggested they return to the tax bill.

27,000 TV Technicians Attend

More than 27,000 television servicemen have attended the first 35 sessions in a nationwide series of technical clinics on installation and maintenance of color television receivers sponsored by the Radio Corporation of America and its distributors, it was announced recently.

In addition to large attendance at the clinics, Mr. Cahill noted that instructional material prepared for use in the company's color TV training program has received wide acceptance throughout the service industry.

As an example, he pointed to the textbook, "Practical Color Television for the Service Industry," which is presented without charge to servicemen who complete the clinics, and is also available either through RCA parts and tube distributors or directly from the RCA Service Company, at \$2.00 per copy.

From the Washington Once-Over column written regularly by Mr. Atlas in "Billboard Magazine."

Technical NOTES

What's Best Type Color Tube?

A. V. Loughren, executive vice president of Hazeltine Research, Inc., said recently that he saw at least three alternatives in selecting the best type color picture for color TV.

The tube finally selected may be the three-gun shadow-mask tube like that currently manufactured by RCA, or the one-gun tube like that being produced by Chromatic Television Labs, or, perhaps, some different type, yet to be announced.

Choice will depend on cost and on the set's stability when operated by the general public, said Loughren. He noted that at present both three-gun and one-gun systems are attractive enough to invite further exploration. Hazeltine, having already reported to its licensees on complete circuitry for color sets using RCA three-gun shadow-mask tubes and issued preliminary report on processing NTSC color signals for reception on one-gun tube sets, is currently demonstrating reception of color with one-gun tube receiver to licensees and will report to them on full circuitry for such reception within the next few months.

Beam Power Tube for UHF

The most powerful beam power tube so far developed for ultra-high frequency (UHF) television broadcasting was announced recently by the RCA Tube Division.

Capable of 12,000 watts of power output at 900 megacycles, the tube, known as the RCA-6448, promises greater economy, efficiency, and simplicity in color and black-and-white TV broadcasting and in high-frequency communications. It is also the first transmitting tube with tetrode construction ever developed for high-power, ultra-high-frequency television service.

Previously UHF TV transmitters with power output above 5000 watts required large, costly tubes of complex design. A comparative midget in size, the 12,000-watt RCA beam power tube measures only $7\frac{3}{4}$ inches in height and $11\frac{3}{8}$ inches in diameter, and features a novel built-in canal system for water-cooling.

Development of a UHF transmitting tube with tetrode structure and high power output now makes possible more powerful and more compact television transmitting equipment with additional circuitry advantages.

In color or black-and-white TV service, the RCA-6448 can deliver a synchronizing-level power output of 15,000 watts at 500 megacycles. As a continuous wave (cw) amplifier in class C telegraphy, the tube can generate useful power output of 14,000 watts at 400 megacycles or 11,000 watts at 900 megacycles.

The beam tube's ability to produce such high power at ultra-high frequencies stems in large part from its unique "inside out" construction. Representing a significant departure from conventional tube arrangement, the tube features a coaxial-electrode structure in which a centrally located plate is surrounded by a symmetrical array of unit electron-optical systems. In the usual type of construction, the plate is on the outside.

The structural design of the unit electron-optical systems makes possible close spacing and unusually accurate alignment of electrodes. This assembly method also permits the building-in of capacitors for effective bypassing of grid No. 2 to cathode.



MOST POWERFUL beam power tube ever developed for UHF-TV broadcast service is this RCA transmitting tube which is capable of 12,000 watts power output at a frequency of 900 megacycles per second. (See Story.)

Station Breaks



202 Jurisdiction at KSAN-TV

San Francisco's first UHF station went on the air March 1, and limited programming was begun on March 9. The call letters are KSAN-TV, and it is owned by S. H. Patterson. (KSAN-AM is owned by the Golden Gate Broadcasting Company.) Programming will be built around sports activities, including telecasts of all night ball games played at home by the San Francisco Seals and Oakland Acorns.

IBEW Local 202 carried on negotiations with the new station simultaneously with the renewal of the AM contract. The two contracts are separate, and there will be no interchange of seniority, since there are two separate ownerships.

Wages under the AM contract were increased \$6 to \$115 a week, and a five-week accumulative sick leave program was inserted for the first time.

The TV contract gives 202 jurisdiction over technicians, floormen, and film cutters and editors. The agreement is based on the format of the KRON-TV agreement and differs, principally, only in the matter of wages. Starting scale of technicians is \$100 per week. The flat rate will increase to \$105 on June 1, \$110 on October 1, and \$115 on February 1, 1955. The men will also receive a dollar a day mileage allowance to the Mount Sutro transmitter location.

Meany Visits 1212 Members



George Meany, AFL President, recently visited with members of IBEW Local 1212 who serve as technicians at CBS, New York. The occasion was Meany's appearance on CBS "Chronoscope."

May Teleradio Deadline

General Teleradio, Inc., Boston, was given until May 3 to answer Federal Communications Commission charges in early April that it is violating the FCC's new multiple ownership rules.

The FCC stated that records show General Teleradio, and General Tire & Rubber Company, (90 per cent owner of General Teleradio), and their officers and directors own all or part of 10 AM, 4 FM and 5 TV stations. This totals 3 more AM stations than allowed under FCC rules.

Stations involved were listed as: WNAC (AM, FM and TV), Boston; WOR (AM, FM and TV), New York; KHJ (AM, FM and TV), Hollywood; WEAN (AM), San Diego, Calif.; WGTH (AM and TV), Hartford, Conn.; WARE (AM), Ware, Mass.; WSJS (AM and TV), Winston-Salem, N. C., and WJW (AM and FM), Cleveland.

Subscription TV at WOR

Television station WOR-TV, New York, on April 16, applied to the Federal Communications Commission for authorization to make experimental broadcasts of Zenith Radio Corporation's Phonevision system of subscription television, according to an announcement released jointly by WOR-TV and Zenith.

The authorization requested is for the daylight hours of 9 a. m. to 4:30 p. m. during times when WOR-TV would not otherwise be on the air, and limited to a 90-day period.

Gordon Gray, general manager of WOR-TV, said that if the authorization is granted, Phonevision equipment will be installed and a program of experimental broadcasts will begin on May 31.

Zenith proposes to install a number of Phonevision equipped receivers in different locations throughout the New York metropolitan area to give comprehensive data on operating conditions through the entire metropolitan region.

These receivers will be operated and controlled by employees of Zenith and WOR-TV and no demonstrations to the general public will be involved.

Technician-Engineer