

*Technicians*

# RADIO AGE

RESEARCH • MANUFACTURING • COMMUNICATIONS • BROADCASTING • TELEVISION



JANUARY  
1954

"CARMEN"  
in  
COLOR TELEVISION





# Ever the East meets West... in Pakistan

RCA joined hands with Radio Pakistan in all phases of this great national communications project

## How the two parts of a great country achieve unity in spite of a 1,000-mile separation... by means of modern radio broadcasting

Six years ago Pakistan had neither a government nor a capital. There were over 77 million people and 360,000 square miles of land, but commerce was almost at a standstill... transportation and communications were disrupted. And the greatest migration in history was taking place... 7,000,000 displaced persons crowding into the as yet unorganized nation.

The years have wrought an astounding change. Today Pakistan is far advanced in a co-ordinated program of enlightenment and education for its own people... and deeply concerned in helping to promote greater understanding, tolerance and friendship among the peoples of the world.

Radio has played a great part in Pakistan's rapid development. From the very birth of the new nation, radio was used as the quick and sure medium

of communication, of enlightenment. Radio Pakistan came into being... attracted competent engineers to its program... developed into a compact powerful voice. To RCA was given the job of providing the powerful radio equipments installed by Radio Pakistan.

Today in Pakistan there are two 50 KW short-wave stations operating on an international schedule. A 7½ KW short-wave transmitter at Dacca is used to link East with West Pakistan. A 5 KW broadcast transmitter at Dacca covers East Pakistan. Others join the great network at Lahore, Peshawar and Rawal-

pindi... operating a total broadcast time of 96 program hours a day.

Radio Pakistan is completely co-ordinated. Its nine transmitters link all sections of the nation into one united network... as well as being an enlightened voice heard 'round the world.

RCA products and services are available in all open world markets, through RCA distributors and associated companies. The new book "Communications, Key to Progress" tells the inspiring story of radio at work in many countries. Write to RCA International Division, 30 Rockefeller Plaza, N.Y., U.S.A.

"Marcas Registradas"



**RCA INTERNATIONAL DIVISION**

**RADIO CORPORATION of AMERICA**

RCA BUILDING

30 ROCKEFELLER PLAZA, NEW YORK, N.Y., U.S.A.

World leader in radio, first in recorded music, first in television.

# Radio Age

RESEARCH • MANUFACTURING • COMMUNICATIONS  
BROADCASTING • TELEVISION

JANUARY 1954



## COVER

Color cameras focus on a scene from "Carmen" at NBC's Colonial Theatre in New York during the first performance of opera on color television.

## NOTICE

When requesting a change in mailing address please include the code letters and numbers which appear with the stencilled address on the envelope.

Radio Age is published quarterly by the Department of Information, Radio Corporation of America, 30 Rockefeller Plaza, New York 20, N. Y.

Printed in U. S. A.

VOLUME 13 NUMBER 1

## CONTENTS

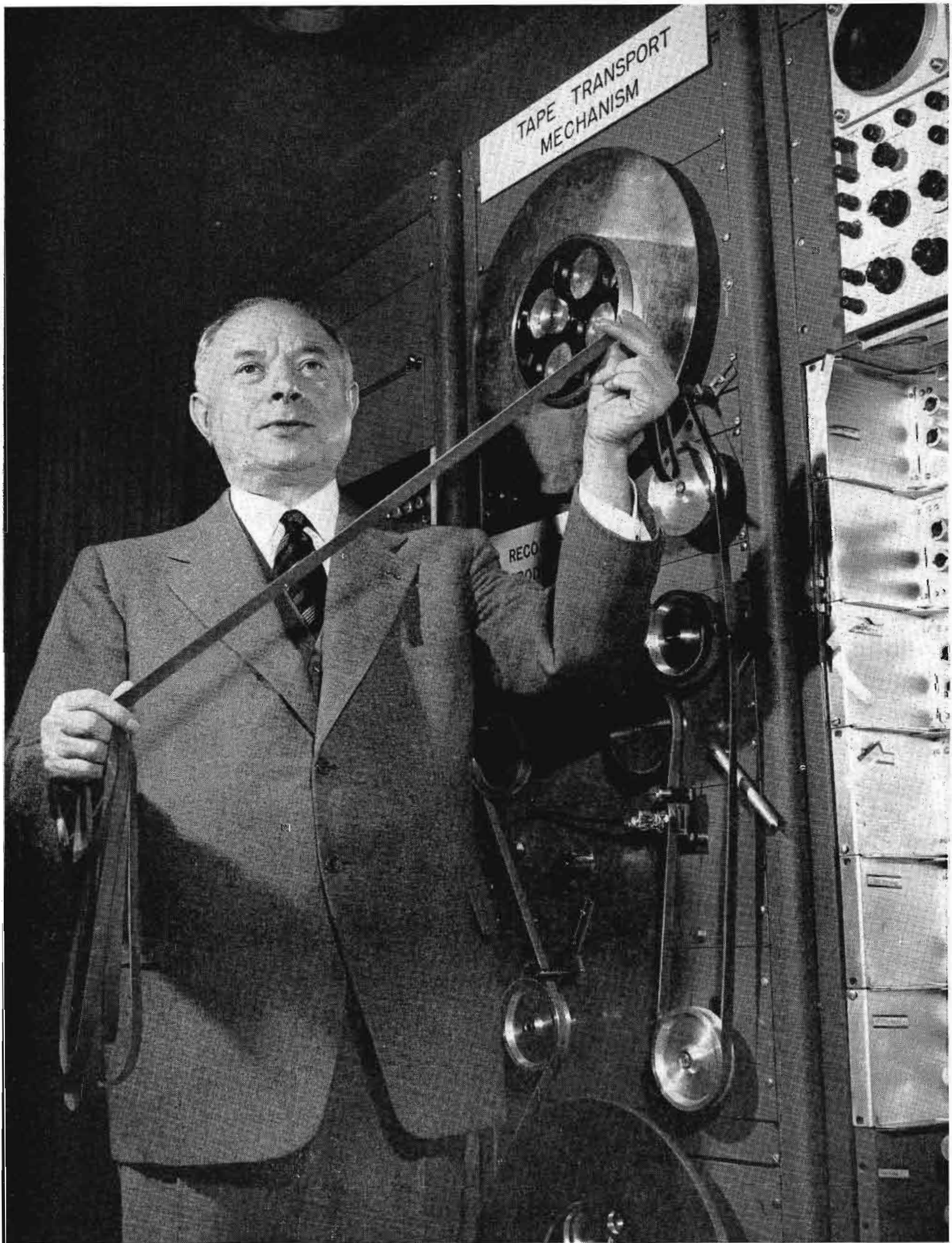
	<i>Page</i>
Stage Set for Color Television as Electronic Science Advances . . . . . <i>by Brig. General David Sarnoff</i>	3
Folsom Sees Business Opportunities in Buyers' Market . . . . .	7
Four Executives of RCA are Promoted . . . . .	9
RCA and NBC Launch Introductory Year of Color TV . . . . .	10
Magnetic Tape Recording of Television Pictures . . . . .	13
RCA Licenses and Royalties . . . . .	16
World's Most Powerful Radio Transmitter Dedicated . . . . .	17
No Secrets Beneath the Ocean for the "Fish Finder" . . . . . <i>by George P. Aldridge</i>	21
Blood Counting by Electronics . . . . .	23
New Flexibility for Television in NBC's Studio 5H . . . . . <i>by Leonard Hole</i>	24
World of Electronics Produces a Long-Run Hit Show . . . . . <i>by Harry P. O'Brien</i>	26
Icebreaker Plows Labrador Waters with RCA Radio Equipment . . . . .	29
Tiny Broadcast Receivers Use Improved RCA Transistors . . . . .	31



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

DAVID SARNOFF, *Chairman of the Board*  
JOHN Q. CANNON, *Secretary*

FRANK M. FOLSOM, *President*  
ERNEST B. GORIN, *Treasurer*



Brig. General David Sarnoff, Chairman of the Board of RCA, displays the magnetic tape and recording unit developed by RCA to record both color and black-and-white television programs. (Story on Page 13)

# *Sarnoff Reports Stage Set for Color TV as Science of Electronics Makes New Advances*

RCA Board Chairman Says in Year-end Statement that 1954 Holds Promise of New Progress in Radio-Television and Electronics

by Brig. Gen. David Sarnoff

*Chairman of the Board*

*Radio Corporation of America*

**P**ROGRESS in development of color television, approval by the Federal Communications Commission of signal standards using the RCA compatible color television system, and preparation by stations for colorcasting, set the stage for 1954 to be the "Introductory Year" of color television.

Color television holds great potential for future expansion of the industry. Other branches of electronics also advanced on many fronts throughout 1953. Major advances during the year included:

1. Great strides in development of electronic weapons and instruments for national defense.
2. Expanded and improved television broadcasting service, including progress in the use of ultra high frequencies.
3. Development of magnetic tape recording for television in both color and black-and-white, ushering in a new era of "electronic photography".
4. Further development and application of transistors, promising simplification and miniaturization of electronic equipment.
5. Further clarification of radio's enduring position as a vital broadcasting service to the American public.
6. Inauguration of the world's most powerful radio transmitter by the U. S. Navy, marking an historic milestone in world-wide communications.
7. New levels of popularity for recorded music, sparked by progress in high fidelity records and phonographs.
8. Progress in industrial electronics, including push-button controls, electronic computers, food sterilization, and closed-circuit television.

The year 1954 holds promise for new advances throughout the radio-television and electronic industry. Fulfillment of the promise of this new year, however, will depend upon how well the leaders of the industry

meet current economic problems and the new challenges of our times.

The Radio Corporation of America in 1953 produced the largest volume of business in its 34-year history. Sales of products and services approximated \$830 million during the year. Net profits are estimated at \$34,700,000. Dividends declared on the Common Stock amounted to \$20,312,000. In addition, \$3,152,952 was paid in dividends on the Preferred Stock. Employment totaled 65,000. Manufacturing accounted for 70% of net earnings; radio-television broadcasting, 15%; communications, 5%, and all other activities, 10%.

Government business accounted for about \$160 million, or 19% of total sales. The current backlog of Government orders was about \$500 million at the year-end, and is expected to expand in 1954.

## *NBC Organization Strengthened*

The organization of the National Broadcasting Company was greatly strengthened during the past year in every phase of its operation. Sylvester L. Weaver, Jr., elected President of NBC on December 4, 1953, has an awareness of high purpose, a sincere regard for public service, proven capacity for showmanship, a thorough understanding of the advertisers' needs and problems and an appreciation of the economic facts of life in the broadcasting industry. He has youth and a breadth and depth of experience.

Robert W. Sarnoff, the newly elected Executive Vice President of NBC, has served in a wide range of capacities which include excellent experience in programming, production and sales. These two men working together as a harmonious team will lead NBC in strengthening its position as the Nation's No. 1 broadcaster and keep it at the forefront as "first" in service to the public in both radio and television.

Since the end of World War II, great advances have been made in the military application of communications, radar, missile control, airborne television and many other phases of electronics which fit into the modern ramparts of our Nation's security. Our objective is not only to produce electronic weapons and instruments, but

through research and engineering to keep the United States at the forefront of science in its relationship to military electronics.

### *Color Television Advances*

The date December 17, 1953, on which the FCC approved standards for the commercial broadcasting of *compatible color television*, will be remembered in the annals of communications along with the historic date of April 30, 1939, when RCA-NBC introduced *all-electronic black-and-white television* as a new broadcast service to the public at the opening of the World's Fair in New York.

RCA is proud of the leadership its scientists and engineers achieved in developing the all-electronic *compatible* color television system and the RCA tri-color tube.

*Compatibility* means that existing television sets can receive color programs in black-and-white without any changes or additional devices. For this principle and feature of compatibility in television, RCA fought hard and long, not only to achieve it scientifically, but to advance such a system as the only logical and practical service in the interest of the public and the television industry.

*Because of compatibility*, no one need hesitate to buy a black-and-white television set. It will not be obsolete because of color, and it will perform many years of service. Color television sets at the outset will cost from \$800 to \$1,000, and production will be in relatively small quantities until the industry is geared for mass production.

The National Broadcasting Company has completed program plans for color television's introductory year that call for each of NBC's regular productions to be broadcast in color at least once during the year—at the average rate of two programs a week.

During the past year NBC's personnel had an opportunity to acquire extensive experience in the broadcasting of color television programs. Significant developments in 1953 pointed the way to further progress that may be expected in 1954:

1. Compatible color television was viewed for the first time in Chicago on September 22, 1953, when RCA-NBC staged a demonstration at the annual meeting of the Association of National Advertisers. This inter-city program was transmitted over a closed circuit from New York.
2. On November 3, 1953, RCA-NBC staged two historic "firsts": A live show performed in the NBC

### NBC's New Team



Sylvester L. Weaver, Jr.  
*President*



Robert W. Sarnoff  
*Executive Vice-President*

color television studio at the Colonial Theatre on Broadway in New York was relayed by microwave across the continent to Burbank, California, and a color film also was televised for the first time from the Atlantic to the Pacific coast.

3. A color television version of the opera "Carmen" telecast by NBC in New York was acclaimed as "breathtaking and beautiful" and "a magnificent feat of technology and showmanship".

4. The first sponsored network program in compatible color television broadcast on November 22, 1953, featured "The Colgate Comedy Hour" starring Donald O'Connor. This telecast was the first of a number of premieres scheduled by NBC.

5. These impressive demonstrations led to another history-making colorcast by NBC — the Tournament of Roses at Pasadena, California. This event was colorcast on New Year's Day through 21 stations, which were equipped for colorcasts, while other stations in the network presented the pageant in black-and-white.

Said *The New York Times*:

"Color television's most exacting test came with the NBC's outdoor pickup of the Tournament of Roses. All things considered the results were exceedingly good, — There was no question that the essence of the parade's panorama of color was projected successfully on home screens some 3,000 miles away."

*The Daily News* noted that the Tournament of Roses parade, "picked up by a special NBC mobile color unit, the only one of its kind in existence, was the first transcontinental colorcast from West to East. It also

went into the books as the first remote (outside the studio) program in compatible tints, under the new FCC standards and the first network color show carried by a series of coast-to-coast stations."

Television is also extending its usefulness to perform new services for business and industry. Television's basic function is "extension of human sight", and wherever such applications are needed the TV camera and associated equipment are ready for practical use. Wherever danger, remoteness or discomfort precluded the presence of human observers, the industrial TV camera comes into play.

RCA's light-weight industrial TV equipment using the small Vidicon camera tube has led to substantial expansions of industrial television, and this field now becomes one of great potential for phenomenal growth, not only in factories but for banks, department stores, hotels, theatres, lecture halls and auditoriums and even for inter-office "sight" communication.

### *Radio*

Radio broadcasting in 1954 moves into its 34th year and during that period has become intimately integrated with American life. Naturally, over such a long period any service undergoes fundamental changes to keep pace with the times, and in the case of radio it has confronted television as a new competitive service.

Nevertheless, radio has continuing economic opportunities for it performs where television and other mediums of communication and information do not reach. Today there are more than 45 million radio families in the United States. There are 26 million automobile

radios, and many millions of portable sets. In 1953 alone, 13 million radio sets, including nearly 5 million auto radios, were produced.

Ultimately, the application of transistors should result in the advent of pocket radios no larger than a wallet, and eventually a watch. This will offer radio new opportunities for extended service in programming, entertainment, information and news.

### *Radio Communications*

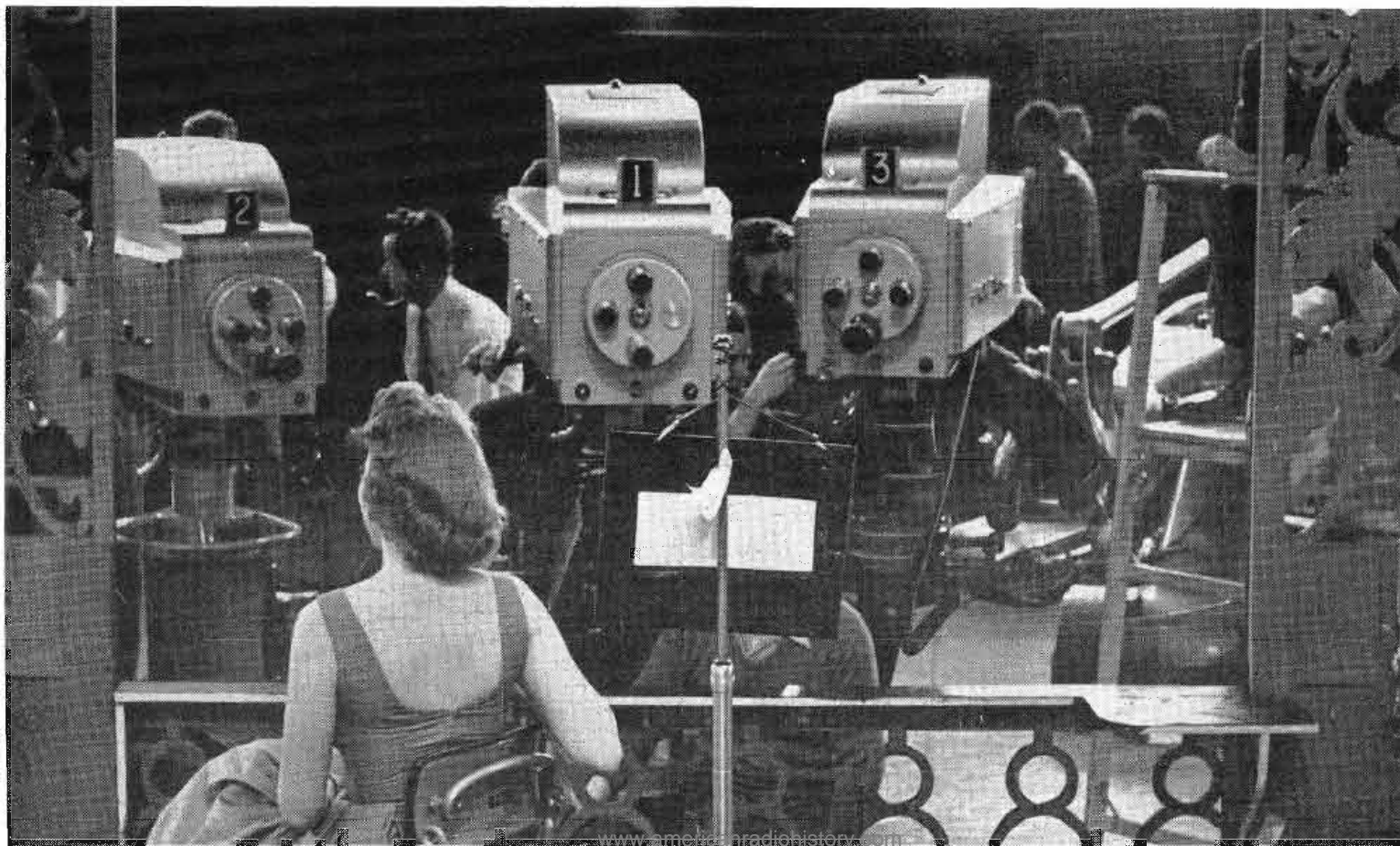
In the field of radio communications, opening of the most powerful radio transmitter in the world (1,200,000 watts) built for the U. S. Navy by RCA at Jim Creek Valley in the State of Washington, marked an historic milestone in world-wide communications. It demonstrates to a marked degree how teamwork between private industry and the military forces contributes to the nation's welfare and to the leadership of the United States in international communications.

### *Magnetic Tape for Sight and Sound*

A new era of "Electronic Photography" was ushered in during 1953 when on December 1, RCA demonstrated magnetic tape recording of both black-and-white and color television. This is a development of great significance to the motion picture world as well as television.

Eventually magnetic tape recording of video signals should make it possible for television set owners to make their own recordings of television pictures in the home. Then they can be "performed" over and over through the television receiver just as a phonograph record is played at will. Many more new uses will

*"Intensive color production activities are under way . . ."*



undoubtedly be developed as means are found for the packaging of magnetic tape in low cost cartridges. Electronic cameras are in prospect.

### *Phonographs and Records*

Phonographs and records reached new levels of popularity in 1953, and this renaissance may be expected to continue in 1954. In 1953 the phonograph-record industry as a whole sold more than 238 million disks. Major factors that lifted record sales to a new peak in 1953 were: Increased use of 3-speed turntables; wide acceptance of 45-rpm Extended Play recordings, and the influence of High Fidelity in generating new interest in records and phonographs.

High Fidelity — a new dimension in sound created by the perfect union of recorded music and the modern electronized phonograph, gained momentum during 1953 through a nationwide interest that reflects the public's growing interest in music of the highest quality. "Hi-Fi", the popular term for High Fidelity, has introduced a new epoch in music which is bright with promise for 1954.

### *The Outlook*

As we look ahead into 1954, we have a clearer view of the field of science than of economics. Science and engineering in 1954 will move forward to new achievements.

Based upon standards of the past, 1954 should be a

good year for the radio-television electronics industry. This does not necessarily mean that new records will be made in production and sales. It is more likely that a moderate degree of economic adjustment will take place in many industries throughout the year. But this can be achieved without dislocation of our economy.

### *Growing Demand for Radio and TV*

America is still a growing country. Its population, annually increasing at the rate of more than 2½ million, continually calls for more and more radio and television sets. In 1953 the radio-television industry as a whole produced 13 million radio sets, including auto radios, and approximately 7,000,000 TV receivers.

Those who first saw the light of day in 1953 most certainly will grow up in an age of color television. They will also find tiny personal radios and other small but powerful sets made possible by the transistor, far different from the large sets used by their grandparents.

RCA now enters its 35th year dedicated, as in the beginning, to pioneering and steadfast in purpose to give America preeminence in communications. Pioneering, vision and scientific research are vital factors in long-range planning. The opportunities ahead for business and industry, for employment, for new and useful services to the public are truly great. We will continue our efforts to do our part to advance and to merit the faith and confidence the American people have in "RCA" as an emblem of quality, dependability and progress.

### *Sarnoff Commended for "Great Victory" in Compatible Color Television*

Senator Edwin C. Johnson, of Colorado, former Chairman and present member of the Interstate and Foreign Commerce Committee of the U. S. Senate, in a letter to Brig. General David Sarnoff, Chairman of the Board of the Radio Corporation of America, commends him for the "great victory you have won for the American people in getting them a compatible system of color TV." The complete text of Senator Johnson's letter, dated December 31, 1953, follows:

"Dear General Sarnoff:

"I must not let 1953 pass into history without commending you heartily for the great victory you have won for the American people in getting for them a compatible system of color TV. You spent money like water in the laboratory to develop this system and you pressed for its adoption relentlessly.

"The scoffers said it could not be done but you were not influenced by their pessimism. The demands for delay only made you press the harder

for prompt and forthright action. You faced the identical obstacles thrown in the paths of all men who have really gotten things done. Columbus for instance. Please accept my congratulations for a mighty important achievement in the Art of Communications.

Gratefully,  
Ed. C. Johnson"

Dr. Lee de Forest, inventor of the audion, or 3-element tube, sent the following message to General Sarnoff on January 5, 1954:

"Highly significant of the glorious future of television was the ushering in of the New Year with RCA's nation-wide compatible color, a magnificent triumph of man's indomitable ingenuity and resourcefulness. Sincerest congratulations to your talented corps of scientists for demonstrating this complete vindication of your twenty years of courageous foresight. The past is but a prelude."



# Folsom Sees Opportunities for Business In Current Trend to Buyers' Market

American merchandising reached a significant turning point in 1953, presenting new challenges and opportunities for the coming year—a year that can be good for business, Frank M. Folsom, President of the Radio Corporation of America, declared in a year-end statement issued on December 30.

"The new trend in merchandising represents a closer approach to normal business operations," said Mr. Folsom. "The 14-year-old sellers' market is gone. Many industries are now adjusting their operations to meet the demands of a buyers' market. Careful planning and hard work are needed to maintain the sales volume developed during the years that business enjoyed a sellers' market."

The changed market condition requires evaluation by business leaders, not only along economic lines, but in over-all strategy of operations, he asserted, and added: "Recognizing these needs, RCA is charting a positive course of action to maintain relatively high volume in production and sales during 1954."

## *Major Steps Being Taken*

Among major steps reported by Mr. Folsom as being taken to achieve this aim are:

1. Reshaping of productive capacity to meet changed merchandising trends and to increase efficiency so that values of products may be enhanced for the consumer.
2. Streamlining of operations and selling organizations.
3. Establishment of closer teamwork between retailers, wholesalers and manufacturers.
4. Strengthening of distribution system so that consumer demands in certain areas can be more readily met by wholesale outlets nearer to dealers.
5. More assistance to dealers in building effective sales staffs.

The growing importance of the radio-television industry in the progress of America was demonstrated convincingly in 1953, Mr. Folsom said. He pointed out that new dimensions of television and sound, in particular, and the continuing electronic requirements of government and military services, provided major areas of development and production.

"Abundant sales opportunities," he said, "are ahead in such fields as black-and-white television, compatible color television, industrial TV, transistors, high fidelity

phonograph instruments and records, office and home communications systems, radio sets, and electronic equipment for industry and military uses, as well as the older lines of communications apparatus."

## *Television—Black-and-White and Color*

RCA expects sales of black-and-white television sets to continue in the millions, during the orderly introduction of compatible color television in 1954, and plans to accelerate promotional activities to achieve this, asserted Mr. Folsom, adding:

"The importance to the public of compatibility in television cannot be over-emphasized. It means that color programs can be received in black-and-white on all existing sets, at no additional cost to set owners, and without added devices. Color sets can also receive black-and-white programs in black-and-white."

RCA commercial planning for color TV made substantial progress in 1953, he revealed, stating that production schedules were mapped to provide stations with necessary equipment to broadcast network-originated color programs in key cities by the end of 1953. Pilot production of color components—including the RCA



One of the most popular home television receivers in the RCA Victor line — the "Master 21."



Supermarket methods have widened the market for recordings. Photo shows self-service store in Hollywood.

tricolor tube—was underway. Pilot production of RCA Victor compatible color receivers was begun.

In regard to the servicing of television, Mr. Folsom said that the RCA Service Company, "in addition to the superlative job of installing hundreds of thousands of television home receivers in 1953," continued to promote high standards of television service in its own branches and cooperated with independent service organizations which share this objective. Special service clinics were devoted to UHF (ultra high frequency) installation and service in 93 cities with more than 10,000 independent technicians in attendance.

#### *Additional Sales Potentials*

Mr. Folsom stated that the phonograph and record industry is expected to continue its impressive growth in 1954 with a 10% rise in record sales—on top of a 12% increase in 1953, expected to push industry volume past the \$250 million mark.

He said the chief factors in the increase of record sales are notable improvements in both the making of records and their presentation to the public, the introduction of high fidelity sound recording and reproduction highlighting the advances.

In the recording field, Mr. Folsom pointed out that

the introduction by RCA Victor of 45-rpm Extended Play recordings provided means for offering shorter classical selections and new couplings of popular music. Industry production of "EP" recordings exceeded the 10,000,000-disc mark in the first twelve months, he added. In record merchandising, the trend toward "super market" or self service record stores has meant a wider market, he said, adding that "evolution of the retail outlet from a library-type operation to a 'super market' using island displays for pop singles and point-of-purchase salespower of album art and liner material has made new customers and bigger customers of old record buyers."

He reported that sales of radio sets—the "hardy perennial" of home entertainment—continued good in 1953 with industry production of 13 million new sets establishing an all-time high of 115 million radios now in use in America.

A new magnetic sound tape recorder, developed by RCA for non-professional use, also is proving attractive to customers, he reported, and listed RCA home air-conditioners and RCA Estate Ranges as other new products that are establishing themselves in the market.

## Folsom Honored At Dinner On 10th Anniversary With RCA

Frank M. Folsom, President of RCA, was honored on December 14 at a dinner given by Brig. General David Sarnoff, Chairman of the Board of RCA, to commemorate the tenth anniversary of Mr. Folsom's association with the corporation.

The dinner, held at the Waldorf-Astoria Hotel in New York, was attended by 375 leaders in the fields of radio, television, publishing, business, industry, finance and the military services. At the head table, with General Sarnoff, Mr. Folsom and Francis Cardinal Spellman, were the Directors of RCA.

In paying tribute to Mr. Folsom, General Sarnoff spoke of the close teamwork between Mr. Folsom and himself, saying, "Of all the things I've tried to do in RCA during a long period of years—I am now in the forty-eighth year of my service in radio—I know of nothing of which I am as proud as I am of the selection I made of Frank Folsom for President of RCA."

Mr. Folsom joined RCA on January 1, 1944, as a Director and Vice President in Charge of the RCA Victor Division, after thirty years in merchandising and two years as head of the procurement branch of the U. S. Navy. He was named President of RCA in December, 1948, on the recommendation of General Sarnoff, whom he succeeded in the position.



Joseph B. Elliott



W. Walter Watts



Dr. Elmer W. Engstrom



Charles M. Odorizzi

## Four Executives of RCA Are Promoted

*Elliott, Watts, Engstrom and Odorizzi Elevated to Executive Vice-Presidents in Move to Keep Pace with Continued Growth of Corporation's Business*

Promotions and organizational realignments in the Radio Corporation of America were announced in a joint statement issued on January 8 by David Sarnoff, Chairman of the Board and Frank M. Folsom, President. Four RCA Vice-Presidents were elevated to the position of Executive Vice-Presidents who will be in charge of their respective operations.

The organizational changes included the creation of a new Consumer Products Division, a new Electronic Products Division and a consolidation of staff functions for the entire Corporation. Present Divisions engaged in other activities of the Corporation continue as before.

The announcement stated that the promotions and organizational realignments would become effective immediately.

Joseph B. Elliott was promoted to Executive Vice-President in charge of Consumer Products Division.

W. Walter Watts was promoted to Executive Vice-President in charge of Electronic Products Division.

Dr. Elmer W. Engstrom was promoted to Executive Vice-President in charge of the RCA Laboratories Division.

Charles M. Odorizzi was promoted to Executive Vice-President in charge of a newly consolidated corporate staff serving all units and subsidiaries of the RCA.

The headquarters of Messrs. Elliott, Watts and Odorizzi will be at the RCA Executive Offices in the RCA Building, Radio City, New York. Dr. Engstrom's headquarters continue at the David Sarnoff Research Center of RCA, Princeton, New Jersey.

In their announcement, General Sarnoff and Mr.

Folsom said: "These organizational changes and promotions are made to keep pace with the continued growth of the Corporation's business. In the last fifteen years, RCA sales have increased eight-fold and the number of employees has trebled to more than 65,000.

"In the television, radio and phonograph fields, RCA products and services continue to expand. In the home appliance field, sales of our air conditioners and ranges are also on the increase. Our production of military communication and electronic apparatus is at new high levels. The new and promising fields of color television, industrial television, and magnetic tape recording of sound and pictures are well under way.

"The promotion of these experienced and able executives to their new positions of increased responsibility and authority is designed to meet the needs of a steadily growing business in a constantly changing art and industry."

### *Hagerty Named to NBC Board*

Election of Harry C. Hagerty as a member of the Board of Directors of the National Broadcasting Company and promotion of three NBC executives has been announced. In addition, three officials of the RCA Laboratories Division were appointed to new positions.

Mr. Hagerty, Financial Vice-President of the Metropolitan Life Insurance Company and a member of the RCA Board of Directors, was elected to the NBC Board of Directors during January. He fills the vacancy on

*(continued on page 28)*

# FCC Approval of Compatible Color Standards Launches RCA and NBC "Introductory Year"

Comprehensive Programming, Production, Training Schedules Are Announced;  
Network Broadcast January 1 Highlights First Series of Programs

The opening of the color television era, launched on December 17 by approval of the Federal Communications Commission of standards for the compatible system pioneered and developed by RCA, put into practice the widespread programming, production and training plans prepared and rehearsed during 1953 by RCA and the National Broadcasting Company.

For NBC, the FCC decision opened the "Introductory Year" plan under which each of the network's major programs will be done at least once in color and a number of special events will be covered by color cameras for the nationwide audience. For RCA Victor Division, it gave impetus to production of both broadcasting and home receiving color equipment, and to extensive plans for training television manufacturing and service personnel of RCA, its licensees and its dealers in the techniques of color.

Within minutes of the FCC action on December 17, NBC went on the air with a network color signal — a multi-color slide reading "Color News Bulletin," and an announcer said: "Attention, please! Color television is here. You are looking at the first color picture telecast since compatible standards for color television were approved."

Assembly of RCA color TV cameras at Camden, N. J.

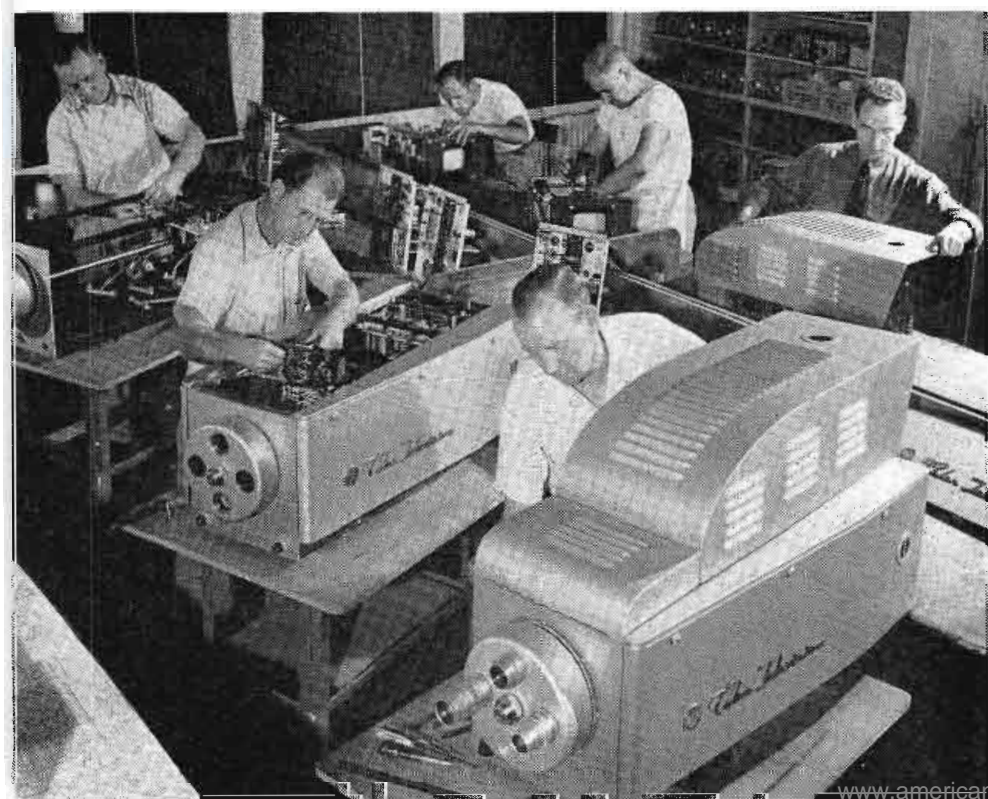
A short time later, NBC presented a special color broadcast featuring a statement by Brig. General David Sarnoff, Chairman of the Board of RCA, who was introduced by Sylvester L. Weaver, Jr., President of NBC. From the stage of the Colonial Theatre, the world's first fully equipped color television studio, Mr. Weaver appeared before the RCA color cameras and took the audience on a brief tour of the theatre's facilities.

### *First Sponsored Color Program*

From the same stage three days later, on December 20, came the first sponsored color broadcast following the FCC decision — NBC's famed presentation of the Gian-Carlo Menotti Christmas opera, "Amahl and the Night Visitors." This was the second operatic production to be telecast in color from the Colonial Theatre; Bizet's "Carmen," the first major opera presented in the new medium, was broadcast in a one-hour version in color on October 31 under temporary experimental authorization from the FCC. Thanks to the compatibility of the RCA color system, both productions were seen in high quality black-and-white on the nation's millions of monochrome receivers.

Following the Menotti opera broadcast, "Season's Greetings," a variety show featuring leading NBC stars, was presented in color on December 22. And on New Year's Day, NBC color cameras, operating from a two-truck custom-built color mobile unit, covered the Tournament of Roses parade in Pasadena in the first West Coast origination of a color program and the first trans-continental West-to-East transmission. The first coast-to-coast color broadcast in either direction was transmitted by RCA and NBC on November 3 over a closed circuit from New York to Burbank, California. Color film also was transmitted for the first time by television on this occasion.

The Pasadena broadcast also was the first network color program handled by a coast-to-coast series of stations using special equipment for broadcasting a true color signal — and behind this fact lies the story of a remarkable production and delivery program carried out by the RCA Victor Division to equip stations in major



cities across the country for color reception and transmission in time for the January 1 program.

To meet the deadline, the special production unit at the RCA Engineering Products Department in Camden, N. J., worked on a 24-hour schedule seven days a week to turn out the stabilizing amplifiers, color monitors, phase correction networks and other items required by the stations to handle programs received over telephone circuits. The first shipment, covering the requirements of five stations, left the factory on November 30.

### *Planes Rush Station Equipment*

As fast as equipment was completed and tested at Camden, it was trucked to Philadelphia's International Airport for shipment by air express to the stations. Five crews of specially trained technicians from the RCA Service Company, travelling by air, kept pace with the delivery schedule, calling at each station to supervise installation soon after the broadcast equipment had arrived.

At the same time, other technicians trained in color equipment courses given by the Service Company were assigned to install monitors in broadcast stations and telephone company locations where the program was to be taken off the network. This group also installed the pre-production model color receivers in distributors'

headquarters, as well as the sets supplied by NBC to stations handling the program.

Indicative of the scope of the operation is the fact that color equipment was installed by January 1 in Los Angeles, San Francisco, Salt Lake City, Denver, Omaha, Minneapolis, Chicago, St. Louis, Milwaukee, Cleveland, Cincinnati, Toledo, Detroit, Philadelphia, Washington, Wilmington, Baltimore, New York, Wilkes-Barre, Johnstown, Pa., and New Haven.

Plans for the production of color receivers for the home also moved ahead with the announcement of the FCC decision. Initial output of RCA tri-color tubes proceeded from the pilot production line established in the RCA tube plant at Lancaster, Pa., where tubes for test and demonstration purposes had been turned out during 1953. At the Bloomington, Ind., plant of RCA Victor's Home Instrument Department, production of home receivers also moved ahead on a pilot basis. At the same time, production specialists advanced provisions to expand tri-color tube output into existing black-and-white kinescope production facilities as the demand for the color tubes increases beyond the 2,000 per month expected of the pilot line at Lancaster.

### *Training Plans For Service Industry*

The official start of color television broadcasting brought with it the announcement of further plans by

## Black-and-White Television Has Assured Future, Elliott Says

By J. B. Elliott

*Executive Vice President in Charge of  
Consumer Products Division,  
Radio Corporation of America*

Now that the Federal Communications Commission has given the official "green light" for compatible color television, more and more people are asking: "What is going to happen to black-and-white television?"

The answer is simple.

For years to come, all stations and networks will continue to broadcast many of their top programs in black-and-white; manufacturers will continue to produce technically improved black-and-white sets and millions of persons will buy new black-and-white sets to bring the marvel of television into an ever expanding number of homes.

The progressive action of the Federal Com-

munications Commission in approving standards for compatible color will serve as a guaranty that the adoption of color will not make obsolete any of the more than 27 million black-and-white sets now in use in American homes. It also assures today's purchaser of a black-and-white set that colorcasts will not affect the usefulness of his new receiver. With the RCA system of compatible color, programs broadcast in color can be received on black-and-white sets as black-and-white programs without any changes whatever in the receivers.

In terms of screen size, picture quality, cabinet styling, and all-around technical performance, black-and-white receivers today offer the greatest values in television history.

The Consumer Products Division of the Radio Corporation of America, as it has since the birth of all-electronic television, will continue to manufacture the finest black-and-white receivers on the market — just as it will produce the finest color sets to be available in the months and years ahead.



The NBC mobile color unit, used for the first time on Jan. 1 for colorcast of the Tournament of Roses parade.

RCA to make available to the servicing industry all needed information on the installation and servicing of color equipment.

The policy of sharing RCA know-how on the broadest basis took several forms during 1953 prior to the FCC decision. In July, licensed tube manufacturers received full information on the RCA tri-color tube, and in October the full design and performance details of RCA's basic color receiver were given to 250 industry representatives at a symposium in New York. The RCA Victor Tube Department also made available to equipment manufacturers special color television kits containing more than 20 special developmental tubes and components, including the RCA tri-color tube.

In addition, the RCA Victor Division held technical seminars in Camden for broadcast engineering consultants to help prepare broadcasters for the handling of color programs. The RCA Service Company, continuing during the year to develop and refine test equipment and servicing techniques, provided technical assistance to television stations in the installation and checking of the equipment for handling network color broadcasts, and trained additional engineers to meet future demands for this type of service.

In the broadcasting field, NBC conducted an indoctrination program to give personnel from affiliated stations the benefit of experience in the color programming and technical fields.

#### *Clinics To Be Held Through 1954*

The plans for 1954, designed to cover the servicing field, were announced by RCA on December 22. The program comprises color television servicing clinics for RCA receiving set licensees, RCA distributors and TV service technicians, beginning early in 1954 and continuing through most of the year.

The first clinics, consisting of four days of intensive instruction and demonstration, will be held for the licensees, it was announced by E. C. Anderson, Vice President in Charge of the RCA Commercial Department. For the convenience of set manufacturers, the same clinics will be held in each of three cities beginning in New York on January 11, followed by Chicago on January 25 and Los Angeles on February 28. Each of the clinics will involve a total of 28 hours of instruction, presented by lecturers of the RCA Service Company. The subject matter has been designed to provide basic color information for service technicians already acquainted with black-and-white television, with the curriculum covering color theory, color signals, basic circuitry, components and adjustments.

The industry-wide training and educational program for TV service technicians, supplementing the program for licensees and distributors, was announced by Edward C. Cahill, President of the RCA Service Company. The principal phase is a series of two-day clinics to be held in 65 cities across the country, starting early in February. Technical specialists of the RCA Service Company, using textbooks, test equipment and other instructional materials developed especially for these clinics by the Company, will conduct the courses, to which service dealers and servicemen in each city will be invited.

The Service Company also has prepared a comprehensive textbook, "Practical Color Television for the Service Industry," based on the experience of more than 5 years in research, development and field testing of color receiving and broadcasting equipment by various departments of RCA. Copies will be made available to servicemen completing the clinics, and will also be distributed through RCA parts and tube distributors or directly from the RCA Service Company in Camden at \$2 a copy.

Mr. Cahill also disclosed that a new type of test equipment for use with color television sets has been installed in RCA factory service branches in areas where color television will be received. Called the color signal stimulator, the equipment is essential for the proper phasing and alignment of color sets.

Another phase of training, a color television home study course for technicians of the electronics industry, was announced by George F. Maedel, President of the RCA Institutes, Inc. The course, in nine lessons, covers all phases in the principles and servicing of color receivers, based on material prepared by the Service Company for the over-all color training program. Mr. Maedel said that a bulletin describing the course in detail may be obtained from the Home Study Department of RCA Institutes at 350 West 4th Street, New York 14.

# Magnetic Tape Recording of Television Pictures Demonstrated by RCA

*Color and Black-and-White Video Programs Reproduced with Device Hailed as Major Step toward New Era of "Electronic Photography"*

COLOR and black-and-white television pictures were recorded on magnetic tape and played back over color television receivers at the David Sarnoff Research Center of RCA in Princeton, N. J., on Dec. 1 in the first public demonstration of new techniques that will simplify the art of making motion pictures.

The achievement was described by Brig. General David Sarnoff, Chairman of the Board of RCA, as the first major step into an era of "electronic photography," in which motion pictures in color or black-and-white will be produced quickly and economically, without the need for photographic development or processing.

The revolutionary device, which records the sight of television by a method basically similar to the tape recording of sound, is the answer by RCA scientists and research men to the first of three requests made by General Sarnoff two years ago, on the occasion of his forty-fifth anniversary of service in radio. At that time, he asked for a video tape recorder, an inexpensive electronic air-conditioner without moving parts, and a true amplifier of light. Research is in progress on the second two items, and the successful development of the first was proven in the Dec. 1 demonstration to newsmen and leaders in the fields of motion pictures, broadcasting and electronics.

In the demonstration, a color television program originating in Studio 3H of the National Broadcasting Company in Radio City, New York, was beamed by radio microwave across the 45-mile span to the Princeton research center. As the program arrived, it was seen on two RCA color television receivers.

## *Picture and Sound on Single Tape*

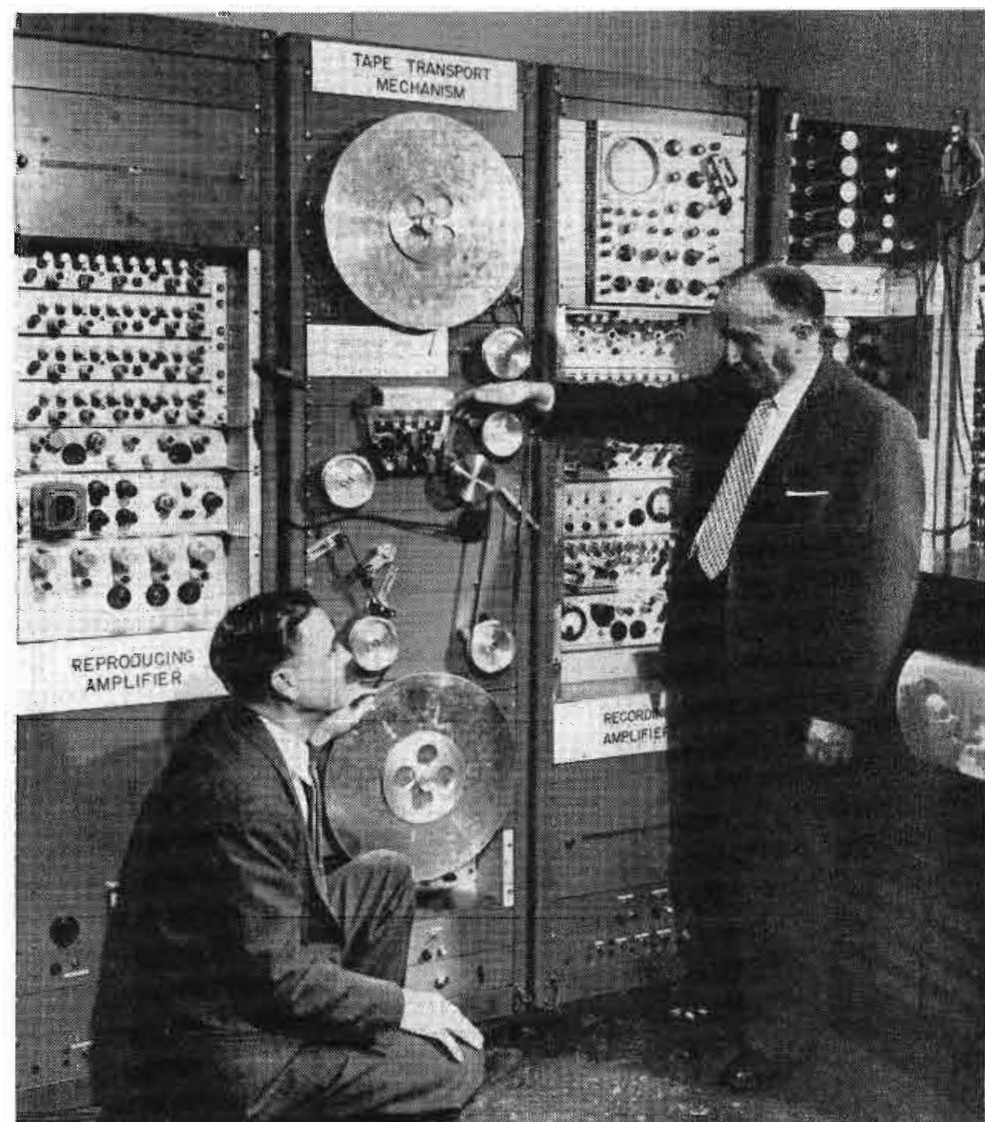
At the same instant, the new video tape recorder recorded the television picture and the sound on a single strip of magnetically coated plastic tape as thin as paper and one-half inch in width. During part of this trans-

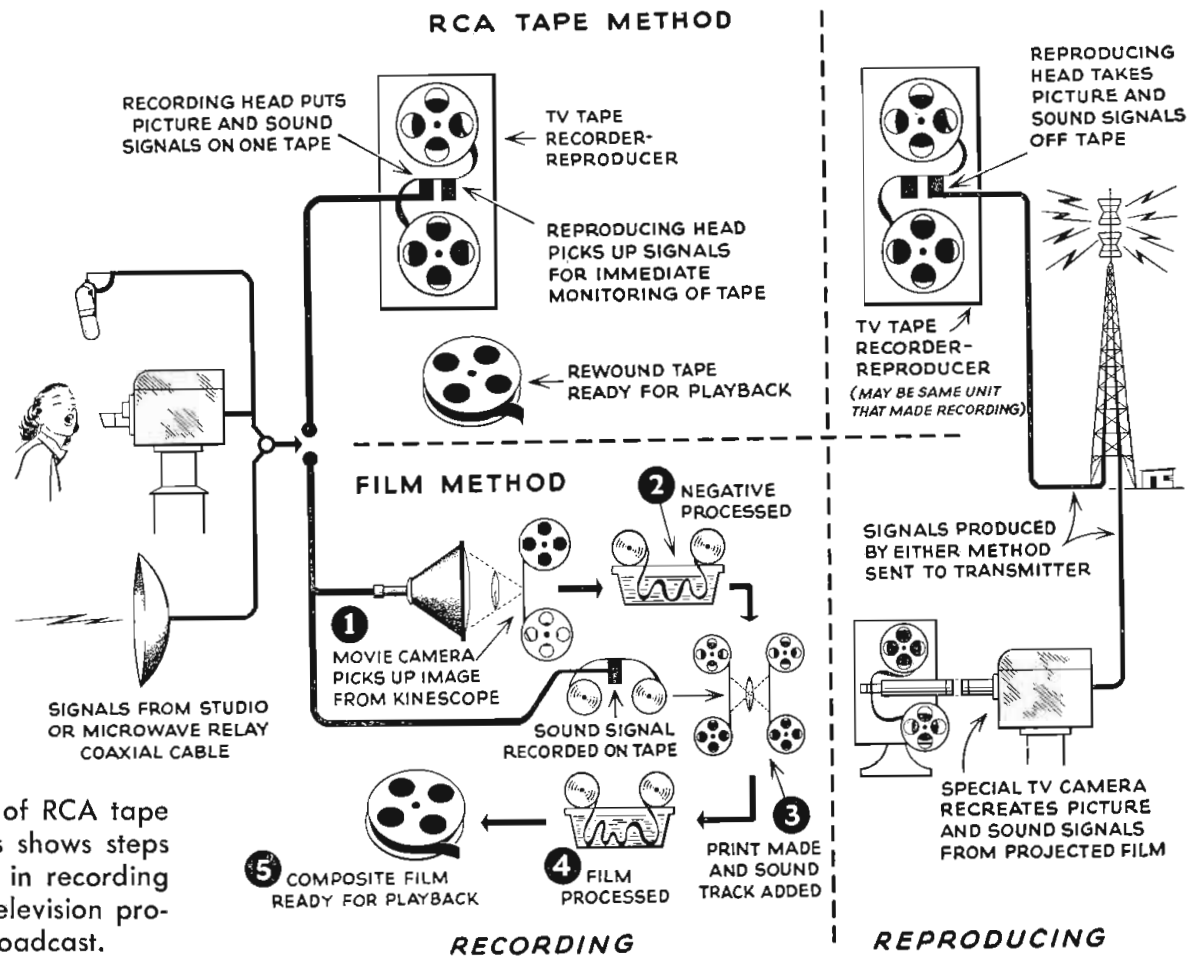
The developmental model of the television tape recorder is checked at RCA's Princeton laboratories by Dr. Harry F. Olson, right, and W. D. Houghton.

mission, both the live program and an immediate playback of the tape recording were shown, permitting direct comparison of the recorded program on one receiver with the live broadcast being received on the other.

As soon as the tape reel was rewound, it was played back, and the recorded television pictures appeared on the two receivers. In an earlier phase of the demonstration, the guests had viewed both black-and-white and color programs previously recorded on the magnetic tape.

The same apparatus handled both the recording and playback of the tape for both the color and the black-and-white tests. This relatively compact experimental equipment was developed by a seven-man team of RCA research engineers including Dr. Harry F. Olson and William D. Houghton, who head the development program, and Maurice Artzt, J. T. Fischer, A. R. Morgan, J. G. Woodward and Joseph Zenel.





Diagrammatic comparison of RCA tape and ordinary film methods shows steps eliminated by use of tape in recording color or black-and-white television programs for later re-broadcast.

To the guests at the demonstration, General Sarnoff said:

"Magnetic tape recording of television programs as shown today has great possibilities first for television broadcasting and, later, for national defense, for the motion picture and theater industry, for industry in general, for education and for home entertainment.

"While this electronic video tape equipment is still in the developmental stage, the basic principles and principal elements of our system have been tested and confirmed. We are confident that it is only a matter of time, perhaps two years, before the finishing touches will bring the system to commercial reality.

"It is essential for the future of the television art that video tape recording be introduced to give the television industry a practical, low-cost solution to program recording, immediate playback, and rapid distribution. Video tape will be important for black-and-white broadcasting; it will be essential in the creation of a full color television service.

"According to our present estimates, the cost of recording a color television program on magnetic tape would be only five percent of what it would cost to put it on color film, since the tape can be reused."

### The Advantages of Tape

Summarizing the advantages of the tape recording method over conventional film methods now in use by the television industry, General Sarnoff emphasized that the tape, unlike film, requires no processing, but that the pictures can be used the instant they are taken, can be preserved indefinitely for reference use or can be electronically erased, permitting repeated reuse of the same tape.

"With further development of video tape techniques, numerous possibilities will open up," he added. "Small portable television cameras are already in wide use in industry, in stores, in banks, in schools and colleges. Low-cost television cameras that work like satellites off home television receivers are ultimately possible. Eventually, low-cost video tape equipment of simpler and more compact design than the studio-type equipment shown today can be made available as attachments for these cameras.

"The all-electronic chain of portable television camera, video tape recorder and standard television receiver would make a convenient and versatile system for making amateur as well as professional motion pictures. It will speed the preparation of newsreels and will be a useful



tool for news reporters. The tape would not have to be sent away for processing with its attendant delays and extra costs. In the home, the tape equipment could be used for home movies or connected to the television set to make personal recordings of favorite television programs."

The primary reason for development of the video tape recording process is to promote the advancement of color television, Dr. E. W. Engstrom, Executive Vice President in Charge of RCA Laboratories Division, told the guests. Use of the tape in color television, he said, will eliminate the "substantial" time lag involved in processing color film for television use and will prove far less expensive.

When a television program is recorded by kinescope recording methods, the pictures pass from the television camera through most of the television system to be reproduced on a small kinescope. A special motion picture camera then photographs the program on motion picture film. The film must be chemically processed and, usually, a print made before the picture can be reproduced. The reproduction requires another installation in which a television camera picks up the scene from a motion picture projector for rebroadcast.

#### *Film Method Called Costly*

"The current kinescope recording process is a round-about and costly approach," Dr. Engstrom said. "It is time-consuming, with film processing time running to

several hours in most cases. And the quality may be limited, since the pictures must encounter all the hazards of both the television system and the photographic process.

"In going from the electrical signals of the camera to the signals for rebroadcast by a television transmitter, kinescope recording requires four separate intermediate pictures to be formed, two by television and two photographically. There is no fundamental need for these intermediate steps.

"Magnetic tape recording, in contrast, stores the electrical signals directly as they come from the television camera. No processing, electronic or photographic, is necessary before the tape is played back. A single compact piece of equipment, which handles both recording and reproduction, will do the job of two complex installations needed with photographic methods."

Comparative estimates of operating costs, including payroll, cost of tape or film and amortization of equipment, are highly favorable to tape methods. Although magnetic tape today costs more per minute of program time than 35mm color film, the fact that tape needs no processing before playback compensates for the expense of raw tape. What makes the savings on tape so great, according to the engineers, is the fact that the program can be electronically "wiped off" and the tape reused, as in present-day sound tape recording. In most normal operations it would be reused many times.

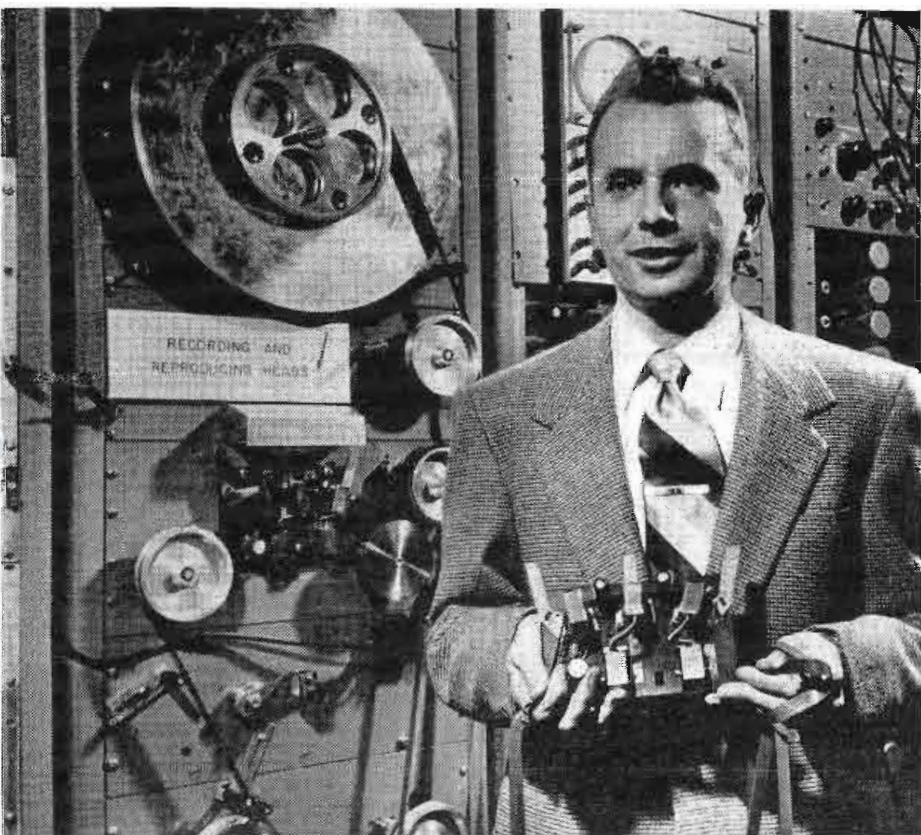
Recording black-and-white programs on film is estimated to be at least five times as costly as it would be on 1/4-inch magnetic tape, assuming that the tape would be reused many times. In making copies for distribution to television stations, a half-hour program could be taped for less than \$15 per copy, provided the tape is reused many times. (These figures, of course, refer only to the cost of producing the recorded tape, and not to the cost of the program.)

Even greater economies are estimated for making the original tape recording of color television programs, which under normal operating circumstances could be handled for only five percent of the cost entailed in color film recording. In making copies on tape that is to be used over and over again, a tape recording of a half-hour color program would cost roughly \$20.

#### *How Video Tape Works*

RCA's method of video recording is similar, in basic respects, to the techniques used to record speech and music with present-day magnetic tape sound equipment. Electrical signals are impressed through a recording head — a small horseshoe electro-magnet — onto the magnetically treated surface of a plastic tape. As the tape is drawn across the recording head, the head continuously

*(Continued on page 32)*



The recording head, which puts signals on tape and provides for video pickup, is held by Joseph Zenel.

# RCA Patent Licenses and Royalties

*Statement Outlining Corporation's Policies Made by General Sarnoff before  
New York Society of Security Analysts*

*Brig. General David Sarnoff, Chairman of the Board of RCA, discussed RCA's patent licensing and royalty policies for the New York Society of Security Analysts at a luncheon on December 14, 1953. Following is the text of his statement:*

I have been told that you are much interested in the subject of Patent Licensing and income from Royalties. For this reason I am glad to give you the facts as I know them.

There has been a lot of talk by some uninformed people that RCA nets about 20 to 25 million dollars a year in patent royalties. Of course I wish this were true, but let me tell you very frankly that it's the bunk.

In the seven years from 1947 to 1953 our net income from royalties, after deducting costs and expenditures incurred in connection with carrying on the fundamental research work of the RCA Laboratories Division alone, averaged less than three and a half million dollars a year. In 1953, it will be less than two and a half million.

Further—and this, too, is important—in addition to the expenses of the fundamental research carried on by the Laboratories Division, very substantial amounts are expended for applied research and development work, by other divisions and subsidiaries of RCA.

Research and development are the life-blood of our business, as they are of many other businesses. To keep this blood in healthy circulation, necessarily costs a lot of money. For example, in order to create the great television industry which exists today, RCA invested more than fifty million dollars in research and development of black-and-white television before it made a dime of profit. Before the end of next year we will have spent more than thirty million dollars in research and development of color television. And we cannot possibly hope to make a dime on color TV in the first year of its life.

## *Research Fundamental to RCA*

It is fundamental RCA policy to continue to spend substantial sums on research and development of new products. For that reason, a substantial amount of our money has gone in the past, and will continue to go in the future, into research and development work.

At the RCA Laboratories in Princeton, where the

major part of our fundamental research takes place, we have three hundred engineers and scientists of the highest competence and reputation. Working alongside them is a large staff. Altogether we have a total of more than one thousand people employed at the Princeton Laboratories alone. In addition, there are 2200 scientists and engineers, with a large supporting staff, at the manufacturing plants of the RCA Victor Division. Other divisions of RCA—such as Communications and Broadcasting—also have extensive scientific and engineering personnel. All this involves a very substantial expenditure. But it represents the best prospects for our future and the future of the entire industry. We firmly believe it is money well spent.

Recently there has been some talk about the law suit brought by General Electric and Westinghouse with respect to our sublicensing rights under their patents. As you analysts who are familiar with this subject know, RCA grants licenses to the industry under its own inventions in what we refer to as the radio and electronics field, as well as under the inventions of the Telephone Company, the General Electric Company, and the Westinghouse Company.

The General Electric Company and the Westinghouse Company have recently taken the position that RCA's right to license under inventions made prior to December 31, 1954—what we call sublicensing rights—expires December 31, 1954. The Telephone Company does not take that position.

## *Facts of the Case*

RCA does not agree with the position taken by the G. E. and Westinghouse Companies. The argument in this case took place about six weeks ago before the District Court in Delaware. No decision has yet been handed down by the Court. Therefore, it would not be appropriate for me, at this time, to speculate on what the decision will be.

However, without arguing the pending case I can tell you certain facts concerning it, and these are important:

First, no matter what the outcome of the case may be, no question has been raised as to the fact that both GE and Westinghouse are required to continue to pay

*(Continued on page 28)*

# *World's Most Powerful Radio Transmitter, Built for Navy by RCA, is Dedicated*

**A** RADIO message flashing from a giant antenna strung across a deep valley in the Cascade Mountains of Washington State circled the world on November 17, 1953, to bring all of the far-flung elements of the United States Navy within direct and instant reach of their homeland.

The historic message signalled the entry into the nation's service of the most powerful radio transmitter ever built — a 1,200,000-watt station erected by the Radio Corporation of America for the U. S. Navy in the remote Jim Creek Valley some 55 miles northeast of Seattle. Tapped out in wireless code by Brig. General David Sarnoff, Chairman of the Board of RCA, the dedication message as dictated by Admiral Robert B. Carney, Chief of Naval Operations, gave dramatic proof of the station's power as it penetrated to vessels in distant seas and to shore stations on the five continents.



Brig. General David Sarnoff taps out first message from Jim Creek to naval units around the world as Admiral Robert B. Carney looks on.

"With this first message we forge another link between you and your homeland," Admiral Carney told the scattered units. "With it, we build a new security channel from America to the naval units which form its outer ramparts of defense."

Six minutes later the acknowledgments began to return, some of them relayed four or five stages to reach Jim Creek Valley. The first came from the battleship *Wisconsin*, operating off Japan. Then came word from the carrier *Yorktown*, the destroyer *Floyd B. Parks* and the submarine *Bluegill* in the western Pacific; the submarine *Sablewish* in the North Atlantic and the cruiser *Pittsburgh* in the South Atlantic; the carrier *Tarawa* in the Mediterranean and the destroyer *Charles S. Sperry* in Florida waters.

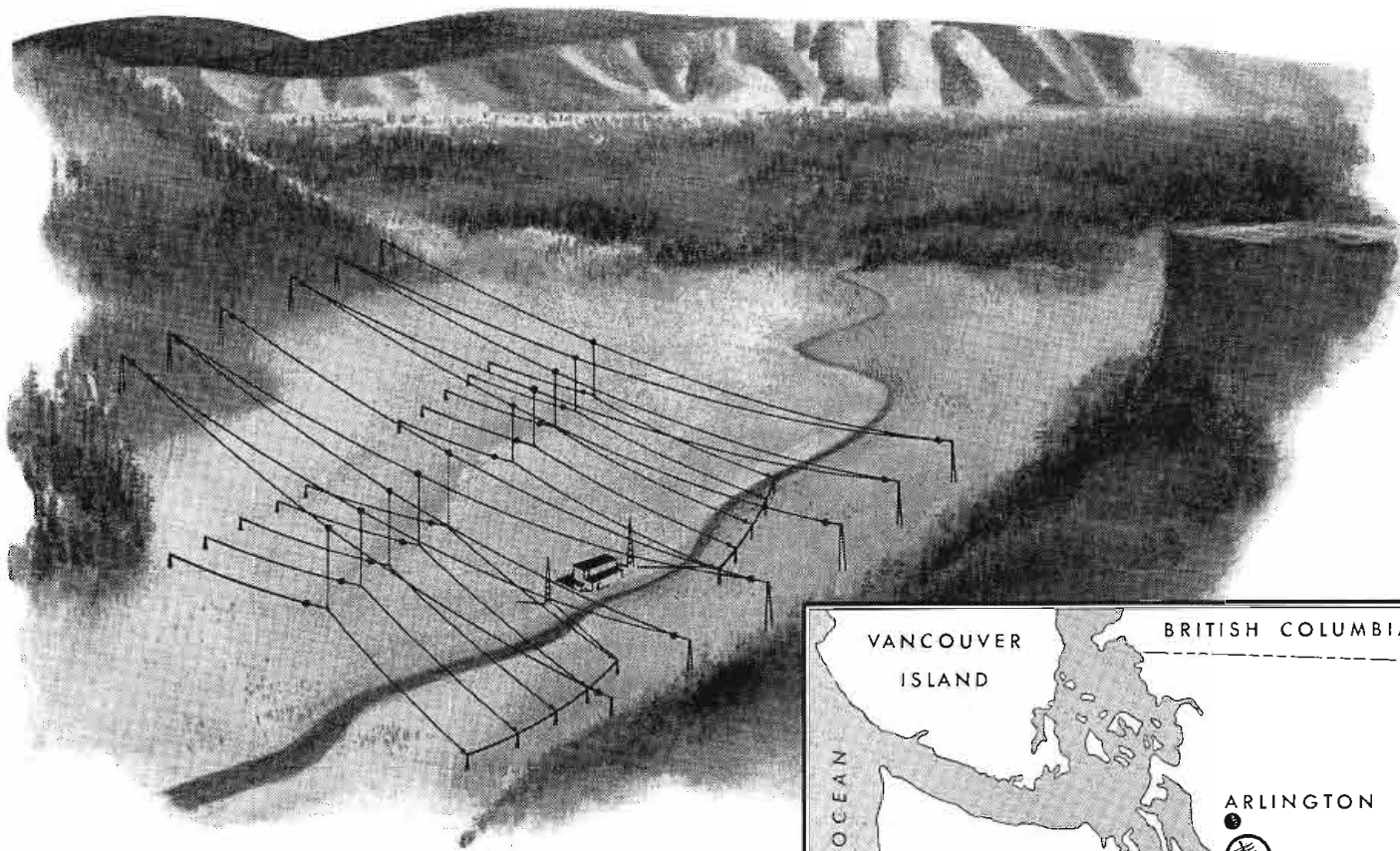
As the replies arrived, Admiral Carney and General Sarnoff plotted the location of the units on a world map set up for the ceremony at the transmitter site. Along with the acknowledgments from the naval units, RCA Communications relayed word of receipt of the message at distant locations in its 65-nation radio circuit and aboard passenger liners at sea.

## *Project Took Six Years To Complete*

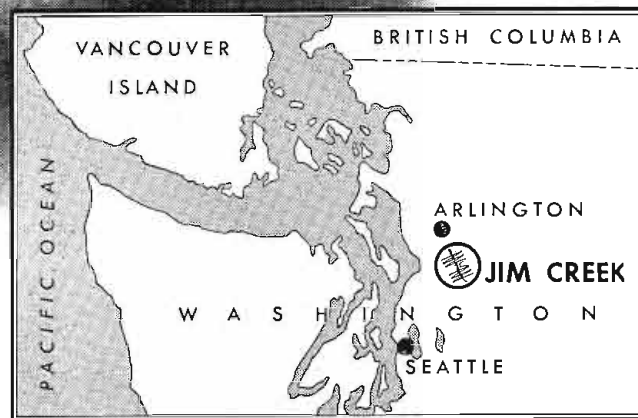
The ceremony marked formal acceptance of the powerful transmitter by the Navy from RCA, whose engineers and communications experts had worked for six years with Navy engineers to complete the \$14,000,000 project. The result of their labor, put to its first test with the initial message, is a transmitter at least twenty-two times more powerful than the strongest commercial station in the country, emanating a very low frequency (VLF) signal capable of penetrating the magnetic disturbances that interrupt higher frequency communications and able even to reach through water to make contact with submarines cruising below the surface.

Turning the installation over to Admiral Carney, General Sarnoff said:

"No branch of the armed services has been more closely associated with RCA than the Navy; none has teamed with us more intimately in devising and producing electronic implements of defense. None, certainly, has based its existence more completely on the science of communications, which we pursue.



Drawing shows arrangement of antenna spanning Jim Creek Valley between high ridges on either side. Map locates the giant transmitter in the Cascade Mountains about 55 miles northeast of Seattle.



"A scroll of our joint ventures would unfold a triumphant story of the electron harnessed to the service of the nation. For more than forty years, we have labored together to produce the radio, sound and electronic equipment that gives the Navy cohesion and mobility. We have demonstrated to a unique degree how teamwork between private industry and the military forces contributes to the nation's welfare."

Reviewing past highlights of RCA-Navy partnership in developing and producing electronic equipment, General Sarnoff mentioned the first modern shipboard radio receivers for the Navy, direction finders, radio transmitters, diversity reception for ship to shore use, homing devices for planes returning to the mother ship, shipboard radar, radio altimeters for Navy patrol and torpedo bombers, one phase of loran, the analogue computer that simulates test runs of guided missiles, and the new combat information center materials with which naval units are being equipped.

#### *Recalls Navy Helped Found RCA*

He recalled that the Navy, "more than any other organization in or out of government, gave us being" by insisting upon the establishment after World War I of an American radio communications company — an insistence that resulted in the formation in 1919 of RCA

with the mission of setting up a world-wide wireless communication network.

"Of course, our company has branched into other fields, finding new applications in radio, television and associated electronic arts," General Sarnoff said. "But it has — as this monument of stone and steel and copper testifies — remained faithful to that original radio wireless trust."

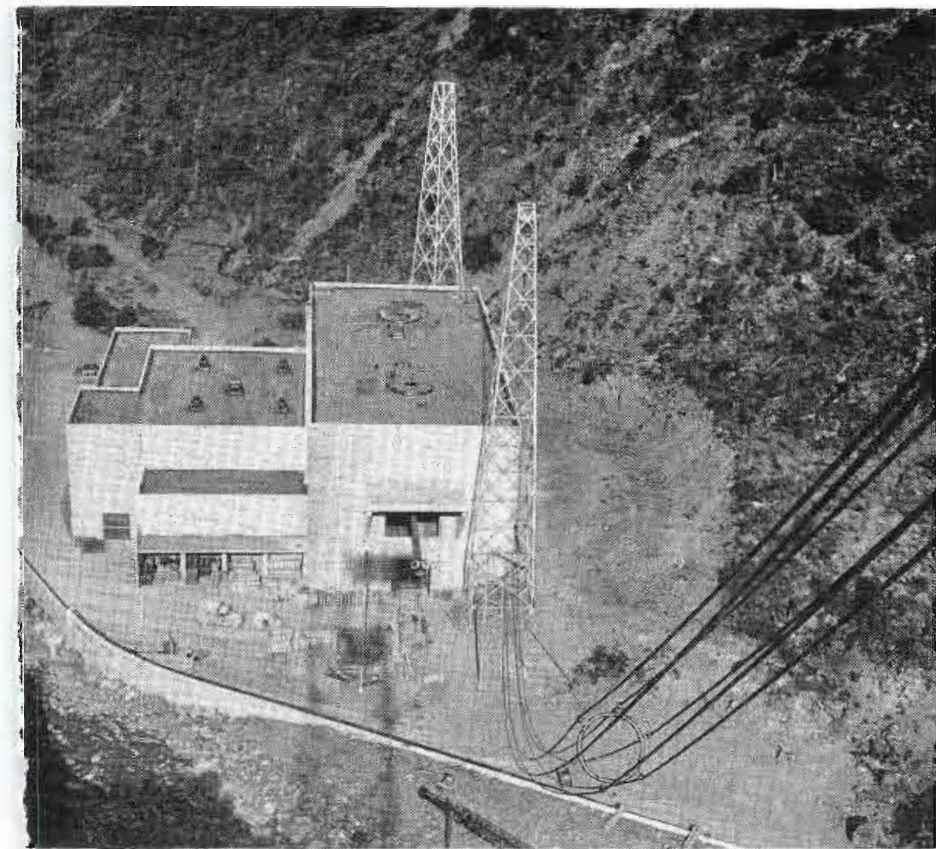
He added that the giant transmitter is "an enduring testimonial to teamwork" symbolized by the 175 business firms that supplied RCA with parts and components for the project.

"They deserve high commendation for their part in a job well done — a job that typifies American industry's teamwork with the armed forces," he said.

Presenting Admiral Carney with the keys to the control panels of the transmitter, General Sarnoff said:

"I turn over to you, on behalf of the Radio Corporation of America, the most powerful radio transmitter ever built. May I express the wish, which I know all in our armed forces share, that this powerful instrument for transmitting intelligence, may add to our national security and to the peace of the world."

Admiral Carney, accepting the installation for the Navy, spoke of the close liaison between the armed serv-



View from one of the towers connecting the antenna with the transmitter shows the transmitter building nestled in the narrow valley on the bank of Jim Creek.

ices and private industry in meeting the complex requirements of national security.

"This great installation at Jim Creek is the newest of RCA's answers to our requirements and is a most eloquent testimonial to the fact that America's great strength lies in the wedded efforts of all elements of our population," he said. "It is a strength built up of the closely knit sum of industrial, economic and military potentials which are welded together by a common objective and a common determination to achieve great national teamwork."

He emphasized the importance of the great transmitter in an era when nuclear power for ships promised to become a reality. Such ships would be able to remain at sea for long periods, indicating "an increasing need for the use of effective radio in directing our tremendous and complicated maritime operations," he said. Referring to the ability of the transmitter to communicate through water as well as air, he added that "we must be able to talk not only to ships on the surface, but we must also be able to communicate with the elusive submarine and with the planes on their sundry missions in the air."

Rear Admiral W. B. Ammon, Director of Naval Communications, explained that the need for the unprecedentedly powerful transmitter had emerged after World War II with recognition that the naval communications system was inadequate to support world-

wide naval operations in time of peace. Since many ships, such as submarines and smaller surface craft are unable to carry extensive antenna systems, he said, "reliance must be placed on powerful transmissions to overcome this handicap and to make sure that any forces operating independently or submarines on war patrol receive combat orders and information promptly." The requirements could be best met by a powerful very low frequency broadcast, requiring large and complicated equipment, he said — and the result was the beginning of the Jim Creek project.

### *Greater Developments Predicted*

Even as the giant transmitter went into operation at the highest power level ever employed in radio communication, General Sarnoff cautioned against any inclination to regard it as the ultimate in communications. More powerful transmitters may yet be built, and better means will be discovered to communicate with the fleet, he said.

"When we look at this big structure, we must remember that while its skeleton is concrete, steel and copper, its heart is the electron — the tiniest thing in the universe," General Sarnoff said. "For forty-seven years I have lived with the electron, and my experience points to one conclusion: great as the electron's achievements have been, we are still in the horse and buggy era of its development. It is not difficult to visualize the day when the electron will carry sight as well as sound to our armed forces around the world."

Already we possess the scientific knowledge to make television world-wide, he said. It is technically possible to circle the globe with a land chain of microwave relay towers, to equip aircraft with relay equipment to form an aerial bridge across an ocean and to lay coaxial cable across the ocean floors to carry both sight and sound internationally. And such advances, he said, "will lead to new uses of the electron for military as well as commercial purposes."

### *Details of the Installation*

The background of the dedication ceremony, attended by about 200 naval, industrial and governmental leaders, was a squat, concrete building nestling in the deep valley between steep slopes and roofed by a web of antenna slung between the ridges looming 2700 feet above the valley floor on the north and south.

The entire assembly — known already to Navy communications men as "Big Jim" — is the answer to a set of requirements determined by the Navy's Bureau of Ships and specified in a contract signed with RCA in 1947. The site itself was chosen on the basis of terrain suitable for the massive antenna, access to the electric power of Bonneville Dam, the nearly ideal ground con-

ductivity of the area, relative access to supply lines in contrast to even more remote sites, and security in the event of a war. For six years, in cooperation with Navy experts, the skilled staff of the Engineering Products Department of the RCA Victor Division worked out details and construction of the extremely powerful transmitter while the unique problems of antenna arrangement and assembly were overcome by the specialists of RCA Communications, Inc.

The transmitting equipment, manufactured at the RCA Victor plant in Camden, N. J. and transported to Seattle aboard 27 freight cars for trucking into the remote valley over a road cut through by the Navy, occupies most of the two-story concrete building at the heart of the installation. On the ground floor are power transformers, switch-gear, pumps, water tanks, heat exchangers, telephone cable terminals and shops for servicing the equipment. The transmitter itself — actually a combination of two 500,000 watt transmitters — is located on the second floor. Its very low frequency transmission ranges from 14.5 to 35 kilocycles, as compared with the 550 to 1600 kilocycle range of the standard broadcasting band for commercial radio.

#### *Antenna System is Spectacular*

The signal goes out over an antenna system that forms the most spectacular feature of Big Jim. This is not the first use of mountains to replace high towers for antenna — it has been done before at Haiku, Oahu, and Trinidad, B.W.I. — but it is by far the largest and most complicated arrangement of the kind ever undertaken.

The ten antenna spans, or catenaries, soar across a space ranging from a little over a mile to a mile and two-thirds from one ridge to the other, forming a zig-zag pattern over the floor of the valley. Twelve 200-foot towers along the crests of the ridges support the heavy spans, the longest of which stretches over an 8,700-foot gap. At the mid-point above the valley, the spans sag as much as 1,063 feet to allow for wind and ice conditions expected in the area, and from the lowest point of each span plunges a cable down to the towers of the system connecting the antenna with the transmitter. The whole antenna system is divided into two sections of five spans each. With the transmitter also divided into two units, this makes possible the operation of one half of the station in case the other half should be out of service for any reason.

The site of the powerful station was selected by the Navy after a careful survey of all possible locations in the Puget Sound area, and the initial measurements, including erection of a single wire 8,000-foot antenna span for test transmission, were characterized by Admiral Ammon at the dedication ceremony as "a story to match

any of those in the history of the taming of the West." Before the full system now in operation could be installed, the Navy spent nearly a year clearing thousands of Douglas firs from the valley slopes to facilitate rigging, eliminate the danger of forest fire, and, most important, improve the efficiency of the transmitter. Trees, it appears, absorb large quantities of the energy radiated by the antenna.

RCA experts had also to cope with a substantial problem created by the electromagnetic field around the transmitter. The field generates enough electricity to spark across a foot-wide gap, and to ground the system, copper shielding and a ground screen were installed in the transmitter building while more than 200 miles of copper wire were laid in a radial arrangement of buried ground conductors. As an added point, the transmitter building was constructed to resist earthquakes.

In operation, Big Jim requires a permanent staff of 4 officers and 70 enlisted men, plus 35 civilian employees. Most of the personnel will live in quarters on the 725-acre site, and the remainder in Arlington, Wash., some 11 miles away.

The installation will be a relatively self-sufficient community with its own water and sewage disposal system, a completely equipped fire house, and electricity from Bonneville Dam — the primary source of power for the transmitter itself.

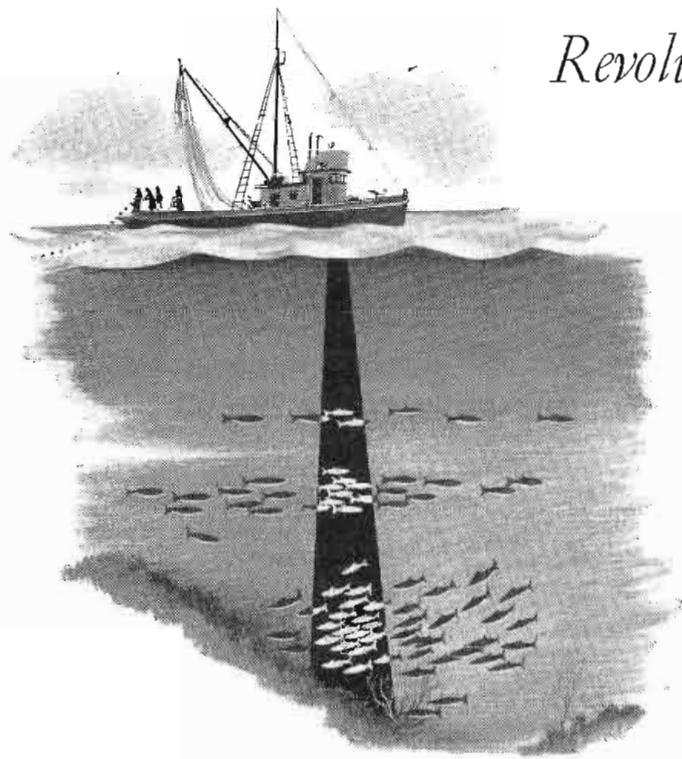


Commander G. W. Warren, Officer in Charge of Jim Creek station, looks on as enlisted men operate code perforator machine, center, and receive teletype tape.

# No Secrets Beneath the Ocean for

## *the "FISH FINDER"*

*Revolutionary Device Tracks Down and Identifies  
Fish in the Sea for Men on the Trawlers*

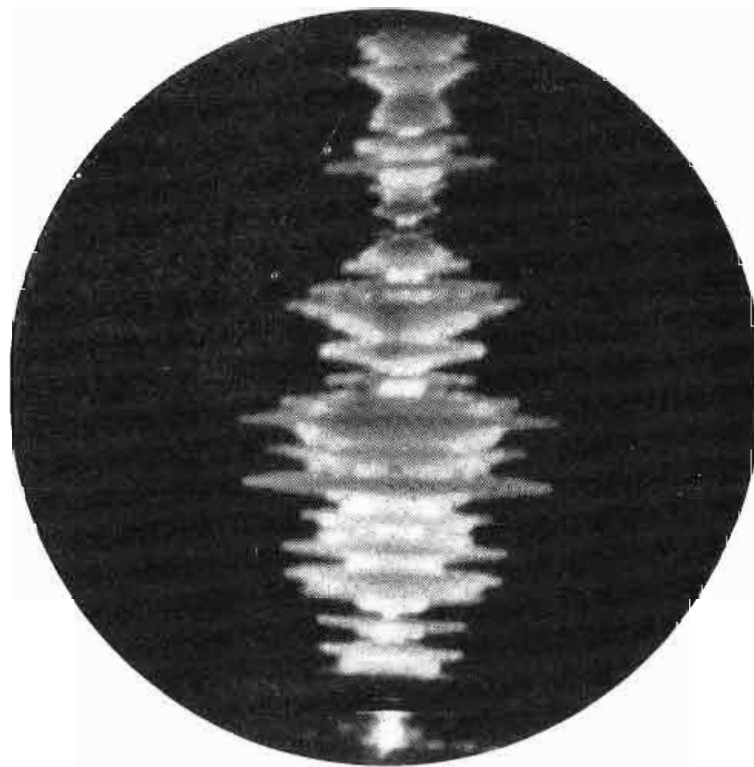


By George P. Aldridge

*Vice President in Charge of Sales and Government  
Contracts, Radiomarine Corporation of America.*

**I**N the late fall of 1953, the trawler *Flying Cloud*, out of Boston, made fishing history by dropping its nets unerringly into schools of haddock and cod off the New England coast and returning to port with a rich harvest days ahead of the normal schedule for a full catch. The secret was an uncanny electronic device that arms the fisherman with information that has been available in the past only to the fish themselves.

The *Flying Cloud* was the first American commercial vessel to be equipped with a revolutionary device that removes the guesswork from fishing by scanning in radar fashion beneath the water with an accuracy that distinguishes between varieties of fish and picks out even a single fish, describes the condition of the ocean bottom and warns of obstacles on which nets might snag. On the basis of its spectacular performance, the equipment has been ordered for installation in the six trawlers of the Irving Usen Trawling Company, owners of the *Flying Cloud*, and considerable interest has been aroused among other fishing concerns faced with the problem of tracking the great schools of food fish as they move away from their traditional grounds to less familiar areas of the sea.

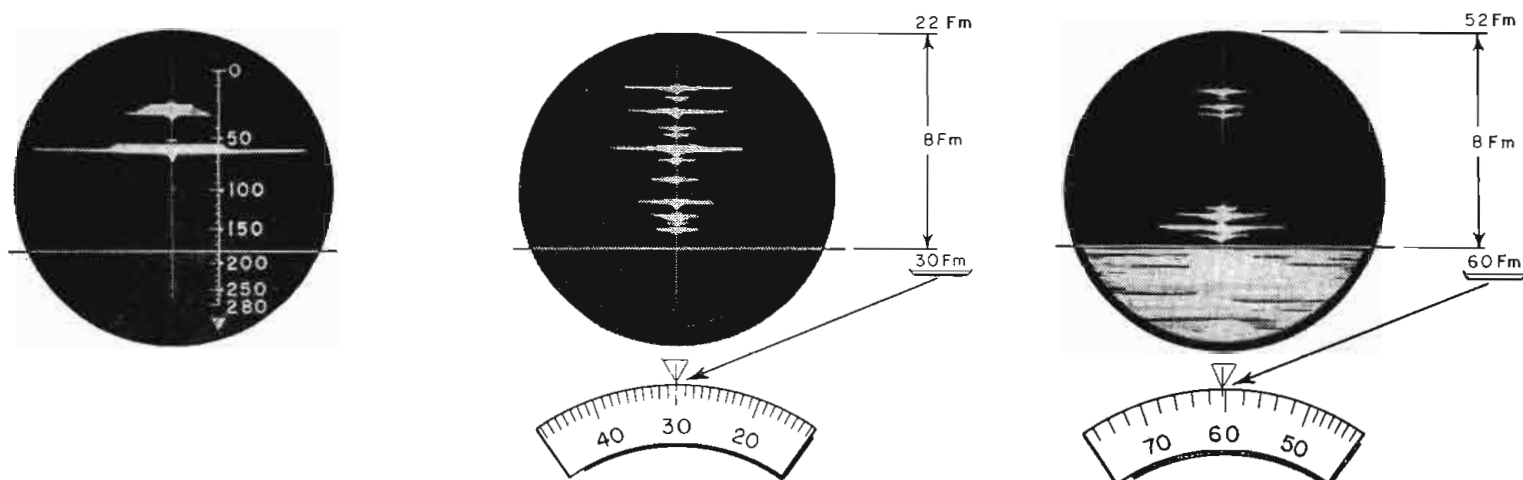


This photograph of the Fischlupe's cathode ray tube shows a school of fish sighted during a test run.

The fish finder, developed by Electro-acoustic G.m.b.H. of Kiel, Germany, is being distributed by the Radiomarine Corporation of America. As installed aboard the *Flying Cloud* for several experimental trips, the equipment comprises a finding unit known as Fischlupe (combining the German word for fish and the French term for the small magnifying glass used by watchmakers), and a recording depth sounder known as the Echograph. Prior to the commercial tests, similar units had been installed for test purposes aboard the motor vessel "Oregon," of the United States Fish and Wildlife Service. During all of the experimental phases, a team of Radiomarine engineers, headed by Melvin Schoenfeld, assisted in the operation and adjustment of the equipment to its maximum effectiveness.

### *Gives Constant Picture of Sea Beneath Ship*

The Fischlupe unit gives a running picture of the waters beneath the ship down to an effective range of



From left to right, drawings show Fischlupe tube face with range control (1) set at fixed range, showing sea bottom at 60 fathoms and school of fish at 30 fathoms; (2) selecting 8-fathom section from 22 to 30 fathoms to show depth of school; (3) selecting 8-fathom section at sea bottom to locate fish swimming at greater depth.

280 fathoms (1680 feet), on the same basic principle employed by radar in spotting objects in the air. Powerful supersonic signals are sent downward from the ship and are reflected by the sea bottom and all objects between. The echoes, bouncing back from the sea bed, rocks, wrecks, layers of plankton and fish, appear as light reflections on the face of a cathode ray tube equipped with a calibrated scale indicating the depth of the reflecting object.

The appearance of a school of fish, which shows up on the tube as a set of short, horizontal traces of light, is the first step for the fisherman. Reading the depth of the school from the calibrated scale, he can turn to a range control switch permitting him to view an 8-fathom (48-foot) vertical section anywhere within the total range — giving him, in effect, a substantial enlargement of whatever he wishes to see. This 8-fathom enlargement may be moved up and down the total range, making possible the accurate measurement of the depth and density of the school.

The Fischlupe does its job with remarkably few controls. The range control switch has only two positions — Fixed, to cover the normal maximum range of 280 fathoms, and Variable, to select an 8-fathom section between the ship and the sea bottom. The depth scale is controlled by another knob, permitting its adjustment to any depth setting up to an extended range of 320 fathoms. The only other manual dials are a sensitivity control, which sets the picture on the cathode ray tube at the desired intensity, and a dimmer control, operating as a rheostat for the panel lights and dial scales. An eight-day clock on the front panel helps the fisherman to determine the extent of a school by estimating the time required for the ship to pass over it at a given speed.

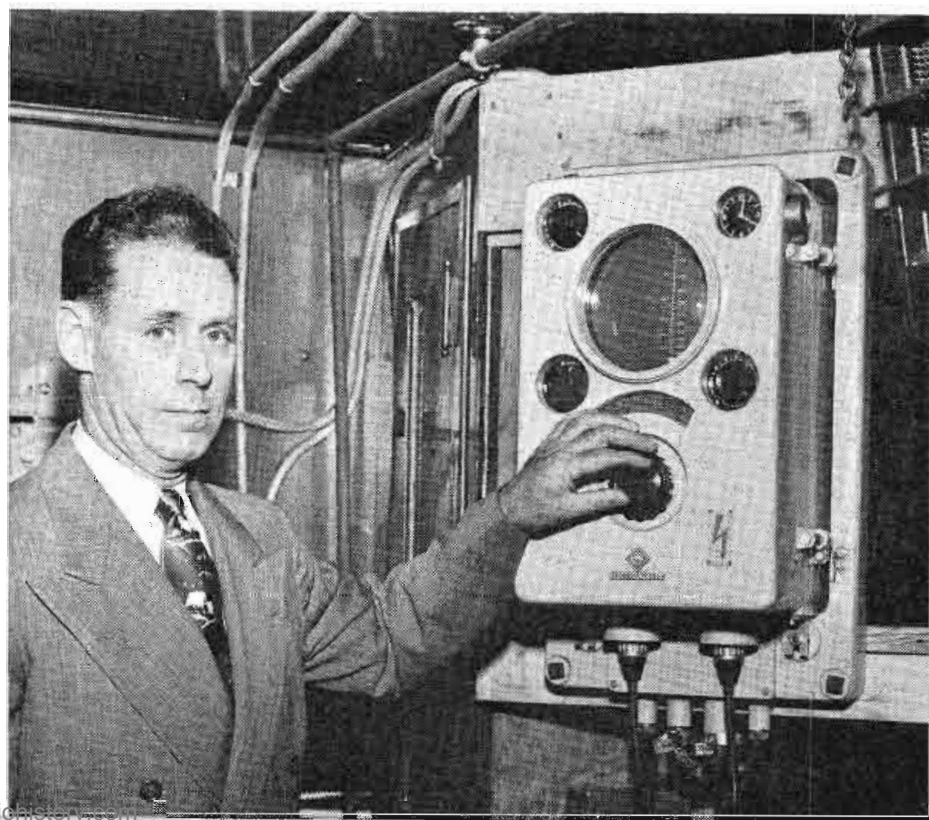
Captain Richard Dobbin, master of the *Flying Cloud*, reported at the end of the profitable first run

Captain Richard Dobbin, master of the trawler *Flying Cloud*, shows Fischlupe installation aboard vessel.

that the equipment did not stop at merely finding the schools.

"I can tell the difference between hard and soft bottom, large haddock and small haddock, and cod and haddock," he said. "I can even pick out single fish — easily spot a dogfish. Unless I see a large catch on the Fischlupe, I never drop my nets."

While the Fischlupe can serve as a normal depth sounder in addition to its duties in locating fish, the new Echograph is being installed in the Irving Usen trawlers to obtain a permanent record of the sea floor and underwater conditions. Operating on the same basic echo sounding principles as Fischlupe, the Echograph produces a lasting record of the underwater information on 8-inch-wide, electrosensitive dry recording paper. Working in tandem with Fischlupe, it supplements the radar-type fishfinder by preserving in permanent form the navigational and survey information that will help the fisherman to set his nets most efficiently and to return on future voyages to the most heavily populated fishing grounds.





# *Blood Counting is Speeded by Electronics*

Sanguinometer Uses Television and Unique Computer to  
Total Microscopic Particles Swiftly and Accurately

The television camera has been turned into the eye of a simple and ingenious computer to count microscopic particles such as blood cells, bacterial cultures or grains of photographic emulsion. The system, known in its laboratory stage as the Sanguinometer, was developed by a team of electronics engineers at the David Sarnoff Research Center of RCA in Princeton, N. J., working in close cooperation with the Sloan-Kettering Institute, research unit of the Memorial Center for Cancer and Allied Diseases, in New York.

The equipment was devised to provide a simple, rapid and accurate mass method of taking blood counts to detect the first signs of radiation sickness among persons in the target area of an atomic bomb. A blood count is an important indicator in many diseases and in those circumstances where anemia may be a complication, such as overexposure to radiation which may occur during atomic attacks.

In addition to this possible emergency use, its application is foreseen in hospitals and research centers to perform almost instantaneously and with a minimum of error a process that has long been a laborious, time-consuming and often unprecise manual operation in laboratory work.

The Sanguinometer is essentially a closed-circuit industrial television system combined with an optical microscope and a novel computer that has the ability to make a count of particles in a given field by means of a unique electronic circuit developed by L. E. Flory and W. S. Pike of the technical staff, RCA Laboratories Division. The television camera, substituting for the eye of the observer at the eyepiece of the microscope, feeds the information which it "sees" to both the computer and a monitor viewing screen used in the developmental version to help in focus and illumination of the microscopic specimen.

The development of the sanguinometer was carried out together with Dr. Leon Hellman, of the Sloan-Kettering Institute, who encouraged use of the television "eye" as the basis of a rapid counting system and worked closely with the RCA technical staff both in adapting the controls into a simple form suitable for

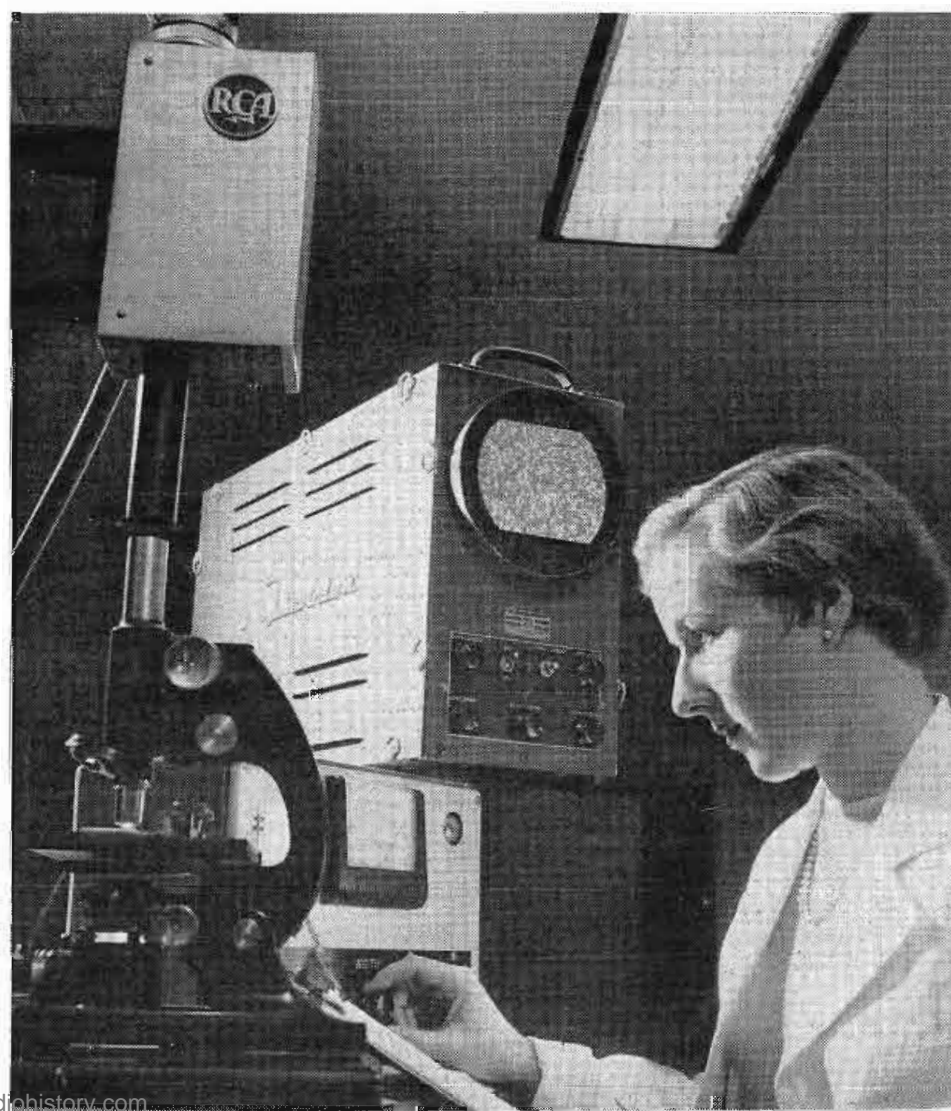
The Sanguinometer undergoing tests at Sloan-Kettering Institute in New York. Television camera attached to microscope in foreground feeds information to computer, center, and to monitor in background.

clinical use and in conducting tests of the instrument on samples of human blood.

## *Video Pulses Operate Counter*

In operation, the camera tube of the Sanguinometer, scanning the specimen under the microscope, sends out video pulses as the scanning beam strikes the images of particles to be counted, and the pulses in turn actuate an electronic counter. As in all television processes, the beam scans its field of vision from side to side, progressing downward in a series of parallel lines. The lines are so close together that in a normal microscopic magnification each particle to be counted interrupts several lines as the scanning beam moves across the field, and consequently produces several pulses in the output of the television system. This means that large particles will interrupt more lines and produce more pulses individually than will small ones, and that the counter would be unable to distinguish between a large number of small particles or a small number of large ones unless compensation were made for their size.

*(Continued on page 32)*





NBC Studio 5H at opening in December. Technicians man console while broadcast coordinator occupies glass-paneled booth at left, facing large monitor panel at right of picture.

## *New Flexibility for TV in NBC Studio 5H*

By Leonard Hole

*Director of Production, National Broadcasting Company*

**F**OR the first time in television history, the National Broadcasting Company last month placed at the fingertips of one man the ability to weave into a unified program the fast-breaking elements of a news story or major public event involving widely scattered locations throughout the country, and to break into any outgoing television program with news bulletins or emergency announcements.

The revolutionary control is built into a compact suite known as TV Coordinating Studio 5H at the heart of the NBC television complex in Radio City, New York. Its entry into service solves a combination of needs that had become apparent to the NBC broadcast operations and engineering staffs over the past few years. From the standpoint of news coverage, for example, the facilities of Studio 5H embody lessons learned in television treatment of the political conventions and the election campaign of 1952, when rapidly shifting action underlined the need for a central point at which a single coordinator might view material picked up by various cameras and switch the outgoing program from one to another to keep pace with developments of greatest interest. Frequently, too, important news flashes were delayed by the somewhat complicated job of cutting into studio programs being broadcast over automatically pre-set circuits.

The solution to these two problems, among others, has been built into Studio 5H. The result for the television viewer will be more rapid handling of important news flashes, more complete and smoother presentation of major news events, conventions and campaigns, sports roundups and other far-flung features calling for simultaneous coverage in several widely separated areas. For the future, it will make a practical reality of program concepts that have been up to now only a planner's dream.

### *Originally Planned as a Film Studio*

The finished studio was several years in the making. Originally, 5H was planned principally as an additional television film studio to cope with increased program schedules. Before the NBC staff had finished with its planning, however, the project had grown into a complex \$375,000 unit capable of originating film programs and integrating film with live programs, originating substitute film programs in case of scheduled program failure, broadcasting network identifications, local spot commercials and apology announcements when necessary, originating spot news bulletins or emergency announcements, combining incoming programs from sources outside Radio City, and coordinating all broadcast transmission so that emergency changes in program routine could be handled swiftly and smoothly. The circuits through which these processes are accomplished are

capable of handling compatible color as well as black-and-white television programs.

The nerve center of the completed studio is a glass-enclosed booth occupied by the broadcast coordinator. Spread out before him, beyond the glass, is a long console with positions occupied by a program producer, a director and technicians controlling sound and picture signals. All face a large monitoring panel, studded with an array of monitor screens presenting a constant view of outgoing programs and of incoming signals from as many as ten outside cameras.

In the event of a major news development, the coordinator can see on the ten receiving monitors the pictures being picked up by NBC news and mobile units covering the story, and, with the help of the technicians, he may select and put on the air at any moment the action of greatest interest. A special 10-position telephone communications systems allows him at the same time to maintain direct contact with the camera units for advice and direction.

Studio 5H also is equipped with a "live commentary" booth for a commentator or announcer who may be called upon to play a part in any special events program. The booth is fitted out with a console for the announcer and a television camera which focuses upon him while

he talks, feeding the picture to one of the incoming program monitors from which the coordinator selects his program material.

#### *Vidicon Cameras Used*

The film equipment of Studio 5H includes two iconoscope film camera chains, two Vidicon film pickup cameras and their associated projection devices. The whole unit can handle both 16mm and 35mm film, film strips, opaques and transparencies.

The tiny Vidicon used in two of the cameras is the smallest television camera tube ever developed for broadcast use. A product of the Tube Department of the RCA Victor Division, the Vidicon was used for the first time in regular broadcasting on Oct. 12, when NBC employed it in two local and network film programs. The tube is only one inch in diameter and six inches long, and its small size and simplicity make possible a simpler, more compact and lower-cost television film camera for broadcast use. As used in the broadcast film camera, the Vidicon is a refinement of the tube originally developed by RCA and now widely used in industrial television. The Studio 5H installation has left room for two more Vidicon cameras in the future.



Satyavati Buch, of India, at work with the electron microscope at the RCA Victor laboratory in Camden, N. J.

## Indian Woman Scientist Plans Fight On Cancer with Electron Microscope

A cancer research program based on electron microscopy will be established in Bombay by a youthful Indian woman scientist as a result of her recent studies of the RCA electron microscope at RCA Victor's Camden, N. J., laboratory.

Twenty-eight year old Satyavati Buch, whose educational visit was arranged under a U. S. State Department public health fellowship, concentrated her studies at Camden on the most advanced technique for operating the electron microscope as a research tool.

A proponent of the theory that cancer is caused by a virus, Miss Buch, now en route to Bombay, plans to study typical cancer tissue under the fabulous magnification of the electron microscope in the hope that it will expose the virus. India has two RCA electron microscopes, gifts of the American Point Four Program, in use at the University of Bombay and at the National Physical Laboratory in Delhi. Nearly 500 RCA electron microscopes are now being used by medical centers, universities, laboratories, government bureaus, manufacturers, and other important centers of research throughout the world.



## *World of Electronics Produces a Long-Run Hit Show*

By Harry P. O'Brien

*Manager of the RCA Exhibition Hall*

ALTHOUGH "science fact" may not be any stranger than science fiction, the real thing is just as popular as the fantasy when it is presented with clarity, color and imagination. This has been proven by the Radio Corporation of America in the RCA Exhibition Hall, designed to give the public an understanding of the present and a glimpse into the future of this electronic age.

Inside the glass-fronted showcase, located across the street from the RCA building in Radio City, New York, is a miniature world's fair of science that demonstrates how electronic development is affecting life in the 20th Century. And like the wheel of fortune, the revolving door that leads into the wonderland of electronics keeps turning, turning, turning. More than 8,000,000 people in six years have visited the Hall to see the latest "miracles" that science has wrought — from an electron microscope to a large-screen color television set.

Whenever new products and developments are perfected in the RCA laboratories, they are introduced to the public in the Exhibition Hall and, when possible, actual demonstrations are performed. Currently, visitors can see the steps involved in the manufacture of the revolutionary transistor, a diminutive device that is replacing the vacuum tube in certain vital electronic functions; they can view the delicate processes involved in the making of an electron tube, and alongside these they may see the most recent technical products that have been developed.

Besides its exhibit of scientific developments, the Hall houses a wide assortment of RCA products, ranging from RCA Victor portable radios to RCA Estate gas and electric ranges. This attractive display has caused the Hall to pay off in more ways than just good will and prestige. According to RCA Victor dealers, visitors frequently are "pre-sold" in the Hall, and many, after leaving, order products they have seen exhibited.

### *Amusement Blended with Science*

Because amusement has been skillfully blended with science and information, the Hall attracts persons of all ages and interests. Sightseers can watch programs on a television screen (no small item during the World Series), hear RCA Victor recordings on request, and even stand before a TV camera and see themselves on a special viewing screen.

This feature, called "See Yourself on Television," has been one of the biggest drawing-cards in the Hall. Millions of ordinary visitors, frustrated actors and professional TV performers have stood before the image orthicon camera staring in amusement, "performing," or checking costumes and facial expressions before a telecast.

One young man used to appear every time Arturo Toscanini was scheduled to broadcast with the NBC Symphony Orchestra. As a radio brought the symphonic music into the Hall, he would stand before the self-television camera and, surrounded by other visitors, watch himself conduct as he thought the Maestro might be doing it. The "audience" in the Exhibition Hall usually applauded the young conductor's performance.



## *Seen by More than 8,000,000 at RCA Exhibition Hall*

Another entertainment feature is the Dave Garroway News Center on the main floor of the Hall. Garroway broadcasts the television shows "Today" each morning from 7 to 10 and has as a live audience passers-by who can see the show through the window from the sidewalk outside the building. Often during the telecasts the camera turns the audience into participants by switching from the show to the crowd outside. One morning recently, both the spectators and the professionals on the show were surprised when the camera picked up former President Harry S. Truman, who happened by on a morning walk just as the camera was scanning the audience. When the Hall opens at 11 a.m., the News Center serves as an exhibit of all the electronic equipment required to produce a network television program.

### *Hall Has Small Theater*

On the floor beneath this industrial and scientific display, RCA has constructed the small, acoustically perfect Johnny Victor Theater. To the last detail, it is completely modern in equipment and functional in design.

Business organizations, cultural groups, fraternal and charitable societies and school groups can meet in the theater, free of charge, to view films, hold discussions or watch television programs. Questions of international scope have been debated behind the soundproof walls when Iranian oil officials, for example, met there, or when United Nations delegations have used the room. Not without some justification, the theater has been

labelled a second U.N. General Assembly, for in the last two years some 50 U.N. delegations have booked the theater and the adjacent lounge for meetings, films and television viewings.

In order to arrange reservations for the theater, answer queries about RCA from all over the world, conduct tours of the Hall and maintain the complicated electronic equipment, the Hall employs a staff of twenty-six, including a manager, three assistant managers, a secretary, technicians, engineers, maintenance men, porters and guides.

When the Hall first opened six years ago, many showmen predicted that the automatic counters at the door would never click past the one million mark, because the public would not be interested in so technical a subject as electronics. But instead, the average attendance has been well over a million a year, and it is increasing annually.

Aside from the fact that scientists and industrialists are now realizing what fiction writers have known for a long time — that people are fascinated by the "magic" of science — there is perhaps another reason for the overwhelming success of the Hall. Many can still remember the prophets of electronics who, in a wilderness of skepticism, predicted that radio and television one day would be an integral part of our lives. Now that it is evident that the comparatively new science is going to continue making today's mode of living obsolete tomorrow, the public may well feel determined not to be caught off guard again when it comes to this fabulous business of electronics.

## Licenses and Royalties

*(continued from page 16)*

the RCA, after December 31, 1954, royalties on all radio, television and other electronic patents in our field which they use and which were developed by GE, Westinghouse, the Telephone Company or RCA before December 31, 1954.

Second, it is the opinion of our experts—and I fully share it—that the most important inventions for the future of our business and for the business of those whom we license, are not the GE and Westinghouse inventions.

Among the areas for licensing which we regard as most important, are color television and transistors. In color television I'm sure you all know that RCA has made the basic inventions. In transistors the basic inventions have been made by RCA and the Telephone Company.

So, while we naturally hope to be able to sub-license under Westinghouse and GE inventions, nevertheless, we feel that the inventions of our own Laboratories, and the patents and applications on them, are of such value for the future that they represent the important inventions in our field.

Another point not generally appreciated is that because we are in the patent licensing business we take the disadvantages that go with that business as well as the advantages.

### *Policy Encourages Competition*

If RCA were not in the business of licensing its competitors on the inventions which it makes, we would be the only one able to market our own important developments and to retain for the RCA all the benefits from such exclusivity. As matters stand now, we share our inventions with our competitors at a very moderate royalty rate of less than two per cent of the manufacturers' selling price of apparatus which uses our inventions. And, our very liberal license agreements contain no restrictions at all as to price, quantity, territory or anything else.

In fact, it is this liberality in our licensing policy which has contributed to making the television industry the highly competitive industry it is today. If RCA were to give up its licensing business and stop licensing the rest of the industry, it would be RCA's competitors who would suffer most in relative standing and not the RCA.

Some of our largest competitors have become successful and have grown prosperous because they benefited greatly from the research and development work of the RCA. The pioneering efforts of RCA have opened new fields of opportunity for the entire industry.

I believe it will also be conceded that we would not have the highly competitive, highly successful television industry that we have today, were it not for the positive assistance which RCA has made available to its competitors through its inventions, licenses, "know-how" and pioneering efforts to create and develop new products and services for the public.

We are confident that we have basic inventions in the important fields for the future of our business irrespective of what may happen to our sub-licensing rights. For that reason, we believe that an RCA license will continue to have as great or even a greater value for our competitors after 1954, than it has today.

## Hagerty Named

*(continued from page 9)*

the Board created by the resignation of Mr. John K. Herbert from NBC.

At NBC, George H. Frey has been promoted to Vice-President in Charge of Television Network Sales. Thomas McAvity was elected Vice-President in Charge of Television Network Programs and Carl M. Stanton became Vice-President in Charge of the Film Division.

Dr. Douglas H. Ewing was named Director of a newly-formed Physical and Chemical Research Laboratory of the Research Department, RCA Laboratories Division, with headquarters at the David Sarnoff Research Center in Princeton, N. J. Dr. Ewing was formerly Director of Research Services for the Division.

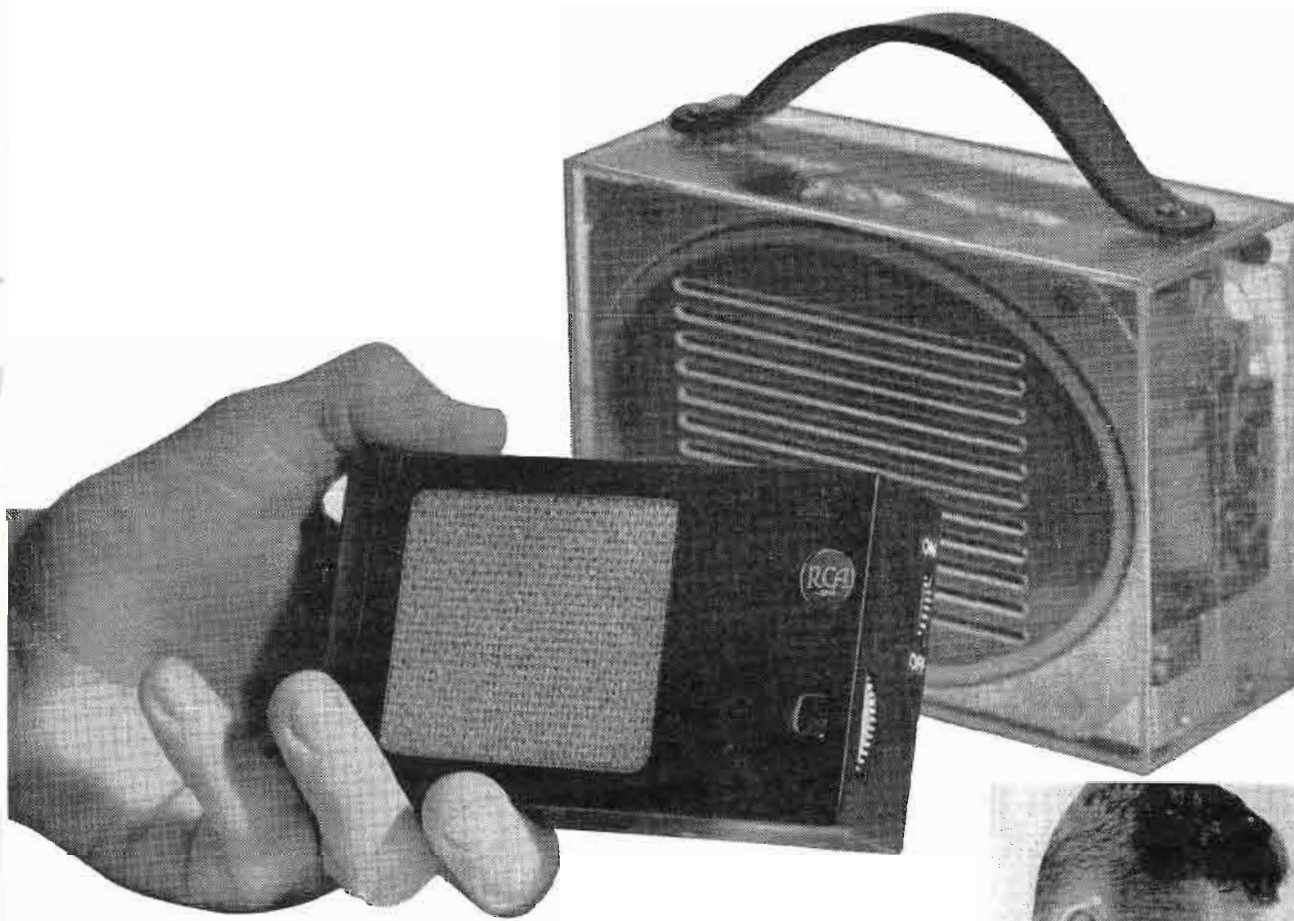
In other RCA Laboratories' promotions, Ralph S. Holmes was appointed Director of Research Contracts, responsible for the administration of governmental and university contracts as well as the supervision of publications of the Division. Arthur W. Vance has become Director of the newly established Special Projects Research Laboratory of the Research Department.

## *Now a Portable Battery Kit*

### *Lets a Man Shave Anywhere*

A handy battery kit that will allow the owner of an electric razor to do his shaving anywhere is now being produced by the Tube Department of the RCA Victor Division.

Designed for travelers, fishermen, hunters, campers and anyone else who takes to the open spaces, the RCA Shaver Battery Kit is built around two batteries and a standard-type receptacle into which any AC/DC electric shaver can be plugged. The elements are packed into a small simulated leather traveling case with a flap-over top that protects the plug, and the assembly is removable for easy replacement of batteries. The whole unit was designed to fit into luggage or outdoor gear.



Transistorized broadcast radio receiver capable of fitting into a breast pocket is shown in comparison with an earlier model equipped with a 4 x 6-inch speaker.

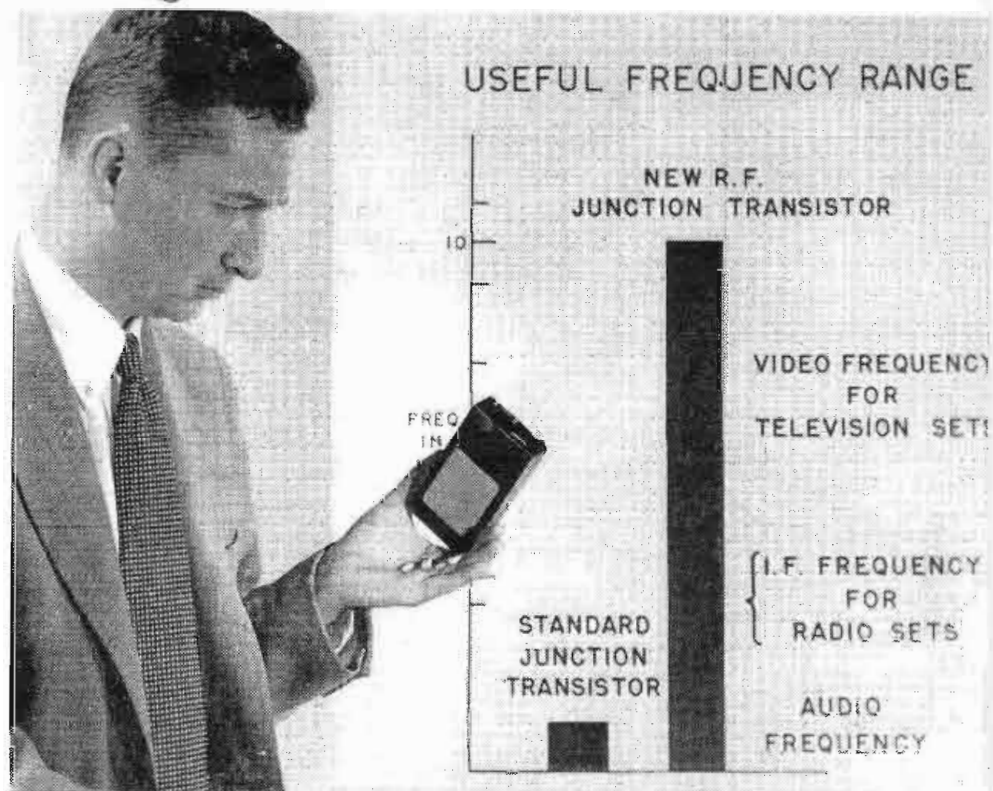
## *Tiny Broadcast Receivers Use Improved RCA Transistors*

An experimental radio broadcast receiver that fits into the breast pocket of a man's suit is the latest by-product of transistor research and development at the David Sarnoff Research Center of RCA in Princeton, N. J. Weighing only a pound, the tiny receiver has an audio output comparable to conventional small portable radios built with tubes.

The new receiver is considerably smaller than an earlier experimental transistorized receiver with a 4 x 6-inch speaker. The larger model (see RADIO AGE, Volume 12, Number 4) compares in sensitivity and fidelity with table model receivers several times its size. Both of the transistorized sets are powered with small flashlight batteries. Although they are still in the laboratory stage, both have been extensively field tested.

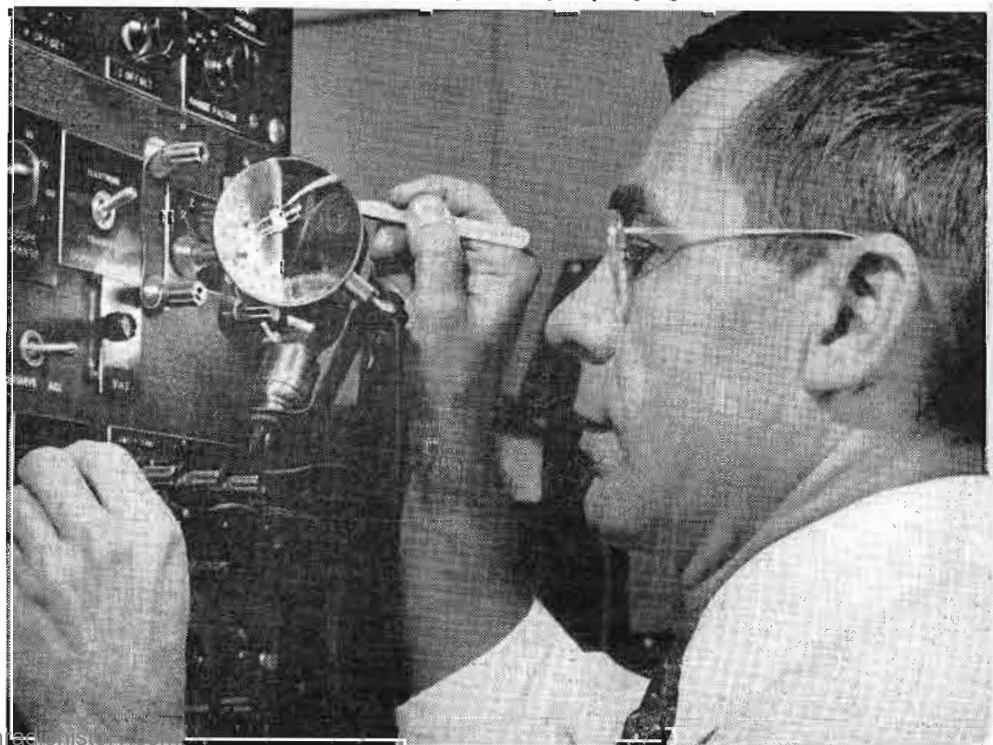
These new approaches in portable radio broadcast receivers have been made possible by RCA's development of simply-constructed junction transistors that amplify signals at frequencies as high as 10 megacycles.

The amplification of high frequency signals has been enhanced in the new RCA experimental transistors by the drilling of a "well" in the center of a germanium crystal wafer, leaving a layer less than 1/500 of an inch in thickness. Before their application in the unique receivers, the transistors have been exhaustively tested.



David D. Holmes, co-developer of the miniature set, holds it against chart showing performance of new transistor, three of which are in the palm of his hand.

Below, Dr. C. W. Mueller, RCA scientist, checks experimental transistor, seen through magnifying glass.



## 19-Inch Tri-Color Tube Is Developed By RCA

Development of a 19-inch tri-color television picture tube was announced by RCA to its tube licensees on December 31. The new tube is of the shadow-mask type, similar in construction to the 15-inch tri-color tube which RCA plans to introduce in its first color sets.

Announcement of the larger tube was contained in a letter to the licensees from Ewen C. Anderson, Vice President in Charge of the Commercial Department, RCA, together with an invitation to the licensees to attend a demonstration and technical discussion of the tube on January 21 at the David Sarnoff Research Center of RCA in Princeton, N.J.

The symposium will be the third in six months for the licensees, under the RCA policy of spreading the results of its research and development as widely as possible through the industry. Last July 15, the licensees attended a symposium on the RCA 15-inch tri-color tube, and in August they visited the tri-color tube pilot plant in Lancaster, Pa., to see and discuss production processes and equipment.

## Blood Counting

*(Continued from page 23)*

This obstacle was overcome with an ingenious diameter compensation circuit that is able to determine the average size of the particles by taking account of a direct relationship between the average time duration of the pulses and the diameter of the particles. This indicates the number of video pulses created by each particle, a figure that is electronically fed to the counter where it divides the total number of pulses to give an automatic reading of the actual number of particles.

The entire process, as performed by the latest laboratory model of the Sanguinometer, is both simple and far more rapid than any manual count. Once the slide is prepared and put under the microscope, the operator manipulates a single control knob on the counting meter until an electric eye tube on the meter case is closed. This indicates that compensation has been made for the average diameter of the particles to be counted. It is then necessary for the operator only to read the meter to determine the number of particles in the field of the microscope.

The Sanguinometer has indicated in tests that it is capable of handling with only a small margin of error a count of many varieties of microscopic particles as long as the particles within any one specimen are nearly uniform in size. It is not suitable for counting particles whose sizes and shapes vary widely in a single specimen.

## Video Tape Recording

*(Continued from page 15)*

changes the magnetic polarity of the magnetic oxide particles on the tape so that they become a compact code of the original signal.

For playback, the tape is drawn across the same, or a similar head. The magnetic "shorthand" on the tape causes an alternating current to flow in the windings around the reproducing head. The reproduced current closely duplicates the original signal.

Although the principles are similar, the engineering problems are not; audio recording is today an easy task compared with video recording. The reason is that audio signals are in the range of 20 to 20,000 cycles per second, while video signals range up to 4,000,000 cycles per second. Color television signals, as now formulated, must carry at least twice as much pictorial information as black-and-white. Video tape also must carry the associated sound signals along with this pictorial information.

RCA research has resulted in specially developed recording and reproducing heads which respond to frequencies many times above the cut-off point for the recording heads used in sound recording on magnetic tape. This means that the speed of the tape across the head has been brought within manageable limits. The equipment demonstrated on Dec. 1 had a tape speed of 30 feet per second. Advanced equipment now under construction will move the tape at a lower speed, and with time, further reductions of tape speed appear likely.

The magnetic tape reels of the present laboratory equipment are 17 inches in diameter and will record 4 minutes of a television program. RCA is working now for a reel 19 inches in diameter which will carry a 15 minute program.

For video tape recording of color television with the RCA system, five parallel channels are recorded on a single magnetic tape  $\frac{1}{2}$ -inch in width. There is one recorded channel for each of the primary color signals (red, green, and blue), for the synchronizing signal, and for the sound signal. For black-and-white recording the tape carries two recorded channels, one for the video signal and the synchronizing signal, and one for the sound signal. For black-and-white television, a  $\frac{1}{4}$ -inch wide tape would suffice.

To rebroadcast a color television program from a tape recording made on the equipment shown at Princeton, it is necessary to combine the three primary color signals with the synchronizing signal to form a composite signal to send to the transmitter. While this operation is not yet ready for demonstration, Dr. Engstrom said that it is the subject of current development that will provide the necessary apparatus to produce this result.





## You're funnier than Berle... better than Pinza!

### Make your debut on the new RCA Push-Button Tape Recorder

A push of a button—and *you're on!*

The new RCA Tape Recorder proves it: yours is without question the greatest theatrical family of all time. Well, better than the Talbots next door, anyway.

There are countless hours of entertainment and years of precious memories built into this electronic wonder—the finest portable tape recorder made. And it has its practical side, too.

You can tape your favorite radio programs and the sound portions of top TV shows. Your children can use the recorder to polish up on piano lessons—and there's no better way for you to rehearse important business talks and speeches. You can keep your recordings forever—strong and clear. Or erase them on the spot.

But mainly this versatile recorder will be the sound and voice of your family. Birthday parties, holiday gatherings, weddings—captured for a lifetime on tape!

The RCA emblem is your assurance of perfect tonal clarity, of top operational ease, and of many, many years of dependable wear.

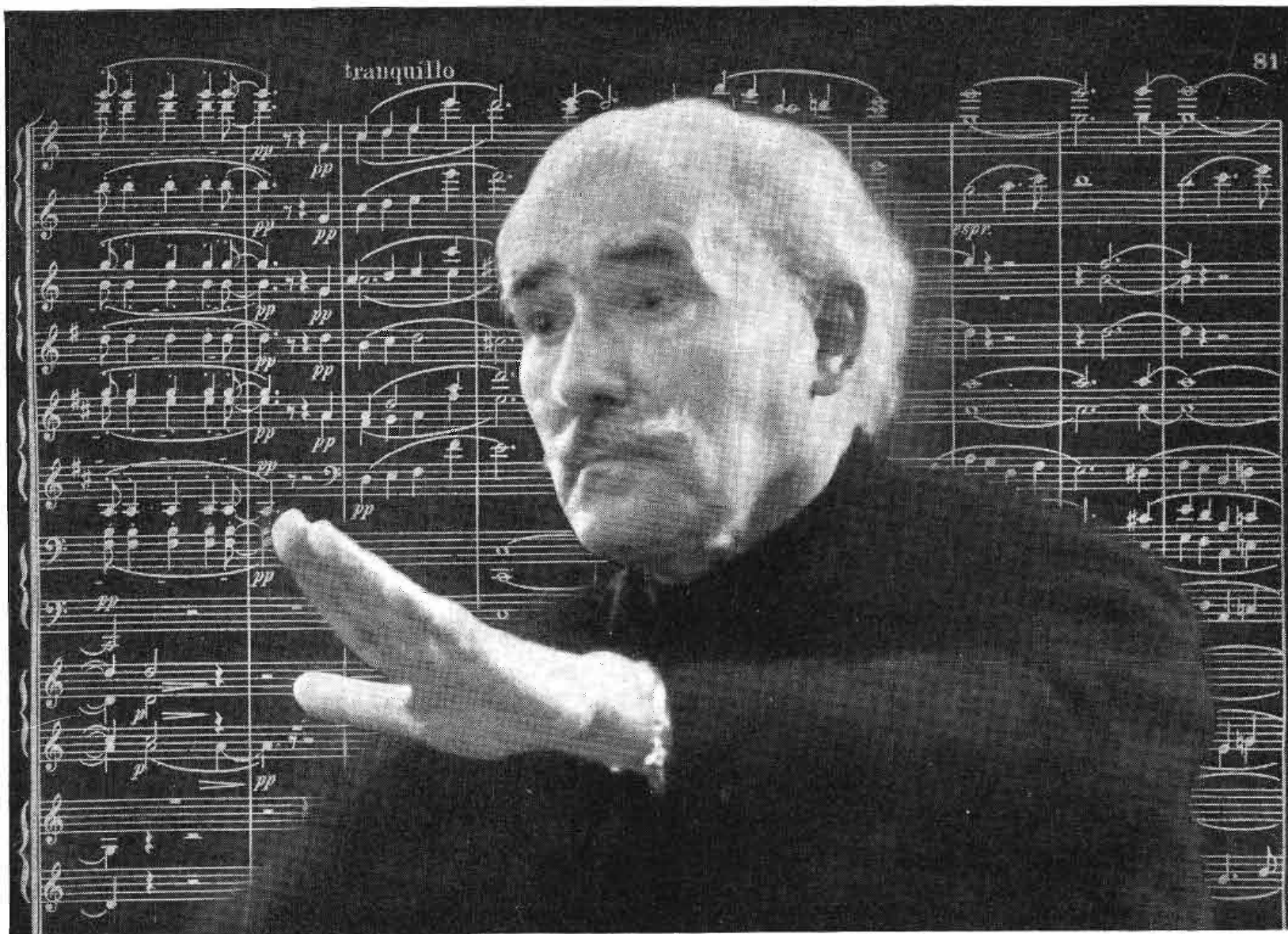
Another great RCA achievement. Another mission accomplished in RCA's never-ending program of bringing the very best in sound and entertainment into the home.

First the RCA Victor phonograph, then RCA Victor radio, and RCA Victor television. Today the new RCA Push-Button Tape Recorder. *And there are many tomorrows now in the RCA "workshop," too!*



**RADIO CORPORATION OF AMERICA**

*World leader in radio — first in television*



Arturo Toscanini conducting "Death and Transfiguration," Opus 24, by Richard Strauss

## RCA High Fidelity brings you every musical note!

RCA Victor High Fidelity is the result of a half century of leadership in recorded music, phonograph research and development of radio and motion picture sound equipment. It is a new dimension in sound created by the perfect union of recorded music and the phonograph.

A genuine high fidelity instrument re-creates the full range of tones and overtones of the original composition—exactly as the composer intended. The precise balance of sounds from the highest to the lowest must be maintained if perfection is to be achieved free of distortion.

"Victrola"® phonographs, Victor records, and "intermatched" high fidelity equipments for those who want to assemble their own units—all are designed to work together to bring the brilliance of the original performance into the home. Now, with RCA High Fidel-

ity instruments, you can hear the full gamut of the orchestra—from the shimmer of the cymbals to the beat of the tom-tom. You can hear your favorite music as it would sound if you were in the presence of the recording orchestra and artists.

True Hi-Fi—as in RCA Victor instruments and components—embraces the entire scale of tones from the rich lows to the colorful highs. There is nothing missing . . . the sounds reach the ear in their proper proportion and relation.

The nation-wide interest in high fidelity reflects the public's growing taste for the highest quality music. Developments by RCA scientists and engineers now make it possible for you to enjoy this new musical experience. Visit your RCA Victor dealer and hear the new Hi-Fi models of "Victrola" phonographs, Victor records and "intermatched" components.



**RADIO CORPORATION OF AMERICA**

*World leader in radio — first in television*