

"Why I bought a

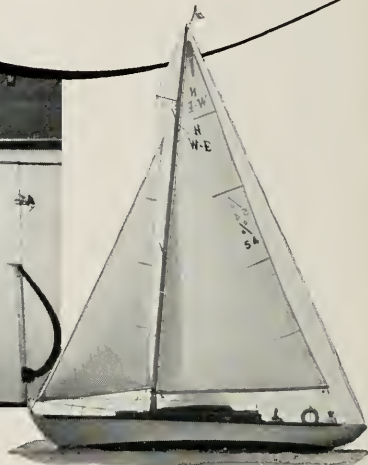
RADIOMARINE RADIOTELEPHONE

*for the
Thor"*



"I can make and receive phone calls from the THOR, through New York or Boston marine operators, to any telephone in the United States or foreign country. I can also phone direct to the Coast Guard or other boats equipped with a radiotelephone."

The THOR, an outstanding 39-foot auxiliary sloop of the New Week-Enders Class. Owned by A. EDWARD THURBER, JR. of the Indian Harbor Yacht Club, Greenwich, Conn. Built by Palmer Scott and Co. Produced by Donald B. Abbott. Designed by Philip L. Rhodes.



"Every available cubic inch of space on the THOR is utilized," says Skipper A. Edward Thurber, Jr. "So, any new gear I buy must be a space saver. I found that Radiomarine's Model ET-8028-A 2-way radiotelephone is small and compact without sacrificing performance. The transmitter-receiver unit was easily mounted athwartship, under the bridge deck. It weighs only 42 pounds and occupies a space of 1.15 cubic feet.

"The small Remote Control Unit, complete with handset and loudspeaker,

installed at the companionway is handy and convenient to use whether I am on deck or in the cabin. During a season of use, I found this 10-watt, 4-channel 2-way radiotelephone, powered by a 12-volt battery, gave excellent results."

There's a Radiomarine Model for Every Type of Craft

No matter what class or size boat you own... you'll find a Radiomarine Radiotelephone that is just right for

your boat... with nation-wide Radiomarine Service wherever you go. Radiomarine offers a complete line of radiotelephones for dependable 2-way communication... radio direction finders for taking bearings regardless of weather conditions... for vessels of all types, from giant passenger liners to small pleasure craft.

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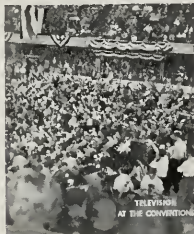


RADIOMARINE CORPORATION of AMERICA

A SERVICE OF RADIO CORPORATION OF AMERICA

RADIO AGE

RESEARCH • MANUFACTURING • COMMUNICATIONS • BROADCASTING • TELEVISION



COVER

Five television cameras installed at vantage points in Convention Hall, Philadelphia, made it possible for millions of viewers along the Atlantic seaboard to see directly the G.O.P. conclave in June. The Democratic Convention also will be telecast beginning July 12.



Services of RCA are:

RCA Laboratories Division

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National Broadcasting Company, Inc.

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RCA Service Company, Inc.

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RADIO CORPORATION OF AMERICA

RCA Building, New York 20, N. Y.

DAVID SARNOFF, *President and Chairman of the Board*

LEWIS MACCONNACH, *Secretary*

ARTHUR B. TUTTLE, *Treasurer*

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THE HIGH TOWER AND LOW MASTS AT THE U. S. COAST GUARD STATION ON FIRE ISLAND, N. Y., WILL BE USED IN CONJUNCTION WITH AN RCA HIGH-POWERED TRANSMITTER RECENTLY INSTALLED IN THE BUILDING AT THE LEFT.

Two-Way Television

Speakers and Performers Separated by an Ocean Will Be United on Viewing Screens of the Future.

By David Sarnoff

*President and Chairman of the Board,
Radio Corporation of America*

TELEVISION, which is daily establishing new records in programming, has yet to reveal fully its great potentialities for the spectacular. Science, which has made it potentially the greatest entertainment and educational force the world has ever known, will continually add to the medium's capabilities. People everywhere will be astounded by its speed and versatility in scanning events far beyond the horizon. Many novel techniques have been developed, but they are of minor consequence compared to those that lie ahead.

People sitting in their own homes may expect to see a newspaperman in New York interviewing a person in London, Bombay or Rio de Janeiro. On the television screen, in every home from coast to coast, the participants in these transoceanic interviews will appear on the screen as if talking face-to-face in the same room, although in reality they will be separated by thousands of miles.

That will be the magic of two-way television; that will be the miracle that will enable a star of

Reprinted from the special television section of THE NEW YORK TIMES, June 13, 1948.



DAVID SARNOFF

the Metropolitan Opera in New York to sing a duet with a star of the San Francisco Company, both appearing side-by-side on the television screen in every home, though the Great Plains and the Rockies actually separate them. Leaders of nations may be brought face to face on television screens although they are on opposite sides of the earth. The possibilities of this technique in television are unlimited and stimulate the imagination in the cultivation of novel telecasts.

Indeed, thanks to television, peo-

ple all around the world may expect to see distant events and places as clearly as if in their own backyard. The pyramids of Egypt, along with Niagara, the Grand Canyon, the Golden Gate, and the many wonders of the modern world will come into view. All such scenes appearing in the school room and home will give a new dimension to geography.

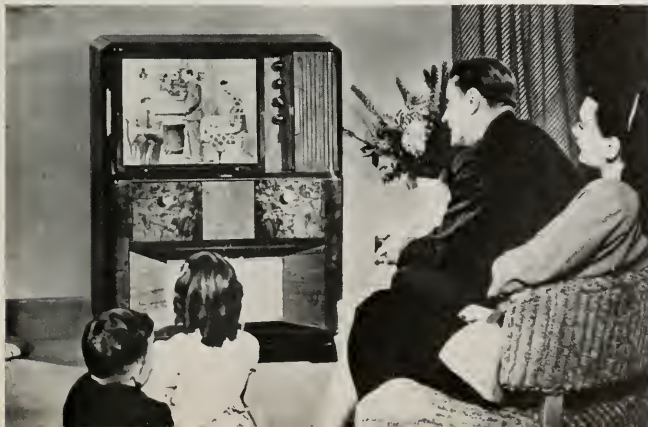
Television Cameras in Planes

Already, as a result of wartime developments, airborne television is a reality. As cameras scan the countryside, observers watching television screens many miles away see the birdseye view as the pilot sees it, for the television camera is in the nose of the plane. No doubt the main television centers of the future will have camera-equipped



"AS A RESULT OF WARTIME DEVELOPMENTS, AIRBORNE TELEVISION IS A REALITY."

"AS TELEVISION GROWS ON AN INTERNATIONAL SCALE, IT WILL ROVE THE GLOBE FOR PROGRAMS AND LITERALLY MAKE ALL THE WORLD A STAGE."



planes in readiness to take off from various points in the country to fly to the most remote areas where such news events as shipwrecks, floods, forest fires, battles and eclipses may be observed at first hand.

Transmitters in these planes will relay scenes to homes and theatres. And with planes so equipped, we may envisage robot rockets carrying a compact television transmitter and camera which can be projected to a specific place under radio control to pick up a scene and relay it for telecasting from stations throughout the world.

Push-Button Polls

Further, experiments indicate that through the magic of radio and electronics, the popularity of a television program or of a political candidate may be polled on a national scale. Tests now under way reveal the possibility that television receiving sets in the future may be equipped with push-buttons, which will enable each observer to express his opinion, "yes" or "no," in answer to a question broadcast from a television station.

Ultimately, it may be possible, during an election campaign, to

ask a coast-to-coast audience of many millions of people, while they view a Presidential candidate, whether they plan to vote for or against him. That will be a quick and secret poll, for electronic computers, which can count into the millions and even into billions in the twinkling of an eye, will tabulate the votes.

Entertainment and education work together in many ways. Travel is educational, and so is sightseeing by radio. Television will aid the teacher and supplement the text book, blackboard, phonograph and films. People learn more from sight than from sound; vision etches a more vivid and lasting impression. Television widens the student's range of learning and makes education more interesting, more timely and dramatic. Through television, a great new lecture hall is being erected in which lessons can be illustrated by natural scenes and by actual demonstrations as noted teachers reach not only schools and colleges but millions of people at home who are eager to learn. In short, television as a teacher, and as a messenger carrying information, will spread into many fields. As time goes on and new inventions are

made, the services of video will greatly multiply, and it may not be just a fanciful dream that television will alter the habits of the nation as much as did Ford's Model T.

As television grows on an international scale, it will rove the globe for programs and literally make all the world a stage, as Shakespeare envisaged it.

Wide Range of Subjects

Music, drama and fashions, along with sports and education, will be within visual reach of the family circle, even as radio now brings them to the ears of the mind. Impresarios, program planners and creative artists—all will contribute new ideas and talents in the creation of a new art form. And at the same time their efforts will be aided by new radio-electronic devices which will enable television to develop far afield from Broadway and Hollywood.

Today, the world is the eye-witness of the dawn of television. Tomorrow, as new techniques develop, the full brightness of its promise will shine across the hemispheres to bring new pleasures to people everywhere.



"MUSIC WILL BE WITHIN VISUAL RANGE OF THE FAMILY CIRCLE, EVEN AS RADIO NOW BRINGS IT TO THE EARS OF THE MIND."



"TELEVISION WILL AID THE TEACHER AND SUPPLEMENT THE TEXTBOOK AND BLACKBOARD."

Television at the Conventions

Political Conclaves at Philadelphia Telecast Over Eighteen Stations and Viewed by Audience Estimated at More than Ten Million—Television Film Recordings Supplied to Nine Stations Outside the Present Network Area

BEFORE the 1948 Republican National Convention drew to a close in Philadelphia, television had gone a long way toward convincing the electorate and candidates alike of its greatness as a new and vital force in the life of the Nation. From the first rap of the gavel until the emotion-packed climax, when delegates selected Gov. Thomas E. Dewey as the 1948 G.O.P. standard bearer, and Gov. Earl Warren as vice presidential nominee, it was television's biggest show.

Estimates of the viewing audience ran as high as 10,000,000 persons—more than the total attendance at all previous political conventions since the founding of the Republic. No other conclave of the major parties had attracted such a demand on the part of the public to see as well as hear democracy in action; television provided the opportunity. Radio broadcasting, which since 1924, had given Americans this quadrennial lesson in civics, now taught with greater effectiveness through sight added to sound.

Installation of the National Broadcasting Company's radio and television facilities—the most elaborate ever set up for a single event—was completed two days before the Republican delegates convened in the historic Convention Hall. It signalled the start of video pickups that, long before the balloting, had won hearty applause from viewers and had caused delegates and candidates to head the oft-repeated admonition of colleagues to "look your best, for the eyes of the country are upon you." One candidate admitted to reporters that he had consulted a make-up artist to be sure of his appearance.

Between convention sessions mobile cameras scurried around the political-minded city for views of the activities, interviews with visiting luminaries, and special broadcast programs. NBC maintained

eight mobile video cameras, five temporary studios and one mobile television unit, together with some fifteen tons of engineering equipment.

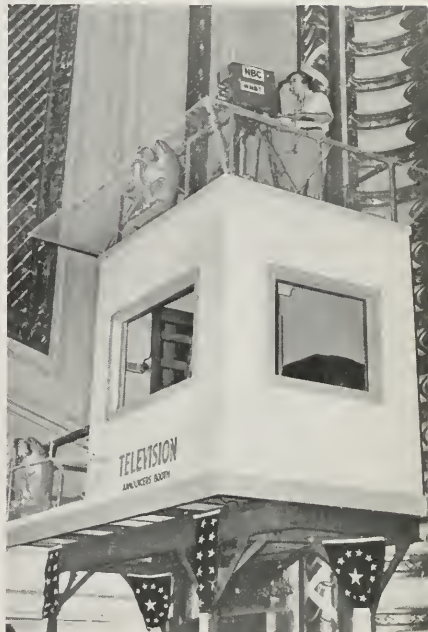
Eighteen television stations in nine Eastern cities pooled their facilities to provide viewers with the political drama. Seven Eastern seaboard stations, members of the NBC television network, broadcast scenes directly from the convention city; nine other NBC affiliates in the Middle West and South West from Buffalo to Fort Worth, which were not interconnected by coaxial cables or radio relays, received by air express film recordings of important events taken from the face of a special kinescope tube. This system known as television recording, was perfected by NBC in cooperation with the Eastman Kodak Company.

Seven Stations in NBC Network

Television stations linked with WNBT, New York, in the NBC network, were: WPTZ, Philadelphia; WTVR, Richmond; WNBW, Washington; WRGB, Schenectady; WBAL, Baltimore; and WBZ, Boston. Reels of television recordings, or film resumes of the highlights, were sent by plane to NBC affiliates: KSD, St. Louis; WBNB, Buffalo; WWJ, Detroit; WLWT, Cincinnati; WTMJ, Milwaukee; KSTP, St. Paul; W6XAO, Los Angeles; WEWS, Cleveland; and KDYL, Salt Lake City.

In the metropolitan area, in addition to the service provided by NBC station WNBT, the convention cameras were linked with stations WPIX, WCBS, WABD in New York, and WATV, Newark.

Two hundred NBC engineers, newsmen and executives, worked in high gear to provide complete radio and television coverage of the Republican gathering. They were assisted by a group of political experts, reporters and photographers



AN NBC TELEVISION CAMERAMAN HAS AN UNOBSTRUCTED VIEW OF THE CONVENTION FROM HIS LOFTY POSITION NEAR ONE END OF THE AUDITORIUM.

from *Life Magazine*. At the conclusion of the Republican conclave they turned their attention to plans for televising the Democratic National Convention opening in Philadelphia on July 12.

Plans for both conventions, developed over a period of six months, were drawn on the basis of the NBC network's quarter of a century of experience in covering nominating conventions on radio, and on its televising in 1940 of the GOP gathering in Philadelphia. At the latter event, NBC became the first and only telecaster to cover such an event prior to 1948.

Many specialists — from wire



LEFT: FROM THESE BOOTHS OF THE MAJOR NETWORKS, NEWS DIRECTORS WATCHED PROCEEDINGS AND ASSIGNED THEIR STAFFS OF ANNOUNCERS, COMMENTATORS AND ROVING INTERVIEWERS AS THE ACTION SHIFTED FROM ONE PART OF CONVENTION HALL TO ANOTHER.

BELOW: VIEW OF THE CONVENTION HALL AS SEEN BY THE NEWS DIRECTOR FROM INSIDE THE NBC BOOTH.



splicers to political prognosticators and fashion experts — were necessary to provide comprehensive coverage of the 1948 gatherings. In all, NBC sent to Philadelphia 40 commentators, reporters and news editors; close to 50 engineers; half a dozen video directors; a 14-man newsreel crew; telephone switchboard operators; secretaries; stenotypists and the many executives necessary for the coordination of such a complex operation.

Cooperating with NBC for video coverage of all off-the-floor events at Philadelphia, *Life* contributed materially to the network's presentation of the news as it happened. *Life* men gathered news, conducted on-the-air interviews and provided commentary on feature programs, while the March of Time film unit produced a series of documentaries on the convention and its principal figures which provided viewers with a comprehensive background picture. This included color material, human interest stories and explanations of the political positions represented by the various figures and factions.

Five television cameras were in action at all times during pooled television telecasts, manned in rotation by a crew from each of the four video networks. One camera was fixed atop the television booth at the left of the rostrum. Three were located at the two sides and rear of the hall, and the fifth was focused on the main entrance to catch delegates and notables as they

entered and left the auditorium. In the production booth, therefore, a supervisor had five screens to watch, each one representing the scene from one of the cameras. It was up to him to choose the view to be transmitted.

News Desk Techniques Used

One of the highlights of NBC's television and radio reporting was the employment for the first time at such an event of a system of pooled information among the network's editorial staff. Instead of assigning each reporter and commentator to gather news for his own individual radio or television program, the system employed a "news desk" technique, whereby all NBC newsmen at the convention received definite assignments and all contributed the product of their

reporting to a central pool of information.

Thus, NBC's overall coverage stemmed from a continuous flow of information in and out of the central pool, rather than an uncoordinated series of reports and news items. This system also made possible a more effective integration of radio and television coverage, since television drew many of its reporters and commentators from radio and leaned heavily on the news furnished by the central pool.

For the first time since political conventions have been held, the disappointed ticket seeker was not ignored. For the convenience of thousands of visitors who were unable to gain admittance to the actual proceedings, RCA and five other manufacturers of television receivers installed a spacious view-

ing room in the Commercial Museum, adjoining Convention Hall. There 150 receivers of all types were arranged to permit audiences sometimes reaching 6,000 to enjoy the same convention coverage available to television set owners.

In radio, the pooled facilities—installed, as at past conventions, by NBC's Engineering Department—comprised the 52 mikes on the floor (one in front of each delegation) and those in front of the speaker's position on the rostrum. In television, all programming from the floor of the hall was done on a pooled basis, with each network contributing an equal number of cameras and each providing supervision of the coverage for one day on a rotating basis.

Supplementing this pooled equipment, NBC had available in Philadelphia, for its own exclusive use, more studios and equipment than the average-sized radio station possesses as its permanent establishment. In Convention Hall, one flight above the stage, were a fully equipped radio newsroom (complete with wire-service teletypes, broadcast studio and space for writers and editors), a television studio, another radio studio for the

use of NBC affiliates and a studio for the rapid processing of the indispensable tape recordings that formed so important a part of the network's continuing coverage.

Control Features Duplicated

This layout, with the exception of the tape recording room, was duplicated at the network's headquarters in the Bellevue-Stratford Hotel, GOP convention headquarters. In addition, studio space was available for both radio and television in the buildings of KYW and WPTZ, NBC's affiliates in radio and television, respectively. It was at KYW that NBC established its master control board through which were funneled all programs originating in the convention city.

In addition to these studio facilities, temporary and permanent, mobile radio and video crews were constantly available for assignment to practically any point of importance in the city. Pack transmitters, with a range of a dozen miles, were used for remote pickup interviews and descriptions on radio, and for similar shows on video NBC had access to a WPTZ mobile truck, borrowed for the duration of

the meetings. On the floor of the hall, roaming up and down the aisles for interviews, were two newsmen equipped with shortwave radio microphones, miniature transmitters which beamed their signals to the NBC control booth.

This entire system was connected by a vast maze of interlocking teletype and talk circuits, so that at an instant's notice communication could be obtained between any two points in Philadelphia—all of which in turn were tied in with control points at the network's headquarters in New York.

All studios used in Philadelphia, with the exception of those in KYW and WPTZ, were arranged to permit the immediate repeat of any important interview or news bulletin on television as soon as it had been carried on radio. Also, in many cases cameras were moved in to the broadcast booths so that programs could be televised and broadcast simultaneously.

When the Republican Convention concluded, the radio and television engineers left their equipment intact so that it would be ready to provide similar coverage for the Democratic National Convention opening on July 12.



TELEVISION, NEWSREEL AND STILL CAMERAS CROWD THE BALCONY PLATFORM ASSIGNED TO THE PICTORIAL SERVICES.

NBC COMMENTATOR W. W. CHAPLIN INTERVIEWS DELEGATES WITH THE AID OF THE NEW "RADIO MIKE".



Solar Storms Forecast

Study of Sunspot Activities Reveals Facts That Aid Communications Engineers in Handling Radiotelegraph Traffic During Magnetic Disturbances.

MAGNETIC storms originating from sunspots now can be forecast over short periods dependably to within fifteen minutes of the start of their destructive effects on world-wide radio communications, research engineers of the Radio Corporation of America have discovered.

Forecasting with such accuracy becomes possible because of a better understanding of solar disturbances, the RCA engineers told an international gathering of scientists recently in Washington. They disclosed the results of observations and studies which may shake many time-worn concepts.

Their investigations proved that the size of sunspots is "a meaningless criterion" in predicting havoc that may be caused to radio circuits. Composition of the spots, their polarity and their position on the face of the sun were declared to be the determining factors of lethal bombardment.

Moreover, the RCA investigations established the existence of a "critical zone" on the face of the sun—an area about 26° in radius from the optical center of the sun, on its eastern hemisphere. It was discovered that the position of sunspots in relation to this critical zone was of utmost importance. Damaging effects on world radio communications occur when they are within this zone.

Sun May Have Ionosphere

"The existence of a critical zone on the sun," the RCA engineers said, "poses an interesting speculation with regard to the existence of a solar ionosphere, or the equivalent thereof, corresponding to the layer of ionized gas surrounding the earth. This might be the corona or the prominences overlying sunspots. If the 26° semi-circle delineates a region from which radiations affecting the earth's ionosphere are confined, these radiations penetrate the solar ionosphere, only when about seven minutes of

are of the line connecting the sun and the earth. Sunspot radiations of lower angle do not reach the earth, or are returned to the sun."

These new facts on solar disturbances—which cause worldwide radio communications and broadcasting companies considerable concern—were presented by H. E. Hallborg and Miss Audrey Arzinger, of RCA Laboratories, Princeton, N. J., and J. H. Nelson, of RCA Communications, Inc., before a joint session of the Institute of Radio Engineers and the International Scientific Radio Union in Washington on May 3.

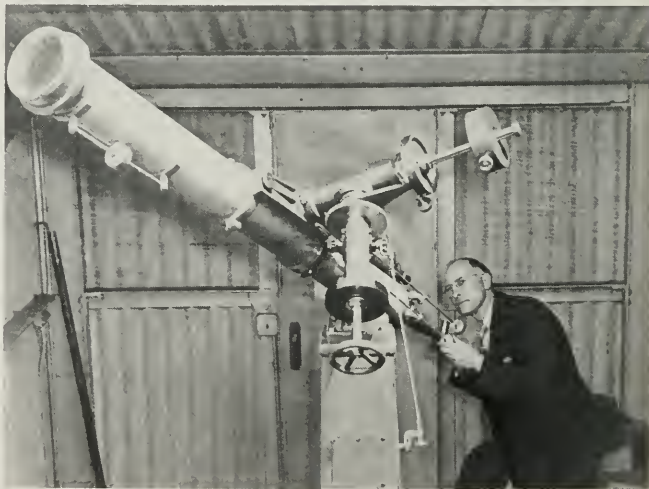
Taking account of the fact that sunspots have been observed for more than 150 years, and that volumes have been written about them, the RCA engineers stated that their investigations represented no invasion into the field of the astronomer, but rather an effort to cooperate with him in the application of solar knowledge.

"We have established that mere size of a sunspot is a meaningless criterion in assessing its possible damage to communications," the report stated. "A huge spot, consisting mostly of penumbra, or dark fringe, may be a complete dud in its effect upon radio circuits. A small spot mostly umbra, or inner darkness, may be quite deadly. Rapidly changing spots, indicative of activity, are the most lethal in their effects upon radio circuits."

Observatory Supplied Reports

The RCA scientists accredited the Mount Wilson Observatory with providing regular reports on the polarity of the umbras as red (positive) and violet (negative), together with relative intensities of the red and violet. It was found that the reds have a preponderant effect in the northern hemisphere of the world, violet in the southern hemisphere. Reds were said to depress frequencies in the northern hemisphere and raise them in the southern. The action of the violet was discovered to be vice-versa.

"This phenomenon," the RCA engineers said, "may be due to the earth's polar attraction for solar radiations of opposite polarity.



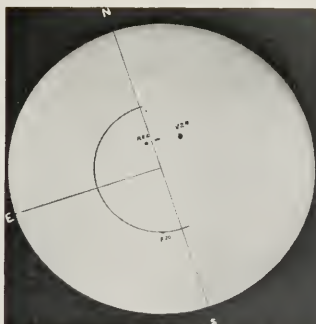
J. H. NELSON SWINGS AN 8-FOOT TELESCOPE TOWARD THE SUN FOR A STUDY OF THE EVER-CHANGING SOLAR SPOTS.

causing a lowering of ionization near the poles for one polarity, and intensification of ionization for the other."

The determination of the critical zone on the sun was reported to be an outgrowth of observation started several years ago by Mr. Nelson, using a six-inch reflecting telescope constructed by himself. He was later joined by Mr. Hallberg and Miss Arzinger in a research program which includes the preparation of daily maps and the issuance of daily radio weather forecasts.

Better Predictions Possible

The further localization of and confirmation of the critical zone, and the confinement of sunspot counts to those in this zone, will not only increase the day-to-day correlations of ionosphere and circuit performance, but will provide a more real-



istic basis for frequency predictions over the sunspot cycle, the RCA engineers reported, adding:

"Practical application of the critical zone, as here indicated, has produced a dependable forecasting service with many hits registered

THE SEMI-CIRCLE ON THE LEFT OF THE UPWARD LINE INDICATES THE "CRITICAL ZONE" OF THE SUN WHERE THE PRESENCE OF SUN-SPOTS MOST SERIOUSLY AFFECTS RADIO COMMUNICATIONS.

within fifteen minutes. Its use is now an accepted RCA Communications, routine service, and an unquestionable aid to traffic handling. The forecasts are distributed daily throughout the RCA system.

Gratitude for assistance in the RCA project was expressed to meteorologists of the Harvard Astronomical Observatory, Climax, Colorado; the Mount Wilson Observatory, Pasadena, California; the McMath-Hulbert Observatory, Pontiac, Michigan; the U. S. Naval Observatory, Washington, D. C.; and the Central Radio Propagation Laboratory of the Bureau of Stand-

APPROVE TAPE RELAY SYSTEM

Leading Nations Express Interest in Proposed Plan to Use Latest Communications Method

NEARLY all leading countries of the world are participating or have agreed to participate in the extension of a system of international radio communications employing modern printing tape relay methods. Sidney Sparks, Vice President in Charge of Commercial Activities of RCA Communications, Inc., reported on June 23, in Mexico City, at the summer general meeting of the American Institute of Electrical Engineers.

Tape relay operation, highly developed during and since World War II, permits messages to be transmitted from the network of one nation over one or more radio links and into the national network of another country without customary manual reprocessing at intermediate points, Mr. Sparks explained.

"The efficiency with which traffic can be relayed by the new methods," he said, "minimizes incentives to maintain direct circuits, and a logical trend in the international network will be toward fewer circuits carrying heavier traffic loads

at lower unit cost. Tape relay traffic routes will be available at lower cost and will be used increasingly to avoid delays due to interruption or congestion of direct circuits."

Mr. Sparks said that growth since the war of the international printing tape relay network, in the face of difficulties, is a "clear indication that the international radiotelegraph industry is conscious of its responsibilities and opportunities."

As a pioneer in the modernization of radio's international facilities, RCA renders assistance to communication ministries all over the world, providing them with concrete engineering proposals and plans to improve and extend radiotelegraph services.

"If the printing tape relay concept ultimately prevails," Mr. Sparks said, "then some future

international radiotelegraph conference may attack the frequency problem on a more fundamental basis than has heretofore been contemplated."

Instead of attempting to parcel out frequencies to each country sufficient to meet the requirements of its many direct circuits, the conference may undertake to establish the pattern for an international tape relay network such as to insure high grade service for each country, with adequate safeguards for economic, political and military interests.

SIDNEY SPARKS (RIGHT), VICE PRESIDENT OF RCA COMMUNICATIONS, AND A GROUP OF U.N. OFFICIALS, WATCH THE TAPE RELAY TRANSMISSION OF RADIOTELEGRAPH MESSAGES FROM LAKE SUCCESS, N. Y., DIRECT TO GENEVA, SWITZERLAND.



TELEVISION RECORDING

New Development Permits Filming of Video Programs From Screen of Kinescope Picture Tube, Together with Sound, for Distribution to Non-Network Stations.



By Robert M. Fraser

*Engineering Development Group,
National Broadcasting Company*

THROUGH the use of a new NBC development called the Television Recorder, television programs including picture and sound can now be recorded on film direct from the screen of a television receiver for distribution to stations not yet interconnected by coaxial cables and radio relays. As the quality of the basic television image improves, the quality of recordings in kinescope photography will be enhanced to a degree where the average viewer will be unable to tell if the program he is seeing is "live" or "canned." The kinescope recorder method will permit not only the establishment of a coast-to-coast video network before cables or relays are installed but will allow retention of television programs for documentary, historical, legal or critical purposes in a manner similar to recordings of radio programs.

The development of this recording system was started in 1938 with experimental cameras operating at 8, 15, and 16 frames per second. They were followed by a prototype camera operating at 24 frames per second. This model was the forerunner of the \$10,000 recorder cameras in use today.

In the earliest experiments, a decade ago, it was found that the amount of light obtainable from available kinescopes was not enough to produce a full exposure on the

fastest films obtainable at a 1/30th second exposure in a 16-frame-per-second camera.

The cameras used in the early efforts were spring-motor driven and the shutter rate was not synchronous with the frame rate of the television system. This caused a flaw in the pictures called "shutter bar" or "banding" in which a black-and-white bar moved across the film image when projected.

Much research work in finding an accurate method of operating the motor-driven shutter in conjunction with the sequence of television images finally led to an acceptable mechanism free from banding effects.

Commercial Camera Designed

Engineers of the Eastman Kodak Company and National Broadcasting Company working together designed a commercial camera along the lines of the original model. However, the design of the new camera was complicated by many factors. First the commercial version had to be able to record a half-hour show with a 1,200-foot load of 16mm film instead of the 200-foot roll used in the first model and in regular Cine Specials. The shutter

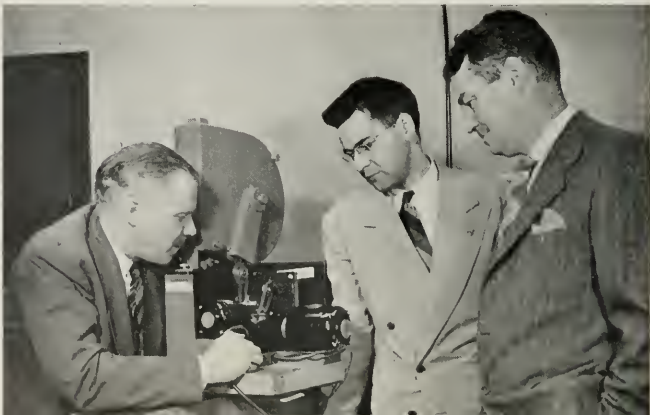
had to rotate with a minimum of flutter since even a slight change in angular speed resulted in banding of the film image. Success eventually came through the use of a synchronous motor to drive the shutter at the necessary speed through a set of precision gears. Another synchronous motor of larger capacity drives the film transport mechanism and the Geneva intermittent which is the device that pulls down the film strip from one frame to the next. The two motors are kept in step during the starting and stopping periods by an ingenious coupling which allows the stronger of the two motors to assist the weaker until both reach proper speed. The coupling then floats so that there is no physical connection between the motors.

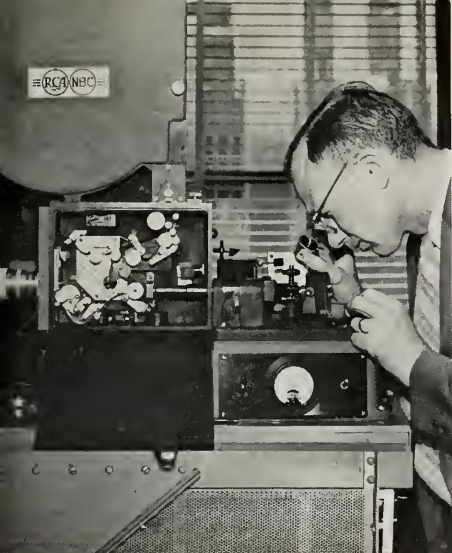
Nylon Solves Emulsion Problem

Nylon which has a low coefficient of friction is used in the film gate and pressure plate to minimize the accumulation of emulsion from the film, always a source of trouble in motion picture cameras. All friction points in the takeup side of the 1,200-foot magazine are equipped with ball bearings so that takeup of film progresses smoothly from the two-inch core diameter of the empty reel to the 10-inch diameter of the full 1,200-foot roll.

Focussing and framing of the picture are carried out by means of a right-angle view finder equipped with a magnifying lens. Visual focussing is done by means of this

DUDLEY GOODALE, PIERRE BOUCHERON, JR., AND GEORGE M. NIXON OF THE NBC ENGINEERING DEVELOPMENT GROUP EXAMINE LATEST MODEL OF A TELEVISION RECORDER WHICH RECORDS BOTH PICTURE AND SOUND ON THE FILM STRIP.





RALPH LOVELL EXAMINES THE MECHANISM WHICH APPLIES THE SOUND RECORDING TO THE EDGE OF THE FILM CONTAINING THE TELEVISION RECORDING.



COMPLETE TELEVISION RECORDING EQUIPMENT INCLUDING CAMERA AT EXTREME LEFT WITH SOUND RECORDING AND MONITORING PANELS.

finder and checked by exposing film at several different settings. Before each program is recorded, processed film is examined under a microscope to determine the best actual focus.

The camera lens is a two-inch Eastman Anastigmat F1.6. Normally, apertures of f2.0 to f2.8 are used.

For several reasons, 16mm film rather than 35mm film was selected for kinescope recordings. One of the main reasons was that the cost of 35mm film is somewhat more than three times the cost of 16mm for the same period of recording. The current quality of television images, which will undoubtedly undergo gradual refinement, is considered to be roughly equivalent to 16mm home movies, although actually somewhat better with reference to contrast and detail. However, recording on 35mm rather than 16mm film results in no marked improvement at the present time. Fire regulations covering the use of the wider film are rigorous regardless of whether the film is acetate safety base or the combustible nitrate base, whereas the narrower films, available only in acetate safety base, are not restricted by such regulations.

In producing television record-

ings in the NBC studios, Radio City, New York, programs are piped by direct line to the kinescope tube. For programs originating outside the studio the program is taken from the coaxial cable before the signals reach the Empire State transmitting station.

Printing of the film is done according to standard motion picture laboratory practice. Step printing in which stock and negative are exposed to the printing light, a frame at a time, is preferred over continuous printing, where the negative and print stock run past an illuminated slit at a continuous speed.

Recording of the sound portion of a television program is accomplished with standard 16mm sound-on-film recording equipment at the rate of 24 frames per second.

ENGSTROM HEADS RESEARCH INSTITUTE

E. W. Engstrom, Vice President in Charge of Research, RCA Laboratories Division, has been elected President of the Industrial Research Institute, Inc., for 1948-1949.

The Institute, of which Radio Corporation of America is a mem-

ber, was organized in 1938 under the auspices of the National Research Council. In the past ten years, the organization has grown from the original nucleus of fourteen member companies to more than a hundred. These concerns employ research staffs numbering more than twenty thousand people.

Purposes of the Institute are to promote through its members more economical and effective techniques of organization, administration and operation of industrial research, and to distribute information on these subjects; to stimulate an understanding of research as a force in the economic, industrial and social activity of the nation, and in general to promote high standards in the field of industrial research.

Prior to his election as President, Mr. Engstrom had served in 1946-1947 as a member of the Institute Board of Directors and Chairman of its Finance Committee, and in the following year as a Board Member, Vice President and Chairman of the Program Committee. As President, he will continue a member of the Board.

TELEVISION MILESTONES

Preeminence of the United States in Television is Largely Due to RCA Accomplishments in Science that Led to the Development of a New Industry, a New Service to the Public, and a New Bulwark of National Security.

I believe that television, which is the technical name for seeing instead of hearing by radio, will come to pass in due course . . . the transmission and reception of motion pictures by radio will be worked out within the next decade
—David Sarnoff, April 5, 1923.

THE cornerstones of modern television were designed and put into place by the scientists and engineers of the Radio Corporation of America who dedicated them to the advance of communications and to the establishment of a new medium of entertainment and information.

On the firm foundation of pioneering and research at RCA Laboratories, television has developed as a new service to the public, and as an important element in military, naval and aviation operations that bulwark the national security.

The outstanding achievements of RCA in the development of television overspread all phases of radio, electronics and optics, from microwaves and electron tubes to electronic cameras and video receivers.

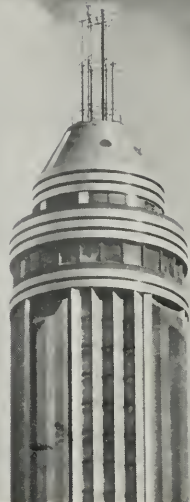
Historic television advances achieved by RCA scientists and engineers have made the United States preeminent in television and have provided American homes with the finest television instruments in the world; NBC, through broadcast engineering and programming, has made outstanding contributions to the progress of television as a new art form—a medium of entertainment, news and education.

The chronology of television is marked by RCA-NBC firsts which reveal the historic steps in the development of a new science, a new art and a new industry:

1923—Dr. V. K. Zworykin, now Vice President and Technical Consultant of RCA Laboratories, applied for patent on the iconoscope, television's electronic "eye," or camera tube. (December 29.)



DR. V. K. ZWORYKIN HOLDS THE ICONOSCOPE CAMERA TUBE INVENTED BY HIM IN 1923.



EARLIEST TYPE OF TELEVISION ANTENNA ERECTED ON THE EMPIRE STATE TOWER, BY RCA-NBC IN 1931.

1929—Dr. V. K. Zworykin demonstrated an all-electronic television receiver using the kinescope, or picture tube, which he developed. (November 18.)

1930—Television on 6 x 8-foot screen was shown by RCA at RKO-Proctor's 58th Street Theater, New York. (January 16.)

NBC began operating W2XBS, pioneer experimental television station in New York. (July 30.)

1931—Empire State Building, world's loftiest skyscraper, was selected as site for RCA-NBC television transmitter. (June)

1932—RCA initiated field tests with 120-line, all-electronic television. (May 25.)

1936—Television outdoor pickups demonstrated by RCA at Camden, N. J., on 6-meter wave across distance of a mile. (April 24.)

1937—RCA announced development of electron projection "gun" making possible television pictures

on 8 x 10-foot screen. (May 12.)

Mobile television vans operated by RCA-NBC appeared on New York streets for first time. (December 12.)

1938—Scenes from Broadway play, "Susan and God," starring Gertrude Lawrence, telecast from NBC studios in Radio City. (June 7.)

1939—RCA and NBC introduced television as a service to the public at opening ceremonies of New York World's Fair, featuring President Franklin D. Roosevelt as first Chief Executive to be seen by television. (April 30.)

Improved television "eye," the "Orthicon" first introduced by RCA. (June 7.)

Major league baseball was telecast for the first time by NBC, covering a game between the Brooklyn Dodgers and Cincinnati Reds at Ebbets Field. (August 26.)

First college football game—Fordham vs. Waynesburg—televised by NBC in New York. (September 30.)

RCA receiver in plane over Wash-

ington picked up telecast from NBC station in New York, 200 miles away. (October 17.)

Portable television equipment, to supplement motor truck mobile stations, demonstrated to FCC by RCA. (December 1.)

1940—RCA demonstrated to the FCC, at Camden, N. J., a television receiver producing images in color by electronic and optical means employing no moving mechanism. (February 6.)

New York televised from the air for the first time by a plane equipped with RCA portable television transmitter. (March 6.)

Television pictures on 4½ x 6-foot screen demonstrated by RCA at annual stockholders meeting in Radio City. (May 7.)

Television program broadcast from NBC station, New York, received on *USS President Roosevelt* while 250 miles at sea enroute from Bermuda. (May 14.)

Coaxial cable used for first time in television program service by NBC in televising Republican National Convention at Philadelphia and transmitting scenes over New York station. (June 24.)

Election returns, telecast for the first time as RCA-NBC showed teletypes of press associations reporting the news, as well as commentators at the microphone. (November 5.)

1941—Demonstrating television progress to the FCC, RCA exhib-

ited the projection-type home television receiver featuring a screen 13½ x 18 inches. . . . Television pictures including a prize fight from Madison Square Garden and a baseball game at Ebbets Field, Brooklyn, were projected on a 15 x 20-foot screen in the New Yorker Theatre. . . . Scenes at Camp Upton, Long Island, were automatically relayed by radio to New York establishing a record as the first remote pick-ups handled by radio relay stations. (January 24.)

Color television pictures in motion were put on the air by NBC in the first telecast in color by mechanical means from a television studio. (February 20.)

RCA-NBC made successful tests with first projection-type color television receiver using mechanical methods. (May 1.)

NBC's television station WNBTV became the first commercially licensed transmitter to go on the air. (July 1.)

1942—First mass education by television was initiated by RCA-NBC in training thousands of air-raid wardens in New York. (January 23.)

1943—NBC televised major sports and other events at Madison Square Garden for wounded servicemen in television-equipped hospitals in the New York area. (October 25.)

1944—NBC announced plans for nation-wide television network to be completed possibly by 1950. (March 1.)

1945—RCA demonstrated projection-type television home receiver featuring screen approximately 18 x 24 inches. (March 15.)

RCA Image Orthicon tube of supersensitivity was introduced as solution to major problems in illumination of studio television programs and outdoor pickups. (October 25.)

Greatly improved black-and-white television pictures and color television in three dimensions featuring live talent were demonstrated by RCA at Princeton, N. J. The color system was mechanical; the black-and-white all-electronic. (December 13.)



GERTRUDE LAWRENCE IN A SCENE FROM "SUSAN AND GOD," FIRST BROADWAY PLAY TO BE TELEVIEWED.

1946—Airborne television as developed during the war by RCA and NBC in cooperation with U. S. Navy, U. S. Army Air Forces and the National Defense Research Council was demonstrated at Anacostia Navy Air Station. (March 21.)

First world's heavyweight championship fight to be seen on television featured Louis-Conn at Yankee Stadium, New York, televised by NBC and transmitted to Washington, D. C., via coaxial cable. (June 19.)

Post-war television receivers introduced by RCA Victor Division. (September 17.)

Color television pictures on 15 x 20-inch screen produced by all-electronic means were demonstrated publicly for the first time by Radio Corporation of America at RCA Laboratories, Princeton, N. J. A simple radio frequency converter was announced that enables black-and-white receivers to reproduce in monochrome the programs of color television stations operating on high frequencies. The converter also enables all-electronic color receivers to receive the programs of low or high frequency black-and-white transmitters. (October 30.)

1947—RCA demonstrated simultaneous electronic color television system at FCC Hearing held at Princeton, N. J. Film and live

Continued on Page 32

MAN-SOOSE BOXING BOUT AT MADISON SQUARE GARDEN WAS PROJECTED ON LARGE SCREEN AT NEW YORKER THEATRE, IN 1941.



NEW TELEVISION STUDIO

*Latest Addition to NBC Facilities Provides Space for Staging
Four Video Productions at a Time*

POSSIBLY not the largest television studio in the world, but certainly the most modern and best equipped, NBC's "8G" in Radio City became a working part of the network's expanding television service on April 22. The new studio increases by three to four times the studio production capacity of NBC's television department and in its appointments represents the cumulative result of two years of planning by engineers and program personnel.

Studio 8G, on the eighth floor of NBC's headquarters in the RCA Building here, is equipped with radically new audio and video controls, television studio cameras and lighting. It has provisions for six of the newly-designed NBC television cameras which make use of the sensitive RCA Image Orthicon tube. The studio lighting eliminates four-fifths of the heat generated by lights formerly used in television studio operations.

In preparing Studio 8G for operation, workmen installed 500 miles of wire, over two miles of coaxial cable, 52 tons of refrigeration, and enough light, heat, power and air-conditioning to supply a village of 100 average-size homes.

As many as four separate programs may be presented consecutively from the studio. Added scenery effects—including falsified perspectives for background scenery, use of photo-enlargement drops, and use of the floor as part of the scenery—will be possible because of the increased size and scope of Studio 8G. In addition, rigging for the scenery will be four times as heavy as that used in NBC Television's present studio 3H, permitting more massive, more realistic sets.

Control Room Has Plastic Windows

The most revolutionary feature of the studio is the control room, designed by NBC engineers. Located one floor above the studio itself, it is separated from the studio by a partition of light-attenuating plastic, which eliminates excessive light from the studio which would interfere with the operation of the monitors. At the same time it permits the operators to see into the studio. Of trapezoidal shape, the control room is so located as to give engineers and program directors a clear view of the entire studio.

Studio 8G, a converted radio studio, measures 48 feet by 87 feet. It is approximately three times as large as 3H, the studio out of which NBC Television has been operating since 1935.

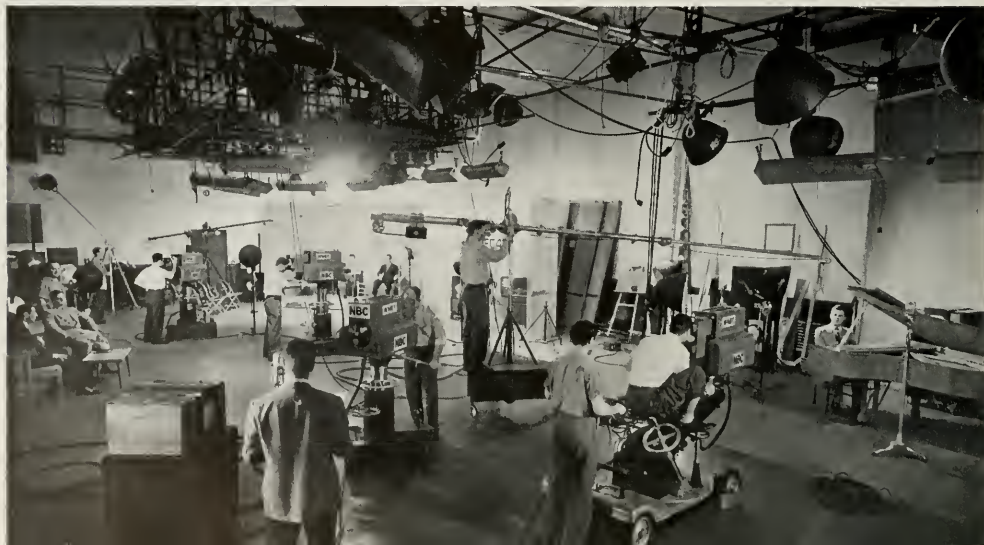
Overhead, and covering one half of the studio, is a permanently fixed steel catwalk which will be used as a lighting bridge. In addition, there are demountable lighting towers which can be used anywhere in the studio—a flexible system devised by NBC engineers to hang lights on short order.

The lighting will consist of a combination of fluorescent units, large incandescent lamps and banks of photo-floods with internal silver reflectors which can be used in any combination required.

A low level of heat will be emitted by these lights because of the small amount of illumination required by NBC cameras. These require a maximum intensity of from 200 to 250-foot candles, reducing to one-fifth the heat and light formerly needed in television studio productions.

The new NBC cameras—of which four will be used at the beginning of the studio's operations but will later be increased to six—use the sensitive RCA image orthicon tube. The cameras were designed by the network's engineers and are of special construction to accommodate the requirements of the new studio.

NBC'S NEW STUDIO 8G IN RADIO CITY PROVIDES SPACE FOR THE PRODUCTION OF FOUR PROGRAMS SIMULTANEOUSLY, AND HAS FACILITIES FOR SIX IMAGE ORTHICON CAMERAS.





STAFF MEMBERS OF THE MUSEUM OF NATURAL SCIENCES IN BUENOS AIRES EXAMINE A CONSOLE MODEL OF THE RCA ELECTRON MICROSCOPE.

Electron Microscopes Abroad

Scientists in Many Foreign Countries Are Using Instruments For Closer Studies of Natural Resources.

NATURAL resources of many countries, in addition to the United States, are being submitted to closer study than ever before by means of electron microscopes. In a statement disclosing this fact, Meade Brunet, a Vice President of Radio Corporation of America and Managing Director of RCA International Division, said that eighty-five of the instruments produced by RCA now are used by research scientists and technicians outside of this country.

"This activity emphasizes the increasing attention which some parts of the world are placing on the fuller development of natural resources, and shows a desire to increase benefits to the public through more exhaustive research," Mr. Brunet declared.

"Many countries are examining their natural resources under these electronic 'super-eyes' to support broad national programs. Foreign scientists are stepping up their study of such vital resources as cotton, wood, coal, oil, rubber and silica, to mention a few raw materials so necessary to employment and security."

With a magnification of more than 100,000 diameters, the RCA electron microscope has become one of the most effective scientific re-

search tools, Mr. Brunet said. Its resolving power is from fifty to 100 times that of ordinary laboratory microscopes, making possible the opening of vast new areas for investigation. Approximately 200 are employed by American medical research laboratories, colleges and industrial organizations.

"The electronic search carries over into manufacturing and finished goods, as well as into the many fields of public health," said Mr. Brunet. "Orders from numerous agencies within a single country indicate the variety of uses which foreign laboratories are find-

ing for the RCA electron microscope. French industry, for example, is employing it for research in rubber, glass and silicas. A recent order brought to eight the number of RCA electron microscopes being used in France.

"In Canada, where the electron microscope has been found of particular value in forestry research, there are four of these instruments in operation. Argentina has four, and Brazil, seven, including one employed by the police in criminal investigation.

"The British Medical and Agricultural Research Institutes, as well as the Cotton Research Bureau, are among the twelve purchasers of the RCA electron microscope in England.

"Mexico's most recent purchase of an electron microscope is a specially converted instrument for use in high altitudes. It has been ordered by the Ministry of Agriculture at the Agricultural College of Chapingo. Others are being used in Mexico City by the Health Department, by the Agriculture Ministry, and by the Escuela Nacional de Ciencias Biológicas for research in physical chemistry."

Mr. Brunet mentioned a number of organizations as the first in their respective countries to install an RCA electron microscope: Administracion Nacional de Combustibles Alcohol y Portland, in Montevideo, Uruguay; Instituto Nacional de Higiene, in Havana, Cuba; the University of Guayaquil, Ecuador; and Fouad University, in Cairo, Egypt.

MEMBERS OF THE MEDICAL CORPS AT THE UNIVERSITY OF BRAZIL WATCH DR. ORLANDO BAIOCCHI AS HE OPERATES AN RCA ELECTRON MICROSCOPE RECENTLY INSTALLED AT THE UNIVERSITY.



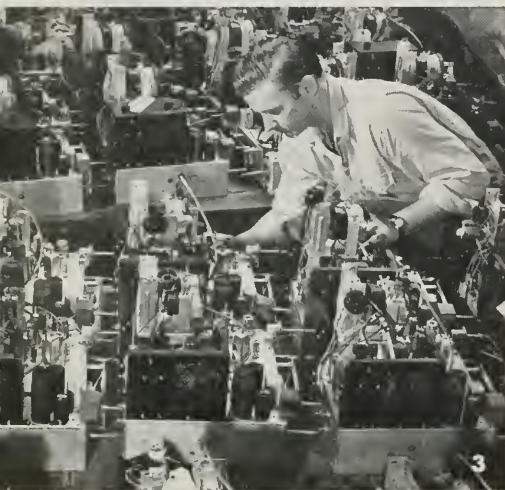


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Television Receivers in P

These scenes show steps in assembling television receivers in the RCA Victor plant, Camden, N. J.



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1. Riveting sockets and small parts to chassis is the first step in making television receivers.

2. Skilled women workers begin the complicated job of soldering wires connecting components.

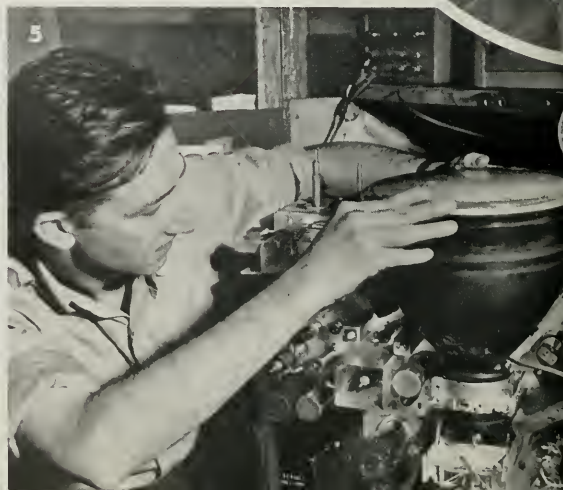
3. An inspector checks the completed chassis before passing them on to cabinet assemblers.

4. Each receiver is carefully checked with its kinescope picture tube in place.

5. Preparing assembled receiver for testing and alignment of its component parts.

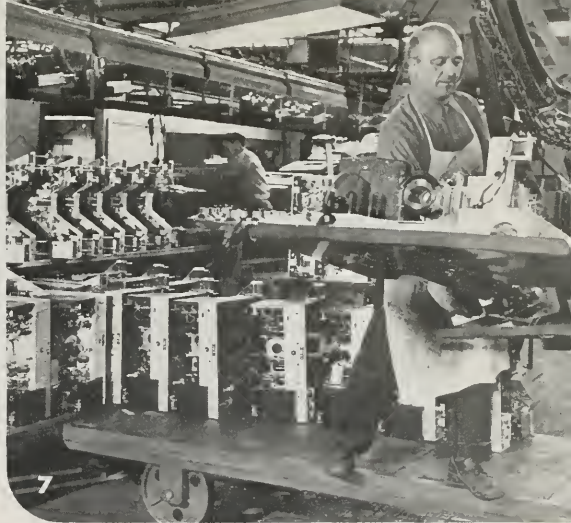
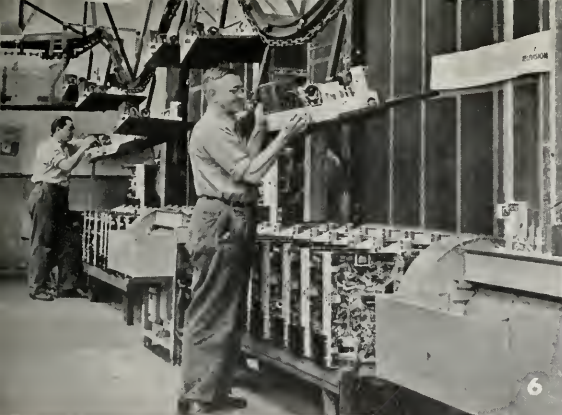


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Production at RCA Victor Plant

Left: RCA Victor projection television receiver with retractable 15 x 20-inch screen.

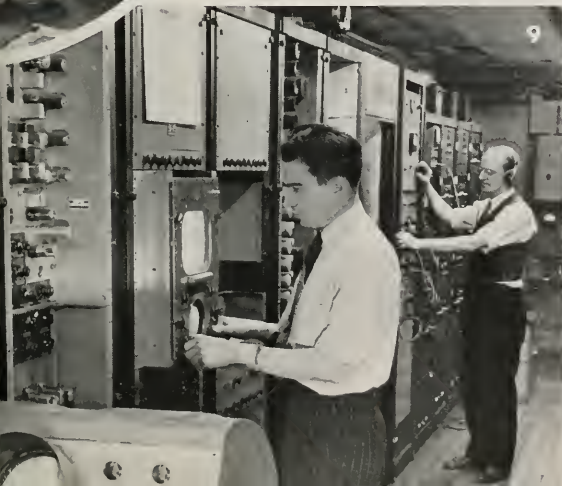
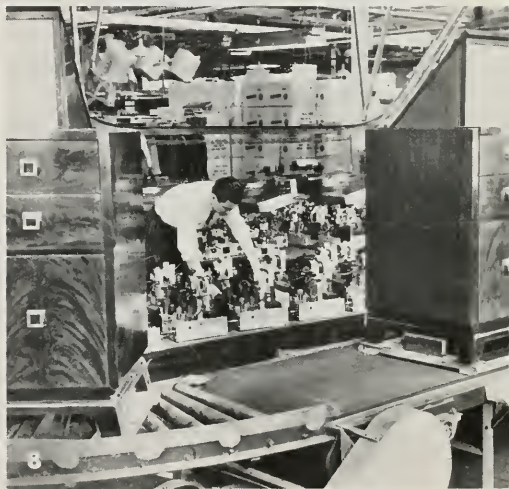
6. Chassis are loaded on conveyor lines which take them to the final cabinet assembly room.

7. At the end of conveyor lines, receivers are removed for insertion into their cabinets.

8. Projection type receiver consoles halt here to receive the chassis shown in the rear.

9. Test patterns are generated at these panels for use in adjusting tuning controls.

10. Workmen make final adjustments on projection receivers before crating them for shipment.





DEMONSTRATION OF LARGE SCREEN TELEVISION PROJECTION, PROVIDING A SCREEN PICTURE 6 BY 8 FEET.

TELEVISION AND THE THEATRE

Large Screen Developments Are Likely to Create Major Changes in Theatre Programming and in the Production of Film Features, Watts Says



By **W. W. Watts**
*Vice President in charge of
Engineering Products Dept.,
RCA Victor Division*

IT is usual, in a discussion of television, to trace its growth beginning with the first whirling-disc scanners of 1885. Actually, these chronological facts are of little consequence compared to an appreciation of television as it exists today—an "infant" industry growing into maturity—and an understanding of where it may go tomorrow.

Recently, the Radio Corporation of America published an advertisement announcing that television is now "Forty Million Big," a reference not to 40 million viewers, or anything like that number, but to the fact that television program

service now covers an area populated by 40 million people.

For many years every broadcast of the NBC Symphony under Toscanini had been viewed by capacity crowds in one of the world's largest studios. Yet, on the night when this program was first televised, it was seen and heard by more people than comprised the total of all previous studio audiences. To recognize the import of this, let us take a brief glance at some current and future statistics.

There are now in operation 28 television broadcast stations. The Federal Communications Commission has granted 83 Construction Permits and applications for 281 additional stations have been filed with the FCC.

If the currently proposed FCC revision of television channel allocations is enacted, then, ultimately, there will be channel space for 953 stations in 456 cities—with an audience that could grow to equal that of the estimated 66 million radio sets now in 37 million homes.

There are, of course, other forms of television than the home type. One is Large-Screen Television, a nomenclature applied to television pictures varying from 6 by 8 feet to 15 by 20 feet.

Although usage has invariably linked these projection systems to the "theatre", it is my belief that theatre television is but one of many applications for large-screen television equipment. As one example, it is conceivable that such equipment will be used for audiences at television studios since the presence of large numbers of visitors to studio sets when in use is fully as impractical in television as in motion picture studios.

Promotional use of large screen television in connection with sports and news events also will be made and may, in some cases, displace the "moving light" bulletin boards now widely used by newspapers. Overflow auditoriums, department stores, hospitals, hotels, cocktail lounges, and night clubs provide additional fields of usage.

Applications Seem Endless

In fact, the possible applications of television seem endless. For instance, television cameras on the front of guided missiles provide a picture by radio to permit guiding the missile to its target; underwater television has obvious uses for examining locations now beyond man's reach. In hospitals, famed surgeons have shown that they can demonstrate their technique by television to audiences far in excess of the capacity of normal surgical amphitheatres. In motion picture studios, directors can view tomorrow's "rushes" on two-dimensional television screens while the scene is being shot. From their easy-chairs on the studio floor, directors can view what is being filmed by the motion picture camera as it gyrates above some huge set on the end of a camera crane.

With possibilities such as these, several motion picture companies already have begun their participation in television. Paramount, through television station operation and demonstrations of its film storage system at the New York Paramount Theatre, has shown an active interest in the medium. Warner

Bros. and Twentieth Century-Fox have filed applications for television stations in several cities.

Film Companies Show Interest

More than a year ago, development work at RCA indicated the attainment of large-screen television pictures of a quality much superior to pre-war performances. Some of the motion picture companies were interested. Inquiries came from national and local theatre circuits, and independent theatres. However until programming possibilities had been explored and customer "know-how" developed, we were not too sure what type of equipment ultimately would best suit customer needs. We could easily have been led into "building a boat that couldn't be moved up the cellar stairs". Accordingly, several motion picture companies were offered what have since been called "joint development contracts" under which we agreed to furnish technical information and "know-how", engineering assistance, a large-screen projector capable of producing 6- by 8-foot projected pictures, a large-screen projector capable of throwing a 15- by 20-foot picture and, ultimately, an 18- by 24-foot picture, a kinescope photography system which, when coupled to a high-speed developer, is capable of feeding film to a standard theatre projector in a short time-cycle—less than 1 minute—and the services of trained theatre service engineers.

Warner Bros. and Twentieth Century-Fox joined us in this undertaking and have some of the equip-

ment in operation. The remainder is scheduled for early delivery.

All of these systems are constructed as professional equipment without regard to physical dimensions or installation requirements. Indeed, the larger projection unit, employing a 42-inch reflector, contains the largest Schmidt-type projection system in use.

Everyone knows that television broadcast stations use and require vast amounts of film fare for programming. They are obtaining some of it from a supply "made in Hollywood." Of its quality, all one can say is that it is the best Hollywood made in those years. Why, one might ask, does the public accept the current film fare? The answer is simple: novelty and lack of competition. As viewers and sponsors increase, they will demand and get better film programming. Furthermore, it is our opinion that advertisers will finance much of this film programming, because we are convinced that the American pattern of free television, like free radio, already has been established and will continue.

Telecaster is a Film Producer

The term "film storage and kinescope photography systems" refers to the business of filming the picture from a special high-intensity television monitor. Adoption of this method makes the television broadcaster a producer of pictures—perhaps chiefly for syndicate or transcription purposes, but nevertheless a producer of pictures.

Thus far, relatively little has been said about the precise nature of programming, much about equipment. Essentially, that is the position of RCA. When we manufacture and sell theatre film projectors and sound equipment, we do not tell the exhibitor what films to run. That is his business and one in which he is skilled.

And speaking of things to come, there is an additional RCA television item which is due on the mar-

ket shortly in limited quantities. This is a large-screen, nominally priced television projector capable of a 7- by 9-foot picture, suitable for theatre lobbies and lounges.

Much of the equipment which has been mentioned here utilizes motion pictures. It has been estimated that television stations of this country ultimately will require many more feet of film than Hollywood now produces, a condition aided and abetted by the fact that there are few chances of "extended runs" on television.

If you could build a theatre large enough to accommodate at one time all of the patrons who attend a three-week run, you would show your film only once. That, in effect, corresponds to television.

A little forecasting based on current AM-FM broadcast practice provides some idea of what the potential film usage of television might become. Today there are about 2,500 AM-FM stations on the air. Nearly half of these are affiliates of the four major chains. They operate about 18 hours per day. Conservatively, they use five hours of chain-originated material daily. That adds up to 4 chains times 5 hours (20 hours daily), times 365 days, or 7,300 hours of network-originated material per year.

Now let us see how those figures might apply to television. It has already been pointed out that the FCC has prepared nearly 1,000 channel allocations in 456 cities. Let us assume that when these 1,000 stations are on the air, they follow the current broadcast pattern, carrying chain material for the same 5 hours, with 2½ hours programmed from film. Four networks times 2½ hours (10 hours per day) times 365 days means 3,650 hours of film annually.

That is the equivalent of 1,825 two-hour features or 14,600 15-minute shorts—plus all the additional film material the 500 remaining independents will use, which is not network originated.

It will require far more film, more technicians, more talent, and more equipment than exists today. It presents an opportunity to which both the motion picture industry and the television industry can anticipate with high enthusiasm.

THE AUTHOR AND BARTON KREUZER, MANAGER OF RCA THEATRE AND RECORDING EQUIPMENT, EXAMINE A TELEVISION PROJECTOR GIVING A 15 BY 20-FOOT SCREEN IMAGE.



New Explorations To Open Way For Television Expansion

RCA's Experimental TV-Station in Washington to Conduct Tests in 500 Megacycle Region — Jolliffe Says if Experiments Reveal Expansion of Television Into Ultra-high Frequencies is Practicable, a Simple, Inexpensive Adapter Can Be Provided for Present TV-Receivers.

A NEW exploration by engineers of the Radio Corporation of America of radio frequencies above 500 megacycles, as a medium for expansion of television broadcasting, will begin about September 1, in Washington, D. C., Dr. C. B. Jolliffe, Executive Vice President in Charge of RCA Laboratories, has announced. An application for the installation of an ultra-high-frequency television station in the nation's capital was filed by RCA with the Federal Communications Commission on May 27, and the necessary license to proceed with the new experiments was granted on June 24.

"Results of the tests," Dr. Jolliffe said, "should provide further information on the problems involved in the development of television on frequencies above 500 megacycles, and if successful will be a major contribution to the expansion of this service to the public."

The new experimental station will be installed at the Wardman Park Hotel in Washington, location of the National Broadcasting Company's commercial television station, WNBW. The simultaneous operation of these two stations on 67 megacycles and 510 megacycles, Dr. Jolliffe pointed out, will give engineers an opportunity for the first time to compare the service possibilities of ultra-high frequencies with those of the present lower-band commercial frequencies.

Should these new experiments reveal that expansion of television into the ultra-high frequencies is practicable, a simple and inexpensive adapter can be provided for present television sets. Such a device will enable these sets to receive programs broadcast on the higher

frequencies, as well as on the present television wave-band.

Transmitting equipment for the tests has been completed, Dr. Jolliffe said, and installation will begin as soon as the FCC authorizes construction. It is expected that tests will commence about September 1, 1948.

Part of Long-Range Program

The Washington experiment is a continuation of a long-range research program of RCA Laboratories to determine the usefulness of ultra-high radio frequencies for television, Dr. Jolliffe said. In the past, he continued, RCA has carried out tests on 288 megacycles, 500 megacycles, and 910 megacycles, but the Washington project will be the first to be conducted with television programs produced by an existing commercial station.

With numerous other services seeking additional frequencies, Dr. Jolliffe said, the only part of the spectrum in which additional channels for television can be found is between 475 and 890 megacycles which already has been set aside by the Commission for future development of television. Little is known of the characteristics of these frequencies as a medium for television signals, hence it is necessary to carry out comprehensive tests such as those now planned by RCA and NBC to determine how the frequencies can best be utilized for maximum service to the public.

Converters to Be Provided

In order to conduct complete field-test comparisons with the low-band (67 mc) transmissions of WNBW, RCA Laboratories will design simple converters for the use of engineers and other observers. These devices, when attached to

standard television receivers, will make it possible to compare the reception of programs as they are transmitted simultaneously on both low-and-high-band channels, thus affording a constant check on the transmission characteristics of the two bands.

The transmitter will produce an effective radiated power up to 25 kilowatts. With this power, engineers can make field strength surveys of a 500-megacycle broadcast service under all conditions of urban, suburban and rural areas, and over all kinds of terrain, an accomplishment heretofore not possible.

Jolliffe Testifies Relative To Television and FM

If all television, which gives promise of being a billion-dollar business this year, were required to move at this time to higher radio frequencies, "it would mean no television at all," Dr. Jolliffe testified at a hearing of the Senate Interstate and Foreign Commerce Committee.

"RCA is interested in the fullest development of all radio services," Dr. Jolliffe said. "It was a pioneer in FM, and it was a pioneer in television. We do not take a stand in favor of one of these services as against the other. We believe in both and we are convinced that the needs of both can be advanced without a feud between the two.

"In our opinion, the way to promote FM is to promote FM and not fight television."

Dr. Jolliffe said that RCA believes this view is shared by most persons in the industry. "But there appear to be some," he continued, "who would block the progress of television with charges which mis-

represent the purpose and leadership of RCA and NBC in bringing television to the American people. One of these misrepresentations is the assertion that all television should be moved into the higher frequencies. Let us make no mistake about this. If such a move were made at this time, it would not mean more television. It would mean no television at all."

Television Can Expand Into H.F.

Television can *expand* into the higher frequencies without disrupting its service to the public, Dr. Jolliffe said. It is one of "the brightest promises of America's industrial progress," he asserted. "If permitted to develop, television will provide thousands of new jobs."

Dr. Jolliffe pointed out that the upsurge in television business has been the occasion for a number of special editions in newspapers recently. He presented copies of these special editions, and asked that they be made a part of the hearing record "because they demonstrate in a very understandable way the extent to which television is being translated into a new business and more jobs."

"The rush to television is an indication of the immense public interest in this new service to the home," he continued. "RCA and NBC are only two of the companies in the forefront of the development of television. Actually more than 45 companies now manufacture television sets. Many of these set manufacturers are small companies whose only business is television. In addition to RCA, still other companies in the television industry are making transmitters, studio equipment, tubes and other component parts for use in television apparatus."

"In addition, as of May 1 of this year, 97 television stations are on the air or have been granted permits to go on the air for commercial television broadcasting, and 223 applications for construction permits for new stations are pending. Of the 97 stations referred to, NBC has two stations on the air and three under construction. Many others are owned by newspapers, other broadcasters, motion picture

producers, manufacturers, and other companies and individuals."

The question has been asked, Dr. Jolliffe said, whether present television sets would become obsolete if the Federal Communications Commission opens up a band of frequencies around 500 megacycles to supplement the present channel assignments to television. "The answer is," Dr. Jolliffe said, "that they would not become obsolete."

"Obsolescence of television receivers," he continued, "can be avoided by the addition of a simple converter which was developed by RCA about two years ago to illustrate the principle in connection with color television. It works equally well for black-and-white television. By the use of this converter, present sets designed for the channels currently in use can receive television on the high band also."

"We estimate the manufacturing cost of a converter like this to be about \$10. It can be easily manufactured by anyone. As television expands into the higher frequencies, this converter or a circuit which performs the same function can be built into new television receivers, with the result that those receivers will contain more than one band, just as do the present multiband sets for sound broadcasting."

Only One Large Band Available

"The frequency space from 475 to 890 mc is the only large band of frequencies now available into which commercial television can expand. The use of this band for television presents many engineering problems. Most of these problems have not been solved. That is why I said at the beginning of my statement that if all television were required to move to these higher frequencies it would *not* mean more television. *It would mean no television at all.* New vacuum tubes capable of generating high power at these frequencies must be developed and manufactured. Much needs to be learned about the facts regarding wave propagation at these frequencies. In short, we need to learn how to use these frequencies to render a reliable television broadcast service to the public."

"A substantial amount of propagation data on high power transmissions at 500 to 900 mc has been obtained, and a technical paper on this subject has been prepared for publication in the June issue of the *RCA Review*. On April 12, we made available to members of the FCC and its staff, at RCA Laboratories in Princeton, our latest findings and technical data on the problems to which I have referred."

"We have been working diligently to solve these problems and much progress has been made. We are continuing this work. We want to make it very clear, however, that there need be no halt in the progress of television, nor any obsolescence of present receivers."

FM Has 80 Channels

Dr. Jolliffe said that there had been no discrimination in the allocation of frequencies against FM and in favor of television. "The contrary is the fact," he testified. "In 1936, 12 channels were made available by the FCC to FM and 8 to television, both for experimental service. In 1939, FM was increased to 14 channels and television to 20."

"As a result of the FCC hearings of 1940, television was required to vacate its channel #1 in favor of FM. Because of this, television was reduced to 19 channels and FM increased to 35. FM was authorized to proceed as a commercial service in May 1940 and television was made commercial in July 1941."

"Following the FCC hearings of 1944 and 1945, television was required to vacate still more channels in favor of FM and other services. The result this time in terms of channels for commercial service was: television, 13 channels; FM, 80 channels. Only last week television lost still another channel."

"*The score today, on commercial channels, is: television, 12; FM, 80.*"

Dr. Jolliffe continued:

"The irresponsible charge that anyone is trying to hold back or block FM has been recklessly hurled before this Committee and elsewhere. The record of research, development, production and broad-

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TUBE PLANT ENLARGED

Million Dollar Extension to Lancaster Factory Will Provide an Additional Acre of Space for the Manufacture of Television Picture Tubes

WHEN engineering and production staffs of the RCA tube plant at Lancaster, Pa., succeeded late last year in tuning up their ingenious machines to turn out television kinescope tubes at the then unheard of rate of one-a-minute, they discovered that the results of their efforts, admirable as they were, were still much below the fast-growing demands of the television industry. For almost overnight, television had caught the fancy of America. Each set that was sold, sold others. Everyone, it seemed, wanted a television receiver. And as set production increased, the demand for kinescopes kept pace. RCA recognized the situation and moved rapidly to meet it. Early this year, a million dollars were set aside for the construction of a wing to the Lancaster plant, which would make available nearly an acre of additional space for more automatic machines and proportionately more tubes.

Before the new building is completed sometime this summer, workmen will have begun the installation of the machines that, by the end of the year, should begin to contribute their appreciable output to the present supply.

Built in 1942 and operated throughout the war by RCA for the Navy Department as the largest

single supplier of cathode-ray and power tubes for critical war equipment, the Lancaster plant was purchased by RCA from the Navy in April, 1946. The most modern electron and television tube factory in the world, the plant at war's end comprised 394,450 square feet of efficient manufacturing and engineering space and presented a supreme opportunity to bring to immediate fulfillment one of the rosy promises of the postwar "dream world."

Plans Revealed to Industry

The first move was to expand and convert the plant's existing equipment, and design and install additional high-speed production machinery. At the same time, RCA's plans were made known to the electronics industry at large with a view to stimulating wide-scale interest and some measure of standardization of tube sizes on the part of manufacturers and designers so that the new-born television industry could move forward on a broad front.

Today, 1800 highly-skilled workers are employed at the plant and television tube production is running on a two and three shift basis for most operations. Newer and even more efficient methods and machinery continue to be installed.

Luminescent materials for the glowing picture face of the picture tube, once produced by the cupful in laboratories, are now manufactured at the rate of almost a ton a month at Lancaster. As an indication of the remarkable efficiency necessary in this operation, impurities must be held to less than one in 30 million to prevent impairment of the luminescent face of the television tube.

The installation of the first of three giant "settling machines" which made the critical process of applying the luminescent screen to the face of the tube almost totally automatic, has recently been completed at Lancaster. The endless belt machines automatically and precisely feed the luminescent solution into the glass bulbs, transport them across the machine while the television screen forms, pour off the excess fluid, wash the bulbs first in an acid then in a water bath, and finally blow them dry. In this critical operation, any vibration which might disturb the even settling of the luminescent particles to the face of the tube must be eliminated. The giant three-ton settling machine is so finely balanced that it is powered by a single quarter-horsepower electric motor—no larger than the motor in a vacuum cleaner. Mounted on precision ball bearings, the machine stands on a vibration-deadening cork "island" isolated from the rest of the plant by thick sandwiches of concrete and cork.

Electronization, expected to be the next great revolution in America's industrial plant, is already

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RCA TUBE PLANT AT LANCASTER, PA, NOW BEING ENLARGED WITH A MILLION DOLLAR EXTENSION WHICH WILL SUBSTANTIALLY INCREASE THE FACTORY'S 1949 OUTPUT OF KINESCOPE TUBES FOR TELEVISION.





DAVID SARNOFF, PRESIDENT AND CHAIRMAN OF THE BOARD, ADDRESSING THE 29TH ANNUAL MEETING OF RCA STOCKHOLDERS IN RADIO CITY, MAY 4, 1948.

RCA Stockholders Meeting

Net Profit After Taxes of Radio Corporation of America for First Quarter of 1948 Amounted to \$5,764,498—Earnings Per Common Share for Same Period Equal to 36 Cents, Compared with 28 Cents for First Quarter of 1947.

NET profit, after taxes, of the Radio Corporation of America for the first quarter of 1948 was \$5,764,498, representing an increase of \$1,084,433, or 23 per cent, over the same period in 1947, Brigadier General David Sarnoff, President and Chairman of the Board of RCA, announced at the 29th Annual Meeting of stockholders held on May 4, in a studio of the National Broadcasting Company at Radio City. Profit for the first quarter of 1948—before Federal Income Taxes—amounted to \$9,631,498.

Earnings per common share for the first quarter of this year amounted to 36 cents, as compared with 28 cents per common share for the first quarter in 1947.

Consolidated gross income of RCA during the first quarter of 1948 amounted to \$88,053,297, compared with \$76,560,096 for the same period last year. This represents

an increase of \$11,493,201, or 15 per cent over the 1947 figure.

During the past ten years, RCA has paid nearly \$61,000,000, or 58 per cent of net profits, in dividends to its stockholders, General Sarnoff reported. Of this amount, \$32,000,000 was paid to holders of preferred stock and \$29,000,000 was paid on the common stock. He said that during the same ten-year period the net worth of the Corporation was increased by \$48,000,000, and is now in excess of \$113,000,000.

40,000 Employees on May 1

On May 1 of this year, RCA personnel numbered nearly 40,000, he said, praising the loyalty and spirit of cooperation given to the Corporation by employees.

"It is especially gratifying to report that there were no strikes in RCA during the past year," he declared. "The labor problems that arose from time to time were solved

through genuine collective bargaining with the forty-one unions representing our workers. Wage rates throughout industry in general are at the highest level in history. Wages and salaries paid to RCA employees in 1947 totalled nearly \$108,000,000, or more than 34% of our gross income.

"To meet increased living costs, the Radio Corporation of America has from time to time granted wage increases to its employees. The average weekly take-home pay for hourly paid employees in our manufacturing division was \$48.96 in January, 1948, an increase of 93% over January, 1941."

General Sarnoff's report covered all phases of RCA activities in radio—research, engineering, manufacturing, broadcasting and world-wide communications.

"At the end of 1947, RCA had a backlog of unfilled orders amounting to approximately \$100,000,000,"

he announced. "At that time, consolidated inventories totalled \$61,500,000 of which \$16,400,000 represented raw materials, \$18,400,000 consisted of work in process, and \$26,700,000 represented finished goods."

Despite expanded manufacturing facilities of the RCA Victor Division, orders for home instruments still exceed production, he said, declaring that the major increase had been in the sale of television sets which, in turn, increased demands for electron tubes, prompting expansion of the RCA Tube Plant in Lancaster, Pa.

Radio Industry Highly Competitive

The radio industry, in all its phases, is one of the most highly competitive businesses in the United States, he pointed out, recalling that newspapers, magazines, and broadcasting stations throughout the land carry the advertisements of the competing radio products and services. These, he declared, provide abundant proof of the keen competition which exists in this industry.

"Outstanding advances in television have amply justified the optimism expressed at our meeting last year and on other occasions," asserted General Sarnoff. "Television began in 1947 to fulfill its promise of becoming a new and dynamic postwar industry. It is gaining impetus daily. The Federal

Communications Commission has authorized 93 television stations. In addition, 226 applications for construction permits are pending before the Commission.

"More than 300,000 television receivers are in use and this number increases daily. By the end of this year, it is estimated that 800,000 television sets will be in the homes of the public. RCA leadership in television, research, engineering, manufacturing and broadcasting has played an important part in bringing this new service into so many American homes.

"Today, there are twenty-five television stations on the air. More than forty stations are under construction and at least half of them are scheduled to be in operation before the end of the year. Television stations now on the air with daily programs reach territory inhabited by 40,000,000 people, and this coverage is expanding rapidly."

Reporting on the activities of the National Broadcasting Company, he said that NBC is a leader in establishing television as a service to the public. In addition to its pioneer station, WNBT, New York, and its second station, WNBW, Washington, NBC has television stations under construction in Cleveland, Chicago and Hollywood. By the end of this year a number of additional NBC network affiliates will have television stations on the air.

NBC marked its twenty-first year in 1947 with the largest volume of business in any year since its formation, the report revealed. Surveys conducted by impartial fact-finding organizations show that its outstanding programs attract more listeners to NBC than to any other network. The network consists of 169 standard broadcasting stations, six of which are owned by the Company.

FM Is Winning Acceptance

General Sarnoff stated that FM broadcasting is winning wider public acceptance, and recalled that RCA has been active in the technical development of FM since 1924. It was pointed out that RCA tube and circuit developments have simplified the technical design of FM transmitters and receivers and have lowered manufacturing costs.

"Today, as FM broadcasting spreads across the country at the rate of approximately 50 new stations a month," said General Sarnoff, "RCA is one of the chief suppliers of equipment. We have delivered 167 FM transmitters, and have orders for 138 more. Ten models of RCA Victor home radio instruments provide FM reception. Each of our television receivers is designed to receive by FM the sound portion of the television program."

PRODUCTION LINES AT THE RCA VICTOR PLANT IN CAMDEN, N. J., DELIVER AN INCREASING NUMBER OF TABLE MODEL TELEVISION RECEIVERS TO MEET THE GROWING DEMANDS OF THE PUBLIC.



With respect to the demand for RCA products in foreign countries, he reported that the distributing organization of the RCA International Division has taken substantial orders for communications equipment in Venezuela, Colombia and Pakistan, and declared that the RCA manufacturing plant in Mexico is being expanded and one under construction in Brazil will be in operation by the end of the year.

Scope of Research Increased

Scientific research and pioneering at RCA Laboratories continue on an ever-increasing scale, he said, adding:

"Our scientists and research men will continue seeking new knowledge, not only in radio and electronics, but in allied fields. We have commenced work in atomic physics because it is related to electronics.

"Nuclear energy, as a source of power, may become an important factor in communications. It is no idle dream to envisage that radio sets of the future may take their power from tiny capsules of atomic energy or even from small particles of such material. Should this miniature power supply become possible, smaller and more compact radio and television sets may be built."

New records of speed and accuracy in the handling of overseas radio messages were achieved during the past year by RCA Communications, Inc., a service of RCA, General Sarnoff reported, noting that new equipment and mechanized operations have greatly advanced the art of world-wide communications.

While mounting costs of operations, lower volume of international traffic and steadily increasing competition from overseas telephony and airmail caused a decline in operating revenues, he said, the new rate schedule authorized by the Federal Communications Commission, effective April 28, is expected to improve the present situation.

His report revealed that radar, as an outstanding development in marine communications, has become a primary field of activity for Radiomarine Corporation of America, with its radar installations on

A WORKMAN AT THE RADIOMARINE PLANT ASSEMBLES RADAR ANTENNAS FOR INSTALLATION ON AMERICAN AND FOREIGN VESSELS.



American and foreign vessels totaling 200. Radiomarine also was said to be maintaining a substantial volume of sales of radiotelegraph, radiotelephone, and direction finder apparatus, at the same time modernizing and expanding its system of inland waterways and coastal radio stations.

General Sarnoff stated that enrollment of students at RCA Institutes has reached an all-time high of 1,625, seventy-five per cent of whom are war veterans. To provide for this expansion of the student body, RCA Institutes has moved to new quarters at 350 West Fourth Street, New York.

Looking Ahead

"In considering the future," General Sarnoff said, "the Directors and Management of the Radio Corporation of America are mindful that this is a critical period in world history and that business and industry face continuing uncertainties both at home and abroad.

"Moreover, the rapid development of television and FM and their relationship to standard broadcasting have brought many new problems into the radio industry that must be faced with the courage of pioneers and the prudence of experience. With our comprehensive operations in research, manufactur-

ing, broadcasting and world-wide communications, we are well equipped to meet these challenging problems and to solve them.

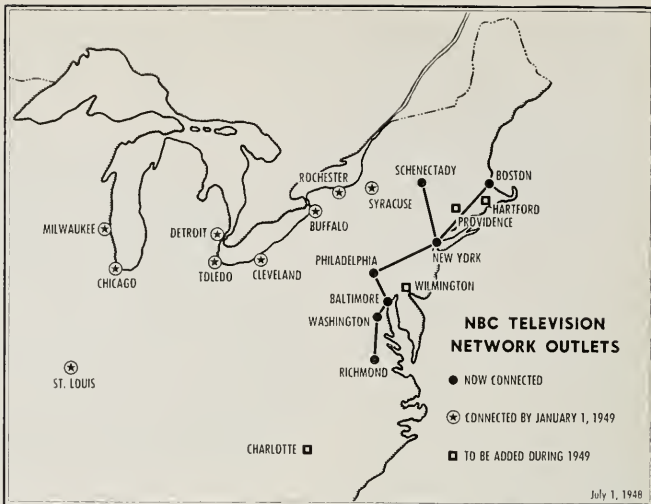
"The radio industry was born of science and its growth is continually nurtured by research and invention. In wartime we vividly saw how the strength and survival of nations depended upon the skillful application of science, and in no small measure upon the availability and efficiency of communications. Indeed, it was from radio that radar, loran and shoran sprang, as well as airborne television, the proximity fuse and many other electronic devices.

"Unhappily the world is still far from having achieved peace and security. Therefore, we must be alert to the responsibilities we have to our country and to our fellowmen. Radio and aviation have reduced the size of the globe and they must be strong in peace if they are to protect us against war. Our industry is a vital bulwark of national security.

"We, of the RCA Family—stockholders, management and workers alike—have great obligations as a result of our daily alliance with countless millions of people. America's research laboratories, manufacturing plants and communication facilities in wartime, were called 'an arsenal of Democracy'. In peace-

time, they must also serve the interests and welfare of the public and thus help to promote the principles of freedom, democracy and opportunity for advancement—principles to which the people of our nation are devoted.

"Since the formation of RCA, twenty-eight years ago," said General Sarnoff in conclusion, "continual pioneering and experience have equipped us for industrial leadership under the American competitive free enterprise system. RCA has played a leading role in building the vast industry of radio, now enlarged by television. During these years it has advanced as one of America's great industrial organizations. Proud of past achievements, aware of present responsibilities, and alert to future opportunities for increasing the scope and value of our service to the public, we shall do our best to foster progress and to maintain RCA leadership in the science, art and industry of radio and television."



MAP OF NORTH EASTERN U. S. SHOWING THE SEVEN NBC TELEVISION NETWORK STATIONS IN OPERATION AND NINE OUTLETS TO BE ADDED SOON.

Tube Plant Enlarged

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widely utilized at Lancaster. In one of the first manufacturing operations on the bulbs, r-f heat burns a dime-sized hole in the glass side wall and welds a metal anode-button to the glass at a temperature of 700 degrees centigrade.

The vacuum itself within the tube is created by another "robot" process in the "straight-line exhaust machines." After rigid inspection, including exacting scrutiny of the luminescent screen face, the precisely engineered electron gun which focuses the beam of electrons to "paint" the glowing television picture on the luminescent face of the tube is inserted into the glass neck and the bulb is placed on moving carts which pass through long oven-like machines. Eighty-four of the bulbs are handled at a time in two parallel exhaust machines. The evacuated tubes, each with a vacuum ten times that of an ordinary electron tube, emerge from the far end of the exhaust machine to be automatically "pinched off" and sealed, and placed on the conveyor belt for the trip to the next process, untouched by human hands.

Besides its vital production role, the Lancaster plant is, in effect, a "pilot plant" for the growing television industry. The unique automatic machines, the rich fund of "know-how" have all been made

available to the tube-making industry at large.

For this and many other reasons, some future historian may well point to the low-lying brick structure at Lancaster as the open sesame that unlocked the gates to television, another of America's great industries.

New Explorations Open Way

Continued from Page 21

casting set forth in this statement, and the position taken by the RCA toward opening up the higher frequencies of the radio spectrum, completely disprove this charge.

"The Radio Corporation of America unequivocally and categorically denies the charge."

Dr. Jolliffe pointed out that RCA and NBC have made notable contributions to the development of FM. "RCA has worked on FM since 1924," he continued. "RCA was a leader in the development of the higher frequencies and the new radio services which those frequencies made possible.

"Long before FM broadcasting could commence, these higher radio frequencies had to be pioneered. New vacuum tubes had to be cre-

ated to work on these frequencies. Transmitters, antennas and receivers had to be developed to meet their hitherto unexplored characteristics. This was the pioneering on which RCA engineers spent years of exploration, research, invention and engineering. Commencing almost with the beginning of the company in 1919, RCA has been in the forefront of the development of this natural resource.

"The significance of this pioneering work can best be understood when it is realized that two of the principal advantages of high frequency or FM broadcasting, viz., high fidelity and freedom from natural static, are derived from the use of these higher radio frequencies, and not from the type of modulation employed."

MICROPHONES - 1920 TO 1948

*Recent Introduction of Bantam-Size, High Fidelity Instrument
Climaxes Development of These Units Since Earliest
Days of Radio Broadcasting.*



By T. A. Smith

*General Sales Manager
Engineering Products Dept.,
RCA Victor Division.*

FEARED by novice performers as a lethal monster ready to pounce upon the timid, and variously caricatured as a "fiend in metal" and a "pie-plate on a stick," the familiar radio microphone, long the symbol of broadcasting, has followed the trend of the times and become a sleek, streamlined object. It is compact, greatly improved in appearance, and capable of a quality of performance once considered almost beyond the reach of engineering design. Compared to the crude carbon button microphone of 1920,

the new bantam-sized velocity instrument, introduced recently by RCA Victor, has reached a point of advance comparable to that exhibited by the sleek automobile of 1948 in its relation to the ox-cart of our colonial pioneers.

Although the microphone as a converter of sound into electrical pulses is as old as the telephone, it was the demands of radio broadcasting that gave impetus to its development. As the scope of broadcasting widened from the earliest days of radio, when any sound reaching the loud speaker however faithful to quality was considered a miracle of science, down to the present when strict fidelity of tone is the yardstick, the capabilities of the microphone have never lagged behind the industry's rapid growth.

Broadcasting Provided Impetus

While the models of 1920 gave satisfactory service for the simple studio programs of those years, the demands of broadcasters soon called for a more practical approach to microphone design. Large groups of performers took the place of lone artists, radio moved to the concert

hall and the opera, and then, putting on seven league boots, it took jaunts out of the studio and broadcasts from remote points became commonplace. An improved microphone was the only answer.

The first microphone that could be considered a forerunner of the quality instruments of today was the condenser "mike." It came to light in 1928 and though far from perfect, relegated the carbon microphone to the shelves of museums. To some degree, it cut out unwanted background noises, but its output was so low that it required a small built-in amplifier to make it operable. Because of its bulky construction it was not the type of microphone to be carried throughout the broadcast of an 18-hole golf match.

First High Fidelity Microphone

In 1930, RCA developed the velocity ribbon microphone, the first true high-fidelity unit. However, this unit, too, was a bit unwieldy, since it employed electromagnetic field poles requiring direct current which was usually supplied by a heavy storage battery. But, taking advantage of improved materials, RCA engineers substituted permanent magnetic metal for the bat-



JINX FALKENBERG DEMONSTRATES THAT FACES OF PERFORMERS AND SPEAKERS ARE NOT HIDDEN WHEN THE NEW, COMPACT MICROPHONE IS USED.

THE NEW BANTAM-SIZE MICROPHONE (THIRD FROM LEFT) IS COMPARED HERE WITH THREE OTHER TYPES FAMILIAR TO AUDIENCES IN RADIO STUDIOS AND AT PUBLIC EVENTS.

tery-powered field coils and a unique microphone was born—the RCA 44A. It took only a very short time after its introduction for this “mike” to achieve world fame; in the United States it won recognition as the “standard of the broadcasting industry.”

Prior to the advent of the RCA-44 series, microphones were essentially non-directional. Because of this, noise and undesired sound were picked up along with desired program sound. The new velocity “mike,” however, was truly bi-directional, with pickup confined mostly to the front and back of the instrument.

A smaller version of the “44” series (known as the Junior Velocity Microphone Type 74), was introduced by RCA in 1935 and became popular among broadcasters. Its reduced size permitted a better view of speakers at banquets and conventions, and performers in night clubs.

Yet what the broadcasting indus-

try still lacked was a microphone which was uni-directional, one which would give uniform response over a large angle without distortion, and one which could be so oriented that undesirable noises coming from a particular direction would be eliminated. RCA introduced such an instrument, the uni-directional model, in 1936. It was entirely new and an exclusive RCA development.

Trend Toward Lighter Weight

Continued research resulted in the later light weight types. One of the models contained a switch for selecting the output of either the velocity, the pressure unit, or a combination of the two units, to produce either bi-directional, non-directional, or uni-directional response. As the next step RCA in 1945 introduced the now famous single ribbon microphone. This polydirectional unit can be adjusted by a single switch to give an infinite

number of directional pickup response patterns.

Taking advantage of the newest, lightweight magnetic alloys to further reduce the size of microphones, RCA engineers then started work on a bantam-size unit which would embody the output and high fidelity of the larger types with a fraction of their weight. The result was RCA's newest miniature velocity microphones, an instrument of broadcast quality, but smaller than a pack of cigarettes. The new diminutive unit is a low-cost instrument for use in radio studios, at remote broadcasts, in night clubs and conventions. It is so small that it will not conceal the faces of singers and speakers, and it fits comfortably in the palm of the hand. It weighs only 12 ounces, making it ideal as a portable unit.

Reduction in the size and weight of this microphone, known as the KB-2C, was brought about by the ingenious idea of designing the magnetic structure as part of the case. New, highly efficient magnetic materials have also contributed to the reduction in size, while retaining an output level comparable to that of larger, conventional types of microphones.

MICROPHONES USING THE PERMANENT MAGNET PRINCIPLE OF OPERATION UNDERGO FINAL INSPECTION AT THE RCA PLANT IN CAMDEN.



French Firm to Make Tubes Under RCA Contract

American type radio tubes, particularly the “miniatures” now widely used in this country, will be manufactured in volume in France under an agreement concluded between the Societe des Lamps Fotos, one of the leading tube producers in France, and the Radio Corporation of America, it was announced on May 6 jointly by Francois Grammont, managing director of the Societe, and Meade Brunet, vice president and managing director of RCA International Division.

The agreement, which covers licenses on certain RCA tube patents and the supplying of technical and manufacturing information, Mr. Grammont said, exemplifies the principles embraced in the European Recovery Plan. The Fotos Company, he added, plans to offer French producers of radio equipment the advantages enjoyed by the industry in the United States.

PRAISE FOR RADAR

Skippers and Navigators Reveal How Radar Serves Them in Many Different Ways in Storms, Fog and Darkness

EYE-WITNESS accounts extolling the value of RCA shipboard radar installations have been received by the Radiomarine Corporation of America in recent weeks from a large number of users. More than 200 vessels now employ this modern navigation and safety aid in darkness, storms and thick weather. The reports tell of its use up and down the Atlantic and Pacific Seaboards, in the Gulf area and on the Great Lakes, the Mississippi River and its tributaries, as well as by foreign-flag vessels on the high seas and in port entrances.

These on-the-spot accounts, volunteered by captains and mates, demonstrate the benefits and savings in time and money which RCA radar has made possible. They reveal dramatically for the first time the wide variety of operating conditions under which the commercial 3.2-centimeter units provide "eyes" to shipping. Excerpts from a representative group of the reports follow:

... "Picked up ships in snow squalls. Operated with good results during heavy snow storm in Baltic Sea and off Cape Race."

... "The Captain told the Second Mate one time during a squall that he would rather sail for \$100 less pay than to sail without radar. Just before sailing time it started to haze. The Mate said he did not care how thick it got; with the radar they would go out in any kind of fog or weather."

... "Along the coast of Florida, the RCA radar was used on the 15 and 20-mile scales and aided in picking up navigational markers and also ships at a range of about 25 miles. We continued on up from Florida to Cape May using these longer ranges merely as an anti-collision measure."

... "The ship sailed the afternoon of January 15th. While going down the canal (from Port Arthur) the pilot mentioned to the Captain and the other bridge personnel that the RCA radar picture was the finest he had ever seen, and it was the first one, in his mind, that would

have enabled him to take the ship out of there in a fog."

... "On arrival off Galveston, the vessel encountered fog. The entrance was made by radar. The Captain uses the radar exclusively when taking bearings on other vessels or harbor entrances, as the radar bearing is much more accurate than a Pelorous bearing."

... "Made landfalls by radar in the Baltic Sea and from port to port in Finland when not visible to the naked eye."

... "Performance excellent. Used constantly in smoky weather in Florida Straits and in sleet storm coming up Delaware River."

... "Going through English Channel — low visibility — radar used to large extent to pick up buoys and lights that were not visible more than one mile at the most."

... "Captain is still singing high praises of the RCA unit."

... "Heavy rain. Spotted targets O. K. Picked up Mantanilla (buoy), distance 10 miles, heavy seas. Used radar approaching Hatteras in dense Gulf Stream vapor. Ships distinctly spotted through this vapor and heavy spray. Picked up Winter Quarters Light vessel at 18 miles. The Captain was entirely satisfied with the operation of the radar."

... "RCA is to be congratulated for the fine work done in being able to install the equipment in the face of so many difficulties. The men who were in charge of the installation did a remarkable job."

Time and Oil Saved

... "We completed a 2½ month voyage to Rio de Janeiro and then to Baltimore with the radar working perfectly. Along the Brazilian coast the ship keeps about 10 miles off shore and it is always hazy and it is impossible to take visual bearings. But, by using the radar, we were at all times able to pick out identifying land masses. Also, by means of the radar, we kept the ship on a true course, thereby saving time and oil."

... "Left Ketchikan for Prince Rupert. Stood by radar almost con-

tinuously negotiating some narrow passages and had intermittent snow, rain and hail squalls. 1½ and 5 mile ranges used exclusively and results were excellent."

... "Passed Scotch Cap at 2:00 A.M. in heavy snowstorm that obliterated all lights. Operation with radar was excellent."

... "The radar operated successfully throughout a recent trip from the West Coast to China, the Philippines and back. On the way to China, the ship ran into some bad weather of near typhoon force and yet we were able to pick up islands and other ships with little difficulty."

... "Came into Lynn Canal and Skagway, Alaska, in thick snowstorm. Radar is a blessing in this weather."

Navigated Channel in Fog

... "During a voyage on Great Lakes from Chicago to Holland, Michigan, we navigated a tricky channel in a thick morning fog, proceeding on slow engine into a harbor, found the radar of real value."

... "Radar equipment permitted the vessel to run seven hours through dense fog at night on the Tennessee River."

... "U. S. Army Engineers are using RCA radar for the preparation of radar charts of the Ohio River. This is an example of the advantages of a high resolution radar in picking up narrow channels, bridges, and other targets for inland navigation."

... "The Captain is highly pleased with performance of this radar and jokingly remarked that he is ready to throw his searchlights overboard inasmuch as he has no need for them because of the radar."

... "We are very well satisfied with the over-all performance of our Radiomarine radar. It is used a great deal for navigation on our trips between Rotterdam and New York."

... "I believe that the apparatus will pay for itself within two years, perhaps sooner, by saving ship's time. In addition, ship and crew are, of course, considerably safer against collisions and breakdowns."

... "Captain summed up by reporting that the Radiomarine radar performed very well under all conditions and that he was very much satisfied with its performance in clear as well as in tropical squally weather."



CO-SPONSORS OF THE NBC COLLEGE-RADIO PLAN. L. TO R.: DR. JOHN W. TAYLOR, PRESIDENT, UNIVERSITY OF LOUISVILLE; GEORGE W. NORTON, PRESIDENT, STATION WAVE; J. U. MILWARD, DIRECTOR OF UNIVERSITY DEVELOPMENT, AND NATHAN LORD, VICE PRESIDENT AND GENERAL MANAGER OF WAVE.

COLLEGE-RADIO PLAN

Experiment in Home Study Courses for Adults Launched by NBC and University of Louisville as a Preliminary to Nationwide Educational Project.

AN ADULT education project of impressive scope in which institutions of higher learning will join with NBC and its affiliates in a college-by-radio plan to provide home-study courses built around selected network-produced programs, was launched on June 21 at the University of Louisville, in Kentucky. The Louisville experiment is being headed by Mayor Charles P. Farnsley of Louisville, Dr. John W. Taylor, president of the University, and George W. Norton, Jr., president of WAVE, the NBC outlet in the Kentucky city. Sterling W. Fisher, Manager of NBC's Public Affairs and Education Department, is supervising the plan.

In explaining how the experiment will operate, Fisher said that listeners may register at a nominal fee for a course in current events, music, literature or a like field, through a participating university. "The registrant," he said, "will be expected to tune in regularly both to the appropriate net work program

and the supplementary guidance broadcasts. He will submit reports on his listening and on assigned reading. At stated intervals and at the end of the course, he will take an examination prepared by the college with which he is registered."

Two kinds of certificates will be awarded for work successfully completed, one for students not interested in or not qualified to seek college degree credits, and the other, involving more concentrated study, for students desiring college credits.

Courses Based on Noted Programs

Home-study courses for the national college-by-radio will embrace many of NBC's outstanding programs in the fields of education and public affairs, such as "World's Great Novels," "University of Chicago Round Table," "Living—1948" documentary series, "Public Affairs," "Pro and Con," "America United," "Doctors Today," the NBC

Symphony Orchestra and "Orchestras of the Nation." Other series in science, history, government and home-making may be added later.

The Louisville experiment started with two NBC network programs, "World's Great Novels" and "University of Chicago Round Table." The University of Louisville has invited Dr. Harvey Webster, distinguished professor of English at the University of Chicago, to conduct the college-by-radio literature course, which will have "World's Great Novels" as its core. A member of the social science department of the University of Louisville will be charged with the current events course, which will be built around "University of Chicago Round Table." Classroom discussions will be broadcast from the University campus.

Results of the Louisville case study will be made available in the fall through all NBC affiliated stations to colleges and universities throughout the country.

Will Help Millions of Adults

The project has the endorsement of former U. S. Commissioner of Education John W. Studebaker. "The NBC college-by-radio plan," he said, "will be a great forward step in strengthening and elevating American life. It will enable millions of adults to carry on systematically their education, through home-study courses which join together stimulating and enlightening radio programs produced by skilled radio people, and material for reading and study prepared under the professional supervision of colleges and universities."

Speaking for WAVE, Mr. Norton said: "Education through radio now, for the first time in history, has the opportunity to perform a completely universal service to the community, the nation and the world. We believe this NBC-University of Louisville-WAVE project

is a milestone in true education for the people—a significant milestone in AM-FM radio collaboration in practical public service.”

President Taylor of the University of Louisville said: “Over a century ago Americans began making a high school education a right rather than a privilege. Now over half of our citizens have been to high school. Our goal for the next generation or two should be to make a college education a right rather than a privilege for our citizens.

Many Can Profit by More Study

“The general intelligence tests given to young men entering the armed forces during the past war have proved beyond doubt that 49 percent of our population can profit by at least two years of college work, and 32 percent have the mental ability to complete an advanced liberal or specialized education. To educate in anything but an unreasonable length of time the vast numbers involved by using present college facilities and methods would be well nigh impossible. The solution to this problem must then lie in making use of modern technological means to take higher education from the university campuses into the homes of those desiring higher education.”

PROMOTIONS

Four promotions in the RCA and NBC organizations were announced by Brig. General David Sarnoff, President and Chairman of the Board of RCA, following meetings of the RCA and NBC Boards of Directors on July 2.

Glen McDaniel, Vice President and General Attorney of RCA Communications, Inc., was elected Vice President of the Radio Corporation of America to serve on the President's staff. Associated with the law firm of Sullivan and Cromwell, 48 Wall Street, from 1936 to 1942, Mr. McDaniel handled cases before the Securities Exchange Commission, the Federal Trade Commission and State and Federal courts. In March, 1942, he was named Special Counsel to James V. Forrestal, then Under Secretary of Navy. Later that year he was commissioned a Lieutenant, USNR, in the Office of the General Counsel of the Navy Department. Promoted to Lieutenant Commander in 1944, he figured prominently in the procurement of aircraft for the Bureau of Aeronautics.

Charles R. Denny, Vice President and General Counsel of the National Broadcasting Company was elected Executive Vice Presi-

dent of NBC. Before joining NBC in 1947, Mr. Denny successively was in the legal divisions of the Department of Justice and the Federal Communications Commission. In the latter post, he served as General Counsel before his appointment to membership on the Commission, becoming its Chairman in 1946.

David C. Adams, Assistant General Counsel of the National Broadcasting Company was elected Vice President and General Attorney of RCA Communications, Inc. Prior to joining NBC, Mr. Adams was a member of the legal staff of the Federal Communications Commission and, in addition to his legal duties, a member of the Cable and Radio Committees of the Board of War Communications.

Gustav B. Margraf, in charge of the Washington office of Cahill, Gordon, Zachry and Reindel, and legal representative of NBC in Washington since 1942, was named to succeed Mr. Denny as Vice President and General Attorney of NBC.

Commenting on the promotions, General Sarnoff said they were “in keeping with RCA policy for regular infusion of youth in management.” Mr. McDaniel and Mr. Denny are 36 years of age, Mr. Adams is 35 and Mr. Margraf, 33.

“Radio and television, because of their close alliance with science and the arts, are young and rapidly expanding industries,” said General Sarnoff. “Youth is essential for industrial growth and progress. The challenges and problems that continually arise call for well-trained young men with energy and initiative, and a record of accomplishment even at an early age.”

NBC REPRESENTATIVES IN CHARGE OF THE COLLEGE-RADIO PLAN. L. TO R.: KEN R. DYKE, ADMINISTRATIVE VICE PRESIDENT IN CHARGE OF PROGRAMS AND PUBLIC AFFAIRS; STERLING W. FISHER, MANAGER OF THE PUBLIC AFFAIRS AND EDUCATION DEPARTMENT, AND WADE ARNOLD, ASSISTANT SCRIPT MANAGER.



Twenty Oil Tankers To Carry RCA Radar

Twenty of the most modern Radiomarine radar units utilizing post-war design are to be installed on seagoing tankers of the Standard Oil Company (New Jersey), following tests carried out aboard the “Esso Paterson.” Eventually the Company expects to equip the ninety vessels of its American and Panamanian Flag fleets with radar.

Television Milestones

Continued from Page 13

talent were broadcast over $\frac{1}{2}$ mile on 520 megacycles; power 50 watts, channel width 14.5 megacycles. (January 29.)

1947—"Blue baby" operation televised by RCA at Johns Hopkins University was witnessed by several hundred doctors and nurses assembled before ten television receiving sets in hospital auditorium. (February 27.)

1947—All-electronic color television on 8 x 10-foot screen as developed at RCA Laboratories demonstrated by Dr. V. K. Zworykin at Franklin Institute, Philadelphia, Pa. (April 30.)

1947—First demonstration of American television in Europe conducted at Milan (Italy) Fair on June 9, at the Vatican, where Pope Pius XII was televised for first time. (July 12.)

1947—RCA announced development of Ultrafax, or radio-mail system, that has a potential for handling a million words a minute and capable of transmitting 50,000-word novels from New York to San Francisco in 60 seconds by high-speed photographic process. (June 23.)

1947—Color pickup camera for three-color electronic color television, using the simultaneous system, was demonstrated to members of FCC and others at RCA Laboratories. Studio and outdoor pickups were shown with a picture brightness of 8 foot-lamberts; pictures were projected on $7\frac{1}{2}$ x 10-foot screen and on a home-receiver screen 11 x 14 inches. (July 16.)

1947—Surgical operations at New York Hospital televised and viewed on screens at American College of Surgeons Congress, at Waldorf-Astoria Hotel, New York. (September 8.)

1947—NBC announced that in cooperation with Eastman Kodak Company a special camera had been

developed to photograph television images directly from the kinescope screen, thus opening the way for kinescope recordings and film syndication of television programs. (September 13.)

1947—Theatre Guild presents St. John Ervine's drama "John Ferguson" as first in a series of plays on NBC television. (November 9.)

1948—Trinity Church service telecast for the first time; it was the first program of its kind to be televised in New York from interior of a church during a religious service. (February 22.)

1948—NBC Symphony Orchestra, Maestro Arturo Toscanini, conducting an all-Wagnerian broadcast concert, also was telecast for the first time. (March 20.)

1948—Beethoven's "Ninth Symphony" played by NBC Symphony Orchestra, Maestro Arturo Toscanini conducting, was telecast as well as broadcast; estimated TV audience, 370,000. (April 3.)

1948—Telecast of Republican National Convention at Philadelphia enabled more people to eye-witness the event than the sum total of all who ever attended GOP Conventions since the founding of the party in 1854. (June.)

In speaking of television for the past 25 years or so, we have been accustomed to saying that "television is around the corner." I should like to bury that phrase. Television is no longer around the corner. It is beyond the doorstep; it has pushed its way through the door into the home!—David Sarnoff, September 13, 1947.

Louis-Walcott Telecast Sets All-Time Record

Approximately seven out of every eight television receivers in the seven cities served by the NBC Television network, were in use on the night of June 25, and 99.7% of the sets were tuned to the Louis-Walcott championship prize fight that evening, a special survey by

C. E. Hooper, Inc., revealed. The resulting rating of 86.6—highest in the history of radio and television—was 7.6 points above the broadcast of President Roosevelt's war message on December 9, 1941, the previous record holder.

Further analysis of the survey showed that the total television audience of WNBC, New York, key station of the NBC network, was 3,930,000 with two million additional viewers distributed among the remaining cities carrying the network sports feature. WNBC's average home audience was 12: seven men, four women and one child.

Electron Microscope for Virus Research

Impressed with the fact that the effective treatment of colds is possible only by an understanding of the cold virus of which he was a victim, Earling H. Samuelsen, Norwegian ship owner, has donated an RCA electron microscope to the Institute of Bacteriology of the University of Oslo for use in conducting research in the virus infections common to Norway. The idea of the gift was conceived by the donor while he was being treated with a series of cold injections by Dr. Theodor Thjotta, Director of the Institute and Professor of Bacteriology.

The RCA electron microscope permits the examination of bacteria, viruses and other particles of the submicroscopic world, with magnifications up to 100,000 diameters.

Dividend Declared By RCA

Following the meeting of the Board of Directors of the Radio Corporation of America in New York, on June 4, Brig. General David Sarnoff, President and Chairman of the Board, announced that a dividend of 87 $\frac{1}{2}$ cents per share had been declared on the outstanding shares of \$3.50 Cumulative First Preferred stock, for the period from April 1, 1948 to June 30, 1948. The dividend was payable July 1, 1948, to holders of record at the close of business June 14, 1948.

Vision—1948

NBC Television is Theater

Theater—without aisles, but with all seats on seventh row center

Theater—with the stage's most intimate house: your own

Theater—with the brilliant immediacy of the legitimate stage,
and the visual scope of motion pictures

Theater—with stars to play an endless repertory of drama

Theater—with the excitement of premieres and the
satisfaction of established favorites.



NBC TELEVISION IS THEATER

to an audience that has ceased to marvel at the promise of television — an audience that knows the dramatic reality of Theater in sight, sound and substance on the air.

What has been said of theater on NBC Television? In context or out, reviews of NBC's dramatic shows read like this:

The Last of My Solid Gold Watches (Tennessee Williams' play, produced by ANTA and NBC on December 14) "challenging video material..." — *Billboard*.

Twelfth Night (NBC production, starring Ann Burr) "chalk up another outstanding television production to NBC's credit." — *Variety*.

The Purple Doorknob (ANTA-NBC production, December 17) "...a harmonious fusion of script, performance and production, the whole constituted a singular triumph." — *N. Y. Times*.

The Late George Apley (NBC-Theater Guild production, December 7) "...a well-produced, acted and directed version." — *Variety*.

Regularly scheduled dramatic programs are but one feature of the balanced television entertainment offered by NBC... America's No. 1 Television. The whole range of sight-and-sound—sports, news, films, special events, children's programs, concerts and variety shows—are beamed to viewers from The National Broadcasting Company, a service of Radio Corporation of America.

W N B T NEW YORK



Millions of Americans—with RCA television—will see history as it is made at the two National Political Conventions.

Look before you vote — with Television

This year, television joins press and radio as a "political reporter," in Philadelphia, at the Republican Convention, June 21, and the Democratic Convention, July 12. As political leaders step up to speak, you're right with them on the convention platform.

The Candidate will be televised as he looks into the camera—talks to the people, face to face. His appearance, smile, gestures, combine with the sound of his voice, and his message, to complete the transmission of his per-

sonality. You have a new opportunity to know your man!

Important as any in history, the 1948 conventions will be covered from start to finish by keen-eyed RCA Image Orthicon television cameras. Highlights and sidelights, all will be seen. And what the camera catches will be sharp and clear on the screens of RCA Victor home television receivers . . .

Today, 40,000,000 Americans are within reach of regularly scheduled daily television programs.

Television as an aid to good citizenship, through the formation of an informed public opinion, is one of the ways in which developments from RCA Laboratories serve the nation and its people. Advanced research is part of any instrument bearing the name RCA or RCA Victor.

When in Radio City, New York, be sure to see the radio, television and electronic wonders at RCA Exhibition Hall, 36 West 49th Street. Free admission. Radio Corporation of America, RCA Building, Radio City, N. Y. 20.



RADIO CORPORATION of AMERICA

H.K.