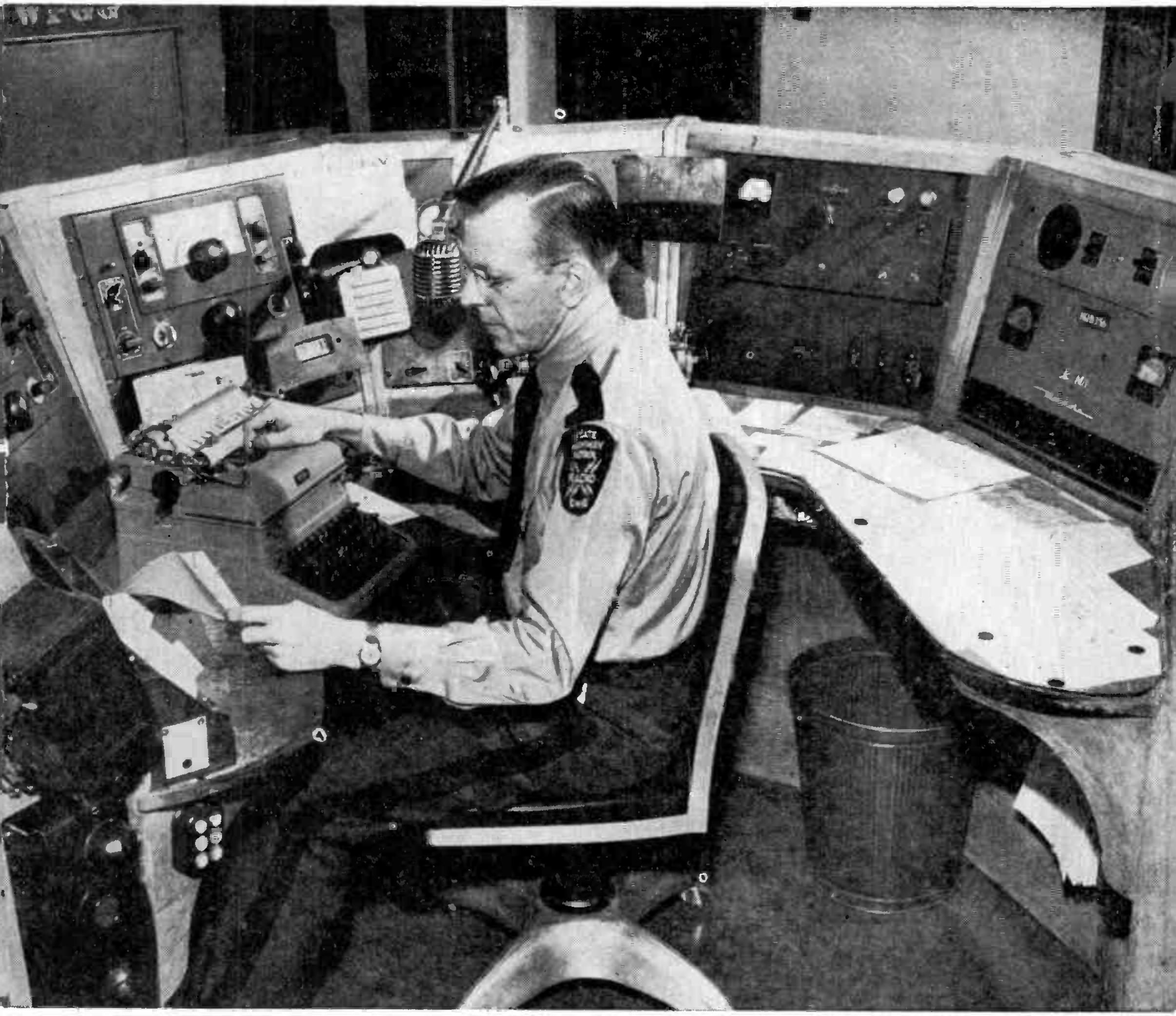
National RADIO-TV NEWS



IN THIS ISSUE

Spanning the Continent by Radio Relay

Color Television

Alumni Association News

Aug.-Sept. 1951

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Good Resolutions

When you make a good resolution, put it into effect *at once*. To postpone it is deadly. Anything that can be done next month or next year can be done NOW—or at least a start can be made toward it.

Millions of people dream about doing fine, worth-while things. But only a *few hundred* people ever get around to actually doing these things.

The *few hundred* may not be as smart as the others—may not be as talented, as capable, or as well educated. But they ACT and achieve concrete results—while the plans and good resolutions *of the millions* fade out into airy nothings.

Remember this when you make plans—when you make good resolutions. Put your plans and resolutions into effect *at once*. Get started!

J. E. SMITH, *President*

SPANNING THE CONTINENT BY RADIO RELAY

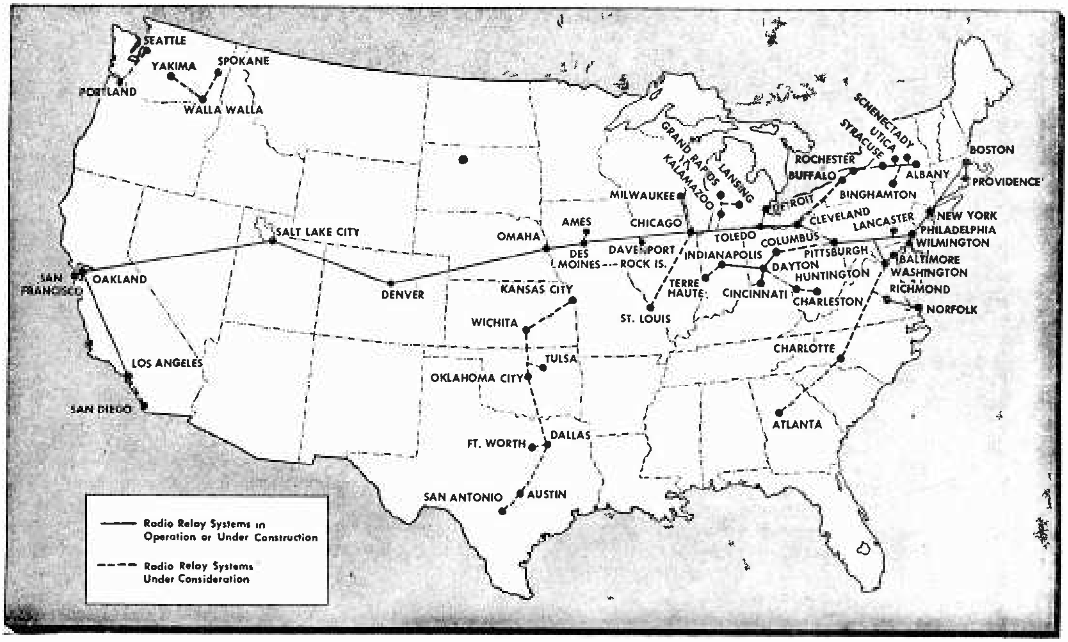
A New Medium of Transmission Is Taking Its Place Beside Open Wire, Cable, and Coaxial Systems as a Conveyor of The World's Telephone Messages

By RICHARD D. CAMPBELL and EARL SCHOOLEY

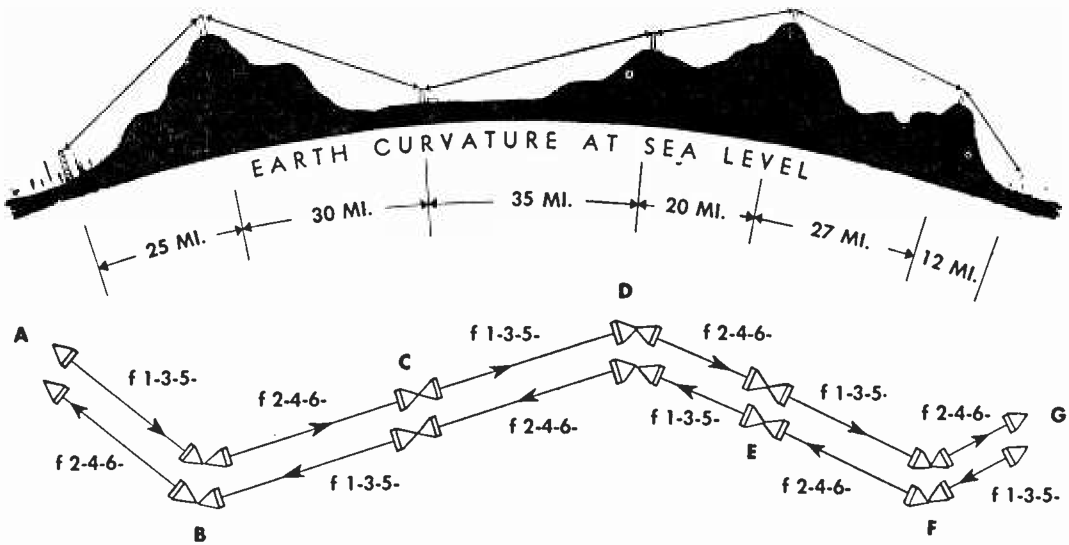
Reprinted from BELL TELEPHONE MAGAZINE *through the courtesy of American Telephone and Telegraph Co.*

THE telephone engineer's vision of bundles of telephone circuits or of television circuits spanning the country by radio is now close to realization. A radio system is being built overland between New York and San Francisco which will be capable of handling hundreds of telephone messages and several television programs. Already it is being used from the East Coast to Omaha—1,300 miles—and in 1951 the new system will push westward another 1,700 miles from Omaha to link the East Coast and the West. Over one hundred telephone circuits—only a small part of its ultimate capacity—are planned for operation initially in the section west of Chicago. Completion of the transcontinental system will make it possible for the first time for hundreds of people to talk and for millions of people to see by radio from coast to coast.

Several wire routes, two of which are cable, already connect the East and West Coasts. But additional facilities are needed, and radio relay is being used for this new transcontinental system because it affords an economical means of providing them. This does not mean that radio relay will replace existing means of wire communication. On the contrary, wire facilities



Bell System radio relay routes in operation or under consideration.



The upper diagram represents a section of radio relay route, showing stations located to permit line-of-sight transmission. The lines between towers indicate direct radio paths, the span length being determined by considerations of attenuation, noise, and fading. Below is a corresponding map of the route, showing the two directions of transmission on separate beams. The route is zigzagged to avoid possible interference between sections using the same frequencies.

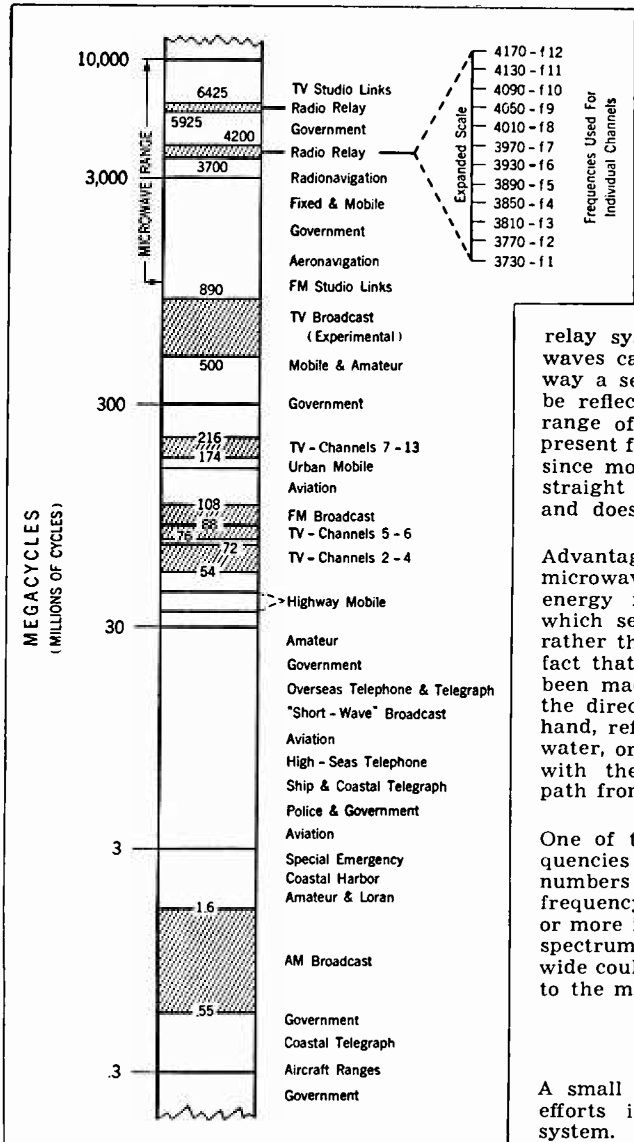
will continue to provide the bulk of the nation's communication facilities for the foreseeable future. Radio relay will be used in preference to other forms of communication where this appears to afford definite advantages. The decision will be based in each case on a consideration of all the factors involved, including cost, reliability of service and performance. This long-run policy will thus continue to insure the telephone-using public of the best possible service at the lowest possible cost.

Widening Radio's Field

Until quite recent years, radio has proved useful in the Bell System principally as a means of communicating with ships and other mobile units and with points that could not readily be reached by wires; but the development of new radio relay systems has greatly broadened its field of use. Wires and radio have in common, however, the fact that research and development over the years have increased the capabilities of each to carry more and more telephone circuits. Forty years ago, it was difficult to make even one speech channel operate successfully over a pair of wires for any great distance, and radiotelephony was just entering the experimental stage. Today, telephone conversations are being "stacked up" sixteen deep on a pair of wires on a pole line, cable pairs carry a dozen messages, and a pair of coaxial tubes may transmit as many as six hundred long distance conversations at one time.

The radio relay systems now taking their place in the telephone plant alongside those facilities are the result of similar growth in the radio art. A radio system placed in operation in 1920 between Long Beach and Catalina Island, Cal., produced one telephone circuit. Today, a radio system from Los Angeles to Catalina carries eight speech channels. Commercial overseas radiotelephone service was first opened in 1927, between New York and London, with one speech channel per radio system. Today, overseas radio systems handling as many as three or four telephone circuits are in use connecting us with some 90-odd countries. A radio system installed in 1941 to span the mouth of Chesapeake Bay has grown from the initial ten to 22 telephone message channels.

The radio relay system being built across the country will be able to carry hundreds of telephone circuits, yet there will be no pole lines or cables to construct and maintain across mountains, rivers, and plains. Instead, radio relay stations are constructed at intervals of about 30 miles on the average, and maintenance will be needed, therefore, only to keep the structures and the equipment at these stations in proper condition.



The location in the spectrum of the frequencies used for Bell System radio relay transmission is shown above with respect to certain other radio services. The individual channel frequencies are indicated on the expanded scale at the top right of the diagram. They are identified as f1, f2, f3, etc., to correspond to the frequencies shown on the diagram opposite. Use of a logarithmic scale is essential here, since a legible linear scale including the same information would be many feet long.

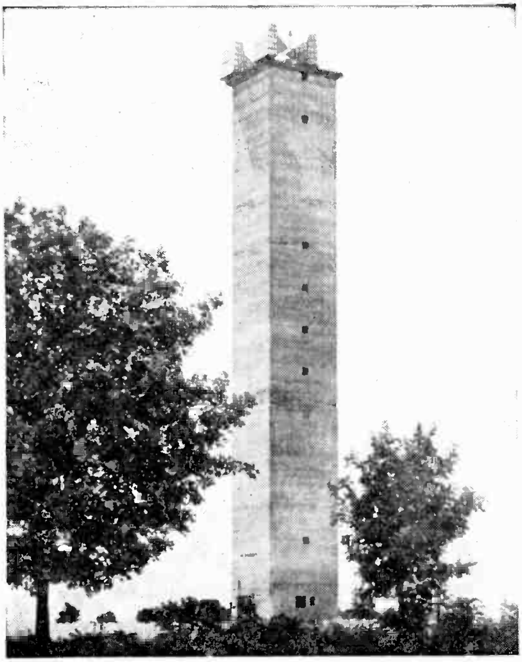
The newly developed radio relay system operates in the 4,000 megacycle range (4,000,000,000 cycles), where the corresponding wave length is extremely short. It is, actually, about three inches long, as compared to wave lengths of about 1,000 feet for frequencies in the middle of the standard broadcast band (550-1,600 kilocycles). Waves of this length are known as microwaves, and they have many characteristics similar to light. These characteristics prove useful in many ways, but they also complicate the design and operation of a radio relay system in certain respects. The microwaves can be focused into a beam in the same way a searchlight sends a beam, and they can be reflected from relatively flat surfaces. The range of reliable microwave transmission with present facilities is limited to line-of-sight paths, since most of the energy travels in essentially straight lines from the transmitting antenna and does not follow the earth's curvature.

Advantage is taken of the ability to focus the microwaves into a beam by concentrating the energy from a transmitter into an antenna which sends it to a particular radio receiver, rather than scattering it in all directions. The fact that such frequencies can be reflected has been made use of in some instances to change the direction of the radio beam. On the other hand, reflections from salt flats, large bodies of water, or treeless plains may seriously interfere with the radio signals traversing the direct path from transmitter to receiver.

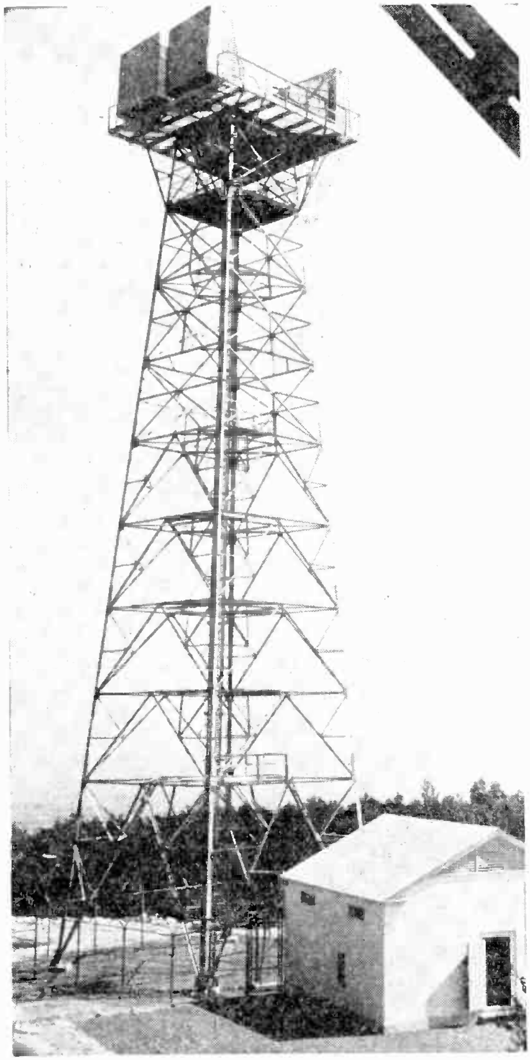
One of the basic reasons for using these frequencies is that television circuits or large numbers of telephone circuits need a very broad frequency band—three or four million cycles or more in width. In order to find space in the spectrum where bands several million cycles wide could be obtained, it was necessary to turn to the microwave frequencies.

Selecting a Route

A small army of people must coordinate their efforts in order to establish a radio relay system. Once a decision is reached to build such a system, engineers study the topography of the ground, using the best maps available, and pick a tentative route. Since the earth's curvature must be taken into account in finding line-of-sight paths, it is natural to seek elevated sites for repeater stations in order to extend the distance between them and thus minimize the number of stations required. Hilltops are likely to make good repeater station locations. Elevations are desirable that will permit sending the radio frequencies about 30 miles on the average.



The antennas are on the top and the emergency generator is in the bottom of this concrete building; the radio equipment and power supply are inside, about half-way up. The airplane warning beacon required on most such towers is visible between the antennas.



The steel skeleton tower supports the antennas on its summit, and carries the connecting "plumbing" to them; the house contains the radio equipment, the power supply, and the emergency generator.

Remembering that the radio equipment has to be cared for, a site which is inaccessible during the winter months will probably not be satisfactory, despite any other advantages it may have. Remembering, too, that microwave frequencies can be reflected, relatively flat sections of the earth's surface—including water-covered areas—must be avoided or else crossed in such a way that, if reflections do occur, no serious harm will be done.

When the map work is complete, crews go into the field to study the locations selected from the maps. In some areas, the only maps available are based on surveys made more than 60 years ago. In several cases, hills appearing on these maps were found, on field check, to be incorrectly located. Locations picked from maps were often found to be already occupied by farm buildings or, in some instances, by radio stations.

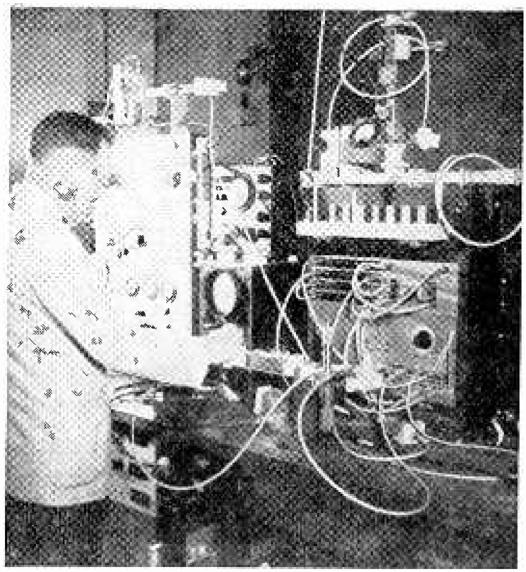
Sometimes hilltops with good access, power supply, and other advantages cannot be used because higher hills, trees, or city buildings are in the line-of-sight path, or because of restrictions imposed by local or federal laws. Even though hilltops are used, towers are required in some locations to provide an additional 200 feet or so of height which may be necessary for reasonably long line-of-sight paths to the next relay points.

Tentative sites for the antenna towers are picked and temporary towers are erected. These towers are used to support special radio test equipment to check the path to the next adjacent site. This check may indicate that the tentative site selected is not satisfactory because of bad reflections, or because the path is obstructed by a hill or by a large structure, such as a water tank. The tests may also indicate that shorter or taller towers are required than the preliminary review seemed to indicate. Other tests are made on the soil, to determine the nature of the tower foundation required.

Since a shift of even a few hundred feet in location of a relay site may affect the tower height and location of the two adjacent repeaters, no sites are purchased until there is reasonable assurance that all sites on a route are satisfactory.

Once the sites have been secured, bids are obtained from contractors for the foundation and erection work at each location. Roads must be built, power brought in, and other facilities provided which are not generally at hand in the remote locations usually chosen for radio relay points.

About ten months later, if all goes well, the buildings and towers will be complete and the radio equipment and antennas will be on the ground ready for installation.



A Bell Telephone Laboratories engineer conducts experimental work on a transmitter-modulator unit of radio relay equipment, shown at the upper right.

Using Microwave Frequencies

The equipment used in the radio relay system consists of the same basic elements as are used for other Bell System radio services. These include radio transmitters, radio receivers, and antennas. The main differences between the radio relay equipment and that used for the other systems are the use of microwave frequencies, the new techniques involved in the apparatus design, and the ability of the equipment to handle wide frequency bands.

The functions of the radio equipment can be readily understood by following a simplified account of the course of a signal passing over the system.

The signal to be transmitted is superimposed on the transmitting frequency, which lies in the range from 3,700 to 4,200 megacycles. This radio signal is amplified and then sent to an antenna, where the energy is concentrated in a narrow beam directed through space toward the first repeater station along the route. Since the energy is concentrated, it is not necessary to use the millions of watts which would be required if the energy were scattered in all directions, as in radio broadcasting. Instead, the actual radio power output is only half a watt, or about the same amount of energy required to operate a flashlight bulb. Yet to obtain the power to provide adequate amplification and this amount of radio energy, several hundred watts of input power is required.

The relay station receives the relatively weak microwave signal, amplifies it to make up for the loss it has suffered in spanning the distance from the preceding station, and sends it on to the next station. This process is repeated over and over again at successive repeater stations located at intervals along the desired routes. A signal transmitted over the entire system between New York and San Francisco will, incidentally, pass through 105 relay stations.

At the distant terminal of the radio relay system, the signal, after amplification, is restored to its original form. If it is a television signal, it is ready for delivery to the broadcast station. If the signal consists of a group of telephone circuits, it must be connected to equipment similar to that used in coaxial and other carrier systems, which performs the feat of unscrambling each telephone conversation from the others before delivery over individual circuits to the customers' telephones.

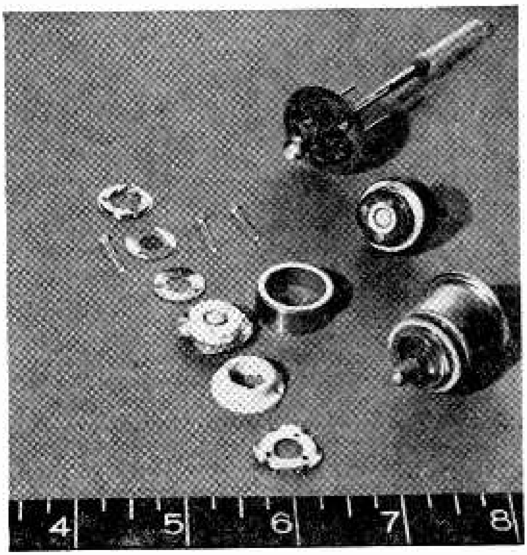
This account has traced the course of a signal transmitted over a radio relay system in one direction only. For two-way service, such as is necessary with telephone communication, equipment must also be provided for transmission in the reverse direction. The traffic on many routes may require the installation of additional radio equipment for the broad-band channels which would be necessary to handle more bundles of telephone circuits or additional television programs.

A single radio relay antenna may transmit as many as six broad-band channels in one direction. Another single antenna may receive the same number. Hence, only four antennas in all —one transmitting and one receiving antenna side by side facing in one direction and a similar pair facing in the opposite direction—will suffice at each radio relay point along a route equipped to handle six broad-band channels in the two directions.

If a branch route takes off from a relay station in a different direction an antenna is also needed for transmitting toward and another for receiving from the new direction.

Microwave Transmission

Every advance in telephone science and telephone service represents foresight, long-range planning, guided and coordinated attack upon a problem, and a practical solution. In this pattern, radio relay is the outcome of long and fruitful effort by the Bell Telephone Laboratories, and its installation bespeaks the utmost skill and manufacturing precision by the Western Electric—the Bell System's division of manufacture and supply.



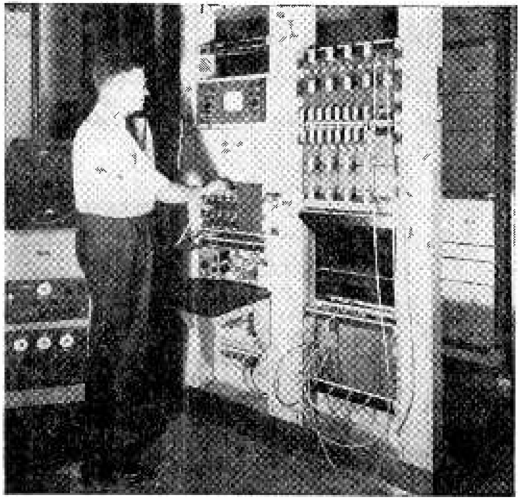
Here are the elements of the close-spaced microwave triode. The upper and lower items at the right are the tube base holding the heater leads and the tube envelope; the rest are components. The inch scale indicates the small size of the tube.

A better appreciation of the development and manufacturing effort required in producing the radio relay equipment can perhaps be obtained by considering a few of the components involved. Take, for example, the close-spaced microwave triode (Western Electric Type 416A microwave vacuum tube), which is the very heart of the equipment. It is used to generate and amplify the extremely high frequencies employed for transmission. This tube, which is about the size of an English walnut, is the same in principle as any ordinary three-element vacuum tube having a cathode, grid, and plate. The placing of these elements in the extremely small space required to make the tube work at these frequencies is a triumph of design and manufacture. The grid structure employs wire only about one-tenth the thickness of a human hair, and the distance between the grid and the cathode is one-fifth the diameter of a hair. Certain critical parts are gold-plated to resist corrosion. Six such tubes are required for each one-way channel at each relay station.

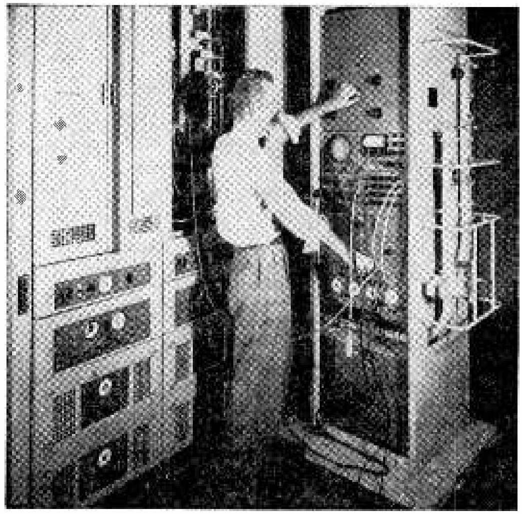
At microwave frequencies, the energy is easily radiated, and therefore ordinary wire connections cannot be used for guiding these frequencies from one place to another. It has consequently been necessary to guide the energy by means of pipes or tubes, called waveguides, and frequently referred to as "plumbing." Sections of waveguide are made in various lengths and shapes, including elbows and other bends, twists, and straight sections. A cross-section is about half the size of a playing card. The various sections are bolted together by means of flanges. Dents and other deformations of the waveguide and flanges must be guarded against because, even when relatively minute, they are likely to result in transmission irregularities.

Microwave transmission would not be practicable without highly directive antennas, and these too deserve particular consideration. The type normally used in the radio relay system is made of metal, and acts in the same manner for microwave frequencies as a glass lens does for light waves. For this reason, it is commonly referred to as a lens antenna. By the use of such an antenna, the microwave frequencies can be focused into an extremely sharp beam. Lens antennas are used for both transmission and reception. If non-directional antennas were used, the output of the transmitter would have to be increased to about 50,000,000 watts of power, instead of the one-half watt used with the lens antennas, in order to produce the same transmission effectiveness.

Equipment has been developed for use at the



This man is watching a video monitor in a patching bay at a radio relay station where a branch connection is provided to a television broadcasting station. A test console may be seen at the left.



The three large cabinets at the left—one with its door open for testing—are radio transmitter-receiver bays. The equipment in each serves as a relay station to receive, amplify, and transmit one-broad-band channel in one direction. The test bay with which the man is working is used to locate trouble and to make routine checks of the equipment.

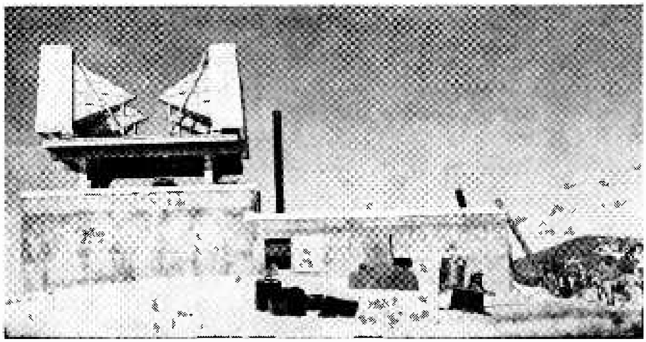
repeater stations and at special maintenance centers to assist in determining the overall performance of the radio equipment during routine testing or to locate the source of troubles which might develop.

The reliability of service over the radio relay system can never be better than the reliability of the power supply from which it operates. For this reason, the equipment is operated from storage batteries. Commercial power is used as the primary source of energy at most stations. However, to insure continuity of service, a standby gasoline or diesel engine generator, capable of automatically taking over the load in case of a failure of commercial power, is installed at each station.

Rectifiers which provide the required current supply for the batteries are installed in duplicate, and if one fails, the other takes over automatically. The storage batteries are capable of carrying the load for six to eight hours, which is generally time enough for a maintenance man to get to a station if something should go wrong; and in some locations difficult of access, a larger battery is used which is capable of carrying the load for as long as 24 hours, further insuring continuity of service.

Since the repeater stations are designed for unattended automatic operation, a control system is used to provide information at special maintenance or alarm centers concerning the operating condition of the individual stations. The system produces a visual and an audible signal at the alarm center when trouble develops at an unattended station. Upon receipt of such an alarm, 42 different alarm conditions at the unattended station can be checked from the alarm center. These conditions range from an open door at the station to failure of a rectifier or the failure of an aircraft tower warning light. The alarm center is thus apprised promptly of unsatisfactory conditions at the unattended stations, and remedial action can be taken.

In a long radio relay system, the maintenance work must be carried on from regional maintenance centers located at strategic places having access to the individual stations along a section of route usually ranging from 100 to 300 miles in length. A special telephone circuit is provided to interconnect the individual stations in each of these sections with their associated alarm and maintenance centers. To facilitate coordination of the maintenance work in the individual sections another circuit is provided which interconnects only the terminals, the main stations, the alarm centers, and the maintenance centers of an entire system—such as the one between New York and Chicago. These circuits are usually provided by wire, but separate radio facilities have been used in a number of cases to connect relay stations at remote points.



This radio relay station, under construction on Mt. Rose, Nev., is nearly two miles above sea level, the highest elevation of any station in the entire transcontinental system.

Problems and Capabilities

The Bell System is now operating some 8,150 channel miles of broad-band radio relay systems. Seventy percent of this mileage is provided by the use of the newly designed microwave equipment, and most of this was placed in regular service in September of 1950. All of the radio relay facilities at present in service are being used commercially for television transmission. The experience to date with the newly developed equipment confirms the expectation that this system can transmit present-day television signals over very long distances with excellent results. Test pictures transmitted twice around the New York-Chicago system, a distance of approximately 3,300 miles, can easily be mistaken for pictures which have been transmitted only over local pick-up facilities.

As may be expected with any new development, some equipment difficulties were experienced during early tests of the microwave radio relay systems. Unexpected sources of noise and transmission irregularities had to be tracked down and minimized or eliminated. Equipment troubles were studied and the necessary corrective action was taken. Plenty of cooperative effort made it possible to place the system in regular operation on schedule.

On the operating side, men had to be trained in large numbers to assume the maintenance and operating duties involved in the use of this new form of communication system. Here, too, the successful operation of the systems now in use speaks well for the manner in which this program was carried out, and for the hard work, loyalty, and skill of the plant personnel.

Tests made on the New York-Chicago system give further support to laboratory tests proving the practicability of carrying large groups of telephone circuits over transcontinental distances. Needed telephone circuit facilities are to be provided by the use of radio relay systems on a number of routes during 1951—including service over the Chicago-San Francisco route. Present plans contemplate that by the end of 1951 the total channel miles of broad-band radio relay systems in operation will have increased to nearly 25,000. Of these, about one-third will be equipped to provide a total of about 800,000 circuit miles of telephone circuits.

There are still things to learn about radio relay, and of its future no man can speak with certainty. But already radio relay has shown that it will have a vital part to play in meeting the communication needs of our nation, in peace or in war. The thousands of miles of radio relay now in service and being constructed will take their place alongside open wire, cable, and coaxial systems as a conveyor of the world's messages.

n r i

Our Cover Photo

We are quite proud of the cover photograph of this issue. The police radio operator shown in the photo is NRI Graduate Donald H. Peters, of Findlay, Ohio. His letter which accompanied the photograph is as follows:

"Last December I passed the Second Class Radiotelephone License Exam. Twelve days after obtaining the license I began my new appointment as Radio Operator at KQB 356, the Ohio State Patrol, Findlay, Ohio. The background that I received from your course in Radio Servicing and Radio Communications enabled me to finally get the type of work I really enjoy."

n r i

No one day is a fair sample of life, any more than one minute is a fair sample of any person's disposition. If things are bad today we are always justified in hoping that tomorrow will be better. Tomorrow *will* be better if we use today well.—Clinton E. Bernard in *Good Business.*

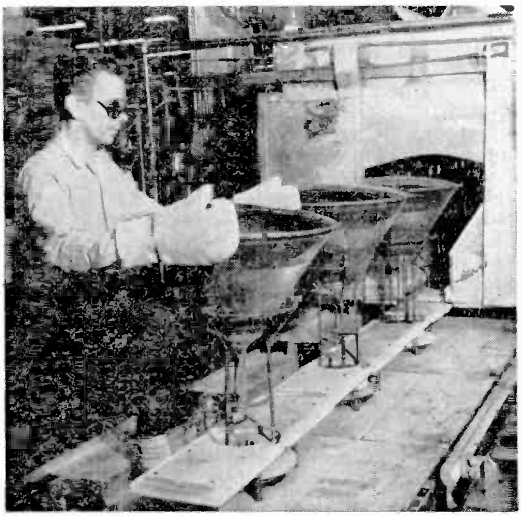
Unselfishness is so exceptional that it is never overlooked. It has the value of gold; it is so valuable that it is sought and bought and paid for without fail.—Gardner Hunting in *Good Business.*

Our Children need our faith, not our fears.—William A. Clough in *Weekly Unity.*

Manufacturing Television Picture Tubes at the General Electric TV Picture Tube Plant, Electronics Park, Syracuse, N. Y.

Sealing the glass funnel to the metal cone of a 24-inch TV picture tube. The whole unit revolves on a turntable while gas and oxygen flames seal the glass to the metal.

A very large in-line exhaust machine. Each "buggy" has an oil diffusion pump which creates a vacuum. Tubes go through a bake-out process in the tunnel at 400 degrees centigrade.



In-line annealing oven for 24-inch metal picture tubes. Each trolly moves slowly through carefully controlled temperature zones. The process removes sealing stresses and increases strength.

Testing a 24-inch TV picture tube for electrical ratings. The 24-inch tube is the largest manufactured by the General Electric Company at the present time.

How to subdue annoying video

By

H. WILLIAM PROPSNER

Reprinted through courtesy of RADIO TELEVISION NEWS *magazine*

NOTHING plagues the television technician more or sours a sale for a dealer faster than reflections which a customer won't tolerate.

Mathematicians and engineers have spent considerable time calculating the source of the reflections on the television screen. Radar theory has them bouncing every which way as water does from a fire hose played on a car.

Even the layman knows that "ghosts are a phenomenon created by successive signals arriving later than the original signal and manifesting themselves directly in super-imposed pictures or reflections on the TV screen."

Unfortunately there is no single solution to the problem of reflected pictures. Every situation is different. Similar problems occur in the same area, but the solutions will vary. The old process of cut and try and experiment will inevitably produce results. An article such as this can only become a guide and provide background data for further experimentation. It is understood that the basic principles of antennas and their use are common knowledge. Certainly there is sufficient literature available. Much of this article may be a recapitulation of information already known. However, since it is based on day in and day out experience in a... ...ds of weather, it can save time and money.

The only definite statement anyone can make concerning the proper installation of a television antenna where ghosts abound is that it requires honest work. What works perfectly for one installation can be disappointing or impossible for another.

The author is selling nothing but the idea that ghosts can be reduced or made less objectionable by the TV set owner himself. Inexpensively.

Generally where there is a ghost, the transmitter is close and the gain is high at the receiver. However, ghosts can occur anywhere, although they are much less of a problem outside a 20-mile radius of the station. Out where the signal is clean or perhaps flecked with a little snow, antenna work follows electrical and mechanical practice. Just put up the necessary sky-hook so it won't fall down, orient it by the sun or neighboring antennas, and run a wire to the set. An airplane may cause a fluttering ghost now and then, but its reflecting surface is happily transient.

There are *wide* reflections, so wide that the left-hand edge of the raster makes a disconcerting vertical bar or two near the middle of the picture. There are ghosts which put extra teams on the field during ball games which are more distinct than the home team. There are ghosts that just make the picture fuzzy. Some affect the best sync circuits so that the picture rolls vertically at every spark or noise. Some ghosts can be tolerated and show up badly only on advertisements or where straight lines are shown. Others may pass as minor on a test pattern when the antenna is installed, but cause cross-eyed actors and maddening outlines on programs.

High-gain, narrow-bandpass receivers tend to accentuate the reflection problem, even picking up ghosts from passing cars. No one receiver is necessarily better than another in a ghost-haunted region. With careful antenna work your set will work as well as the next. The antenna is more important than the set.

Initially, a transmission line to match the set, usually 300-ohm line, is preferred. Brown or black polyethylene cracks and deteriorates less in sunlight than the lighter colors. Where a strong signal is known to be present, good shielded line is all right, provided thought is given to the possibility of moisture entering the tubing. If it can be done at all, a well-routed unshielded line and an antenna, particularly a stacked array, located and oriented to minimize interference are better than the results achieved by the installing coax or Twin-X.

The simplest of electrical tools and television antenna materials are all that are necessary to clean up most pictures. A complicated antenna for high power gain, installed at much expense and effort as high as practicable, does better as a balloon trap than as a device to cut down reflections.

An adjustable V-type, or bug antenna is an ideal type in ghost-elimination work since it can be oriented in every possible position by hand with angles between 0° and 180°. The dipole lengths can be adjusted as shown in the diagrams, and it can be very easily moved about by hand, or on a pole if necessary. Unbalanced arrangements of angles and dipole lengths and odd orientations can be tried right at the set, providing there is sufficient signal strength. Of course, few people want an antenna stuck in some odd place in the same room with the set, but an idea of the best arrangement for a dipole can sometimes be secured before work is done elsewhere. Unfortunately, it is only an idea, for ghosts are nasty and don't play fair.

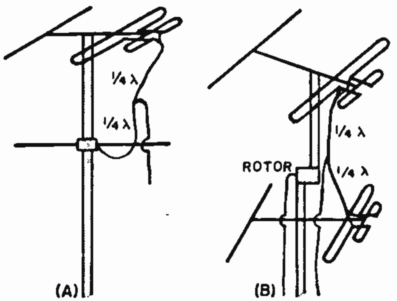


FIG. 1. (A) A 6 to 8 foot dipole phased to existing antenna. The antenna may be of any type. The quarter-wave sections of lead-in are equal and cut to frequency desired. The antennas are oriented independently for minimum ghosts. (B) A rotor turns one antenna of a stacked array, thus varying the receiving field pattern. Conical antennas may be used, but the simpler units are preferable. The rotor may also be used to turn the phase-control dipole.

In an apartment building an indoor antenna may be necessary, and here the reflections may be of the worst possible type. For many such installations a booster is necessary or a genuine aid.

Begin with the V-antenna and a piece of lead-in connected to the set, nothing else. Perhaps a vertical orientation with an angle of 120° produces a satisfactory picture, though minimum gain is secured this way. Often the location of the antenna in relation to hidden wires and pipes is critical. Transmission-line antennas have been installed in the cellar and have, under certain conditions, given pictures superior to the best roof-top arrays. However, with many sets and with inside installations where the signal is critical, furniture movement or lights and appliances turned on or off may affect the pictures. The movement of people within the room is often responsible for the presence or absence of ghosts.

The answer is experimentation. Check on how an indoor antenna works in that ghost-free location you have found. If the antenna must be moved for different channels, separate antennas are advisable, with independent leads and a switch, rotary or toggle.

A V-antenna, quite naturally, is excellent for surveying. Here is where the helper comes in. If personnel is easily secured, someone can operate the set and watch the ghosts, preferably test patterns in all work of this kind. Another individual can survey with the antenna. A third person can act as the liaison man.

In any survey work, the more information given the man on the roof, the more he can accomplish. There should be a continual flow of messages to tell him what's happening at the set. Instruments can show him the orientation for strongest signals, but only a confederate can tell him whether he's doing any good with the

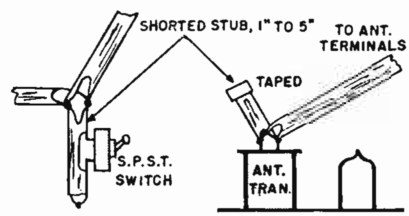


FIG. 2. How the line can be tuned for close-in ghosts, ⅛" or less with a shorted stub a few inches long. The length is found experimentally with a razor blade. The stub may be installed at the antenna transformer or socket by baring ⅜" leads on the stub, inserting them in socket holes, and pushing transmission line plug in on top.

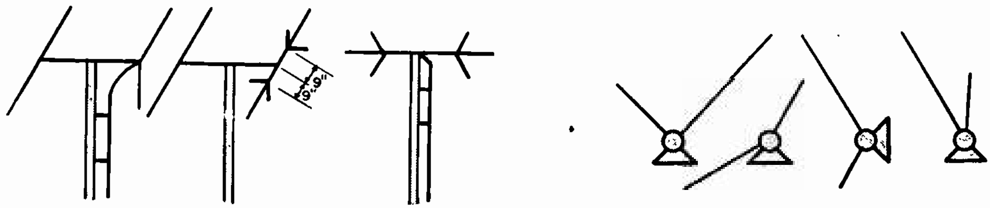


FIG. 3. (A) Means of controlling the lobes in the antenna field pattern. The "wings" are commercially-available RCA type. Each is usually spaced nine inches from the lead-in connection but may tune the antenna better if adjusted individually on dipole arms. (B) Several arrangements of an indoor "V"-type antenna which can sometimes be used.

ghost reduction or elimination problem.

A normal horizontal position of the antenna should be maintained in all search work. Incidentally, guys or ground wires for lighting have a decided effect on reflections. Avoid metal guys by substituting plastic-covered clothesline or waterproof rope on short masts if no other means of mounting is feasible.

Spot checks should be tried close to roof flashing, thus incorporating the effects of this metal work as a director or reflector in your antenna. It goes without saying that a location may be discovered halfway up the side of the house in front of a window with metal sash or screening. Or the antenna may work well just over the front door or under the rain gutter, then that is where it belongs.

When the antenna is installed and oriented for the best picture, a little gimmick (see Fig. 1) may do more to help you than all the manufactured antennas on the market today. A simple aluminum rod or plated metal-tubing dipole six or eight feet long is phased in as illustrated and moved up or down the mast, independently of the existing antenna for best pictures. The desired vertical spacing from the fixed antenna is achieved when a half-turn of the dipole gives the maximum variation in gain between two positions 180° apart. The signal on the phasing dipole is emphasizing or de-emphasizing the signal on the other antenna, depending on whether the antenna is in or out of phase.

When this height is found, the phasing antenna can be slowly turned to minimize the ghost. This method has cancelled reflections in the worst possible receiving areas. Conveniently, too, it may be added, with little difficulty, to most existing installations. A suitable outdoor lightning arrester may be used at the junction of the two antennas thus making soldering unnecessary. All leads are secured.

Whether an antenna matches is usually of little consequence. Trifilars and line transformers are fancy gadgets. The diagrams, Fig. 3, show designs to overcome the wide lobes in the receiving patterns of elementary antennas and the means of making one dipole work for both high and low frequency. The phasing or ghost-control antenna does just this—regulates the directivity.

A dipole can be used as a parasitic and adjusted for minimum ghosts on the same mast with no electrical connection whatsoever to the existing antenna. It is best to try a V-antenna first, with 180° angle and maximum length. Then adjust its angle and length. If it works, a dipole may be cut and formed for a parasitic, *being careful your own body isn't indispensable to the receiving set-up.*

Rotors have become an imposing aid in subduing ghosts. Installed with proper considerations for the problems at hand, they can overcome the effects of changing conditions in the immediate area. For a good picture one day can gradually get worse with the weather, until it becomes a snake pit of confusion. A little turn of the antenna, even though a ghost persists, can clear it up until the weather is dry again.

Mechanical means of remotely orienting the antennas may correct a changed receiving condition which develops when another antenna joins the joyful throng on the rooftops, or a new water tower goes up on the pretzel plant. It can swing the antenna to cut ignition or motor noise picked up directly.

Two antennas stacked the proper distance and correctly phased can be divided—one fixed and the other turned from the armchair by a rotor. You can thus alter the pattern of the receiving antenna to suit many conditions. Its orientation, too, may have a wide range, provided it has the leads and switching arrangements.

A word of caution, however. Although a rotor serves in many situations, it cannot satisfy every person. A problem at any particular location can be quite complex. Thus the application of a rotor can easily be the most disappointing investment of all. It is often purchased as a fascinating cure for a disease that only the conscientious labor of surveying and experimental work can treat.

The lead-in length is very important in certain installations. This can be checked by splicing in temporarily several length of wire up to ten feet. A few trials will demonstrate whether any real significance can be attached to the effects of standing waves on the line.

Should more than one lead-in arrive at the back of a set, it's a good idea to ascertain if there is any cross-over of signals. A 250-ohm *carbon* resistor, switched across the end of the suspected lead, can act as a terminating load. A *shorted* quarter-wave stub, tuned to the desired frequency, performs best. This trap is *shorted* at the junction.

Twisting the lead-in has little effect in the reduction of interference or ghosts. It provides a little symmetry to the run, makes for a slightly more taut line, and that's all.

The first thing to do in any antenna troubleshooting is the substitution of an entirely new temporary lead-in, run as far as possible from the existing transmission line, yet without undue length.

Sometimes a well-chosen folded-dipole antenna will work wonders with a selected length of temporary 300-ohm lead-in. Different lengths are tried once the best position and orientation of the antenna are located. Loose wire can be coiled and arranged at the set while watching the reflections.

An improperly placed stand-off or lightning arrester may introduce reflected wave energy into the line. For having once found the place where a search antenna with temporary run gives good pictures, one must naturally exercise care at every point in the securing or routing of the lead-in from antenna to set.

All one has to do is experiment with a half-wave open stub at the set's antenna terminals, and it is forever impressed on his mind how sensitive certain points along a transmission line can become. This is especially true of a set without automatic gain control on the picture circuits. With due regard for metal window sash, drainpipes, roof flashing, phone and power lines, and anything at all electrically conductive, he will end up with a transmission line routed with all possible separation from these things. Generally speaking, a few inches is sufficient and all that one can attain. Where there isn't high signal strength, a half-inch will suffice.

Incidentally, television leads have been cut by telephone maintenance men where they passed within six inches of the telephone company's wires.

Close-in ghosts should always be checked with a piece of transmission line attached at the set and tuned experimentally with a razor blade. Beginning six inches from the terminals of the set, the stub is shorted in half-inch steps. Here a mirror or an interested, willing helper becomes a must, particularly with the consoles and large-screen sets of today. Frequently an improvement in gain will be noticed. Certain lengths of shorted stub may make the reflections stronger. If anything is unbalanced, poorly soldered, or even open-circuited in the antenna system, this method of tuning can make you look like a magician. It has often shown spectacular results. It may prevent the expense and nuisance of repair or replacement of a whole antenna and line run. A closed stub of only a few inches, adjusted critically, will improve reception in many instances. Tuned correctly to aid reception on any one channel, it will not harm reception on others.

This article naturally does not present formulas or methods for tuning lines or trapping any interference other than the original frequency in the form of a ghost. It is understood that a ghost is recognized. If transients or other effects, due to improper alignment of the set itself, are apparent in the pictures, no amount of work on the antenna system will ever do any good. Although, however, many *tunable* transients can be directly traced to the antenna installation. These, a tuned stub can trap out without any difficulty. In any case where there is doubt as to the origin of transients or close reflections, applying the right stub won't hurt

An open-end antenna, because of a high mismatch, more often requires this stub tuning than a folded dipole, yet the simpler antenna is favored in a reflected area, where, as has been mentioned before, the signal strength is usually high.

Ghosts show up as shadows and are even more troublesome on the proposed ultra-highs and with color transmission, so there's no sense in waiting. You've got a ghost, and if you throw away your antenna and end up with a delta match on the guyed-mast itself, it's perfectly acceptable if it kills the ghost.

n r i

Today when a man gets married he is happy if his wife is a good cook. But there was a time in Anglo-Saxon days when a girl was deemed most desirable as a wife if she knew how to brew beer and ale! If she could cook, that was fine, too, but it wasn't too important, apparently. This idea must have been popular because the word "bride" is derived from "to brew." To round this out, the wedding feast was known as the "bride-ale." Today, we drop the final "e" and say it as one word, "bridal."

Read How NRI Graduates Are Forging Ahead In Radio and Television

Has Spare-Time Business in His Own Building

"About six months after enrolling I started taking in radios of friends. I erected a workshop to be used exclusively for radio servicing. So, at present I am servicing radios in spare time in my own small building. I have done no advertising and yet my business is gradually growing bigger and better.

"There are so many practical benefits received from the NRI experimental kits, such as procedure of testing circuits. I certainly appreciate the many things you have done to help me."

Kenneth B. Folck,
Fogelsville, Penna.

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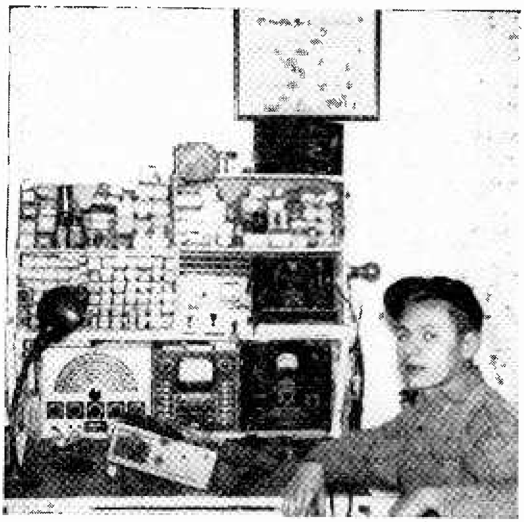

Earnings Paid for NRI Course by 20th Lesson

"By the time I was on the twentieth lesson, I had made enough money to pay for the Course and put some in the bank, not counting what I put into equipment. I own enough equipment to equip an up-to-date service shop for Radio and Television.

"I couldn't begin to estimate the personal profit that I have received from the Course. I average about $50 per month for my part time service work besides extra money out of my regular job, in wholesale parts, which I have as a direct result of the NRI Course."

Coy C. Riggs,
807 Washington Ave.,
Memphis, Tenn.

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$25 a Week Working Evenings in Own Shop

"I want to tell you how happy I am that I took your Course. I have a spare-time radio business here at home that keeps me mighty busy. I average $25 a week, usually spending three or four nights a week.

"I intend to open a large Radio Shop and also to take the examination for a Radiotelephone license. I love radio.

"I am sure of one thing; thanks to all of you at NRI, the knowledge I now have in Radio will help me serve my country very well in case I am called."

Harold C. Dudeck,
1229 S. Prospect St.,
Nanticoke, Penna.

Was Unemployed —Now Earning Good Money in Radio

"Before taking your course I was an unemployed musician. I could hardly afford the down payment.

"Now I am employed as a Radio Mechanic helper here at the U. S. Naval Station. My salary is about $70 per week. I also clear from $15 to $30 each week by repairing radios at home, in my spare time.

"I never fail to praise your course and method because it is a fine one, and I am one who knows."

Robert C. Beckett,
3072 Webster Ave.,
San Diego, Calif.

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Has Own Radio and Television Business

"I am at present working full time repairing Radio and Television. I own my own business.

"In my Television work, I have encountered everything from bad picture tubes to bad condensers, resisters, deflection coils, etc. With all these different problems I think I am getting along pretty well.

"There is one thing for sure—you are never through learning."

William F. Rockenberger,
34 E. Main Street,
East Palestine, Ohio

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As Proud As If He Had Graduated From College

"I wish to thank you for the wonderful start you gave me in Radio and Television. I don't think I could be more proud than if I had graduated from college. I think of your school more as a Radio College because you seem to be present throughout your course with good sound personal advice, which gives a fellow confidence.

"I paid for half of my equipment while studying your course, and I'm now doing part-time service work at my home shop. I am a service station attendant and most all the service business I do comes through the station at which I'm employed. My business is now doing nearly $100 per month."

James E. McClung,
101 Argonne Street,
Clarksburg, W. Virginia

—n r i—

As space permits, from time to time, we plan to devote a page or two in NR-TV News to short success stories such as above. They are taken from testimonial letters we have on file. Photographs and letters of this kind are always greatly appreciated by us. We feel we should pass them on to our readers for the inspiration to be gained from a reading of them.

Color Television

By the Engineering Department, Aerovox Corporation

(Reprinted through the courtesy of the "Aerovox Research Worker.")

ALTHOUGH the adoption of a system of color television for regular commercial telecasting has been long delayed by hearings, court battles and injunctions, there is nothing in these legalistic proceedings to prevent the experimenter, technician and radio engineer from preparing himself technically for this service. The burden (and profit) of converting many of the millions of black-and-white receivers to color reception will fall on the shoulders of the able TV technician.

So, while industry battles bitterly over ways and means, this article is devoted to an unbiased and non-political discussion of the fundamental principles of color television which apply equally to all of the systems as yet proposed. A description of the three systems which have been demonstrated before the FCC is also included.

Color Fundamentals

All systems which have been considered for color TV in this country are trichromatic in nature, i.e., three primary colors are used in various combinations to form all the hues of the visible spectrum. The primary colors employed are not the familiar red-blue-yellow used in art and color printing, but rather a more basic red-green-blue combination. These primaries are known as the "additive" primaries whereas the red-blue-yellow primaries (more accurately "magentacyan and lemon-yellow" since they are complex colors made up of bluish red, bluish green and greenish yellow, respectively) are known as the "subtractive" primaries. The distinction comes from the fact that a subtractive color filter *subtracts* one color from pure white light passing through it, leaving a complex hue made up of all other colors, while an additive filter absorbs all colors in the spectrum but one. In this respect the subtractive color filter is analogous to an electrical *band-rejection* filter, while an additive color filter is like an electrical *band-pass* filter. This concept is illustrated in Fig. 1, which shows the response of an additive color filter as a solid line and that of a subtractive filter as a dotted line.

In all practical systems of color television, the additive primary colors are transmitted one at a time. However, if two or three of the primary colors are transmitted in a time interval which is shorter than the persistence of vision of the human eye (about 1/16th of a second) the eye sees the "secondary" color formed by those primaries. Thus, a yellow object is produced by transmitting its image in both red and green, in rapid succession. The various tones or shades of yellow are formed by varying the relative intensities of the two primaries forming it. In the same manner all other colors are produced by transmitting their primary color values in sequence. This method, which is common to all systems practical for broadcast use, is therefore called the "sequential" system of color transmission. The various systems using it differ essentially only in regard to the rapidity with which the color values of the composite color picture are sequentially "sampled."

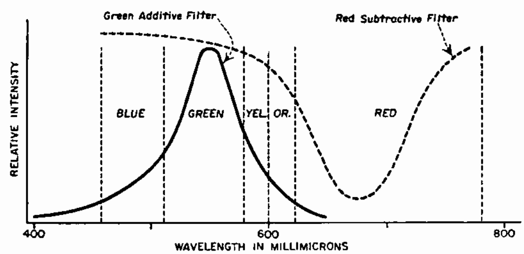


Fig. 1

The Field Sequential System

The elements of a *field sequential* system, which is the simplest in all respects, are shown in Fig. 2. In this system, the colors are switched after the transmission of each field. A rotating color wheel placed in front of the camera tube causes the scene being televised to be passed through a different additive primary color filter during the scanning of each field. Thus, one field contains information on only the red elements of the picture, the next field only the blue and the next field green. Field interlacing is used and six fields are required to produce a complete color picture. At the standard black-and-white field frequency of 60 per second, a

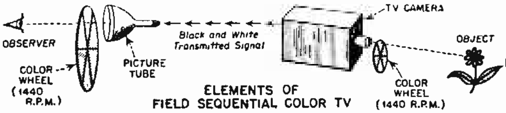


Fig. 2

six field picture would be produced only each 1/10th second—not fast enough to avoid "flicker" on scenes which are predominantly of one color. Therefore, field sequential transmission of color requires 144 fields per second. This gives 24 complete pictures per second, which is safely above the "flicker" rate.

At the receiving end, the field sequential system employs a process which is the reverse of that used for transmission. The picture tube is viewed through a rotating color wheel which is synchronized with the one at the transmitter in both speed (1440 rpm) and phase. A filter of the same color is thus before both the camera pickup tube and the receiver cathode ray tube at any given time. Suppose the color is green. The camera tube then "sees" only the green elements of the picture and these are transmitted in the usual manner to the receiver which reproduces them as white light. The additive filter between the viewer and the picture tube passes only the green light, however, so that the green highlights of the picture are faithfully reproduced. The green field is rapidly followed by one in red, one in blue, etc. The intermediate colors in the picture are then formed by the super-position of the primary fields on the retina of the eye. The advantages of the field sequential system of color TV are mainly the economy and simplicity of the equipment required. For the expenditure of only a few dollars, many experimenters have converted standard receivers to satisfactorily receive test transmissions in color using this system. Other advantages include excellent color fidelity.

The major disadvantage of the system is that it is not "compatible." This means that a program transmitted in color by the field sequential method cannot be received in black-and-white on standard receivers without modification. Since the color transmissions use a horizontal line frequency of 29,160 instead of the standard 15,750 lines per second, and a vertical sweep frequency of 144 per second rather than the present 60 per second, sweep circuit changes must be made in the existing sets to permit reception in either black-and-white or color. This is termed "conversion" and ranges in complexity from very minor changes in some sets to major redesigns in others. The task of performing such conversions would probably fall to the TV service technician who is qualified for such work.

Another disadvantage of the field sequential

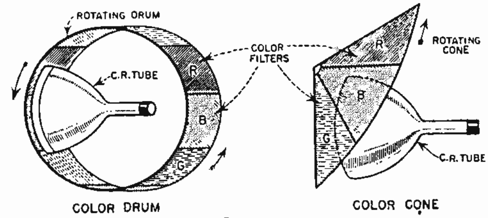


Fig. 3

system, as it is presently being demonstrated, is the bulkiness of the mechanical color disc. Since each of the six color filter segments arranged on this wheel must be large enough to cover most of the picture tube face, the wheel must be at least twice the diameter of the tube. This sets a practical limit on the size of the picture tube which can be used—tubes larger than about 12½ inches requiring discs of ungainly proportions. However, magnification can easily be employed to provide larger pictures from small tubes. Other forms of the color wheel, such as the color cone or color drum shown in Fig. 3, have form factors more adaptable to TV cabinets. No problem exists at the transmitter, since the filters used need only be large enough to cover the camera lens.

The field sequential system is not essentially "mechanical." The color wheel could readily be replaced with an all electronic, three-color picture tube if a practical one were commercially available.

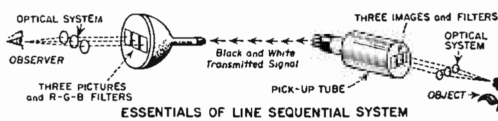


Fig. 4

Line Sequential Color Television

Another method of color transmission which has been demonstrated is called ***line sequential.*** As the name implies, colors are switched sequentially after each line rather than after each field. Therefore, color switching occurs 15,750 times per second instead of 144 times as in the field sequential system. Each of the standard 60 fields per second is made up of alternately red, green and blue lines. Line interlace is used and six fields must be sent before each of the 525 lines is scanned in each color. This results in only 10 complete "frames," or pictures, per second. However, flicker is minimized to a large extent by the line interlacing.

Fig. 4 shows the elements of the line sequential system. At the pickup end, an optical mixing arrangement consisting of three lenses and three color filters focuses the scene being tele-

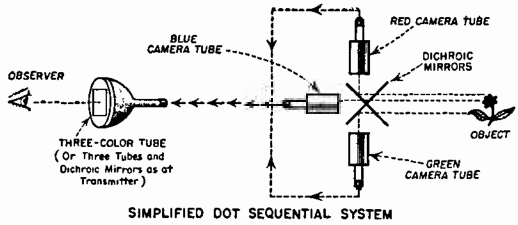


Fig. 5

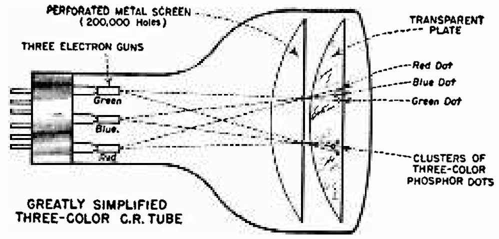


Fig. 6

vised on the camera tube mosaic so that the three color images appear side by side. The electron beam sweeps across all of the pictures in succession to generate sequentially colored lines.

Here again the transmission process is reversed in receiving colored pictures by the line sequential system. Three images containing the separate color information are reproduced side-by-side on the picture tube face. These images are viewed through separately colored filters and an optical system which superimposes them so that they appear to the observer as one colored image.

Since the line sequential system conforms to present TV standards it is compatible and could be received equally well on either black-and-white or color receivers. Its major disadvantage is an effect called "line creep" or "line crawl" which is particularly distracting to the eye since prominent color lines seem to be moving up or down through the picture.

The Dot Sequential System

The dot sequential method of color transmission goes one step farther than the line sequential approach and breaks each line up into many picture elements or "dots" which are transmitted sequentially in the three primary colors. To do this, color switching must be accomplished almost 11 million times per second. This high sampling rate is responsible for both the good features and some of the bad features of this method, as will be mentioned later.

To transmit dot sequential television, three separate pickup tubes are used. The televised scene falls on the three mosaics through a system of *dichroic mirrors,* as in Fig. 5. Each mirror is transparent to two primary colors, but reflects the third. Thus each tube receives picture information in one color only. An electronic sampling system connects the transmitter sequentially to the output of the three camera tubes at the rate of 3.6 *million* cycles per second. Each line consists of about 420 dots in alternate colors. Four fields are used per frame—two fields of standard line interlace and two of "dot interlace" wherein dot elements of the third and fourth fields fall midway between dots of the first and second fields, respectively. By this means, all elements of the picture are scanned in each color 15 times per second.

As in the previously described systems, this method reverses the transmitting procedure for receiving. One way of achieving this is to use three picture tubes, each viewed through a separate color filter and superimposed with a dichroic mirror. The color dot information is then electronically switched to the proper color tube for reproduction. The color sampling circuit at the receiver is synchronized with that at the transmitter.

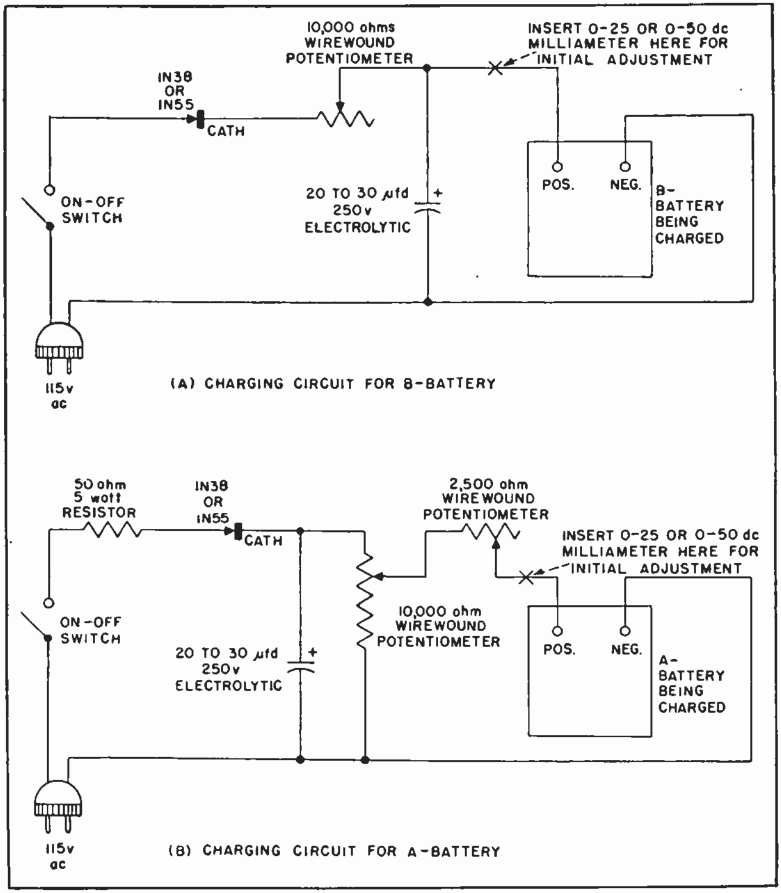
Since the use of three cathode ray tubes or color reproduction is both costly and cumbersome, much effort is being expended on the development of a single tube capable of three-color reproduction. Such a tube has been successfully demonstrated, but has not been commercially perfected. Fig. 6 illustrates the principle of its operation. The screen is made up of 600,000 dots of colored phosphors, 200,000 each of red, green and blue. A perforated metal screen is arranged between the phosphors and three separate electron guns in such a manner that each gun excites dots of only one color.

The advantages of the dot sequential system are compatibility and high definition. Its disadvantages are complexity, higher cost for conversion, and the fact that the high sampling rate of 3.6 megacycles per second prevents its use with some existing cable facilities.

——— *n r i* ———

Remember that we lift or lower ourselves by our thoughts. When we are in high spirits we walk on air, but when we are in low spirits we drag our weary feet along a hard road. What we think about other people and things lifts or lowers our spirit. This is because our thoughts, while they may concern others, are functioning in us. Our thoughts affect us more than anyone else, because they are a part of us.—Lowell Fillmore in *Weekly Unity.*

CHARGER FOR SMALL DRY BATTERIES



SMALL dry "A" and "B" batteries, such as those used in hearing aids and portable radios, which have lost their pep can be rejuvenated sufficiently for at least one more service period by passing a small direct current through them.

A very compact charger can be made to operate from the ac power line by using a 1N38 or 1N55 crystal diode to convert the ac to dc. The above figure shows circuits for rejuvenating "A" and "B" batteries. A combination of the two circuits might be employed to charge both batteries simultaneously. 1½ volt "A" batteries, and "B" batteries from 22½ to 67½ volts can be accommodated with the circuits shown.

To adjust the circuit initially, insert temporarily a 0-25 or 0-50 dc milliammeter at the point marked "X" in the circuit diagram and adjust the potentiometer for a current of 5 to 10 milliamperes through the battery. In the "A" battery charging circuit, both potentiometers must be adjusted.

The amount of time required to rejuvenate the battery will depend upon how much energy the battery has lost. Do not attempt to charge a battery which is completely discharged, or one which is leaking chemical.

Some small batteries which are just under par can be rejuvenated within a few minutes. Others require an overnight charge. Discontinue the charging process when the battery becomes warm to the touch.

New Half-Size, Double-Range Walkie-Talkies Turned Over to Army Signal Corps by RCA

A NEW walkie-talkie that is half the size and weight of its World War II counterpart and doubles both the range of communication of such equipment and the number of equipments that may be used in a given area without interference was recently turned over to the U. S. Army Signal Corps by the Radio Corporation of America.

An outstanding example of the progress being made in sub-miniaturization techniques, the new walkie-talkie, Type AN/PRC-10, is the smallest tunable radio transmitter-receiver of its type ever produced. It incorporated complete sub-assemblies such as the FM discriminator unit and the IF stage, each containing many components, which have been scaled down and compressed to fit in metal cylinders no larger than a miniature electron tube.

To accomplish this reduction in size, the equipment utilizes sub-miniature tubes throughout, with the exception of the power output tube, which is a miniature tube. New coil techniques were developed in turning out the miniature parts. The equipment boasts the smallest tuning coil of its type ever manufactured. It is smaller than a dime in diameter, and about ¼-inch thick, yet so efficient that engineers can arrive at a "Q" approaching 100.

Special manufacturing techniques were called into play in turning out the equipment. Resistance-type soldering was employed in the i-f stages and other small components. Instead of soldering irons, electric current was used to directly fuse the parts with a special flux.

Workers on assembly lines often were compelled to use magnifying glasses for the assembly of the small i-f, r-f, afc, oscillator, and mixer units. Each unit has been built separately, so that it can easily be replaced in the field. The miniature i-f transformers are expendable capsules.

The transmitter-receiver unit of the new walkie-talkie is only 3 inches deep, 9½ inches high, and 10½ inches wide, and it weighs only nine pounds. The entire equipment, including battery power supply, carrying harness, handset, two antennas, operating handbook, and spare parts, weighs only about 25 pounds.

The AN/PRC-10 is a 16-tube equipment providing for two-way voice communication over a range of about five miles on frequencies within the VHF bands. It can be used while strapped to the back of the operator, mounted in a vehicle, or set up as a semi-permanent ground installation. Provision is also made for remote operation and unattended relay operation, using two sets. This corrects a shortcoming of earlier walkie-talkie equipment, enabling communications personnel to overcome the obstacle sometimes presented by high ground or hills between their position and a command post or another unit. This may be done with the new equipment by placing two sets back-to-back on the intervening elevation and so interconnecting them that they will pick up and retransmit messages in both directions.

The equipment is housed in two waterproof cases, held together by spring clamps. The top case contains the receiver-transmitter unit and the bottom case contains the battery pack. An eight-wire cable connects the transmitter-receiver with the battery.

An adaptor harness and suspender belt are provided to strap the equipment firmly to the back of the operator, while a side pouch contains the handset, two antennas, spring section, operating handbook, and spare parts.

All controls are located on a cast-aluminum panel on the top of the equipment. These include a power off-on remote-calibration and dial-light switch, which serves in the "on" position to connect the receiver-transmitter to the battery pack through external circuits of the audio jack, while in the calibration and dial light position it connects the receiver-transmitter, calibration oscillators, and dial lamp to the battery pack. A tuning knob with dial-drive mechanism inside adjusts transmitting and receiver circuits to operating frequency simultaneously. The dial-drive mechanism is an anti-backlash gear train, with the antenna tuning components mounted on and operated by the mechanism. The dial drum, with its frequency calibration markings and pointer, are visible through the lens on the panel.

Other controls are the pointer adjustment, which permits minor adjustment of dial settings to correspond to settings indicated by the built-in calibrator; a dial lock, to lock tuning so the operating frequency cannot be accidentally changed; long and short antenna jacks, an auxiliary antenna jack with chain and cap; dial lens and pilot light, volume control, squelch control, and ten-prong audio jack providing external connections for the handset or control cables.

The small receiver-transmitter chassis supports the miniature r-f, mixer and receiver oscillator circuits, the i-f amplifiers and discriminator, crystal calibrator, squelch and audio sections, and transmitter oscillator and afc functions.

The r-f, mixer, and oscillator circuits are located in individual boxes, except for the antenna coil, which is separate and common to both transmitter and receiver. Each sub-assembly consists of an extremely small coil, trimmer capacitor, decoupling resistors and capacitors, and a sub-miniature tube and tube socket. Interconnection of the boxes is accomplished through small terminal boards on the tops of the individual boxes.

Of special interest are the ¾-inch diameter cans, 2 inches long, which enclose the i-f amplifier, sub-assemblies, consisting of a sub-miniature tube, coils, resistors and capacitors. The assemblies are hermetically sealed in the cans. The cans have 7-prong plugs similar to miniature tube bases, and plug into sockets located in the i-f chassis. The discriminator cans are similar to the i-f cans, except that two germanimum diodes are used in place of the sub-miniature tube.

The left center portion of the chassis contains the crystal calibrator and squelch and audio tubes, all mounted vertically. A calibration crystal is mounted at each end of the rows of tubes, and the microphone and output transformers are located in front of these tubes. Other components associated with these tubes are mounted on a terminal board, located below the chassis and to the rear of the tube sockets.

The transmitter oscillator and afc boxes are at opposite ends of the row of boxes, the afc box being at the rear. Construction is similar to that of the r-f boxes. The modulator tube is mounted on the transmitter oscillator box, extending under the chassis. Inside the box are the grid coil, trimmer, and coupling capacitors. The afc box contains coils, tuning capacitors, coupling capacitors, decoupling circuits, and germanium diodes.

The new AN/PRC equipment provides two types of antennas. A long seven-section whip-type antenna, each section fitting into the ferrule of the previous one, is used for maximum range, for stationary use, and for two-way unattended relay service. A spring section antenna provides tension and protects the long antenna from damage by bending if it strikes an object during operations.

A short demountable semi-rigid steel antenna is used for general service. It consists of several lengths of flexible steel tape, riveted together at the base and at points along their length, forming a tapered antenna three feet long. It can be folded into a small space without damage.

Because of low power and high frequency used by the AN/PRC-10 equipment, the location of the equipment will greatly affect its service range. The equipment works well in line-of-sight, on flat terrain, over water or to and from liaison type aircraft. The effective range of the equipment is greatly extended if a semi-permanent antenna is mounted on a tower or other high point above the surrounding terrain.

The receiver of the new equipment uses a superheterodyne circuit for the reception of frequency modulated voice signals over a VHF frequency range. A signal entering the antenna is resonated in both the antenna and the antenna coil. It is then amplified in the two r-f stages. These stages are gang-tuned to the operating frequency. The r-f signal and the local oscillator signal are fed into a mixer to produce the desired intermediate frequency in the mixer plate circuit.

The i-f signal is amplified in five identical i-f stages, connected in cascade. These stages are sealed plug-in units, with all components of each stage in an individual housing. The stages are connected as grid limiters, and operate as cascade limiters if the signal strength is great enough.

The output of the fifth i-f stage is fed into the discriminator to produce the audio signal. The discriminator stages uses two germanium diodes in place of the conventional diodes. A single audio stage is used with the volume control in the grid circuit. The output is connected to the handset receiver.

The squelch tube operates a relay which shorts the discriminator output when the squelch circuits are turned on and no signal is being received. The control signal for the squelch tube is the fifth i-f stage limiter grid voltage, which biases off the squelch tube. This in turn releases the relay, removing the audio input short.

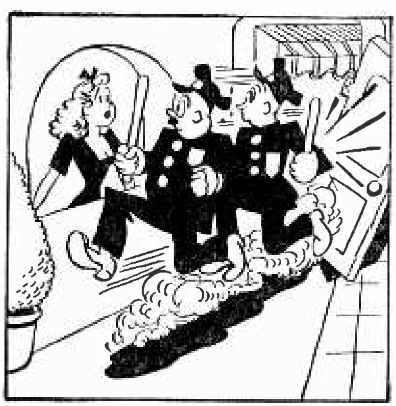
Two crystal-controlled oscillators provide a calibration circuit when the power switch is in the calibrator and dial light position. One oscillator operates at a given constant frequency and its output is fed into the antenna coil. Specific harmonics of this oscillator beat against the i-f frequency of the other calibration oscillator to produce a calibration signal at every megacycle point on the dial.

The transmitter is a neutralized output electron-coupled oscillator. Its frequency is controlled by comparison to the receiver local oscillator. The output circuit of the transmitter is the antenna coil common to both transmitter and receiver. A modulator operates by changing the magnetic flux through the ferrite core of an inductance coil shunting the grid coil of the transmitter and thereby changing the frequency. The modulator has two inputs: the microphone signal and the steady output voltage from the afc circuits. The transmitter grid circuit is mounted in the modulator box.

The afc driver is an amplifier tube followed by a discriminator using germanium diodes. The discriminator center frequency is tuned precisely to the intermediate frequency. It thus gives zero output at that frequency, and a positive or negative output voltage, depending on whether the input frequency is higher or lower than the intermediate frequency. The discriminator output voltage, applied to the modulator, controls the transmitter center frequency. The afc driver signal is obtained in the following manner. Some of the transmitter signal is bypassed by the first r-f stage (inoperative during transmission) and amplified by the second r-f stage. In the mixer, it is mixed with the local oscillator signal to produce a given i-f signal. The closer the frequency to the center intermediate frequency, the smaller the voltage developed to the afc discriminator. As a result, the transmitter frequency is controlled to the local oscillator frequency, less this given i-f signal frequency.

Performance characteristics of the new AN/PRC-10 transmitter show an output of approximately 1 watt. The oscillator has an electron-coupled afc controlled by comparison to the receiver local oscillator. The microphone input impedance is 150 ohms. The receiver sensitivity is 0.5 microvolt with 2.5 milliwatts output, 15 kc deviation, and a 10-db signal-to-noise ratio. Its selectivity is 80 kc at 6 db down, and the output impedance is 600 ohms.

n r i



Check your hats, please!

New Automatic-Focusing TV Picture Tube

A new Du Mont Teletron boasts 100% built-in automatic focusing. Eliminating all focusing controls, coils, mechanical focusing devices, this new tube is said to maintain a perfect edge-to-edge focus at all times regardless of line-voltage fluctuations, contrast or brightness settings, or installation procedure. The CR Tube Division of Du Mont Laboratories, Inc., Clifton, N. J., is now manufacturing the new automatic focusing tube in the 17" rectangular size, in limited quantities.

n r i

Channel Converter for Use With Tacoplex System

In community master antenna systems, losses of signal strength at higher TV channel frequencies when transmitted through long lengths of cable have presented some problems. To overcome this difficulty, Technical Appliance Corporation, Sherburne, N. Y., manufacturers of Tacoplex Antenna Systems, have designed a Channel Converter. The converter beats the higher channel signals down to an open low-band channel, using a crystal oscillator.

LOOKING AHEAD

By
GEORGE S. BENSON

President—Harding College
Searcy, Arkansas

THE SUBSTANCE OF SECURITY

THE problem of security has become more and more dominant in all discussions of human affairs. The term "social security" is today almost as much a part of our political-economic language as are the words "profits" and "wages" and "taxes." People have had dinned in their ears—by numerous office-seekers, office-holders and Socialists—the theory that government "social security" covering all citizens would be the final answer to the problem of security.

It hasn't worked out that way in any country where it's been tried. Most American families now are covered by some phase of the Federal Social Security program. Within a few years no doubt everybody will be covered. Yet no observant could today be certain of future security while inflation continues to waste away the very substance of the government "security" program—which is money value. Nor could any person feel really secure about his property or his future welfare with our country at war with Communist hordes and with the atom bomb in the hands of the ruthless, anti-God war-makers of the Kremlin. Real security contains more than the money element; in it too are the spiritual bulwarks of faith and peace-of-mind which money cannot buy.

A Valuable Book

Dr. Henry C. Link, one of America's foremost psychologists, has written a book entitled *"The Way to Security"* (Doubleday). It ought to be read by everybody. With the sureness of a master technician in human behavior, he explores the area of scrambled understanding on the subject of security and sets forth his factual findings in clear language. It is a book such as we desperately need today—since it focuses attention on the spiritual values in the midst of a world-wide movement toward materialism.

"Social security is what his family or society does for the individual," Dr. Link points out. "Personal security is the result of what the individual does for himself. The former comes from the individual, the latter comes from within. Social security consists largely of benefits and money given to the individual. Personal security comes from habits and benefits which the individual develops for himself and which make him self-reliant under almost any circumstances.

The Early Training

"Probably the chief weakness in our thinking about security is its emphasis on social security and its neglect of personal security. It is the emphasis on security from without rather than from within. It is the belief that our families, or our government can give us security instead of the realization that the individual must win his own security."

Dr. Link emphasizes that an individual's personal security can be strengthened or weakened by the early training given in the family. "The common practice of giving the children an automatic allowance," he writes, "prevents them from finding out what life really is. Instead of learning the truth about money, they learn that it is something to be had for nothing. They get the impression that a regular allowance is something they are entitled to by right." This, he says, is an unwholesome attitude and later may hinder the individual's effort to attain economic security.

In my work with boys at Camp Tahkodah, which I have operated in the Ozarks during the past seven summers, I've noticed a difference in the self-reliance and resourcefulness of boys who had formed the habit of earning their spending money by carrying papers or doing household or other chores, and those whom I knew to be on a "free" allowance. Invariably the manly characteristics and Christian humility which we seek to develop at the summer camp are more readily acquired by those boys whose parents have encouraged the habits of work and thrift.

The quest for security is motivated by an entirely normal human longing. But, as Dr. Link shows so clearly in his book, it cannot be satisfied with money alone; nor can it be guaranteed to the population by government. Just when economic security may seem within the grasp of a people, inflation or depression, national bankruptcy or war can utterly destroy it. And when this happens, the attribute of self-reliance, built on a foundation of Christian faith, is both the nation's and the individual's best chance for survival and recovery.

N.R.I. ALUMNI NEWS

NOMINATIONS FOR 1952

ACCORDING to the Constitution and By-laws of the National Radio Institute Alumni Association, it is again time to call for nominees to serve as officers during the coming year. Every member of the Alumni Association is requested to vote for the man whose name he would like placed in nomination for President of the NRI Alumni Association and, in addition, to vote for four nominees for Vice-Presidents.

Most of our members understand our election procedure but for the benefit of those who may have joined the Alumni Association during the past year we give this bit of necessary information. The two men who receive the largest number of votes for the office of President, will be declared nominees. The eight men receiving the largest number of votes for Vice-Presidents will be declared nominees. The names of the nominees will be published in the October-November issue of National Radio-TV News.

That, of course, is our next issue. Our members then will be asked to choose from among the nominees, a President and four Vice-Presidents. The election will take form during the month of October. The final date for voting will be October 25.

The first important step then is to hold our primary to select our nominees. That is what you are asked to do now. The final date for voting in the primary is August 25, 1951. Please be sure to vote and mail your ballot early.

The following portion of our Constitution is taken from Article VI, pertaining to the election of officers.

1. The election of the President and the Vice President shall be by ballot.

2. The President shall be eligible for re-election only after expiration of at least one year following his existing term of office, and when not a candidate for President, may be a candidate for any other office. Other officers may be candidates to succeed themselves, or for any other, but not more than one, elective office.

3. The election of officers shall be held in October of each year, on the day designated by the Executive Secretary, but not later than the twenty-fifth of the said month.

4. The Executive Secretary shall advise Members by letter, or through the columns of NATIONAL RADIO-TV NEWS, *on or before August first of each year that names of all nominees shall be filed in his office not later than August twenty-fifth following.*

5. Each Member shall be entitled to submit, in writing, one nomination for each office, and the two nominees receiving the highest number of votes shall be the nominees for the office for which nominated.

6. The Executive Secretary, before placing any name on the ballot, shall communicate with each nominee, to ascertain his acceptance of the office, if elected. If such tenative acceptance is withheld, the eligible nominee having the next highest number of votes shall be the nominee for that office.

7. The Executive Secretary, on or before October first of each year, shall furnish Members a ballot listing the names of the nominees for each office.

8. No Member shall be entitled to vote if he is in arrears in the payment of dues.

9. Ballots, properly executed and valid according to the instructions plainly printed thereon, shall be returned to the Executive Secretary on or before midnight of October twenty-fifth of each year.

10. In the event of a tie vote for any office, the

Executive Secretary shall cast the deciding ballot.

11. The nominee receiving the greater number of votes for the office for which nominated shall be declared by the Executive Secretary to be elected to that office, and notice of such election shall be forwarded in sufficient time, prior to January one, to permit such elected officer to enter upon the duties of said office on that date.

A convenient ballot has been prepared and will be found on Page 28. Please keep in mind that the Polls for nominations, will close August 25, 1951. Thus we at headquarters are given five days in which time to count the votes and announce the nominees in the October-November issue of National Radio-TV News, which goes to the printer on September 1. Balloting on the nominees will then take place and the successful candidates will be announced in the December-January issue of National Radio-TV News in time for them to take office on January 1, 1952.

At the close of 1951, that very popular man from Baltimore, Mr. H. J. Rathbun, who is our President during 1951, will retire from office.

We have many men in our organization, which has members in every state and all Provinces of Canada, who have contributed a great deal to our progress. Few have done more than has Mr. Rathbun. For many years he has been one of the strong pillars of our chapter in Baltimore. He is experienced in Alumni affairs. He is capable of delivering a good talk on anything pertaining to Radio and Television. He is genuine and sincere. Enjoying, as we do, a membership now totalling almost 12,000, Mr. Rathbun will be able to retire at the end of 1951 knowing that he had a wonderful year as the President of the NRI Alumni Association.

Last year, you may recall, Mr. Alexander Remer of New York was the candidate who ran against Mr. Rathbun. Mr. Remer was Vice-President for several terms. He is very active in the New York Chapter and would make an excellent President.

In an effort to be helpful, we have selected the names of a few members from various parts of the country as an aid to you in choosing your nominees. These names appear below.

Please be sure to vote. Remember you are to select one candidate for President and four candidates for Vice-President. Sign your ballot, give your address, and mail it promptly to Mr. L. L. Menne, National Radio Institute Alumni Association, 16th and U Sts., N.W., Washington 9, D. C. Mr. Menne has appointed Mr. Charles Alexander, Bookkeeper, NRI to act as teller. The results of the primary will be announced in the next issue of National Radio-TV News.

Nominations

All Alumni Association Members are requested to fill in this Ballot and return it promptly to National Headquarters. This is your opportunity to select the men you want to head your association. Turn this page—the other side is arranged for your selections.

After the ballots are returned to National Headquarters, they will be checked carefully and *the two men having the highest number of votes* for each office will be nominated as candidates for the 1952 election. The election will be conducted in the next issue of National Radio-TV News.

The President cannot be a candidate to succeed himself, but you may nominate him for Vice-President, if you wish. You may, however, nominate all Vice-Presidents who are now serving, to succeed themselves, or select entirely new ones. It's up to you—select any men you wish as long as they are MEMBERS IN GOOD STANDING OF THE NRI ALUMNI ASSOCIATION. Be sure to give the city and state of your selections to prevent any misunderstanding.

The Executive Secretary is appointed by the Board of Trustees and is not an elective office. Vote only for a President and four Vice-Presidents.

Tear or cut off the ballot at the dotted line, fill it out carefully, sign it, and return it immediately to L. L. Menne, Executive Secretary, NRI Alumni Association, 16th and U Sts., N.W., Washington 9, D. C.

Let's all do our part to help the staff handling the elections by submitting ballots early. Polls for nominations close August 25, 1951.

ALL NRI ALUMNI MEMBERS SHOULD VOTE

Nomination Ballot

L. L. MENNE, *Executive Secretary*
NRI Alumni Association,
16th and You Sts., N.W.,
Washington 9, D. C.

I am submitting this Nomination Ballot for my choice of candidates for the coming election. The men below are those whom I would like to see elected officers for the year 1952.

MY CHOICE FOR PRESIDENT IS

....

City........................... State.........

MY CHOICE FOR FOUR VICE PRESIDENTS IS

1. ....

City........................... State.........

2. ....

City........................... State.........

3. ....

City........................... State.........

4. ....

City........................... State.........

Your Signature ....

Address ....

City........................... State.........

Student Number ....

Nomination Suggestions

H. E. Nichols, Bisbee, Ariz.
Gorden E. DeRamus, Selma, Ala.
Don Smelley, Cottondale, Ala.
Edgar E. Joiner, El Dorado, Ark.
A. R. Waller, Keo, Ark.
Oliver B. Hill, Burbank, Calif.
Jos. E. Stocker, Los Angeles, Calif.
Herbert Garvin, Los Angeles, Calif.
P. A. Abelt, Denver, Colo.
Chas. Bost, Leadville, Colo.
Fritz Boehm, Bridgeport, Conn.
Geo. W. Neely, E. Woodstock, Conn.
Joseph Snyder, Danbury, Conn.
Eric Woodin, Naugatuck, Conn.
Wm. F. Speakman, Wilmington, Del.
Jos. Certesio, So. Wilmington, Del.
Max Yacker, Washington, D. C.
Wm. G. Spathelf, Washington, D. C.
Glen G. Garrett, Bonifay, Fla.
Henry C. Hasse, St. Petersburg, Fla.
Stephen J. Petruff, Miami, Fla.
W. P. Collins, Pensacola, Fla.
Odell Puckett, Rocky Face, Ga.
R. R. Wallace, Ben Hill, Ga.
Joseph Bingham, Twin Falls, Idaho
Arvil H. King, Montpelier, Idaho
Erwin Andrews, Batavia, Ill.
Robert Reid, Evanston, Ill.
Fred J. Haskell, Waukegan, Ill.
Jerry C. Miller, Skokie, Ill.
Louis Brodhage, Chicago, Ill.
John Janesick, Chicago, Ill.
Harold Bailey, Peoria, Ill.
Dick Michael, Hartford City, Ind.
Chase E. Brown, Indianapolis, Ind.
Russell Tomlinson, Marion, Ind.
H. E. McCosh, Charles City, Iowa
E. C. Hirschler, Clarinda, Iowa
C. Hopkins, Hutchinson, Kans.
Wm. B. Martin, Kansas City, Kans.
K. M. King, Wichita, Kans.
Wm. Griese, Bellevue, Ky.
R. B. Robinson, Louisville, Ky.
L. H. Ober, Alexander, La.
Lawrence Merz, New Orleans, La.
Walter Dinsmore, Machias, Maine.
Harold Davis, Auburn, Maine
Ralph E. Locke, Calais, Maine
H. J. Rathbun, Baltimore, Md.
J. B. Gough, Baltimore, Md.
John Kelley, Riverdale, Md.
G. O. Spicer, Hyattsville, Md.
Manuel Enos, Fall River, Mass.
Louis Crestin, Boston, Mass.
A. Singleton, Chicopee, Mass.
Omer Lapointe, Salem, Mass.
Robert Swanbum, Duluth, Minn.
Arthur J. Haugen, Harmony, Minn.
Ray Williams, Minneapolis, Minn.
F. Earl Oliver, Detroit, Mich.
Chas. H. Mills, Detroit, Mich.
Harry R. Stephens, Detroit, Mich.
Floyd Buehler, Detroit, Mich.

R. B. Hamblin, Pontotoc, Miss.
Robert Harrison, West Point, Miss.
C. S. Burkhart, Kansas City, Mo.
A. Campbell, St. Louis, Mo.
C. W. Wichmann, Inverness, Mont.
Earl Russell, Great Falls, Mont.
V. S. Capes, Fairmont, Nebr.
Albert C. Christensen, Sidney, Nebr.
C. D. Parker, Lovelock, Nev.
L. R. Carey, Elko, Nev.
Clarence N. George, Dover, N. H.
Geo. Stylianos, Nashau, N. H.
J. A. Stegmaier, Arlington, N. J.
Delbert, Delanoy, Weehawken, N. J.
Claude W. Longstreet, Westfield, N. J.
O. B. Miller, Albuquerque, N. Mex.
Solomon Ortiz, Raton, N. Mex.
Denver Stephens, Castle Pt., N. Y.
Alfred R. Guiles, Corinth, N. Y.
Alex Remer, New York, N. Y.
L. J. Kunert, Massapequa, N. Y.
Charles W. Dussing, Syracuse, N. Y.
George Leininger, Rego Park, N. Y.
Irvin Gardner, Saratoga, N. C.
Max J. Silvers, Raleigh, N. C.
Arvid Bye, Spring Brook, N. Dak.
Jacob J. Knaak, Cleveland, Ohio
H. F. Leeper, Canton, Ohio
Chas. H. Shipman, E. Cleveland, Ohio
Byron Kiser, Fremont, Ohio
Robert Bond, Okla. City, Okla.
Emil Domas, Ritter, Oreg.
Verl Walker, W. Jackson, Oreg.
Norman Kraft, Perkasie, Pa.
Harvey Morris, Philadelphia, Pa.
Elmer E. Hartzell, Allentown, Pa.
Chas. J. Fehn, Philadelphia, Pa.
William Dyson, Pawtucket, R. I.
James F. Barton, Greer, S. C.
Joel J. Lawson, Aberdeen, S. Dak.
Chester Warren, Lead, S. Dak.
Arthur Winther, Collinswood, Tenn.
Matthew Duckett, Memphis, Tenn.
Oscar C. Hill, Houston, Texas
Dan Droemer, Ft. Ringgold, Texas
N. G. Porter, Cedar City, Utah
Clyde Kiebach, Arlington, Va.
A. P. Caldwell, Buchanan, Va.
Floyd Goode, Richmond, Va.
Burton F. Chase, Northfield, Vt.
Chas. Farrimond, Seattle, Wash.
Alfred Stanley, Spokane, Wash.
G. Blomberg, Aberdeen, Wash.
Edgar Maynard, Red Jacket, W. Va.
Wm. Wiesmann, Fort Atkinson, Wisc.
J. C. Duncan, Duncan, Wyo.
Robert Kirkham, Calgary, Alta., Canada
M. Martin, New Westminster, B. C., Canada
E. D. Smith, Winnipeg, Man., Canada
H. V. Baxter, St. John, N. B., Canada
W. F. Arseneualt, Dalhousie, N. B., Canada
Donald Swan, Springhill, N. S., Canada
J. A. Hehir, Smiths Falls, Ont., Canada
G. Favreau, Montreal, P. Q., Canada
Thos. Crooke, Saskatoon, Sask., Canada

Chapter Chatter

Philadelphia-Camden Chapter had one of its largest attendance at a recent business meeting.

At another meeting the guest speaker, Mr. Jack Hirst of the Stuart H. Lockheim Co. of Philadelphia, gave a very interesting talk on TV Horizontal Output Transformers and Front Ends. Mr. Hirst also demonstrated how to adapt the Zenith Front End for VHF and UHF.

Mr. I. Heskowitz is our newest member. He was given a royal reception. Any NRI students or graduates in this area are welcome to join our chapter. You need not be a graduate to participate in our activities.

Through the cooperation of the Radio Electric Service Co. of Philadelphia we secured some Sylvania Tube Substitution Manuals and distributed them among our members. They are especially valuable in TV servicing.

Recently two engineers from El-Tronics Company, located here in Philadelphia, demonstrated the NRI Professional TV Oscilloscope for the benefit of our members. A fine meeting.

We meet on the second and fourth Monday of each month at the K. of C. Hall, Tulip and Tyson Streets in Philadelphia. Any NRI man in the Philadelphia-Camden area who is interested in knowing more about our chapter should contact our chapter secretary, Mr. Jules Cohen, 2527 N. Marsten Street in Philadelphia.

New York Chapter goes along smoothly with plenty of good material for members. The series of lectures being given by Mr. James J. Newbeck continue. These have been among the most popular talks given by our member lecturers and we are very much indebted to our own Jimmy Newbeck for the time he gives in preparing himself for these talks. Newbeck is now an engineer with RCA in New York.

One need not look far for the reason for the enthusiastic meetings held by New York chapter. They revolve around the officers and it is interesting to note that Bert Wappler, Chairman, Lou Kunert, Secretary and Frank Zimmer, Treasurer, have held these offices for nine consecutive years. The unselfish devotion to duty, the sacrifices these men have made to serve the chapter so long without any compensation is truly an example of genuine fraternalism.

NRI men in this area are always welcome, whether students or graduates. Meetings are held on the first and third Thursday of each month, at Saint Marks Community Center, 12 St. Marks Pl. (between second and third Ave.) New York City.

Chicago Chapter is devoting much of its time to Round Table discussions. For some time the chapter has been meeting on Wednesday. It has been suggested that Friday might prove to be a better evening for more of our members and an experiment is being carried on.

Louis Brodhage favored us with a very commendable talk on antennas, with accompanying charts.

On motion made and carried it was decided to dispense with meetings until September because of the extremely warm weather in Chicago.

Chairman Charles C. Mead is putting forth very serious efforts to reach a decision regarding a meeting place, type of meetings and matters which have been discussed by the members. In a city as large as Chicago there is no ideal meeting place. It is advantageous to meet downtown, as we do in our present location, but if a better suggestion is brought forward it certainly will be given consideration.

During July and August while the chapter is not holding regular meetings Chairman Mead nevertheless is keeping open house on designated evenings for the purpose of enabling those in the chapter who were interested in working out the practical training plan in TV servicing as outlined by NRI to meet and exchange ideas. (The chapter previously approved the purchase of a television set for the purpose of carrying out these experiments.)

The chairman is arranging a program of activities for the chapter for meetings beginning in September. He is contacting as many members as are willing to take part in these activities and the cooperation of all Chicago chapter members is earnestly solicited.

Detroit Chapter has been working with a TV kit. Earl Oliver completed the initial alignment at one meeting. The members were very much pleased with the progress we are making with the kit and the benefits they are deriving. At another meeting Mr. Oliver and Mr. Mains gave an interesting talk on the deflection circuits. Mr. Oliver, assisted by Mr. Mains, placed the oscilloscope probe at different points on tube pins in the TV kit deflection circuit. In turn Mr. Mains described the function of the circuit and why the circuit gave the particular wave shape on the oscilloscope screen. At another meeting Mr. Charles Mills gave a very interesting talk on the things members should do during the time we experience seasonable slumps.

The annual social meeting of Detroit Chapter was held at Detroit Turner's Hall, an ideal place for such an event. Unfortunately the strike of transportation employees was still on which may have affected the attendance but nevertheless the old standbys were there. As usual there was good food, and plenty of door prizes contributed by Erickson Electronic Wholesale Supply Co., 21 Henry St., in Detroit. Those fortunate to receive door prizes by reason of having their name drawn from a hat were as follows: Viola Oliver, Earl Oliver, Milton Oliver, Harry Stephens, Peggy Novasel, Steve Novasel, Edwin Madill, Francis Madill, Lucile Upham, Charles Mills, Mrs. Mills, Helen Ludtke, Max Ludtke and Lou Menne.

At the dinner it was announced that Bob Mains, past Chairman of Detroit Chapter, was recalled to active duty, U. S. Air Force, as a First Lieutenant. He is now on duty at Camp Selfridge. Bob, who was present with his very pleasant wife, responded nobly.

The Chairman, Harry R. Stephens, explained the absence of Floyd Buehler and John Stanish. Floyd was in the hospital getting a physical check-up and John likewise was at a hospital comforting his wife who was ill. Mrs. Elvera Stephens, who hasn't failed to attend a party for years, also was on the sick list this year.

The chairman wishes to call special attention to the excellent job being done by Prince Bray our faithful librarian.

Baltimore Chapter was pleasantly surprised to receive a visit by Mr. J. B. Straughn, Mr. L. E. Garner and Mr. L. L. Menne, from headquarters. Chairman Elmer Shue called the meeting to order and introduced our newest member, Mr. M. F. Cavey of Baltimore. Mr. Menne then gave a short talk and introduced Mr. Straughn who talked on the NRI Oscilloscope. He in turn introduced Mr. Garner who gave a very fine demonstration of the NRI Professional TV Oscilloscope, using a square wave generator. A visit by these men from NRI was greatly appreciated by all the members of our chapter.

Mr. H. J. Rathbun, at one of our meetings, gave a talk on selenium rectifier voltage doubler circuits. At this meeting Mr. Martin D. Trainor, Jr., was accepted as a member.

At our most recent meeting refreshments were served. Preceding this there was a general discussion on auto radios and television problems. It was announced that our very reliable member of long standing, Mr. Thomas Clark, has started a radio and television shop of his own. He sells and services Motorola TV.

We meet on the second, third and fourth Tuesday of each month at Redmen's Hall, 745 West Baltimore Street, in Baltimore. Anyone interested in getting information is invited to contact Mr. Arthur F. Lutz, Secretary, 1101 Overbrook, in Baltimore.

Here And There Among Alumni Members

Orazis P. Cara, of Brooklyn, New York, has just accepted a position as Trouble Shooter with the Link Radio Corporation. Says he is doing very well, thanks to NRI training.

———n r i———

Vacation visitors at the National Radio Institute include Mr. and Mrs. Harley, M. Walters of [illegible]eth, Pennsylvania.

———n r i———

Graduate Louis M. Berliner, whose home is in Yonkers, New York, recently visited NRI. Berliner was in the hardware business when he enrolled with NRI. Soon he found it necessary to devote full time to Radio and TV, hiring several men. Reserve officer duties called Berliner back to the Signal Corps. He was wounded a few months ago in Korea. Berliner is now recovering at Walter Reed Hospital, Washington, D. C. He plans to open a new business as soon as his health permits.

———n r i———

Graduate David Melhado, Passaic, New Jersey, is now employed in the Engineering Department, Materiel Laboratory, Wright Aeronautical Corporation, Woodridge, New Jersey.

———n r i———

Graduate A. Fairrie, of Hamilton, Ontario, is employed as an Electronics Technician with Canadian Westinghouse. Says he likes his work very much.

———n r i———

Graduate Clarence J. VanAkkeren of Sheboygan, Wisconsin, reports a "whale of a good Radio and TV Business." His son, James VanAkkeren, is now enrolled with NRI.

———n r i———

Alumnus Charles W. Crowell of San Diego, California, proudly reports that he is now his own boss. Crowell has established his own Radio and Television Servicing Business, and is clearing better than $350 per month. A fine report.

———n r i———

Graduate Robert J. Lawrence is TV Service Manager for Dicengo & Company, in Niagara Falls, New York. Says, thanks to NRI, he is breezing right through some of the toughest TV problems.

———n r i———

Alumnus George W. Levins, of Mobile, Alabama is participating as a teacher in a Governmental program for training veterans. He says, "The NRI course is one of the best courses in the world."

———n r i———

Graduate Bernard Siers, of Cleveland, Ohio is employed as a "Bench Technician" for the Cleveland Television Clinic, Inc. As a bench technician, his work consists only of the difficult jobs which cannot be repaired in the customer's home.

———n r i———

Graduate Otis L. Venson, of Canton, Ohio, has opened up a new service shop in his city. He says, "I cannot explain in words how proud I am to be a graduate of NRI."

———n r i———

Graduate Valeriana Sia, a member of the U. S. Coast Guard, visited NRI while en route to Hawaii where he expects to be stationed.

———n r i———

Graduate Arthur A. Phillipe, of Denison, Texas reports that his Federal Government Civil Service status has recently changed so that he is now doing Radio and Electronic work—and that this was a promotion. He says that he also has more spare time radio work at home than he can handle.

———n r i———

Another recent visitor at NRI was Charles F. Smith, of Marianna, Pennsylvania. Smith has his own Radio Repair Shop, spare time, and works full time in the coal mines as an electrician.

———n r i———

Here is an interesting report from Alumnus Leonard B. Clayhorne, of Jacksonville, Florida. He says, "I'm a menace to Radio repair. I have all the work I can do, but do not make one cent. I am retired and living in a little Christian community where we have so many poor families who need radio repair and cannot afford it—some old, some blind, some crippled. I just cannot charge them."

———n r i———

Robert L. Montgomery, of Waxhaw, North Carolina, has just been issued a First Class Radiotelephone License by the Federal Communications Commission.

———n r i———

Graduate Forrest Back, who is now in the U. S. Navy, has completed his basic training and is stationed in Norfolk, Virginia. Back is studying to be a Radioman.

———n r i———

Graduate Leslie Edwin McKinney, Binghamton, New York, conducts a flourishing spare time Radio servicing business. He is employed full time in railroad work, and has contact with Diesel Railway Engines in his capacity as a fireman. McKinney writes that he was recently called upon to make repairs on some of the electronic equipment on one of these large Diesel Engines.

———n r i———

John M. Ticknor, Field Representative for Sylvania Electric Products, Inc., working out of Buffalo, N. Y., was in to see us. Ticknor is a great booster for NRI. He graduated in 1932 and has been in Radio ever since—and now, of course, Television.

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