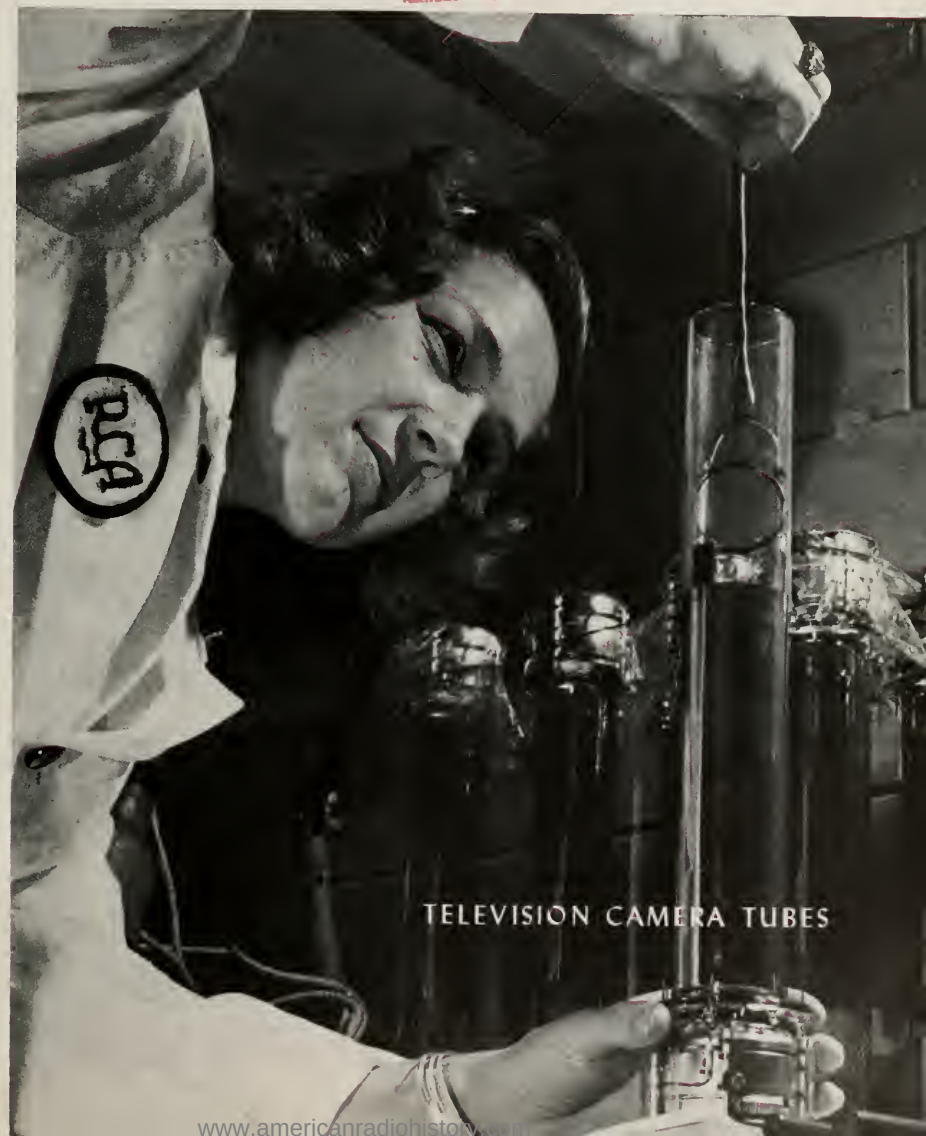
RADIO AGE

RESEARCH · MANUFACTURING · COMMUNICATIONS · BROADCASTING



RCA

ANUARY

1947

RADIO AGE

RESEARCH • MANUFACTURING • COMMUNICATIONS • BROADCASTING • TELEVISION

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VOLUME 6 NUMBER 2 JANUARY 1947

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RADIO CORPORATION OF AMERICA
RCA Building, New York 20, N. Y.
DAVID SARNOFF, *President*

LEWIS MACCONNACH, *Secretary* ARTHUR B. TUTTLE, *Treasurer*

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DAVID SARNOFF, PRESIDENT OF RADIO CORPORATION OF AMERICA, HOLDS THE SILVER PLAQUE AWARDED HIM BY RADIO AND APPLIANCE JOURNAL AS "RADIO'S MAN OF THE YEAR—1946"—"IN RECOGNITION OF HIS GREAT SERVICE TO THE RADIO AND TELEVISION INDUSTRY IN DEVELOPING PUBLIC AWARENESS OF ITS OUTSTANDING WARTIME ACHIEVEMENTS AND PEACETIME POSSIBILITIES," AND AS A "TOKEN OF THE ENTIRE INDUSTRY'S RESPECT AND ESTEEM."

Radio in 1946-47

PEACE AND PRODUCTION SEEN AS KEYS TO PROGRESS AND PROSPERITY—RECENT ACHIEVEMENTS CLEAR WAY FOR SIGNIFICANT ADVANCES IN TELEVISION

By Brig. General David Sarnoff,
President,
Radio Corporation of America.

PROGRESS and prosperity in 1947 depend upon greater international cooperation for world peace and accelerated industrial production. In the achievement of these objectives, it is imperative that a free flow of information prevails throughout the world. It is also vital that scientific research be expanded to create new products, services and processes that continually will lead to full employment and rising standards of living.

The uncertainties, largely related to shortages of raw materials and other industrial deterrents, which cloud the horizon of the New Year, must be cleared without delay to avoid economic paralysis. If industrial unrest is ended and the flow of basic components is increased, 1947 holds promise of being America's first major television year, for science has equipped that great new industry to move forward as a service to the public. Furthermore, trade estimates indicate a large replacement market for radio sets and radio tubes which were in service throughout the war. In addition, a potential market for radio-phonographs and television receivers exists in the 7 to 10 million new homes which may be built during the next ten years.

Television in 1947 can make big strides in taking its place alongside the older arts, and in many instances visual communication can give them new and modern import. Although the television camera already has scanned national political conventions and presidential candidates, it will be ready to play its first big role in the 1948 campaign. That year will be to television what 1924 was to broadcasting, when Coolidge, Davis, Dawes, Cox, Bryan and other orators picked up the microphone for the first time in a national campaign and marveled at its ability to reach the people. Political techniques were vastly changed in that era of the headphones and gooseneck loudspeaker horns. Similarly, in 1947, television will be studied as a new factor in politics as plans are laid for the '48 campaign of radio sound and sight. In 1948, it may be expected that in the United States there will be several hundred thousand television equipped homes.

Increased activity among the broadcasters in television programming during 1946 revealed that the showmen are prepared to present an interesting variety of entertainment, newsreels and sports events. Their technique in the operation of new cameras has attested that they are on the mark and ready to go! They now have mobile camera-equipped television trucks to relay on-the-scene programs by shortwaves to the main transmitters. New York is the television capital of the world—the center of this great new medium of entertainment, which will expand through networking across the country from city to city and from state to state —and finally nation-wide.

All-Electronic Color Television

On October 30, the men of science at RCA Laboratories demonstrated for the first time in history, clear, flickerless, all-electronic color television. And it was accomplished without the outmoded rotating disc or any other moving part. It was done all-electronically by means of electron tubes and electron beams "painting" pictures in natural colors. The pictures were viewed on a 15 x 20-inch screen.

The realization of this universal system of television, which transmits and receives both color and black-and-white pictures with equal quality, is as far-reaching as was the creation of an all-electronic television system which supplanted the mechanical discs used in black-and-white television when it first began. The realization of all-electronic color is as significant in television as electronic recording over mechanical recording of phonograph records, or the present color movies over the early mechanical color on the screen.

By this new advance in television, *simultaneous* color transmission, instead of *sequential* transmission,

NEW MOBILE TELEVISION "STUDIOS ON WHEELS" CARRY CAMERAS AND MICROWAVE EQUIPMENT FOR PICKING UP AND TRANSMITTING NEWS, SPORTS AND OTHER OUTDOOR EVENTS.

DEVELOPMENT MODEL OF INEXPENSIVE RADIO FREQUENCY CONVERTER WHICH ENABLES BLACK-AND-WHITE TELEVISION RECEIVERS TO REPRODUCE COLOR PROGRAMS IN MONOCHROME.

color by color, is achieved. Thus, our scientists enabled RCA, the creator of all-electronic black-and-white television, also to create all-electronic color television which has been the dream of radio scientists from the beginning.

The new RCA electronic color television system, which contributes to the television leadership of our country, will be available to the entire radio industry. The initial demonstration firmly established the basic principle; it will be followed in 1947 by the transmission and reception of color pictures in motion, then outdoor scenes and finally, in 1948, electronic color television on large-size theatre screens.

At the same time that RCA demonstrated all-electronic color television, it announced a simple, inexpensive and easily installed radio frequency converter which will enable black-and-white television receivers—even those of 1939 vintage —to receive in monochrome the programs of color stations when in the future they take to the air on ultra-high frequencies.

Thus, the problem of obsolescence in television has vanished. The public may enjoy the thrills of television, while scientists and engineers are exploring the high frequencies, building apparatus to study their behavior, field testing new instruments and laying the groundwork for commercial standards and practical color television service. This is a big task. Our engineers estimate that it will require about four years to bring any system of color television to the present status of black-and-white all-electronic television.

Sensitized by wartime research and development, television's electronic eye now rivals the human eye in what it is able to see. Performance of the RCA Image Orthicon television camera during 1946 greatly advanced the art and proved that television no longer needs brilliant lighting; it can see whatever the eye can see in twilight, moonlight, candlelight, and even go a step further and see in "black light", or infra-red to which the human eye does not respond.

Radio, which gave a world-wide voice to Peace and Freedom, now gives to them the added advantages of vision through space. With the scientific revelations of 1946 as the foundation, more and more people, more and more nations will extend their radio sight in 1947 and in the years to come. Those who witnessed the dawn of all-electronic color television beheld triumphant colors of progress — a rainbow of promise that eventually will arch over a world-wide horizon.

Radio-Electronic Triumphs

While television portrays the expansive pictures of baseball, football, prizefights and panoramas, the electron microscope — another triumph of radio science—continues to peer deeper into the unseen world of the infinitesimal. In 1946, at RCA Laboratories, this powerful aid to man's eye carried his vision into the submicroscopic domain, where tiny cells grow, where bacteria and the virus dwell, no longer hidden from view.

Thus, man through science in 1946 greatly extended the range of his vision. The same radio science, which by the miracle of radar flashed a signal to the moon and echoed it back across 240,000 miles in two seconds, also caters to the eye and promises great new services for people everywhere — new services in entertainment and education; new services in the war against disease; new services in international understanding.

There are countless and unbounded frontiers of radio research extending into the upper atmosphere and far beyond the orbit of the moon. As radio penetrates the secrets of outer space, it will bring back new knowledge that will open many undiscovered frontiers for other branches of science. The scientists of this planet, who are only beginning to reach upward in their conquest of Nature, continually will be challenged anew.

Nuclear Energy in Space?

Those who have been working scientifically with atomic energy have been looking underneath the ground for metals such as uranium and other materials which are employed to release the power contained within the atom. Yet, who among the scientists would be willing to say that there may not be more nuclear energy between the heavens and the earth than is within the earth? Will a way be found to release the nuclear energy of hydrogen, nitrogen, helium or other gases that may be in space? When we seek atomic energy that may be released from cosmic rays, we may find that there are greater treasures in the emptiness of space than in the solid earth.

Electronics has become a vivifying force in American life. This science has a magic touch that not only creates new instrumentalities, but brings old devices and services up-to-date. Electronics has, for example, made the phonograph in combination with radio more popular than ever. Yet there was a day in the Twenties that the cry went up that radio was broadcasting the requiem of the talking machine; that the newspaper was imperiled by newscasting, and the theatre by radio entertainment. All have survived and have grown; they supplement each other and have gained new popularity in their spheres of influence. In 1946, RCA Victor turned out its billionth phonograph disc, and 1947 promises to quicken the pace on the way toward the second billion.

The modern magic of electronics goes far afield of the home. By radar, ships are navigating fog-hidden channels and rivers, as if in the clear sunlight. Aviation too is offered new safeties through radio and radar, and by Teleran—the new

RCA radar-television system of air navigation and traffic control.

The world-wide communication services operated by RCA were mechanized and speeded in 1946, enabling significant reductions in traffic rates to many points. Circuits cut off from enemy countries and invaded lands during the war were restored, and RCA Communications, Inc. now operates direct radio circuits to more than 51 foreign countries. Similarly, radiophotos take wing across the hemispheres to a longer list of cities.

Broadcasting and television now are supplemented by the service of FM, or frequency modulation. RCA approached the end of the year with facilities in readiness to produce tens of thousands of FM receivers and combination AM-FM sets, that is, FM plus standard broadcast reception.

Broadcasting, which won the rapt attention of anxious listeners throughout the world in wartime, finds people no less anxious for news, forums and entertainment in peacetime. Ears, which for six years were tuned to theatres of war now are turned to the microphones that put UN on the air, listening in hope that the voice of Peace will grow ever stronger in every language. Those who heard the atomic blast at Bikini echo around the earth by radio, and later saw televised films of "Operation Crossroads", may well have hoped that it was radio's final portrayal of war.

When man thinks of television, he thinks of it as an instrument of peace, although it can be used in war. When he thinks of atomic energy, he thinks of it in terms of war. This reaction must change—he must relate the atom to its vast possibilities for good in peacetime as he does television.

Science is at man's command! He can use radio and radar to guide rockets and bombs loaded with atomic warheads; he can equip these winged missiles and robot planes with television eyes focused on great cities as targets of destruction. Or he can use radio, radar, television and atomic energy for peacetime pursuits in commerce, industry and home-life that will contribute greatly to "One World" in which people everywhere may live together in understanding, happiness and friendship.

Man's fate, his destiny and that of civilization are in his hand which grips the clutch of science and in his fingertips which rest on the push-buttons that give War or Peace the right of way on the international highways. If he ignores Peace and presses for War, he will never regain control; he may never have a second chance again!

Should he press for war he would not survive to behold the beauty of the world that can be unfolded on the television screen. A third World War would shatter the picture; the drama of civilization would end in tragedy. But this cataclysmic finale need not occur if man will turn his mind, his heart and his soul toward Peace and the use of science for the benefit of civilization. That, it seems to me, is the lesson which 1946—the first postwar year—has taught. Thus, science in 1947 and in the years to come can play an all-powerful part in the everlasting attainment of "Peace on Earth, Good Will Toward Men."

BELOW: J. W. MURRAY, VICE PRESIDENT IN CHARGE OF THE VICTOR RECORD DEPARTMENT, EXHIBITS THE BILLIONTH PHONOGRAPH DISK PRODUCED BY RCA VICTOR. RIGHT: 1947 MODEL COMBINATION VICTROLA RADIO-PHONOGRAPH WHICH EMBODIES ADVANCED DEVELOPMENTS IN SOUND REPRODUCTION.

All-Electronic Color Television

RCA DEMONSTRATES FLICKERLESS, ALL-ELECTRONIC COLOR TELEVISION SYSTEM, WITHOUT ROTATING DISCS OR OTHER MOVING PARTS— CONVERTER DEVICE SOLVES PROBLEM OF OBSOLESCENCE ENABLING BLACK-AND-WHITE TELEVISION RECEIVERS TO SEE COLOR PICTURES IN MONOCHROME

ELECTRONIC color television pictures, produced by all-electronic means, were demonstrated publicly for the first time on October 30, 1946, by Radio Corporation of America at RCA Laboratories, Princeton, N. J.

The demonstration, revealing a revolutionary development in radio science, proved that flickerless, all-electronic color television is practical without rotating discs or other moving parts.

This new system, the engineers explained, is a complete departure from mechanical color, shown in various forms since 1925. In announcing this important advance, RCA officials pointed out that the time period estimated by their engineers in December, 1945, when they said five years would be required to bring any color system to the present status of black-and-white television, still holds.

It was further disclosed that a simple, inexpensive radio-frequency converter makes it possible to introduce this all-electronic color television system without causing obsolescence of black-and-white television receivers.

A new color slide television camera, developed by RCA and used in the demonstration, produces signals from 35 mm. Kodachrome slides. Transmission of the pictures on the slide is achieved in natural colors when a light beam from a kinescope is focused through the slide and separated into component colors by a system of mirrors and photo-electric cells.

Each of the three transmitted images—red, blue and green—is of the same number of lines, that is, 525; also the same horizontal scanning rate and the same picture repetition rate of 30 pictures a second as in present commercial television broadcasting.

The receiving set is equipped with three 3-inch kinescopes, which separately receive the signals representing red, blue and green. This trio of kinescopes is called a Trinoscope. From it the three color images are optically projected into a brilliant composite picture which appears on a 15 x 20-inch screen in natural color, free from any flicker, color fringes or break-up of color.

By this new advance in television, *simultaneous* color transmission, instead of *sequential* transmission, color by color, is achieved.

Obsolescence Problem Solved

Since the electrical characteristics and all of the standards of the green image — including the synchronizing pulses—are identical to those of the present black-and-white standards, any broadcasts from color stations using the electronic simultaneous system can be received clearly on black-and-white receivers by the addition of the easily installed radio-frequency converter. No modifications whatever are required inside the set.

This converter will enable present-day television sets to receive color programs and reproduce them in black-and-white, even when transmitted on ultra-high frequencies. Thus, existing receivers will not be made obsolete by the introduction of color at some future date. On the contrary, their usefulness will be extended. For example, if a football game is broadcast by a color transmitter, the owner of a black-and-white receiver can see it in black-and-white. Even one of the first television sets introduced by RCA at the time of the World's Fair in 1939 can be adapted to tune-in the electronic color pictures in black-and-white.

Likewise, it will be possible for electronic color television sets to receive the broadcasts of black-and-white stations. Furthermore, when electronic color television is established as a broadcasting service, the black-and-white receivers will be able to reproduce the color broadcasts in monochrome. Engineers explained that this cannot be done with any known system of mechanical color.

Officials of RCA pointed out that a station owner can begin with a black-and-white broadcast service. He may operate a monochrome transmitter on low frequencies and also an electronic color transmitter on ultra-high frequencies using the signal of the color camera to operate both transmitters. With such a dual arrangement, the problem of obsolescence for the broadcaster as well as the viewer is reduced to a minimum. In fact, the broadcaster would thereby be able to render service in both black-and-white and color from the same station.

Brigadier General David Sarnoff, President of Radio Corporation of America, in commenting upon the development said:

"The realization of this universal system of television, which transmits and receives both color and black-and-white pictures with equal quality, is as far-reaching as was the creation of an all-electronic television system which supplanted the mechanical discs used in black-and-white television when it first began. The realization of all-electronic color is as significant in television as electronic recording was over mechanical recording on phonograph records, or the present color movies over the early mechanical color on the screen.

"It is with great pride and satisfaction that I congratulate the men who have created all-electronic

color television in our Laboratories," said General Sarnoff. "They have enabled RCA, the creator of all-electronic black-and-white television, also to create all-electronic color television which has been the dream of radio scientists from the beginning.

"The new RCA electronic color television system will be available to the entire radio industry. The development is so important in contributing to television leadership for our country that we have decided to demonstrate it publicly as apparatus becomes available for each successive step. We begin with the current demonstration in which still pictures are used, but which sufficiently establishes the basic principle; it will be followed by the transmission and reception of color pictures in motion, then outdoor scenes and finally electronic color television on large-size theatre screens."

Dr. C. B. Jolliffe, Executive Vice President in Charge of the RCA Laboratories Division, declared that this development in television, which establishes an all-electronic system of color transmission and reception, takes the issue of color television out of the range of controversy. All-electronic television, he said, is far superior to any mechanical system of color with its rotating discs and other well-known limitations.

"The problem is no longer how to transmit and receive color pictures by an all-electronic method, because the basic principles have now been solved," said Dr. Jolliffe. "The problem that still challenges is how to operate television broadcasting as a steady and regular service to the public on the higher frequencies, whether in black-or-white or in color. To open the high-frequency spectrum and to make it commercially useful will require propagation studies under broadcasting conditions, development of new circuits, new tubes and new cameras, all of which must be field-tested before commercial standards can be recommended by the industry for approval by the Federal Communications Commission.

"Although we have solved the all-electronic color television problem, it will require a number of years to establish color television as a service to the public," said Dr. Jolliffe. "What we have done today is to demonstrate the realization of the principle of simultaneous electronic color television. The apparatus used in the demonstration is purely experimental as developed in the Laboratories. It is not commercial equipment, but it reveals that the American people will be assured of the finest color television instruments in the future as they now have in all-electronic black-and-white television.

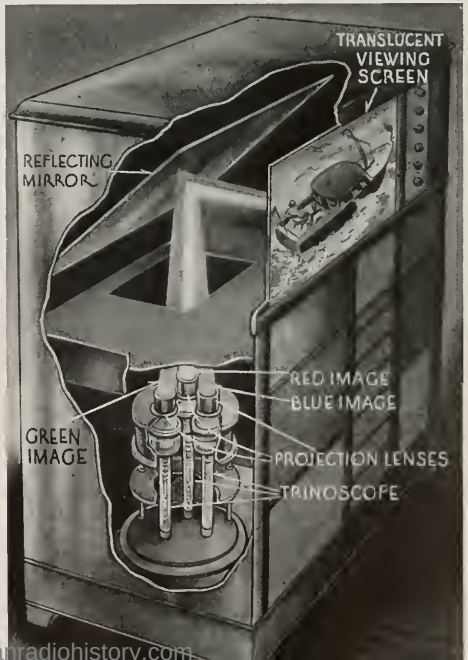
"Let me emphasize that the most important fact to remember in regard to color television is that any commercial system, whether it be mechanical or electronic, depends upon the ultra-high frequency spectrum in which the necessary band width for color exists. No matter how far the development of the principle and the apparatus has gone forward, there must yet be complete exploration and tests in the field of the behavior and limitations of ultra-high frequencies. We expect to complete our development of electronic color television apparatus before the ultra-high frequency spectrum is made ready for its use in a commercial way.

"This demonstration, therefore, does not change the time period estimated by us in December, 1945, that it would require five years to bring a color system to the present position of black-and-white television.

"We will move along rapidly in this development, but no matter how many years pass before the ultra-high frequency spectrum is harnessed for commercial color

REAR VIEW OF RCA ALL-ELECTRONIC COLOR TELEVISION RECEIVER SHOWING THE TRINOSCOPE, COMPRISING THREE CATHODE-RAY TUBES WHICH PROJECT RED, BLUE AND GREEN IMAGES ON THE MIRROR AND VIEWING SCREEN ABOVE.

DRAWING OF RCA ALL-ELECTRONIC COLOR TELEVISION RECEIVER SHOWING HOW IMAGES ON THE THREE KINESCOPES OF THE TRINOSCOPE ARE PROJECTED ONTO A MIRROR AND THEN TO THE VIEWING SCREEN WHERE THEY BLEND TO REPRODUCE THE ORIGINAL SCENE IN ITS NATURAL COLOR



television service, no one need fear that the black-and-white television set of today is destined for quick obsolescence. The inexpensive converter takes care of that problem. In the meantime, the development of both black-and-white and color television will continue to advance, and eventually will increase the service to the public.

"We have demonstrated a principle that now enables us to go forward with a timetable which is not based on a scientific theory but on the required engineering of equipment," said Dr. Jolliffe. "The system already has been perfected to a point where we now could show motion picture films or outdoor scenes in electronic color, except that we have not had the time necessary to build the essential equipment."

Dr. Jolliffe disclosed that the RCA timetable for future demonstrations of color television is divided into five stages, the first of which featured still pictures televised from color slides on a large screen 15 x 20 inches. There is no flicker. Blending of three colors—red, blue and green — is achieved simultaneously to produce a perfectly natural picture.

The remaining stages in the timetable of laboratory demonstrations of electronic color television were outlined as follows:

Motion picture films within 3 months.

Live-action studio scenes by the middle of 1947.

Outdoor action scenes by the latter part of 1947.

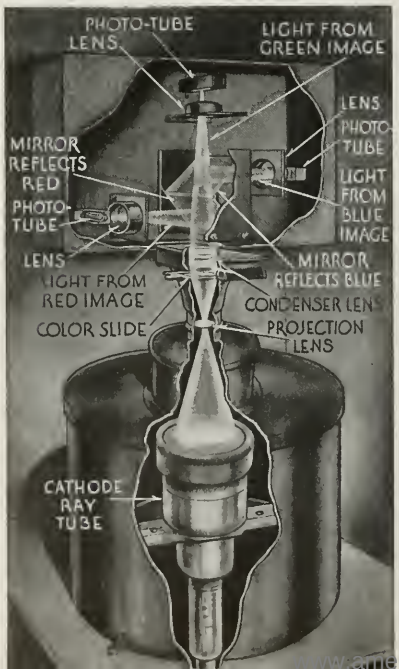
Large-screen theatre-size pictures in 1948.

"RCA scientists and engineers have a complete plan for this schedule and our laboratory tests reveal that this is practicable," added Dr. Jolliffe. "We need only time to produce the necessary equipment such as cameras and tubes, so that a demonstration can be made in approximately one year, that will include all five stages at the same time, that is, the complete range of universal all-electronic color television—in motion, indoors and outdoors."

In conclusion, Dr. Jolliffe stated that success in achieving all-electronic color television is the result of team-play among the scientists and research men in RCA Laboratories. He described their achievement as "a coordinated and concentrated attack by scientists, which writes a new chapter in television and industrial research." He said that as a result, color television has moved into the modern Electronic Era and will take its place ultimately alongside the RCA all-electronic black-and-white television system, which is presently bringing news, entertainment and championship sports events to observers in New York, Philadelphia and along the Atlantic seaboard as far south as Washington, D. C.

"As a broadcaster, I am delighted with the news that an all-electronic color television system has been achieved at RCA Laboratories," said Niles Trammell, President of the National Broadcasting Company. "We are mindful, as the scientists at the Laboratories have pointed out, that new apparatus must be built and field-tested before color television can be brought to the home in a state of practicability to serve the public. In this task our engineers with their practical knowledge of broadcasting, will cooperate in every way with the scientists. We will include the new RCA electronic color system in our plans to establish nation-wide television, for this practical color system can be fitted into an expanding service."

AT THE ALL-ELECTRONIC COLOR CAMERA, THE LIGHT BEAM FROM A CATHODE-RAY TUBE IS PROJECTED UPWARD THROUGH A KODACHROME SLIDE AND THROUGH A SERIES OF COLOR FILTERS WHICH SEPARATE RESPECTIVELY THE RED, BLUE AND GREEN PORTIONS OF THE IMAGE. EACH COLOR IS THEN REFLECTED INTO PHOTOCELLS WHICH CHANGE THE LIGHT VALUES INTO ELECTRICAL SIGNALS FOR TRANSMISSION TO THE RECEIVER.



RAY D. KELL OF RCA LABORATORIES ADJUSTS THE ALL-ELECTRONIC COLOR CAMERA. THE CYLINDRICAL UNIT HOUSES THE SCANNING KINESCOPE. MIRRORS AND PHOTOCELLS WHICH CONVERT COLOR INTO ELECTRICAL SIGNALS ARE IN THE UPPER CABINET.

Status of Color Television

DR. C. B. JOLLIFFE, RAY D. KELL AND GEORGE L. BEERS TESTIFY AT FCC HEARING ON COLOR TELEVISION

The Federal Communications Commission held hearings in Washington during the week of December 9 relative to Color Television. Following are news digests covering the testimony of Dr. C. B. Jolliffe and Ray D. Kell of RCA Laboratories, and George L. Beers of RCA Victor Division.

PREMATURE attempts to introduce color television on a commercial basis might deprive the American public of all television service now and for some time to come, Dr. C. B. Jolliffe, Executive Vice President of Radio Corporation of America in Charge of RCA Laboratories Division, told the Federal Communications Commission at the hearings held in Washington during the week of December 9. Because of this possibility, Dr. Jolliffe requested that the Commission deny a petition of the Columbia Broadcasting System for establishment of standards for color television and authorization for commercial operation in the higher radio frequencies.

"Further developments and improvements in television must and will be made," Dr. Jolliffe declared. "One of these developments will be a color television system which can become an integral part of the present monochrome (black-and-white) television service. RCA has developed the basic elements of an electronic simultaneous color television system which can be introduced, when it is ready in the future, without obsoleting the present excellent electronic monochrome system.

"Much work remains to be done before a determination can be made as to the proper standards for a system of color television which ultimately should be adopted. To adopt standards and authorize commercialization of any system of color television now will probably result in *no television* rather than in *improved television.*"

Dr. Jolliffe made it clear, however, that RCA has definite plans for the future of television and its service to the public. He announced:

"Research and development must be pushed with vigor. We propose to carry on with our research and development work in monochrome and color with all the resources at our command, regardless of the status of operations, manufacture, or adoption or non-adoption of standards. We will not cease in our efforts to improve service to the public."

From the beginning of television development, the addition of color has been a laboratory matter, Dr. Jolliffe pointed out, and added: "It still is in the laboratory stage and will continue to be for at least a few years to come. Publicizing work on color television which misleads the public into believing that it is ready for commercialization is the greatest disservice that can be done to television. It has retarded the progress of monochrome television and if continued will deprive the public of the very excellent service which it deserves."

Public Has Been Confused

Declaring that RCA and the National Broadcasting Company, in common with "most of the radio industry," desire to see television increase its service and contribution to the public and industrial welfare, Dr. Jolliffe asserted bluntly that "public thought about television has been confused during the last few years by statements made by some members of the industry" to the effect that existing television service is limited, or would become obsolete because of the imminence of color television.

"It has been argued," he said, "that the introduction of monochrome television should not be attempted because if it were, the later introduction of color would make all prior monochrome apparatus and service obsolete and worthless. Such allegations have caused unnecessary fears, uncertainties, and delays in the introduction of television. The allegations were, and are, groundless and fallacious. Had these statements been designed deliberately to sabotage all television, they could not have been more effective."

The history of all large production developments in this country, Dr. Jolliffe said, has shown that once a development has achieved commercial stature, engineering skill sees to it that whenever improvements arrive they are integrated into the basic structure without destroying it or damaging it. Improvements which can be added to an existing system without disruption, he added, will be found more readily and applied more easily if the standards of the initial system are sound and correct.

Dr. Jolliffe told the FCC that the RCA system of electronic simultaneous color television proves the soundness of this principle, in that it can be added to the basically sound monochrome system without any disruption to the latter. He emphasized that disclosure of the RCA color system was made at this time, not for the purpose of requesting adoption of standards for its operation, but rather to point out its compatability with the monochrome system and its freedom from "fundamental defects and limitations" of the so-called sequential color television system for which approval of the FCC for commercial operation is asked.

"We have today a well developed monochrome television service," declared Dr. Jolliffe. "All of the equipment — transmitting and receiving— has been engineered to a point where it is capable of excellent reproduction in the home of the best in current events, sports, drama and education. We urge the Commission to give its full support to this proven service and continue to encourage its fullest use for the benefit of the public.

"No steps should be taken under the guise of bringing color television to the public if, instead of advancing the art of television, they

confuse the public, the broadcaster and the equipment manufacturer and result in depriving the public of any television service now and for some time to come."

Dr. Jolliffe recalled that present commercial television standards and frequency allocations were established by the FCC after extensive and careful study on its part and upon recommendations of the Radio Technical Planning Board, set up at the suggestion of the Commission and representing the entire radio industry. These standards were agreed upon as adequate and proper for post-war television, and are the basis for current production of television equipment and broadcasting plans, Dr. Jolliffe stated, and added:

"Since the close of the war, many companies, including RCA and NBC, have been working energetically to develop commercial operation on the basis of the standards adopted. This has included the production of commercial equipment, as well as expansion of station operations. Both transmitting and receiving equipment have been designed, tested, and produced in quantity.

"Many difficulties have been overcome and the manufacture and distribution of apparatus are now under way. Much time, effort and money have been spent for engineering, design, production planning and installation of manufacturing equipment to produce transmitters, studio and field equipment, and receivers.

"The present situation in television is exciting. The post-war expansion of commercial television broadcasting service and the first post-war sales of receivers have had an enthusiastic reception by the public."

Dr. Jolliffe pointed out that television stations are giving regular program service in New York, Philadelphia, Washington, Schenectady, Chicago and Los Angeles, and said that several other stations have been authorized by the FCC, with still others pending action of the Commission. He reviewed the past year of television service to the public, which included world's championship prize fights, football and baseball classics and a wide variety of important public events and dramatic and educational features.

"These are only a few of the examples of the service that television is now giving," Dr. Jolliffe said. "From the universally enthusiastic response that followed these programs we know that the public is eager for television."

In work yet to be done in the studies of color television are such items as development of new circuits, development of new tubes and cameras, and the field-testing of component instruments and the complete system, said Dr. Jolliffe, concluding:

"In these matters, there are no problems the solutions of which are doubtful. They are all straight-forward engineering development items without uncertainty as to successful result. But it will take time to do the job adequately and obtain satisfactory results. When they have been solved, and a thoroughly practical color television system and all its apparatus elements have been designed and proven by adequate tests, the time will have arrived for approval of commercial standards."

AT THE FCC HEARINGS ON COLOR TELEVISION: DR. C. B. JOLLIFFE (RIGHT), EXECUTIVE VICE PRESIDENT IN CHARGE OF RCA LABORATORIES; E. W. ENGSTROM (CENTER), VICE PRESIDENT IN CHARGE OF RESEARCH, AND RAY D. KELL, IN CHARGE OF TELEVISION SYSTEMS RESEARCH AT THE LABORATORIES.

Kell Outlines Advantages of Simultaneous System

Success of the Radio Corporation of America in developing a simultaneous, all-electronic color television system, completely modern in design, less costly to produce, and superior in at least seven respects to any color system as yet disclosed, was reported by Ray D. Kell, of RCA Laboratories Division, Princeton, N. J., at the FCC hearings.

Mr. Kell, who is a recognized authority on television research and development, appeared before the FCC as a representative of RCA and the National Broadcasting Company to present facts which he contended made it inadvisable for the Commission to take affirmative action at this time on the CBS petition.

Comparing the RCA simultaneous color television system with the so-called sequential transmitting one color after another) method proposed by CBS in its petition, Mr. Kell summarized the advantages of the RCA system, as follows:

It is compatible with the present commercial (black-and-white)

television to the extent of complete interchangeability and consequent avoidance of obsolescence of one by the other.

Less band width is required than in the sequential system.

It is completely free from flicker.

There is no color fringing — that is to say, no fuzziness or unfaithfulness of color around the edges of fast moving objects being televised.

There is no color break-up. In other words, reproduction of primary colors is achieved in all portion of the image simultaneously.

There is greater color fidelity in the pictures.

It makes possible greater picture brightness for comparable size of pictures.

It affords greater flexibility for network operation. This is due chiefly to its basic compatibility with the present black-and-white system which employs modern coaxial cables or radio relays with success far beyond-the-horizon transmission.

Most of the early work in color television, Mr. Kell said, utilized the sequential method because of equipment limitations which made it impossible at the time to obtain satisfactory results by the simultaneous method.

"During the last few years," he continued, "improvements in television circuits and devices were developed which made it appear that the simultaneous method might now be attempted with success. Experiments were made by RCA using the improved devices and techniques. The result was the development of the simultaneous all-electronic system which RCA recently demonstrated at Princeton.

"Work on this simultaneous system using modern tubes and techniques has been carried to a point where all the basic factors have been studied, and the ultimate success of the system seems assured. From the work we have done, we are convinced that the simultaneous system is basically superior to the sequential system of color transmission."

Mr. Kell called attention of the FCC to the compatibility of the new simultaneous method with present television transmission, a characteristic which he described as "having far-reaching effect on the development of the commercial television service."

"It completely solves the problem of obsolescence of monochrome receivers which would be created with the introduction of a sequential color system," he declared. "It likewise greatly reduces the problem of obsolescence for the television broadcaster.

"Because the three primary color pictures are transmitted at the same time in the simultaneous system, each of the three primary color pictures can have the same number of lines per picture, the same number of fields per second, and the same other standards identical to those of the present monochrome system.

"If they are so chosen, the present monochrome and the simultaneous color systems are identical in all basic respects except that the color system transmits three independent monochrome signals at one time. The three signals are kept separate by radio frequency discrimination.

"This condition results in the enormously important fact that with only the addition of a radio frequency converter and without any alterations a present monochrome receiver will receive the programs transmitted by the simultaneous color method (reproducing them in black-and-white).

In contrast to this, Mr. Kell stated, there is no way to provide a converter for, or reasonable way to alter, present monochrome receivers and future receivers built with present basic design so that such receivers can properly receive programs transmitted by the sequential system. He said the modification of a monochrome receiver, to enable it to receive a sequential color signal as a monochrome picture, requires major redesigning of the receiver.

Introduction of a sequential color television system, as advocated by the Columbia Broadcasting System, would represent a serious problem to television broadcasters, Mr. Kell asserted, and explained: "In the sequential system, the broadcaster must decide whether he will erect a station for the color audience, for the monochrome audience, or, of course, two separate stations for the two separate audiences. There is no common ground on which monochrome and sequential color can operate, and this is a serious economic handicap to broadcasters, as well as a restriction to the number of programs available to each audience."

Mr. Kell reiterated at this point that, on the other hand, the RCA simultaneous color system could be introduced with standards that would permit complete interchangeability of service of color in the upper television channels and black-and-white transmissions on the present commercial frequencies, as well as on the upper channels.

In concluding his testimony, Mr. Kell estimated that the work necessary, including field testing and industry consideration of color television, would require a minimum of four to five years, and cautioned the FCC: "Until this has been done, standards for color television cannot logically be adopted."

Beers Reveals Schedule of Television Production

Television home receivers having a retail value of approximately $65,000,000 are scheduled to be manufactured by the RCA Victor Division of the Radio Corporation of America during the coming year, George L. Beers, Assistant Director of Engineering of the RCA Victor Division, reported to the Federal Communications Commission.

"As of December 1," Mr. Beers said, "the RCA Victor Division has produced 2,950 home television receivers. It is expected that the total 1946 production will be 8,000 instruments. Our 1947 production schedule calls for 25,000 receivers in the first quarter, 25,000 in the second quarter, 50,000 in the third quarter, and 60,000 in the fourth quarter, or a total 1947 production of 160,000 instruments. These receivers will have a retail value of approximately $65,000,000."

It should be borne in mind, Mr. Beers added, that these production

(Continued on page 27)

ROTATING RADAR ANTENNA AS MOUNTED ON A TOWER ABOVE THE SHIP'S WHEELHOUSE.

SHIP RADAR TESTED

New Equipment Designed by Radiomarine Proves Its Value in First Practical Try-out on Great Lakes Ore Carrier

By C. J. Pannill
President
Radiomarine Corp. of America

WITHIN two months after its installation on a Great Lakes ship, a 3-centimeter shipboard radar designed by Radiomarine Corporation of America to meet the exacting needs of merchant marine navigation had played the leading role in two practical demonstrations of radar's peacetime value. On one occasion radar made it possible for a ship to move at normal speed through heavy weather which had caused all other craft to anchor and await the lifting of the fog. A few weeks later, during a severe blizzard, the same radar scope revealed an imminent collision between two vessels in the distance in time to notify the pilots of their danger.

The new Radiomarine model CR-101 radar was installed early in October aboard the Pittsburgh Steamship Company's modern ore carrier *A. H. Ferbert*. Tests were carried on for the next two months during the vessel's regularly scheduled six-day round-trip voyages between Conneaut, Ohio, and Two Harbors, Minn. Operated daily by the ship's personnel, the new radar proved capable on its first test cruise of detecting buoys and other small objects at ranges as short as 80 yards. The ship's captain soon found that with the aid of the radar he could locate and plot positions of rain squalls and also detect ship and buoy targets both in and beyond the squalls. When navigating through narrow channels, it has been found possible consistently to distinguish on the radar indicator the contours of shorelines on both sides, even when the vessel is only 250 feet from the shore.

The radar antenna, which is only 12 feet above the pilot house, transmits a beam only 1.6 degrees in width. This narrow, high frequency beam hugs the surface of the water and picks up buoys and other small objects, not only at short ranges but at distances twice as great as those afforded by lower frequency wartime radars. Land masses as far distant as 50 miles have been clearly identified on the radar indicator.

This radar produces luminous, map-like images of exceptional clarity on a 12-inch indicator scope. A unique feature is the provision for instantaneous switching from "relative bearing" to "true bearing" presentation on the scope. In relative bearing presentation, the scope picture is oriented with respect to the ship's bow, so that the area ahead of the vessel appears at the top of the image. This form of presentation is used for navigation through rivers and narrow channels. In true bearing presentation, the picture is oriented with respect to true north, to facilitate checking against navigational charts.

Several Dramatic Instances

Several dramatic instances have occurred to illustrate the effectiveness of this electronic aid to navigation. In mid-October it enabled the 614-foot *Ferbert* to negotiate the winding channel of the 22-mile St. Mary's River, which connects Lakes Superior and Huron, through a pea-soup fog which immobilized 60 other vessels for more than 14 hours. Approaching the southern entrance to the St. Mary's channel about 5 a.m., at the height of the fog, Captain Frank Davenport of the *Ferbert* observed on the indicator scope of his radar that the shores of the river were lined with fog-bound ships at anchor. Relying entirely upon the radar picture, he was reported able to see the positions of other ships as precisely as in normal weather. None of the other ships was able to proceed until after the fog lifted. The *Ferbert* not only saved more than eight

hours by not waiting for the fog to lift, but gained additional time by passing through the Soo locks ahead of the 60 other vessels. The following day, the Detroit District Office of the War Department Corps of Engineers reported that the *Ferbert's* comparatively rapid progress through the hazardous channel had alarmed other shipmasters who did not know that the vessel was guided by radar.

On one of the *Ferbert's* last voyages before traffic on the Great Lakes was suspended for the winter, this Radiomarine radar played a vital role in the prevention of a near tragedy. This happened during a blinding snowstorm on Lake Superior, just before dawn on November 28. The *Ferbert* was running eastward toward Sault Ste. Marie, about 12 miles above the northernmost tip of the upper Michigan peninsula. First Mate Tom Hermansen was watching the radar image when he observed that the luminous "pips" representing two other ships were rapidly converging from opposite direction—racing toward a head-on collision. Realizing that lookouts on neither vessel could see the other ship in the snowstorm, Hermansen immediately contacted the two ships by radio, warned them of their danger, and directed each on a change of course which averted the collision. The two vessels were the *SS J. H. Sheadle* and the *SS Sascatu*, and it was reported later that the officers of both vessels had been unaware of their danger until they were warned by Hermansen.

CAPT. FRANK DAVENPORT (LEFT) OF THE STEAMER A. H. FERBERT WATCHES AS C. E. MOORE OF RADIOMARINE EXPLAINS THE OPERATION OF SHIPBOARD RADAR, HOUSED IN CABINET WITH BLACK SUN-SHADE OVER SCOPE.

As this storm continued after dawn, the *Ferbert* with her radar was reported to be the only vessel able to navigate with certainty, and her officers repeatedly received radio calls from other ships requesting information on their position in relation to other shipping and the shore. This performance of the three-centimeter radar in the snowstorm was significant evidence of the suitability of the ultra-high-frequency equipment for use in merchant marine navigation.

The installation of the Radiomarine radar aboard the *Ferbert* was sponsored by the Lake Carriers' Association, which is testing a variety of merchant marine radars to determine the type best suited for Great Lakes navigation. Three more of the model CR-101 radars have also been sold to the United States Maritime Commission for service in international trade. They will be installed on the freighters *Heredia, Parsimia,* and *Metapan,* which are now under construction for the Maritime Commission at the yards of the Newport News Ship Building and Dry Dock Company at Newport News, Va.

Engineering Group Formed to Develop Teleran

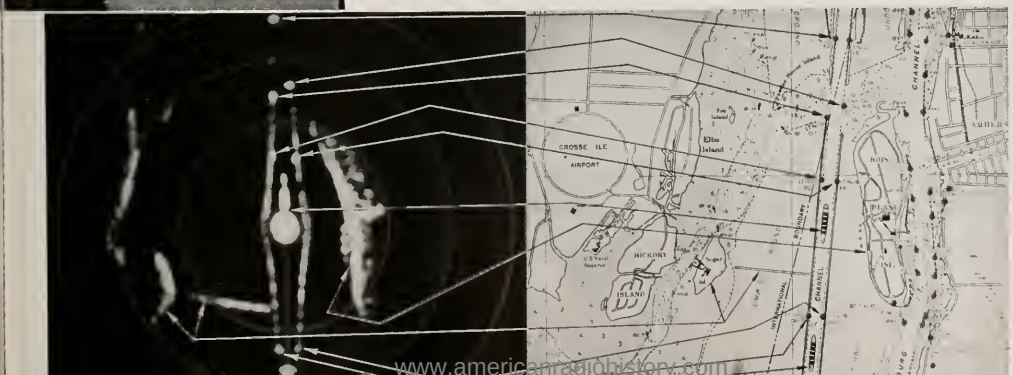
Formation of a large engineering group to develop Teleran, the revolutionary new air navigation system which combines television with radar, has been announced by W. W. Watts, Vice President in charge of the RCA Engineering Products Department.

The new group is headed by Dr. Douglas Ewing, who, as Chief Teleran Engineer, brings to RCA his years of experience as assistant Director of M.I.T.'s Radiation Laboratory.

Other leaders in the Teleran development program are P. J. Herbst at Camden, and Dr. Irving Wolff at Princeton. Mr. Herbst has conducted air traffic control studies at the RCA Laboratories, with which he was formerly associated, and Dr. Wolff is internationally famous for his pioneering in radar.

Plans for the general development of Teleran are being coordinated by Loren F. Jones, Manager of Research and Development Projects and proposer of the original idea of this system of air navigation and traffic control.

BELOW: ARROWS LEADING FROM ACTUAL RADAR PICTURE TO OFFICIAL NAVIGATION CHART SHOW HOW LANDMARKS CAN BE EASILY AND ACCURATELY IDENTIFIED BY PILOT OF RADAR-EQUIPPED SHIP. THESE SCENES COVER A 1½ MILE SECTION OF THE DETROIT RIVER.



TODAY THE ALBUM SHOWN BELOW SELLS FOR LESS THAN THE SINGLE RECORD COST 40 YEARS AGO.

MODERN DISTRIBUTION

New Methods of Moving Goods From Factory to User are Complicated and Expensive but Because of Them the Public Gets More for Less Money

By Frank M. Folsom,

Executive Vice President in Charge of RCA Victor Division, Camden, N. J.

OF late years, many of us have been putting more and more thought into a phase of business activity which appears to need reform. This phase is a highly complicated process, involving a large number of loosely associated activities, and it goes under the name of "distribution." It represents a great deal more than the mere physical transportation of goods from one place to another. It includes everything that happens to a product between the time it is produced and the time it is owned by the ultimate consumer. It includes advertising and sales promotion and display and shipping and packaging and warehousing and wholesaling and retailing. And it costs money.

Many of us have been wondering if it costs too much money.

Since 1870 the trend of distribution costs has been upward. In 1939 the 20th Century Fund made a study and found that 59 cents out of every consumer dollar went for distribution. And it's still going up.

That sounds high. It sounds like waste. It sounds wrong to pay more to distribute a product than to make it in the first place. At first glance it looks as though we ought to change the system so as to eliminate some of these costs.

Should we eliminate the wholesaler, or the retailer, or both? Should we strike out advertising and promotion? Before we take any rash steps, let us remember the danger. Let us be sure what the effects will be, and whether they are what we want.

The business of RCA Victor consists of a variety of product lines. They are all basically electronic, yet their uses, and the types of customers to whom they appeal, differ widely. Separate distribution systems are therefore necessary. These distribution systems vary from a relatively small list of 35 distributors for aviation radio products, to 600 distributors for radio tubes — who in turn service between 30,000 and 35,000 retail outlets. In between come the specialized distributors and dealers for Home Instruments, Records, Replacement Parts, Sound Equipment, 16mm. Sound Film Projectors, and many others.

Let's examine that largest group —the tube distributors and dealers. Where are these thousands of outlets, and what part do they play in distribution? Suppose a tube burns out in your radio or Victrola radiophonograph. If you want to take the time, you can run down to the local store, buy a new tube, and replace it yourself. But the average person's knowledge of radio doesn't go much beyond changing tubes, so if that burnt-out tube is not the sole difficulty, but merely an indication that the set needs a general checking over then you're in trouble. You have to rely, as millions do on a radio service man.

Serviceman's Role Important

The service man tests all the tubes and other parts that may be the source of trouble. If he's a good service man he uses modern testing and analyzing equipment, and we know that's good because we make it. Then he advises you of the difficulty, and makes the necessary repairs. In this role he performs the same function as your automobile service shop. While he sells parts and tubes, this is only part of his job. The real value to you is the service he renders.

Now suppose we were to eliminate this multitude of small outlets and sell all radio tubes direct—say through factory controlled outlets.

Obviously there would be far fewer such outlets than there are radio tube dealers today. Would the inconvenience and delay be worth the few pennies you would undoubtedly save on each item? Obtaining replacement tubes would, in many cases, become a matter of days rather than hours. And suppose, after you got the tubes, the set still did not work?

Customer Service is Cornerstone

Some of you may think my selection of radio tubes, as an illustration, is too technical. Being technical, they naturally require service the customer cannot render. I wonder if you would say the same thing of RCA Victor records. That's a very aesthetic product. Yet service to the customer is, once again, the cornerstone on which our distribution system of 52 distributors and 10,000 retail record outlets is built.

In normal times there may be from eight to ten thousand selections in the RCA Victor Record Catalog. Servicing and stocking ten thousand stores is a complex operation. Yet it is the only way we know of that satisfies the needs and desires of record buyers. Very few record customers are willing to part with their money without first hearing the selection played. A vast majority prefer to buy records as they buy books—by walking into a store, examining the records in stock, playing them, and making their selections accordingly. Remove the thousands of local record outlets and you remove this privilege. Remove this privilege and you remove much of the pleasure in buying—and listening—to records!

Not that our system of record distribution has stood still. It is an evolution that has taken place over many years. It's present efficiency is due to many factors. Included among these is the strategic location of our three record pressing plants in the East, Middle West and Far West, for quick shipment to any one of 58 distribution centers. Also included are the initiation of many merchandising plans for the elimination of excess distribution costs. Our people have pioneered the "self-selection" method, whereby more customers get faster service from fewer record clerks.

Such measures, coupled with constant laboratory research, improved production methods and an active merchandising program have resulted in an improved product at lower cost. In 1903 a 10-inch Victor record, recorded on only one side, sold for $5.00. Today, a standard 12-inch Red Seal record, recorded on both sides, costs $1.00—a far better record both musically and technically.

Millions Employed in Service

Much discussion was occasioned by the statement of the Secretary of Commerce two or three years ago, of the need for 60 million jobs to support our postwar economy. Of these 60 million jobs, 12 million or 20% were in the service industries—the retailers, wholesalers and other service organizations (excluding Government) which our society re-

(Continued on page 27)

IN 1924, THIS RADIOLA SUPER VIII WAS CONSIDERED A GOOD VALUE AT $425, COMPLETE WITH BATTERIES.

IN 1947, APPROXIMATELY THE SAME SUM PURCHASES THE ATTRACTIVE CONSOLE SHOWN BELOW, WHICH TUNES THE STANDARD BROADCAST BAND AND TWO SHORT-WAVE BANDS, AND IN ADDITION PROVIDES AN AUTOMATIC RECORD CHANGER AND GENEROUS STORAGE SPACE FOR RECORDS.

CHECKING KINESCOPE PICTURE TUBES DURING A 500-HOUR CONTINUOUS TEST.

MAKI
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Important Ste
of Kinescopes
Iconoscopes a
Lancast

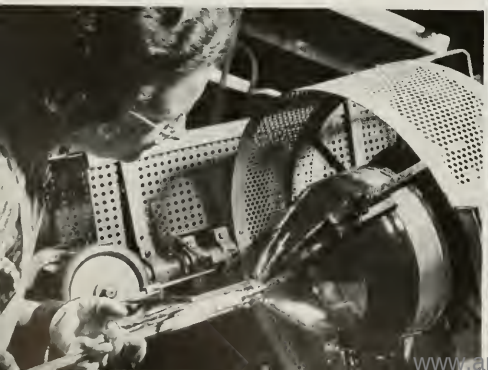
RACKS OF KINESCOP

MAKING FINAL TESTS ON 10-INCH KINESCOPES USING A SPECIAL CHART AS A REFERENCE STANDARD.

LEFT: OPERATOR THREADS LEAD-IN WIRES INTO SOCKET BASE OF A KINESCOPE. AFTER AIR HAS BEEN EXHAUSTED.

BELOW: OPERATORS PREPARE THE FLUORESCENT SOLUTION WHICH IS PLACED IN KINESCOPES TO FORM THE PICTURE SCREEN.

BELOW: NON-REFLECTING CARBON COATING IS APPLIED TO INTERIOR OF TUBE BY LONG-HANDLED BRUSH TO KEEP STRAY ELECTRONS FROM THE PICTURE SCREEN.



TUBES
VISION

Manufacture
Orthicons and
Victor Plant,
lvania.

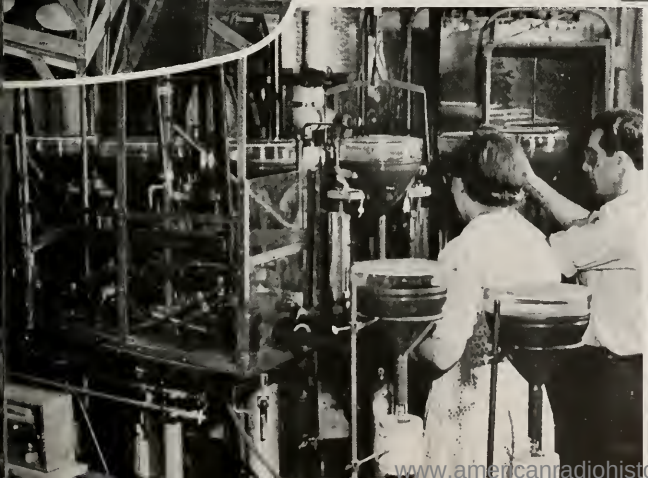
AL PROCESSING AND

AN OPERATOR POURS FLUORESCENT SOLUTION INTO A GROUP OF 7-INCH CATHODE RAY TUBES.

CATHODE RAY "GUN" IS ADDED TO THE IMAGE ORTHICON CAMERA TUBE.

RIGHT: FINAL CHECK ON SMALL CATHODE RAY TUBES USED IN SERVICING RADIO AND ELECTRONIC EQUIPMENT.

BELOW: AT THIS AUTOMATIC EXHAUST MACHINE, THE AIR IS COMPLETELY REMOVED FROM KINESCOPE BEFORE "TIPPING OFF" OR SEALING THE STEM.



BELOW: USING THE INTENSE FLAME OF GAS BURNERS, THE GLASS FACE IS SEALED TO THE BACK OF A CAMERA TUBE.

ADVERTISING IN THE PUBLIC INTEREST

New Products Established and Buying Habits Changed Rapidly Through the Skilfull Use of Radio and Other Advertising Media

By Niles Trammell
President,
National Broadcasting Company, Inc.

BEFORE the days of modern advertising it took many years to establish new products or change the public's buying habits. Seventy years elapsed before the power loom had eliminated the hand loom. The Bessemer process of steel-making had to overcome thirty years of stubborn opposition before it was generally adopted. Even McCormick's reaper needed almost a generation before it became fully accepted.

But how long did it take for the modern radio to catch on?—or refrigerators?—or frozen foods?—or nylon stockings? And almost within a matter of months, the non-refillable fountain pen has become an accepted commonplace in the United States.

In no other country in the world do these things happen! Why? Because we have found the key which never fails to unlock the resourcefulness and ingenuity of the American economy—*advertising.*

If you doubt the creative function of advertising, consider the humble orange. Until California orange juice was advertised, people had considered the orange a delicacy to be put in the Christmas stocking.

Thirty-five years ago the president of a transcontinental railroad asked his advertising agent to help stimulate freight shipments out of California by promoting the Eastern use of the products of the then infant California orange industry. Arrangements were made for the shipment of large quantities of oranges by freight. An advertising fund was subscribed by the railroad to run a test in Iowa. What was the result?

California oranges and orange juice were advertised successfully. Orange juice became a breakfast staple throughout America. A soda fountain reamer for fresh orange juice was invented. Soda fountains started serving orange juice and ended by serving breakfasts, and then three meals a day. Orange drinks and drink stands began to appear everywhere and served light meals. A roadside industry appeared on our highways.

Experiments were conducted which discovered vitamins and other beneficial ingredients present in fresh orange juice. This led to the advertising of competitor's tomato and other fruit juices. The dairy industry, to protect their market, started research and found new vitamins in their product. They irradiated milk and found calcium content. The bakers took the ball from there and made better bread enriched with vitamins. An entire science of vitamin therapy developed.

Can anyone question that the health and well-being of the consuming public benefited from this campaign, to say nothing of the prosperity of the orange growers, the refrigerated express-car makers, the railroads, the drug-stores, drink stands, dairy-men, bakers, advertising media and all the workers, suppliers and producers of accessories who benefited from the development of these industries?

Advertising Establishes Markets

Similar case histories of the creation, by means of advertising, of new desires, new tastes, new and beneficial habits of living, can be told by the hundred. Advertising has established markets — where none existed before—for packaged coffee, candy, dentifrices, shaving preparations, cigarettes, cosmetics of all kinds, condensed or dehydrated or frozen food products, washing compounds, paper towels, napkins, and handkerchiefs, gelatine desserts, floor wax and other products too numerous to mention. They are as commonplace in low-income as in high-income households. Services such as electric lighting and refrigeration, oil heating, telephone, banking, insurance, hotels and resorts, theatres, and transportation by rail, bus, water and air have been enormously expanded through advertising.

Without advertising, how many children and grown-ups would be eating prepared breakfast foods? How many people would have learned to use a mouth-wash? How many would have opened a personal checking account at the bank? Or taken out an annuity insurance policy? Or learned to lubricate their cars properly, and to protect them from freezing? Or made regular visits to the dentist?

There may be some who will claim that all these things might be possible in a communist economy. I, for one, do not believe so. I do not believe they could have happened without the stimulus of advertising in our competitive economy.

Bulwark of Free Press and Radio

There is another significant aspect of advertising which is sometimes overlooked. Advertising, the right arm of distribution, deserves equal recognition as the right arm of a free press and free radio.

In the case of the vast majority of newspapers and magazines, advertising makes all the difference between progress and poverty, between editorial freedom and slavery, between printing news that has been *sought* out and news that has been *handed* out.

The accurate, detailed reporting by American news services and

radio correspondents of events as they occur all over the globe, and the rapid, nationwide dissemination of news, are such a regular feature of our daily life that they are simply taken for granted by the public. These tremendous news facilities and services are largely made possible by advertising.

In the United States, all radio programs — whether called "commercial" and sponsored directly, or called "sustaining" and sponsored by the broadcaster—are made possible by advertising.

In other countries, where the radio system is a state monopoly, the listener has to pay for his listening. In America, he gets more news, information and entertainment than anywhere else, and is thanked for his listening.

Under a state-controlled system of broadcasting, the opportunity always exists to make radio the mouthpiece of dictatorship. State control of radio in prewar Germany was the precondition of the poisonous, one-sided propaganda of Hitler and Goebbels.

In the United States, radio advertising not only pays for the performances on the air, but the sharp competition between our many stations, networks and advertisers is responsible for the best and most reliable news information and the highest artistic performance. This is all the more important since the radio reaches by far the largest audience of any communications medium.

A Favorite Target

Among those who do not care to listen to the radio, it has become the fashion to jeer at radio commercials and some of the programs sponsored by advertisers. Soap advertising is a favorite target. In this connection I am reminded of an old European proverb that "the culture of a nation is determined by its use of soap"—and that the United States, with six percent of the world's population, uses one-third of the world's soap supply.

Broadcasters are mindful of the fact that the sponsors of serial dramas pioneered in the daytime use of radio. They helped broadcasters build a new daytime service; and in doing so, they brought pleasure and relief from drudgery to millions of American housewives. Criticism of these program pioneers overlooks their contribution both to the American system of broadcasting and to the American housewife.

Story-telling is one of the oldest of the arts. The popularity of the serial drama represents a basic emotional response to a human-interest story. Such stories have a rightful place in a well-balanced program schedule.

Then there is the criticism that there is too much advertising on the air. Since American broadcasting is entirely supported by advertising and the press not entirely so, it might be natural to expect that advertising messages would occupy a larger proportion of radio program time than they occupy in the white space of newspapers or magazines. The reverse of this is true.

In the case of the great majority of successful newspapers and magazines, 50% or more of their total space is occupied by advertisements. In the case of a network with which I am familiar, only 6.8% of the network's total program time is devoted to commercial announcements. In other words, out of the 1080 minutes this network is on the air each day in the week, the commercials take an average of only 74 minutes.

This difference is due to the nature of the two kinds of media. It does not imply that one deserves more praise than the other. There are certain limitations imposed upon radio advertising by the special characteristics of the broadcasting medium. It is obvious, however, that broadcasting is not so heavily burdened with advertising as some critics make it out to be.

Our basic standard must always be "Truth in Advertising." Good salesmanship is not enough. It must be truthful salesmanship—truthful not only in what it says but also in what it implies. This maintenance of truth is a responsibility which must be shared, not only by the advertiser who pays the bill, and by the advertising agency which prepares the copy, but also by the broadcaster who accepts and transmits the message to the public.

We broadcasters, who are the stewards of radio's service to the public, must be vigilant in preserving its good name and reputation. No one station, no one network, can fulfill this responsibility alone. It must be fulfilled by the entire broadcasting industry, united in the conviction that the only kind of advertising which serves the best interests of broadcaster and sponsor is that which serves the best interests of the public.

To be effective, the commercial message should be as welcome a guest in the home as the program itself. If as much brains and experience and creative ability are put into the advertising message as are put into the radio entertainment, both advertiser and public would benefit.

The content of the advertising message, its length, its placement, and its blending into the rest of the program, require extensive research and the best efforts of all who are interested in making broadcast advertising more effective.

NEW RECORD PLANT AT CANONSBURG, PA.

A new phonograph record manufacturing plant which will greatly increase the capacity of the RCA Victor Record Department is to be established at Canonsburg, Pa., it was revealed recently with the announcement that the RCA Victor Division of the Radio Corporation of America, has leased one of the buildings of the War Assets Authority's multiple-tenancy project near Pittsburgh.

The building contains 115,000 square feet of manufacturing space, which will be devoted exclusively to record production, supplementing existing facilities in the company's record manufacturing plants at Camden, Indianapolis, and Hollywood. J. W. Murray, Vice President in charge of the RCA Victor Record Department, declared that the company plans to begin immediately the installation of the most modern facilities, which will make the Canonsburg plant the country's model plant for record manufacturing.

TELETYPE TAPES CONTAINING RADIOTELEGRAPH MESSAGES FROM FOREIGN POINTS ARE FED INTO THESE MACHINES WHICH AUTOMATICALLY TRANSMIT THE MESSAGES OVER LAND LINES TO THEIR DESTINATIONS IN THIS COUNTRY.

RADIOTELEGRAPH TRAFFIC DOUBLED

Record Message Volume and Opening of New Foreign Circuits Revealed by RCA Communications, Inc.

INTERNATIONAL radiotelegraph traffic in 1946 increased 100 per cent over the last pre-war year of 1940, Thompson H. Mitchell, Executive Vice President of RCA Communications, Inc., revealed early in January in a business report disclosing the opening by RCA of additional direct circuits between the United States and foreign trade centers and the improvement of service here and abroad.

The new or reestablished direct circuits, which bring the RCA Communications total to 66, connect this country with Poland, Yugoslavia, Gambia, Korea, French-Indo China, the Dutch East Indies, Tangiers, and Nanking and Kunming, China. In addition, RCA opened radiophoto circuits with Vienna and Bombay, for a total of twelve operating with points outside the United States, and established radio broadcasting program service with five additional countries, for a total of thirty.

Mr. Mitchell reported that commercial traffic handled by the Company in 1946 represented an increase of 43 per cent over that of 1945. The peak was reached during the Christmas holidays, he said, when the volume surged more than 56 per cent over traffic in the same period last year.

New Equipment Developed

"To make possible the handling of this record volume of traffic," Mr. Mitchell said, "RCA has pioneered in the application of wartime advances in radiotelegraphy, and at the same time our engineers have developed new types of equipment which are now proving their value in actual service.

"I have long held the conviction that if electrical record communications systems are to survive other forms of competition without the aid of government subsidy, the industry providing this service will have to move greater volumes of traffic more expeditiously and at less cost to the public. It must, if it is to remain healthy, at the same time earn greater returns for its workers and its owners. This can only be achieved through ingenuity and technological improvements, which have, during the past year, been initiated by RCA at considerable cost."

Mr. Mitchell said that the increased volume of traffic had been reflected in the pay envelopes of employees by a boost of 30.8 per cent in hourly income, and the number of employees was up 24 per cent over the 1945 figure.

Printer tie-lines for direct service to customers in New York were installed in increasing numbers during the year, he disclosed, and four new branch offices were opened—one at 12 East Eighty-sixth Street, Manhattan; another at 162 Pierrepont Street, Brooklyn, and one each at the Lake Success and Flushing headquarters of the United Nations. The Company has installed a complete new operations center in Washington, D. C. with added facilities for the collection and delivery of international messages.

Mr. Mitchell reported that in 1946 RCA Communications, in addition to taking steps toward mechanization of its vast world-wide circuits through application of war-tested advances and new innovations in radiotelegraphy, made progress in improving service by instituting a comprehensive training program for its employees.

The special training courses cover virtually all phases of communications, including radio operation with high speed Morse, operation of printers and the handling of service correspondence. Instructors have developed their own text-books, Mr. Mitchell revealed, and some of these, which have been sent to foreign communications centers, have re-

ceived high praise. The training program is so efficient that the usual period of one year for the courses has been reduced materially.

Public is Benefited

The modernization program of RCA has brought about considerable benefit to the public, Mr. Mitchell said, recalling that early in 1946 reductions in international telegraph rates proposed by the Company were approved by the Federal Communications Commission. These new tariff schedules cut rates between the United States and practically all points on the globe. They were described at the time as one of the most significant moves in the interest of the public ever made in the field of international communications.

At the Bermuda Conference of 1945, Mr. Mitchell recounted, it was agreed by British and United States delegates that a ceiling price of thirty cents per full-rate word, or ten cents per night-letter word, should apply from all parts of the United States to all places within the British Empire. The action later taken by RCA provided for extension of this principle to all messages going from the United States to any part of the world, including more than eighty additional countries, territories and islands to which the rates formerly ranged from thirty-three cents to one dollar and fifteen cents per ordinary word. Press rates were coincidentally reduced to six and one-half cents, or less, per word to all foreign points.

This meant, in effect, that to all points of the world where telegraph charges were formerly in excess of thirty cents a word, such rates now are reduced to a uniform basis of not more than thirty cents, with charges of fifteen cents a word for deferred service and ten cents a word for radio-night letters.

"Technological developments made by RCA Communications were largely responsible for our ability to extend in this manner the principles advanced by the American delegation to the Bermuda Conference", said Mr. Mitchell.

The new tariff schedules of RCA also provide for uniform rates from all points within the United States to any given foreign destination—that is, a person anywhere in the United States can send a message to Europe and beyond at the same rate charged in New York; as to transpacific messages, the rates will be the same as from San Francisco.

"These reductions may be expected to save millions of dollars each year in telegraph tolls to the American public," Mr. Mitchell said. "Under this plan, no other country in the world enjoys service or rates comparable to those which are available from the United States, where, unlike most other countries, communications service is conducted under private ownership."

More Installations Under Way

Mr. Mitchell disclosed that progress is being made in the program initiated last spring for the expansion of the RCA radiophoto network into a world-wide transmission service. In addition to the new radiophoto stations in Vienna, and Bombay, installations are to be made in Santiago, Chile, Rio de Janeiro, Mexico City, Manila, Honolulu, Tokyo, Shanghai and Seoul, Korea.

It was pointed out that while the principal volume of traffic over the RCA radiophoto circuits consisted, during the war, in handling newspictures of world events and personalities, the expanded service is winning favor with commercial organizations and other interests desiring speedy transmission of photos, charts and documents of urgency. For instance, branch offices of commercial firms are able to send radiophotos of their monthly balance sheets to main offices in this country, and the service likewise enables banks to transmit radiofacsimiles of checks or other monetary documents from one distant point to another for rapid confirmation of signatures and authenticity.

By means of the RCA radio program transmission service, Mr. Mitchell pointed out, programs and events of interest to the public are brought to this country for rebroadcast over American networks. In addition to the five new circuits which tie-in Lisbon, San Juan, Shanghai, Belgrade and Seoul, Korea, the RCA service has made it possible for transmissions directly from the Byrd Expedition, now in the vicinity of Little America on its way to the South Polar regions.

TAPES PASSING THROUGH THIS "PACKAGE SET" AT THE CENTRAL RADIO OFFICE MAY CARRY RADIOTELEGRAPH MESSAGES ARRIVING IN NEW YORK FROM MOSCOW OR ON THEIR WAY TO THE RUSSIAN CAPITAL.

Food Research Aided

ELECTRON MICROSCOPE FINDS ANSWERS TO PROBLEMS THAT HAVE BAFFLED FOOD TECHNOLOGISTS FOR YEARS

USE of an electronic "super eye" in a modern research program designed to improve taste, texture and appearance of many familiar food products has been disclosed by scientists of the General Foods Corporation and the Radio Corporation of America. The program is under way at General Foods Central Research Laboratories, Hoboken, N. J., first major scientific center of the American food industry to employ an RCA electron microscope.

This electronic device, which is nearly one hundred times more powerful than the most efficient light microscope formerly used in such research, is finding answers to problems that have baffled food technologists for years, according to Thomas M. Rector, Vice President in Charge of Research at General Foods.

"Fundamentally," Mr. Rector said, "food processing consists of exerting physical and chemical changes on natural foods as they come from the farm, and the important thing for a food technologist to know is exactly what he is doing to food by processing. The electron microscope enables him to find out this information, whereas in the past he was limited as to what he could see.

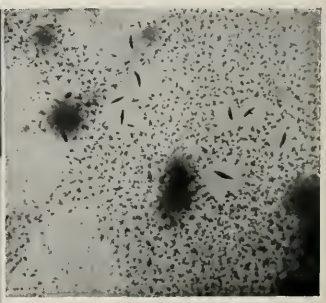
"We expect this 20th century 'super eye' of RCA to aid us immensely in our endeavor to improve food products sold under our trademarks. It already has demonstrated that it will have an important bearing on the improvement of chocolate by disclosing the manner in which ingredients are blended together and manipulated in processing.

"For instance, Baker's Chocolate, one of the oldest brands in the field, has for years had an especially tempting flavor for which our food research scientists have not been entirely able to account. They have known, however, that the 'feel' of a candy bar, as it melts in the mouth, has a lot to do with the flavor. A rough, grainy texture will suggest a poor flavor. All of this is related to the size and shape of the tiny particles which are visible for the first time through electron microscopy."

Mr. Rector went on to explain that chocolate processing has been developed largely by a "rule-of-the-thumb" method, with little actually known about the reason for the results. He said the electron microscope promises to answer this question of "why" by ascertaining the relationship of the various particles to each other. One of the most important relationships, he said, is the "wedding" of particles with the cocoa butter.

"General Foods research scientists," Mr. Rector said, "are carefully studying these relationships with the electron microscope and they expect, in the end, an improvement in quality, texture, flavor and color."

It was explained that most simple food is made up of hundreds of compounds, many of which are still unknown. When these compounds are present in a complicated cell structure, it is often impossible to ascertain how the cell structures are related to each other. Through the aid of the electron microscope most food molecules become visible, enabling food scientists to study molecular structures, step by step in food processing. This, in the opinion of authorities at General Foods' Laboratories, is expected to open the way for far-reaching knowledge in food processing.



FOUR STEPS IN THE ANALYSIS OF A CHOCOLATE SAMPLE BY ELECTRON MICROSCOPE. AFTER CHIPPING THE CHOCOLATE (LEFT), THE SPECIMEN IS PLACED IN THE VIEWING CHAMBER OF THE ELECTRON MICROSCOPE (BELOW AT LEFT), THEN THE CONTROLS ARE ADJUSTED FOR DESIRED MAGNIFICATION UNTIL THE IMAGE APPEARS AS SHOWN AT THE EXTREME RIGHT.

MEXICO CITY'S NEW 60,000-SEAT BOWL, SCENE OF THE FIRST BULL-FIGHT TELECAST ARRANGED BY RCA.

RICHARD HOOPER, RCA VICTOR PROMOTION MANAGER, EXPLAINS MAGIC O IMAGE ORTHICON TO A GROUP OF GAILY COSTUMED MATADORS.

Bull-Fights Televised

LATIN AMERICANS ENTHUSIASTIC OVER DEMONSTRATIONS STAGED BY RCA BEFORE 30,000 GUESTS IN MEXICO CITY

THE first successful telecast of a bull-fight, staged by RCA in Mexico City last October as a feature of the First Inter-American Broadcast Congress, created an interest in the new art which already has spread far "south of the border" to Cuba, Puerto Rico, Brazil, Argentina and Chile.

According to Meade Brunet, Managing Director of RCA International Division, broadcasting officials from the Central and South American nations who witnessed the convincing television demonstration are now considering the establishment of regular television program service in their respective countries.

The bull-fights were televised at the Plaza Mexico, new 60,000 seat arena in the Mexican capital, and the program was transmitted by microwave radio relay to the Hotel del Prado, six miles away, where 7,500 spectator viewed the event on the screens of RCA Victor television receivers.

During the five-day demonstration period, fashion shows sponsored by a local department store, and other subjects also were presented to an aggregate audience of over 30,000 persons. One television receiver installed in a window of the sponsoring store drew crowds which were televised by a camera set up on a balcony across the street. By this arrangement, the watchers were able to see themselves on the screens. To carry out the Mexican assignment, RCA not only shipped eight carloads of equipment to that country but found it necessary to send a hurry call to Camden for a special television relay link. An engineer loaded the 700 pounds of apparatus on a passenger plane and accompanied it to Mexico City.

Portable Units Prove Adaptable

Technical aspects of the bullfight pickup emphasized the adaptability of the new portable field equipment. For this television premiere of Mexico's number one sport, the RCA group placed the Image Orthicon Camera under the judges box at the bullring, facing the gate through which the animals charge into the arena. A spot was found for the monitoring unit farther up the side of the stadium bowl and the portable microwave radio relay parabola was installed near the rim of the bowl in order to give clear, unobstructed line-of-sight transmission to a similar receiving reflector atop the roof of the Prado.

Because of the high sensitivity of the Image Orthicon, no special arena lighting was needed. By using a telescopic lens of 15-inch focus, it was possible to pick up the thrilling action even when it took place 100 yards from the camera. So clear and sharp were the pictures that spectators around the battery of receivers could see the gleam of the matador's sword and the braid on his jacket.

None of the usual sound effects of a great sports event was absent. Paco Malgesto, ace bullfight announcer of Radio Mil, narrated the "blood and sand" epic from his position just behind the Image Orthicon where he could fit his description to match the scene as he saw it through the camera view finder. And out of the loudspeakers of the receivers came the trumpet calls, the traditional music at the death of the bulls and the surging roars of the stadium spectators. Enthusiastically reported Mr. Brunet, "We felt as though we were right down there in the bullring with our feet in the sand."

The Mexico City episode proved the box-office potentialities of television. Delegates to the Broadcast Congress clamored to pay their pesos for tickets that would admit them to the space set aside in the lobby of the hotel for the bank of television receivers. At one time, the pressure of the crowds become so great that police were called to empty the viewing space so that the overflow crowds could be accommodated. Proceeds from the sale of these tickets went to the education fund of the Mexican government.

PLACARDS, TICKETS AND NEWSPAPER ADVERTISEMENTS WERE WIDELY USED TO CALL ATTENTION TO THE LOUIS-CONN FIGHT TELECAST.

TELEVISION PROMOTION

Public Interest in Feature Telecasts is Created Through Use of Many Forms of Advertising

By Charlotte F. Stern

Manager, Television Promotion
National Broadcasting Co.

FOR several weeks before Joe Louis and Billy Conn stepped into the ring at Yankee Stadium, every television set owner along the eastern seaboard knew that the 1946 Battle of the Heavyweights was to be televised by NBC television station WNBT. It was impossible for them to escape this knowledge if their sets were in operation. Night after night announcers recalled the fact in the intervals between program features. And yet, adequate as this procedure seemed at the time those who direct the promotion plans of the National Broadcasting Company, were not satisfied with the coverage.

At NBC, television promotion is designed to "sell". It "sells" television generally but NBC's variety in particular. But whether it appears as paid advertising in newspapers and magazines, as displays in store windows and on counters, or is sent in various forms through the mail, the underlying objective of all NBC television promotion is to get people excited about this great new broadcasting service, to arouse an interest in television that will reflect itself in the mass purchase of television receivers. Obviously, this is as much to our advantage as broadcasters, as it is to the interest of those who manufacture and merchandise sets.

At NBC it is a simple matter to advise television set owners of programs available on WNBT. Postcard announcements dropped in the mails reach the bulk of television set owners within the broadcasting area of the Empire State Building transmitter. With interest in the fight itself as high as it was, there is no doubt but that one such announcement would have sufficed to cause every television set in operation to be tuned to Channel 4 the evening of June 19th. A dozen or so announcements on WNBT during the week prior to the fight telecast would have secured the attention of that part of the audience, if any, unreached by the mailing list. The announcement in the daily press of the fact that the fight was to be televised, by itself would have assured SRO signs at every receiver which could pick up the fight.

Yet NBC invested more hard cash to promote its television coverage of this fight than had ever been spent to announce any single event in television history. Why? Because we are convinced that it is the *programs* that will cause people to buy television sets.

That is why all NBC promotion has emphasized television programs actually on the air, concentrating on those features which highlight any month's schedule. It may be an outstanding sports event (the Army-Navy game); a superlative studio production (Cavalcade of America); a spectacular news event (the Jap Surrender) or an important advance in television programming made possible by technical developments (the opening of New York - Washington network facilities).

Primarily, such program announcements are of direct concern only to set owners, representing at most some 7,000 families in this area. Yet large space advertising is purchased regularly in several metropolitan dailies to announce NBC television programs to an estimated newspaper readership of millions.

To buy so much "waste" circulation is normally contrary to all the rules of good advertising practice.

It is justified in this instance because it is felt such advertising serves some very real purposes. It identifies NBC and television in a manner which tends to make the words synonymous in the public mind. It is laying the groundwork for what we hope will build into an NBC viewing habit by establishing the already evident superiority of NBC television programs.

As a subject for program promotion, the Louis-Conn fight telecast was opportunity thundering at the door. Here was our chance to sell television, with our readership guaranteed by the tremendous public interest in the fight. Ringside seats cost $100. You couldn't buy a television set at any price. But if you had a television receiver or could get close to one—well, as one reporter described it, you had a seat that was "better than ringside." And NBC's television broadcast was an exclusive.

To the best of our promotion ability we prepared to capitalize the universal interest in the fight, to convert it to interest in television.

To do so, we utilized every promotional device that came to hand and mind: Space advertising, direct mail, displays, radio and television spot announcements, demonstrations, stunts, etc.

Thousand-line newspaper advertisements in New York and Philadelphia papers informed millions of readers that the Big Fight could be seen on television. An additional full page advertisement inserted in the Official Fight Program sold at the Stadium advised thousands: "This Fight is Being Televised"—and would be seen by other thousands as far removed from the scene as Schenectady, New York and Washington, D. C.

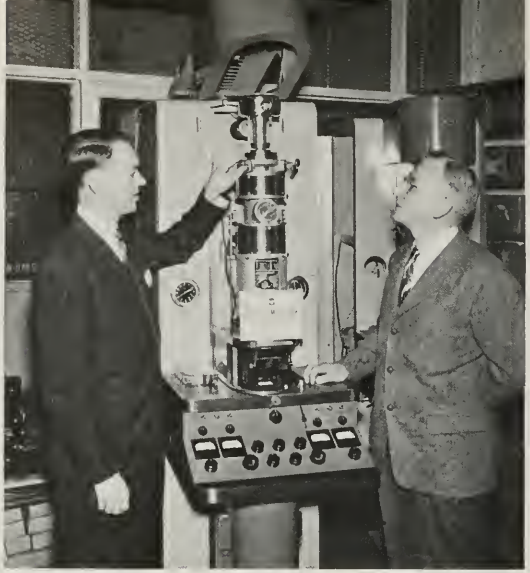
In several thousand store windows in and around New York city, colorful fight posters shouted the news at passersby.

Ten thousand facsimile tickets delivered by mail, gave televiewers and their friends "ringside" seats, courtesy of NBC Television.

There is little doubt that more people were "sold" on television that June 19th night than had been converted in the seven years of broadcasting that preceded it. The next morning's press made that plain, as did the enthusiastic remarks appended to the questionnaires returned by television audiences. As promotion men, we must be forgiven if we allow ourselves to think that what we did to put over a program also helped make people want television sets.

BY MAIL TO RECEIVER OWNERS AND THROUGH POSTERS NBC INFORMS THE PUBLIC OF FORTHCOMING TELECASTS.

NEWSPAPER AND MAGAZINE ILLUSTRATIONS CALL ATTENTION TO OUTSTANDING PROGRAM FEATURES AND TO THE RECEIVERS THAT MAKE POSSIBLE THEIR ENJOYMENT.



T. A. SMITH OF RCA VICTOR ENGINEERING PRODUCTS DEPARTMENT EXPLAINS DETAILS OF THE 200TH ELECTRON MICROSCOPE TO DR. P. E. KLOPSTEG OF NORTHWESTERN UNIVERSITY.

200th Electron Microscope

Instrument installed at Northwestern University Embodies Numerous Advances Made Through Electronics Research Since 1940

A MILESTONE in the application of electronics to scientific research was reached on December 9 when the 200th RCA electron microscope was completed at RCA Victor's Camden plant and turned over, with appropriate ceremonies, to a representative of Northwestern University.

Only a few days earlier, at the annual convention of the Electron Microscope Society of America, Dr. James Hillier of RCA Laboratories, a co-inventor of the microscope, reported on RCA's latest achievements in electron microscopy. Recent improvements, Dr. Hillier said, have made possible magnifications up to 200,000 diameters. Of greater importance, this order of magnification can now be achieved "relatively frequently", and magnifications of 100,000 diameters can be achieved in more than fifty per cent of the exposures on suitable specimens.

W. W. Watts, Vice President in charge of the RCA Engineering Products Department, presided at the ceremonies in Camden when the 200th microscope was formally delivered. Dr. P. E. Klopsteg, Director of Research at the Technological Institute of Northwestern, accepted the instrument in behalf of the University. The presentation was made on the factory floor, where workers had just completed the final adjustments and tests.

The first commercial RCA electron microscope was started in 1940 and took nearly a year to complete. The first seven microscopes were produced on a model shop basis, but mass production was achieved to a limited extent after the War Production Board, recognizing the instrument's importance as a tool of war industries, assigned it a high priority and placed it on strict allocation. However, since each microscope consists of nearly 10,000 separately manufactured parts, involving extremely close tolerances, the scale of production has been limited.

Using a beam of electrons in place of light to make possible useful magnifications of invisible particles of matter far beyond the range of the optical microscope, Mr. Watts said, the electron microscope is an increasingly vital tool of modern science, industry, and education. It enables scientists and engineers to peer deep into the submicroscopic mysteries of metals, chemicals, foods and drugs, disease-causing organisms, and other substances, and study details of structure and reactions never before observed. It can magnify a single tuberculosis germ to the size of a saucer, a human hair to the breadth of a giant redwood tree, or a blood corpuscle to the dimensions of a sofa pillow. It has enabled scientists to see for the first time the viruses which cause influenza and infantile paralysis.

Mr. Watts pointed out that many important advances in electron microscope design have been made since the completion of the first instrument six years ago. These have simplified its operation, reduced the time required for various processes, and increased its utility in numerous ways.

"The history of this symbolic 200th unit is just beginning," Mr. Watts said, "but with it, we know, the great research and educational institution receiving it will explore new mysteries of nature and open new scientific frontiers for the benefit of humanity."

RCA Dividends Declared

At the conclusion of a meeting of the Board of Directors of the Radio Corporation of America held in New York December 6, 1946, Brigadier General David Sarnoff, President of RCA, announced the following dividends had been declared:

On the outstanding shares of First Preferred stock, 87½ cents per share, for the period from October 1, 1946, to December 31, 1946, payable in cash on January 2, 1947, to holders of record of such stock at the close of business December 16, 1946.

On the outstanding shares of Common Stock, 20 cents per share, payable in cash on January 29, 1947, to holders of record of such stock at the close of business December 20, 1946.

Modern Distribution

(Continued from page 15)

quires. If we eliminate or reduce substantially the accumulation of small businesses which our distribution represents, and other industries do likewise, what becomes of our 60 million goal? In other words, any severe dislocation in one phase of our industrial system, may have far more drastic repercussions in another phase.

Now I would like to take you back in the history of RCA Victor and remind you of some facts that you may have forgotten with the passing of time.

In 1924, when radio was already well on the road to glory, the best radio in the RCA line was the Radiola Super VIII. For its day, this was a good radio. Enough families purchased this model to put seven Radiola Super VIII's in every city and village in the country with a population over 2,500. The list price was $425—without batteries. At the beginning of 1941, the latest year of full-scale production, one of RCA's most popular radios was Model 1-X. This little set, compared with the Radiola Super VIII, had a better tone, higher fidelity, less noise, simpler tuning, greater reliability, and longer life. It had a built-in antenna, and instead of bothering with batteries you simply plugged it into a light socket. The consumer bought it for $9.95. In the same year, 1941, for $115 the consumer could buy the finest straight radio produced by RCA Victor.

It looks as though something was happening in those 17 years besides rising distribution costs!

Again, let us go back, this time to the year 1928. In that year you could buy an Electrola (which was a Victrola with modern electronic amplification) for anywhere from $250 to $650 depending on the model. For a combination Electrola and radio, you paid from $322.50 for the cheapest to $1,150 for the finest. And for the sum of $1,550, you could buy a combination Electrola and radio with an automatic record-changer.

In 1941, a Victrola radio-phonograph with automatic record-changer was available at $60; and for $495 the consumer bought the finest model in the RCA Victor line. Electrically and acoustically, both models far surpassed the best of the old Electrolas.

While distribution costs were rising, it had become possible for every home in America to have the latest in home entertainment!

Once more, let us look at the early 1920's. In 1923, one commonly used type of electron tube cost the consumer $9. Today you can buy an RCA Tube that does the same job better—for 80 cents.

How do we account for all of these price reductions? How is it possible to have made such gains in product performance while at the same time the cost to the consumer grew less and less?

It is certainly no secret. I have drawn these examples from the history of RCA Victor simply because I am more familiar with that business than with others. The story of a steady technical advance accompanied by a decline in consumer price is by no means peculiar to RCA Victor. The same story appears again and again throughout our industrial scheme. It is the story of modern American industry.

Reduced to a simple pattern, here is what happened: (1) In order to sell at lower prices, it was necessary to produce and distribute more merchandise. (2) In order to produce and distribute more merchandise, it was necessary to provide and maintain the machinery and organization for large-scale production and mass distribution. (3) In order to support the output and justify the scope of such a system, it was necessary to build and maintain a mass market that demanded that output. (4) In order to build and maintain a mass market, it was necessary to emphasize advertising, sales promotion and merchandising.

Status of Color Television

(Continued from page 11)

figures are dependent upon the availability of materials and economic conditions which may influence the demand for receivers.

"As evidence of our faith in the excellent entertainment service which present black-and-white television receivers will render," declared Mr. Beers, "orders have already been placed on our manufacturing departments for 90,000 receivers which will have a total retail value of approximately $36,000,000. The television receiver testing equipment and facilities which have already been installed represent an investment of over $600,000. Additional facilities are now being provided which will bring the testing facilities investment to over a million dollars.

"At the end of 1947 our television receiver production facilities will support an annual production of 300,000 instruments.

"With respect to television transmitting equipment," Mr. Beers continued, "we now have in the process of manufacture over *six million dollars* worth of monochrome equipment. Included are 40 transmitters and antenna systems, 150 image orthicon cameras, 205 monitors, 50 film projectors and cameras, 75 synchronizing generators and numerous other items.

"The expenditure necessary to prepare for this manufacturing program totalled more than one and three quarter million dollars. This includes manufacturing and testing facilities, construction of models, design engineering and drafting."

Mr. Beers said that on the basis of engineering estimates, it is believed that the major elements of color television transmitting equipment will cost from 40 percent to 100 percent more than the corresponding black-and-white units. He stated that a color television receiver comparable in performance to black-and-white receivers being sold today would be approximately double in cost.

Television, Films and the Human Eye

RESEARCH REVEALS THAT THE TELEVISION IMAGE ORTHICON TUBE AND THE EYE ARE EQUALLY SENSITIVE, FAR SURPASSING FASTEST PHOTOGRAPHIC FILM IN RESPONSE TO LIGHT

By Dr. Albert Rose

RCA Laboratories, Princeton, N. J.

A MOVIE patron steps from the bright outdoors into the dim interior of a theater. Some moments elapse before his eyes become sufficiently adapted to the dark to guide him to a seat. The seat he chooses is circumscribed—within limits. He cannot, for example, approach within arm's length of the screen with the intent of determining whether the heroine wears 60- or 80-mesh sheer hose, for by design the seats stop thirty or more feet short of the screen.

The viewer of a home television receiver is not subject to the same limitations. The aim, at least, is that he may view his picture with enough light in the room to see comfortably. There is, moreover, no barrier to prevent him from taking his seat where he can exhaust the last particle of picture detail.

Both these considerations, i.e., picture brightness and viewing distance, determine the technical standards that a picture must meet in order to be judged satisfactory by the eye. Both are more severe for a television picture than for a motion picture.

Because the judgment of picture quality is made by the eye, it is highly desirable to be able to specify the performance of the eye quantitatively and in such terms or units as will allow ready comparison with the performance of motion picture film or a television system.

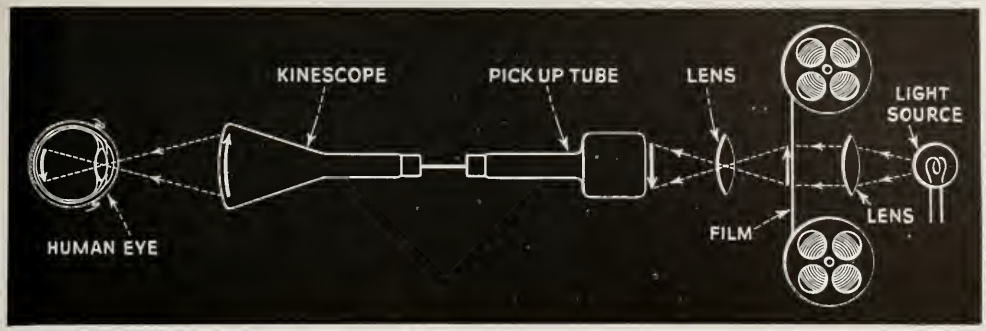
The problem of choosing a performance scale that can be applied with equal validity to motion picture film, the eye and television pick-up tubes is considerably simplified by the fact that all three devices are subject ultimately to the same limitations. These limitations are set by the statistical fluctuations in the absorption of light. The fluctuations can give rise to graininess in films, to "noise" in a television picture and to limited half-tone discrimination in the eye. They also permit a unified approach to performance evaluations — an approach whose technical economy can readily be appreciated since only a single number, corresponding to the light efficiency, is needed to specify the performance range of a well designed picture pick-up device. And this statement holds equally for the eye, photographic film and pick-up tubes.

Here, in brief, are a few of the conclusions to which the above unified approach leads.

More Sensitive Than Film

The sensitivity of the image orthicon and the human eye are approximately equal and each is about ten times as sensitive as photographic film. The comparison pictures in the accompanying photograph, when properly interpreted, support the factor of ten betweeen

THESE FOUR PHOTOGRAPHS SHOW THE INCREASED EFFICIENCY OF THE IMAGE ORTHICON OVER THE MOST SENSITIVE FILM UNDER NORMAL AND LOW LIGHTING CONDITIONS. PICTURE ON LEFT SIDE OF EACH FILM SQUARE SHOWS THE IMAGE AS PICKED UP BY IMAGE ORTHICON AND PHOTOGRAPHED DIRECT FROM KINESCOPE. PICTURE ON RIGHT OF EACH SQUARE IS THE IMAGE AS RECORDED BY CAMERA. ONLY WHEN LIGHT WAS MAXIMUM WAS FILM ABLE TO RECORD AN IMAGE ALTHOUGH IMAGE ORTHICON TUBE WAS SUCCESSFUL WHEN ILLUMINATION WAS REDUCED 99 PERCENT. FIGURES UNDER EACH SQUARE INDICATE RELATIVE INTENSITY OF LIGHT.



ESSENTIAL PARTS OF A TELEVISION SYSTEM WHEN A FILMED SCENE IS TO BE TRANSMITTED AND REPRODUCED.

image orthicon and film sensitivity. At two foot-lamberts, both pickup tube and film can record pictures. At lower scene brightnesses, only the pictures transmitted by the image orthicon are present. The fact that motion pictures are viewed at less than one-tenth the brightness at which the original camera recorded them is in support of the increased sensitivity of the eye over film.

The discrimination of the eye (for half-tones and resolution) is enhanced when looking at brighter pictures. This means that both television pictures and motion pictures must improve their quality hand in hand with their brightness. Because television pictures, in order to be viewed in moderately lighted surroundings, are likely to be brighter than motion pictures, the quality of the television picture should exceeed that of the motion picture. This burden of improved quality is passed on mostly to the television pick-up tube, in that improved quality needs more illumination in the original scene or, preferably, more sensitivity in the pick-up tube. A particularly interesting problem arises when the original scene to be picked up is not as bright as the picture reproduced on the kinescope. For this picture to be judged satisfactory, the pick-up tube performance must exceed the performance of the eye in the same proportion as the kinescope brightness exceeds that of the original scene.

Much confusion has been generated by comparing the "limiting resolution" of motion pictures with the number of lines of a television picture. The conclusion has usually been that a motion picture is two or three times, as the case may be, better than a television picture because the limiting resolution of film is 1,000 to 1,500 lines and the number of lines in a television picture is only 500. This conclusion is at least misleading. The limiting resolution of a picture is not as important in the eye's judgment as is the response, or signal-to-noise ratio, for 500 lines and below. A more valid comparison of television and motion pictures, based on signal-to-noise ratios, places the capabilities of a 500-line television picture close to the resolution of present 35 millimeter motion pictures.

Major Problem in Film Industry

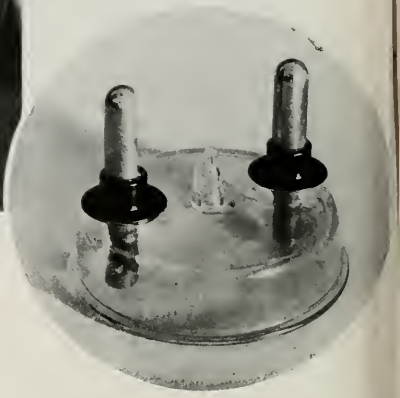
The evaluation of the graininess of motion pictures has been a major problem in the film industry as evidenced by the many technical papers on this subject throughout the last quarter century. The television art is faced with the same problem in the evaluation of noise in television pictures. Only very recently has there been an appreciation that the complete treatment of this problem requires a knowledge of the properties of the eye as thorough as the knowledge of the properties of the motion picture or television picture. It is of considerable help that the eye appears to be limited by fluctuation phenomena in much the same way as film or television pick-up tubes.

One might expect, if the eye is limited by fluctuation phenomena, to be able to "see noise"—that is, "visual noise"—similar to the noise in a television picture or graininess in a motion picture. The writer is convinced that such visual noise is readily observable at very low levels of scene brightness, around 1/10,000 foot-lamberts. A white surface then seems to take on a fluctuating grainy appearance.

Other conclusions have resulted from the treatment of the eye in the same terms as pick-up tubes and film. For example, the large range of dark adaptation (the ability of the eye to re-adjust itself to see scenes 10,000 times below normal brightness levels) can be interpreted as arising from a "gain control" mechanism in series with the retina and brain and not unlike the volume control knob on a television receiver. Further, existing data on the eye suggest that the gain control operates selectively more on blue light than on red light.

The accurate comparison of the performance of film and pick-up tubes with the performance of the eye cannot but enhance one's admiration for the nicety of design that has gone into the human eye by chance selection. At the same time, one has firm grounds for expecting even to surpass the performance of the eye by deliberate design of pick-up devices.

HEAT IS APPLIED TO JUNCTION OF GLASS AND METAL AS ONE STEP IN MAKING A VACUUM-TIGHT SEAL. BELOW: A COMPLETED SEAL BETWEEN TWO METAL TERMINALS AND A GLASS SUPPORT.



SEALING GLASS TO METAL

New Process Forms Vacuum-Tight Junction of Steel and Glass in Manufacture of Metal Vacuum Tubes

DESPITE general accepted theory and practice that in a glass-to-metal, vacuum-tight seal, the expansion of the glass due to heat must match the expansion of the metal when subjected to the same temperature, the RCA Victor Division at Harrison, N. J., has developed a vacuum-tight, compression seal in which the steel expands nearly twice as much as the glass for each degree rise in temperature. This development, which was started in 1941, was accelerated by the war-shortage of chromium alloy initially used for metal-to-glass seals in metal tubes. More than twenty million metal tubes embodying the seal have now been produced. Tubes made in this way have met the acid test of performance in all kinds of equipment including that built to rigorous requirements of Army, Air Force and Navy.

Tons of Vital Metal Saved

The chrome-iron alloy originally used in tube assemblies contained 25 to 30 per cent chromium. If the chromium saved by the use of this new seal had been employed in armor plate, it could have made 1,300,000 pounds of plate having 2 per cent chromium content. In addition to the saving in chromium, a critical wartime material, the new method saved approximately 80 per cent in material cost alone.

The new seal employs commercial grades of low-carbon steel and soft lead glass. Since the new seal was readily adapted to regular seal-making equipment and actually simplified preparatory operations, its development did not interfere with the intensified production required for war needs.

Procedure Changed Slightly

The new seal is made essentially in the same manner as the seal using the chrome-iron alloy; however, several minor but very important changes are necessary. Since steel will oxidize at a lower temperature than chrome-iron, and since the oxide of steel becomes thicker at higher temperatures than that of chrome-iron, the steel must be kept as cool as possible during the operation of "puddling" or softening of the glass. After the glass is formed, a somewhat higher temperature than that used for chrome-iron is required to dissolve the iron oxide into the glass in order to produce a vacuum-tight seal. If a thick layer of oxide is left between the metal and glass, the seal will not be vacuum tight because a thick layer of oxide is porous and brittle. After the seal is made, the glass is annealed to a slightly lower residual strain than is employed with chrome-iron seals.

Although the steel used is a commercial grade, certain essential qualities must be present. One is an inherently fine-grain size which must remain fine-grain after the seal is made. This quality prevents excessive or non-uniform creep which would relieve the compressive stress on the glass at the bond and cause cracks to develop in the glass at the seal.

Another essential quality of the steel is a proper surface for good bonding with the glass. The surface also must be chemically and physically free from any foreign matter because the nature of the surface determines the nature and adherence of the oxide. Finally, proper stress relationship in the finished seal must be obtained.

This type of seal is an excellent, low-cost substitute for the glass, chrome-iron type of compression seal which provides the proper compression strains. However, it is not satisfactory for seals where the metal is enclosed in glass, because steel expands faster than soft lead glass and, therefore, would shrink away from the glass on cooling instead of shrinking tighter around the glass as in the compression-type of seal.

The Pocket Ear

PYGMY RADIO RECEIVER CONVEYS CUES FROM TELEVISION PROGRAM PRODUCER TO STAGE DIRECTOR

EVER since the first ambitious program was staged in a television studio, the trailing loops of wire that carry telephoned cues from the program producer in the control room to the stage director on the floor have been an occupational hazard. These cables, lying here and there in innocent coils were wont to spring to life without warning and tangle with cameras, microphone booms and studio scenery. Like rubber-covered fiends, they were extraordinarily skillful in trapping a careless thespian or technician with a taut bowline around his ankles, while the director, finding his lifeline snagged beyond help, expressed himself mutely but effectively by movement of lips and manual gestures.

Such episodes no longer take place in NBC's television studios. For out of the network's engineering laboratory has come the "Pocket Ear" to replace the telephone headset equipment formely used for communication within the studio. In development for some time, the device has been given a thorough tryout at WNBT and has been called successful.

The Pocket Ear is a vest-pocket sized radio using small batteries and even smaller tubes. It weighs only one pound complete and measures 6½ by 3½ by 1 inch. The spoken instructions are conveyed from the little receiver to the user's ears through a flexible vinylite tube 1/16" in diameter terminating in a small rubber ear-plug which can be worn for long periods without becoming uncomfortable. This tube, small as it is, also contains a hair-like wire which acts as the antenna.

Signals reach the tiny receiver from a high frequency transmitter installed in the studio ceiling. Although the transmitted power is less than 1/10th of a watt, it is sufficient to give clear reception in any part of a large studio yet is too weak to cause interference beyond the studio walls.

The first model tested retained the standard telephones on the ears but used a vertical antenna rod and tuning attachment which gave the wearer a "man from Mars" appearance.

Since the latest models have been available, the "Pocket Ear" has greatly improved the conditions under which the stage director works. No longer are his movements limited by connecting cables. Wherever he moves on the stage, he is able to cue the actors, cameramen and other crew members and direct sound effects while maintaining continuous contact with the program director in the control room.

THE WIRE LEADING FROM COMPACT RECEIVER TO EAR IS ALSO THE ANTENNA WHICH PICKS UP THE SIGNALS FROM A TRANSMITTER IN THE STUDIO CEILING.

Recording Studio on Wheels

NEW SOUND FILM UNIT CONTAINS ALL FEATURES REQUIRED IN FIELD OPERATION OF MAJOR COMPANIES

The first complete mobile recording unit to be developed especially for 16 mm. sound film recording has been designed and custom-built by the RCA Film Recording Department in Hollywood for the Coronet Instructional Film Company, of Glenview, Illinois.

The unit consists of a complete film and disc recording channel installed in a custom-built body mounted on a 1½ ton truck chassis. The recording channel has all the features necessary for the normal operations of major studios.

The optical system of the standard RCA Film Recorder installed in the mobile unit was specially modified to permit recording of direct positive as well as negative variable area sound track.

For "location" recording, the channel can be operated entirely by batteries which have sufficient capacity for approximately 20 hours of operation.

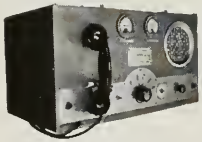
The front compartment of this "recording studio on wheels" contains the disc and film recording machines, film loading cabinet, power supply batteries, and a number of storage compartments. The amplifier, power control panel, selenium-type charging unit, dynamotor and filter are located in a bulkhead which runs crosswise of the truck. The rear compartment contains two large cable reels, lamp batteries, and a cable storage compartment.

Three large doors in the rear of the truck provide easy access to all storage space and equipment, while the rear side of the power panel and amplifier racks are equally accessible through hinged doors, immediately behind the amplifier and power panels.

If it's RADIOMARINE ...it's dependable

MODEL ET-8028

10 watts. 4 channels, 2-way radiotelephone. Remote control with standard telephone hand-set and built-in loudspeaker. Operates from 6 or 12 volt battery supply system.



MODEL ET-8027

25 watts. 6 channel, 2-way radiotelephone. Operates from 12, 32, or 110 volt D.C. supply system. Designed for small coastwise vessels, tugs, trawlers and pleasure craft.

MODEL ET-8012-D

75 watts. 10 channel, 2-way radiotelephone. Remote control unit may be installed in any convenient location aboard. Operates from 32 or 110 volt D. C. power supply. Designed for ocean-going vessels, river and Great Lakes ships, tugs, trawlers and large pleasure craft.

MODEL AR-8702-A

Radio direction finder, highly sensitive and selective, easily installed in a location of greatest convenience. Loop may be mounted inside or outside, as required.

THERE's more than a quarter of a century's proven dependability in back of Radiomarine equipment. That's the reason you will find so much more marine radio equipment, made by Radiomarine, aboard large merchant ships, fishing vessels and pleasure craft.

Leading ship operators and boat owners know that quality pays off in the long run. *Dependability . . . longer life . . . simplicity of operation . . .* and *lower maintenance costs* are characteristic essential requirements for all radio and electronic equipment made by Radiomarine.

To boat owners, this means added safety, freedom from worry, savings in time and money and greater boating pleasure.

Take a tip from thousands of satisfied owners. Install a Radiomarine direction finder and radiotelephone aboard your boat.

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RADIOMARINE CORPORATION of AMERICA

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CHRISTMAS NIGHT 1937

Toscanini first conducted the NBC Symphony Orchestra

Arturo Toscanini directs 16 concerts in this, his tenth season with the NBC Symphony Orchestra

For the past ten years . . . or ever since that memorable Christmas night when Toscanini first conducted the NBC Symphony Orchestra . . . millions of listeners have heard, over the NBC Network, many outstanding musical performances under his inspired baton and those of other world-famous conductors.

The NBC Symphony Orchestra, under this distinguished leadership, has enriched the lives of millions. The first full symphony created and maintained for radio broadcasting, it has brought its gifts of fine music performed with the fire of inspiration to all listeners. For it is one of the privileges of American radio to make great music accessible to millions.

This season, Toscanini will conduct sixteen concerts while Fritz Reiner and Eugene Szenkar will be guest conductors in concerts not sponsored directly, but made possible by revenue NBC receives from its advertisers.

NBC is proud to provide, not only its facilities, but also the orchestra itself—the NBC Symphony Orchestra, every Sunday, 5:00 to 6:00 PM (EST).

AMERICA'S NO. 1 NETWORK

NBC

A Service of Radio Corporation of America

...the National Broadcasting Company

Television camera, receiving tube, all-electronic receiver and radio relay equipment —are the result of pioneering and research at RCA Laboratories.

Behind every big stride in Television– RCA Laboratories!

From the scene of action—to your own living room—these RCA developments based upon research at RCA Laboratories mean *television at its finest:*

RCA Image Orthicon Camera sees whatever the human eye sees, even in the light of a match! Sports events on cloudy days or in twilight do not fade because this super-sensitive camera eliminates the need for strong lighting.

RCA Mirror-backed Kinescope—searchlight brilliance for home television. All the lifelike realism and detail caught by the RCA Image Orthicon Camera is reproduced by this new receiving tube that loses none of the original brilliance.

RCA Victor Television Receiver—with the new RCA exclusive "Eye Witness" feature that "locks" the picture, keeps it bright, clear—as steady as a picture on the wall.

RCA Radio Relay equipment enables television stations to broadcast events taking place far from the studio, and eventually may link television networks. In television, as in radio, Victrola* radio-phonographs, records, or tubes, if it bears the name RCA or RCA Victor, it is one of the finest instruments of its kind science has achieved.

Radio Corporation of America, RCA Building, Radio City, New York 20 . . . Listen to The RCA Victor Show, Sundays, 2:00 P. M., Eastern Time, over NBC. *"Victrola" T. M. Reg. U. S. Pat. Off.

RCA VICTOR table model television receiver with the exclusive "Eye Witness Picture Synchronizer" that assures you *brighter, clearer, steadier* pictures. It is now available in some areas—see your local RCA Victor dealer.

RCA **RADIO CORPORATION of AMERICA**

Science in Democracy

BRIGADIER GENERAL DAVID SARNOFF URGES SCIENTIFIC PREPAREDNESS FOR NATIONAL SECURITY—REVOLUTIONARY CHANGES IN WARFARE AND COMMUNICATIONS FORESEEN.

By Brig. General David Sarnoff
President,
Radio Corporation of America

An address before the American Academy of Political and Social Science in Philadelphia on October 5, 1945.

AMERICA, to be first in Peace and first in War, must be first in Science.

To achieve this, we must have democracy in science as well as science in democracy.

The essence of science is freedom to question and to experiment, with an opportunity to draw conclusions, unrestricted by any forces that would hamper liberty in thinking. The realm of study, investigation and development, must be free. Whether in politics or in science, it is the keynote of democracy that people must be free to think, free to discuss, and free to try their ideas in practice. To impose the opposite is tyranny.

That is one of the great lessons of World War II. We should not embrace victory merely as a triumph and let it rest as such in history books. We should study its lessons to cultivate progress and to safeguard the future. With peace comes the vivid truth that to be strong in this modern world a nation must have science ever ready to march with its Army, to sail with its Navy, and to fly with its Air Force. Indeed, some products of science, such as an atomically-powered missile, must be ready to fly through the air instantly, unattended by sailor, soldier, or pilot; guided to its target by push-buttons in a control room far away.

Such an alliance of science and military power can be achieved most effectively under the democratic form of government. The fate of Germany and Japan is evidence enough. Despite an earlier start by Germany in the creation and development of scientific weapons of war, the democracies were able to outdistance the enemy in this domain. If there be any doubt, let the doubter look to radar and atomic power. Developed and harnessed by democracy, they searched out the enemy and wiped out despotism. Our scientists gave their best voluntarily, while those of the Axis powers worked under duress. Democracy, unhampered by prejudices and obsessions about race and creed, was able to utilize the knowledge and brain power not only of its own scientists but of many who had been ruthlessly banished from their homelands by the dictators.

Freedom to Pioneer

For many years past, scientists from foreign lands have come to our shores and settled here so that they could study and experiment free from oppression, free from commands, and free from regimentation. Prominent among them we find Tesla, Steinmetz, Pupin, Einstein, Michelson, Zworykin, Fermi, and many others. Here they found the environment conducive to study and research, to free exchange of ideas, to experiment and discovery. Our nation has profited by their endeavors, and science has advanced.

America, the cradle of liberty, is also the cradle of invention. The list of our native scientists and inventors is a shining roll of honor. As a result, thousands of wartime scientific accomplishments helped to turn the tide of victory for the United Nations and thus rescue democracy from those who would destroy it. Scientists in democracy must continue to pioneer on an ever-expanding scale. We must be as daring in peace as in war. We must follow our vision with the same confidence if we are to cross new frontiers of progress. Through new products, processes and services that science can create, we should gain a fuller life, increased employment, improved health and national security. We must cultivate our natural talents and resources to meet the promise of science if we are to develop its endless opportunities for securing a higher standard of living for the masses of people everywhere.

Vigorous Policy Needed

It is imperative, therefore, that the United States maintain a vigorous national policy for the promotion of science. Statesmen, philosophers and religious leaders have led in the past—now scientists must join them in the vanguard of civilization. In the future, freedom and science must walk together, hand-in-hand as the spearheads of peace.

For this purpose, every phase of