# RADIO AGE

RESEARCH · MANUFACTURING · COMMUNICATIONS · BROADCASTING



RCA

APRIL

1945

Radio-Telegraph Communication Now Restored with the Liberated Countries in Europe...

# No.3 BELGIUM

No. 1.. ITALY*
No. 2.. FRANCE
No. 3.. BELGIUM*

RESTORATION
*of*
RADIO-TELEGRAPH
COMMUNICATION
*with the* LIBERATED
COUNTRIES OF EUROPE

# No.4 HOLLAND

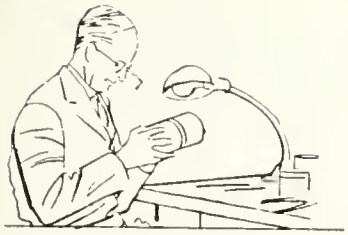
No. 1. ITALY*
No. 2. FRANCE
No. 3. BELGIUM*
No. 4. HOLLAND*

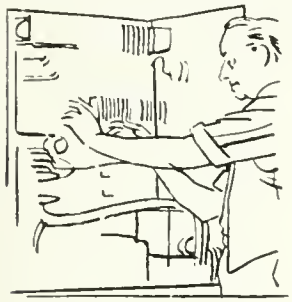
RCA

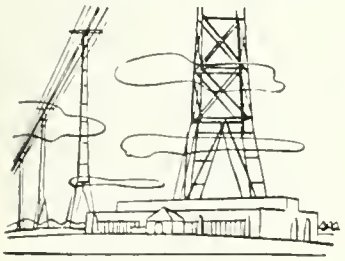
## RCA COMMUNICATIONS, INC.

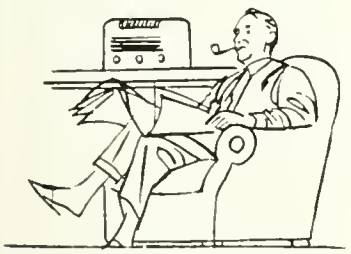
*Until further notice, service is available only for Government and Press messages.

A SERVICE OF RADIO CORPORATION OF AMERICA









COVER—Cadets at the U. S. Merchant Marine Academy, Kings Point, N. Y., demonstrate the new Radiomarine Lifeboat Radio equipment. (Story on page 6.)

# RADIO AGE

RESEARCH · MANUFACTURING · COMMUNICATIONS · BROADCASTING

VOLUME 4 NUMBER 3
APRIL 1945

## CONTENTS

PAGE

WARTIME ACHIEVEMENTS IN RADIO
*RCA Annual Report Reveals High Production* . . . . . 3

NEW LIFEBOAT RADIO
*by Charles J. Pannill* . . . . . 6

TRAMMELL ELECTED TO BOARD
*Succeeds General Dawes, resigned* . . . . . 7

SCENES FROM RCA LABORATORIES
*A Picture Page of Interesting Views* . . . . . 8

MUSIC RADIOPHOTOED FROM MOSCOW
*Shostakovich Score Rushed to New York for Premiere* . . . . . 9

LARGE SCREEN TELEVISION
*Advanced Development Model Shown to Press* . . . . . 10

STUDIES IN SOUND
*by Dr. Harry F. Olson* . . . . . 12

RADIO AND FILMS IN INDIA
*Interview with M. Akbar Fazalbhoy* . . . . . 15

COMMUNICATIONS WITH WINGS
*by H. M. Hucke* . . . . . 16

"INVASION" BY RADIO
*Short-wave Transmitters Aid War Effort* . . . . . 18

TUBES IN MINIATURE
*Smaller Radio Sets Will Result from Development* . . . . . 19

NETWORK POLICIES REVISED
*NBC Makes Changes in Public Interest* . . . . . 20

JOLLIFFE MOVES UP
*Elected Vice President in Charge of Laboratories* . . . . . 21

OPERA BY TELEVISION
*by Dr. Herbert Graf* . . . . . 22

"ONE WORLD" HONOR
*General Sarnoff Receives Award* . . . . . 24

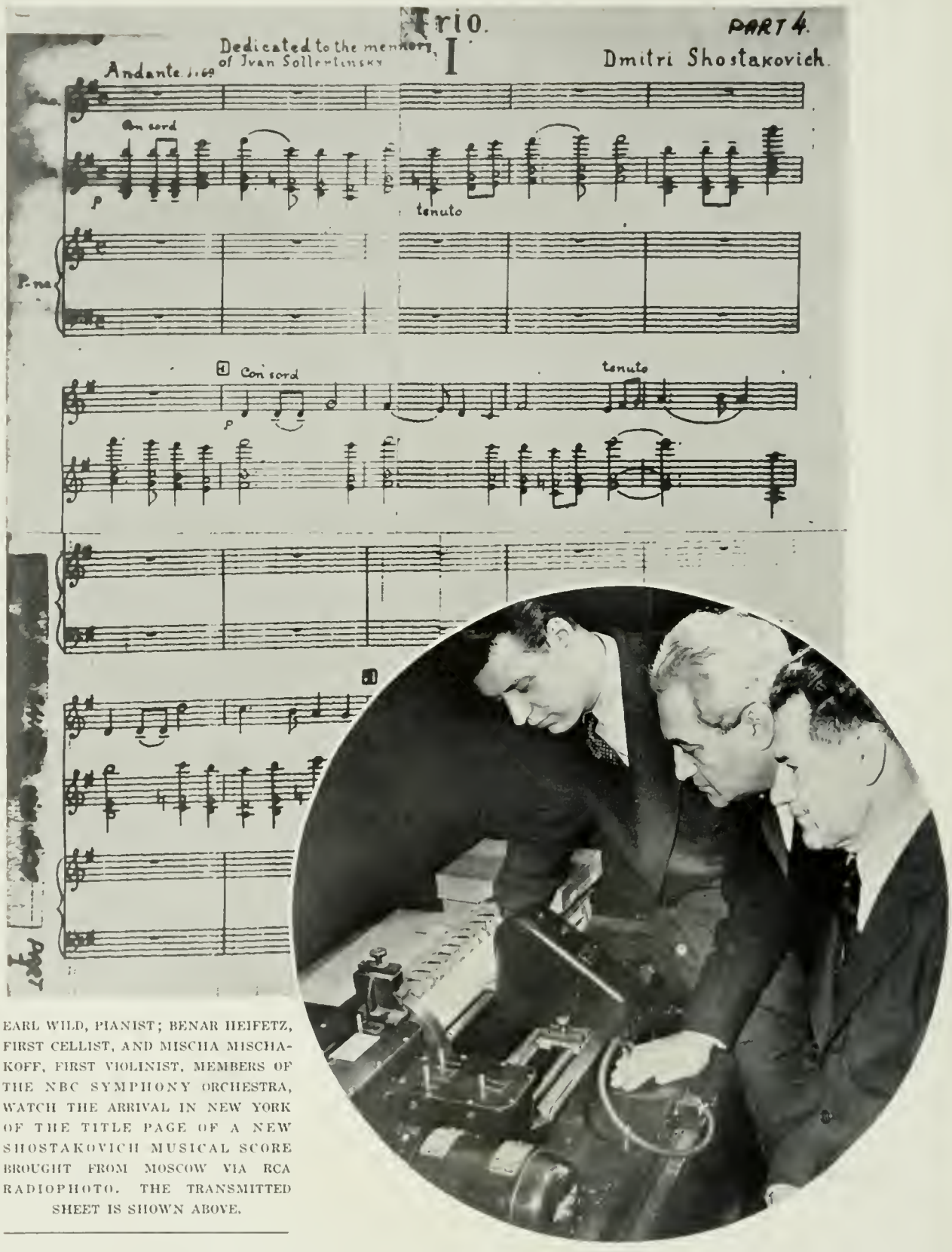
COVERING THE WAR FRONTS
*by William F. Brooks* . . . . . 26

NEW ADVANCES IN RADIO FORESEEN
*Dr. Jolliffe Predicts Huge Television Industry* . . . . . 28

"OUR FOREIGN POLICY"
*NBC Inaugurates Series with State Department* . . . . . 30

RELAYING BY RADIO
*by C. W. Hansell* . . . . . 31

Radio Age, published quarterly by the Department of Information of the Radio Corporation of America, RCA Building, New York, N. Y., for the RCA services: RCA Laboratories, RCA Victor Division, RCA Communications, Inc., Radiomarine Corporation of America, National Broadcasting Company, Inc., RCA Institutes, Inc., RCA Service Company, Inc.




EARL WILD, PIANIST; BENAR HEIFETZ, FIRST CELLIST, AND MISCHA MISCHAKOFF, FIRST VIOLINIST, MEMBERS OF THE NBC SYMPHONY ORCHESTRA, WATCH THE ARRIVAL IN NEW YORK OF THE TITLE PAGE OF A NEW SHOSTAKOVICH MUSICAL SCORE BROUGHT FROM MOSCOW VIA RCA RADIOPHOTO. THE TRANSMITTED SHEET IS SHOWN ABOVE.

# Wartime Achievements in Radio

*RCA ANNUAL REPORT SHOWS NEW PEAKS IN PRODUCTION OF WAR EQUIPMENT, NEW RECORDS IN COMMUNICATIONS AND 100 RESEARCH PROJECTS COMPLETED FOR ARMED SERVICES*

THE Radio Corporation of America in 1944 reached new peaks in production of radio-electronic equipment vital to the war effort, established new records in radio communications, and completed more than 100 research projects for the Armed Services, it was revealed in the RCA 25th Annual Report released February 27 by Brigadier General David Sarnoff, President.

Net profit of RCA in 1944 was $10,263,291, compared with $10,192,452 in 1943. While the earnings for 1944 are subject to renegotiation, specific provision has been made therefor on a basis not materially different from 1943. After payment of preferred dividends, earnings per share of common stock were 51.2 cents, compared with 50.5 cents per share in 1943.

Total gross income from all sources amounted to $326,421,913, compared with $294,535,362 in 1943, an increase of 10.8%.

Provision for Federal Income Taxes amounted to $29,947,900, or 14.6% more than the preceding year, and represented 74.5% of income. The tax provision in 1944 was equivalent to $2.16 per share on the outstanding common stock, compared with $1.88 in 1943.

### *On Second Quarter Century*

Recalling that RCA observed its 25th anniversary in 1944 Lieutenant General J. G. Harbord, Chairman, and Brigadier General Sarnoff, speaking for the Board of Directors, reported in a joint statement to stockholders that the company had "entered its second quarter century with full energy devoted to aiding the successful conduct of the war, ever mindful of the interest of America and its people in a postwar world at peace."

The Report states that war products delivered to the United States and its Allies by the RCA Victor Division during 1944 established an all-time record, exceeding 1943 deliveries by 16%. More than a thousand RCA engineers have been working on research, development and production of radio and electronic equipment vital to the war effort. Results of their accomplishments are found in the fact that RCA has built more than 200 new types of electron tubes and more than 350 types of apparatus not manufactured by anyone prior to the war.

### *Designs Radio Altimeter*

While the complete story of RCA's war achievements remain secret for security reasons, it is disclosed that RCA Victor has been, and is, the designer and first producer of many radio altimeters used by the Army, the Navy and the British. This essential device enables airmen to measure their distance from the ground so accurately that it makes possible more effective flying operations at night, through fog and other difficult weather conditions. It also increases the effectiveness of low-level, high-speed attacks and hedge-hopping missions; and is equally valuable in paratroop operations and in dropping supplies from the air.

Research in RCA Laboratories during 1944 was concentrated on radio and electronics, including new electron tubes, radar and other devices important to the war effort. More than 100 research projects, conducted for the Army, Navy and the Office of Scientific Research and Development, resulted in the creation of radio-electronic weapons which now are contributing to victories on many battlefronts.

Advances also were made in related work outside the category of confidential activities. For example, one of the major achievements in the field of electron tubes was the development by RCA scientists of additional miniature tubes and other types to perform new functions. These tiny tubes will shrink the size of many postwar radio products, including home and portable radios, phonographs, television receivers, hearing aids and business machines.

Vastly increased quantities of the miniature tubes were manufactured by RCA Victor in 1944. First developed by RCA engineers and publicly introduced in 1940 in the camera-size "Personal Radio," these tubes made possible the walkie-talkies, the handie-talkies and other electronic devices for planes, tanks, and motor transports where weight and size of equipment are important factors.

### *First with High Power*

Creation of other special electron tubes has enabled engineers to construct a television transmitter to operate at frequencies up to 300 megacycles, that is, a wavelength of one meter. It is the first time a transmitter with a power output of 5,000 watts has been devised for

*Signal Corps Photo*

FLANKED BY SIGNAL CORPS MEN, GEORGE THOMAS FOLSTER, NBC NEWS REPORTER, BROADCASTS A DESCRIPTION OF FRONT LINE ACTION FROM THE RIM OF A BOUGAINVILLE FOX-HOLE.

U. S. Signal Corps Photo

Army Photo

LEFT: FISH-POLE LIKE ANTENNAS RISE FROM THESE TANKS AWAITING ORDERS ON A JUNGLE ROAD IN THE SOUTH PACIFIC. CENTER: A JEEP HALTS DURING ITS RECONNAISSANCE WHILE A RADIO MAN REPORTS TO HEADQUARTERS. RIGHT: MERRILL MUELLER (LEFT), NBC REPORTER, WATCHES AN ARMY OPERATION WITH GENERALS EISENHOWER AND BRADLEY.

television broadcasting on a frequency so high in the radio spectrum.

Another achievement of RCA Laboratories is a highly efficient optical system for projecting television pictures. This will have important applications in home television receivers to produce brighter pictures as large as 18 by 24 inches. It also involves a remarkable development — that of molding lenses from plastic material to reduce costs and to make the system economically practicable for home receivers.

With respect to television, the Report recalled that in January of this year the Federal Communications Commission issued a report proposing the assignment to television of 12 channels below 300 megacycles for commercial operation and a large band of higher frequencies for experimental work and future services.

"The management of RCA," the Report commented, "believes this proposal to be a constructive step toward the postwar development of television. It confirms the faith of RCA-NBC scientists and engineers that their years of television research and engineering have succeeded in developing satisfactory and practical television, of tried and tested standards. If the proposal is adopted, it will make possible the expansion of television as a service to the American people immediately upon the release of manpower and materials from war demands."

U. S. Navy Photo

MASKED AGAINST HEAVY WEATHER, A NAVY GUN CREW GETS ITS ORDERS OVER THE SHIP'S COMMUNICATING SYSTEM.

### *FM Is Aided*

In order to stimulate the progress of frequency modulation (FM) broadcasting, NBC announced in January, 1944, that its regular network programs would be made available to the FM stations of its affiliates, as new FM transmitting facilities become available.

During 1944, NBC broadcast a record-breaking total of 2,173 programs which originated in foreign countries. This was over 400 more than those broadcast in 1943.

RCA Communications, during 1944, handled 150,000,000 words of radio traffic, largely related to the war. New direct circuits were established with India and Gambia, British West Africa. Direct service with Paris, interrupted since the German occupation of France, was resumed late in the year. At the request of United States military authorities, and in cooperation with them, RCAC established and operated its own stations at Naples, Rome, and in Southern France.

Radiomarine Corporation of America continued in 1944 to maintain its leadership in production of marine radio apparatus, and in equipping and servicing merchant vessels. Shipments of apparatus for use by the Army, Navy and Merchant Marine increased 17% over 1943.

The Report recalled that on February 1, 1945, the RCA International Division was created. This Division places RCA in a more advantageous position to provide for anticipated expansion of the company's activities in foreign trade, including export to and sale in foreign countries of products manufactured by RCA, as well as products of non-affiliated companies which will be sold through RCA's foreign distribution channels.

### *Special Courses Organized*

RCA Institutes ended the year with substantially increased enrollment. Many of the new students are veterans of the war, preparing for jobs as radiotelegraph operators, technicians and maintenance men. A special course in television was attended by 300 engineers and employees of broadcasting stations.

Reviewing the progress of RCA operations in 1944, the Annual Report said: "Five years of global warfare have intensified the demands upon radio communications

as a military necessity. Radio, because of its speed, mobility and ability to cover any distance regardless of geographical barriers, is the greatest single factor of coordination of the widely scattered battle forces. Experience and leadership of the Radio Corporation of America as a 'Pioneer in Progress' have placed the company in the forefront of wartime advances in the use of radio and in the application of electronics."

Conversion of radio-electronics from war to peace will bring into public service such wonders as radar, television, electron microscopy, radio-frequency heating, among other developments, according to the Report.

### *New Services In Prospect*

"Return of peace," the Report stated, "will find new wartime inventions available for application to everyday life, offering new services of safety and comfort, entertainment and education."

As of December 31, 1944, RCA personnel numbered 38,435. Of this number, 51% were women and 49% were men. At the close of the year, 7,946 employees of RCA had joined the armed forces of the United States, and 77 of them had given their lives to their country.

It was disclosed that the RCA Retirement Plan, adopted by the Board of Directors and effective since December 1, 1944, has been approved by the Commissioner of Internal Revenue. Stockholders will be asked to approve the Board's action at the annual meeting of stockholders to be held May 1, 1945. As of February 1, 1945, more than 85% of those eligible had agreed to participate in the Plan, which assures employees life incomes upon retirement.

### *Year-End Statement*

Year-end financial statements contained in the Report show that:

Total current assets amounted to $190,629,493, compared with $189,312,778 at the end of 1943.

Total current liabilities, including borrowings under V-Loan Credit, were $133,251,944 at the year-end, compared with $138,977,334 at the end of the previous year.

Working capital (the excess of current assets over current liabilities) at December 31, 1944, amounted to $57,377,549, compared with $50,335,444 at the close of 1943. As of December 31, 1944, borrowings under V-Loan Credit totaled $55,000,000, a decrease of $10,000,000 during the year. On February 15, 1945, an additional amount of $20,000,000 was repaid, reducing current borrowings under the V-Loan Credit to $35,000,000.

After providing for dividends and adjustments, including the writing off against earned surplus of $3,671,931, representing the entire amount of goodwill shown on the balance sheet at December 31, 1943, the total earned surplus at December 31, 1944 amounted to $43,645,087, an increase of $2,039,436 over earned surplus at the end of 1943.

In a chart showing the growth of RCA during the past ten years, the report reveals the Company's gross income increased from $89,228,898 in 1935 to $326,421,913 in 1944.

TOP TO BOTTOM: 1. A NATIVE OF THE OLD WORLD EXAMINES THE ELECTRON MICROSCOPE, A MARVEL OF THE NEW WORLD. 2. A LINE-UP OF RADIO TUBES IS FEATURED IN A MOVIE OF RCA'S ELECTRONIC ADVANCES. 3. PENICILLIN DEHYDRATING APPARATUS BEING DEMONSTRATED AT RCA LABORATORIES. 4. FROM NBC'S NEWSROOM, COMMENTATORS COVER DEVELOPMENTS AT HOME AND ON THE BATTLEFRONTS. BELOW: RADIO EQUIPMENT FOR THE ARMY, NAVY AND MERCHANT MARINE ROLLS OFF RCA PRODUCTION LINES.

# NEW LIFEBOAT RADIO

*Compact Unit Has Own Power Generator and Is Automatic in Many of Its Operations—Balloon or Kite Holds Antenna Aloft*

By Charles J. Pannill,
*President,*
*Radiomarine Corp. of America*

AMERICA'S wartime shipbuilding program has intensified the development of radio equipment for use with the lifeboats carried by each vessel. Despite the fact that American Merchant Marine tonnage in 1944 was four times greater than in 1942, there has been a very substantial decrease in casualties because of improved safety devices and equipment.

For several years certain passenger vessels have carried radiotelegraph lifeboat equipment, but soon after this country entered the war the U. S. Coast Guard and the Federal Communications Commission issued regulations requiring lifeboat radio gear on cargo vessels. The advantages of this wartime move are self-evident.

After a ship has been abandoned and its personnel has disembarked in lifeboats, there arises the major problem of providing suitable facilities so that the lifeboat may be located by rescuing vessels. At the time of the emergency, the lifeboats may be far from the nearest land and the occupants may have only an approximate knowledge of their position. Through the use of a radio installation the morale of the men in the lifeboats is appreciably improved by the knowledge that contact has been made with rescuing agencies.

The first portable lifeboat radio sets designed to meet the Government regulations were battery operated transmitters using only a 500 kilocycle frequency. Such equipment left much to be desired because of its limited communication range and restricted power supply. In addition, because the equipment did not include a receiver, there was no way for the men in the lifeboats to know whether their distress signals had been intercepted by rescue craft.

In conducting its research and experiments with advanced models, Radiomarine Corporation of America proceeded on the basis that lifeboat apparatus should derive its power supply from a hand-driven generator, rather than from storage batteries, in order to insure reliable operation at any time. Furthermore, to insure maximum transmission ranges, a high frequency (short wave) was allocated by the Government in addition to the conventional distress frequency of 500 kilocycles. For most efficient transmission and reception, a suitable antenna system is needed, preferably one which is not restricted by the height of the boat's sailing mast.

### *Operation is Simple*

Because each lifeboat may not have a trained radio officer aboard, it is also important to design the equipment so that anyone, by following simple instructions, can use the equipment to summon aid. This calls for both two-way radiotelephone and radiotelegraph apparatus, all housed in a single unit. Moreover, the entire installation must be immune to weather conditions so that it will continue to function in spite of salt spray or heavy rain.

All of these requirements will be met successfully in the new Radiomarine model ET-8030 lifeboat radio. A compact water-tight binnacle contains a complete radio transmitter and receiver, a built-in hand-driven generator power supply unit, a telephone handset, a telegraph key, and a reel containing 300 feet of antenna wire. The radio transmitter may be used for either voice or code transmission, and delivers five watts of power to the antenna on frequencies of 500 kilocycles and 8,280 kilocycles. Using the lower frequency, average distances from 50 to 200 miles can be covered; the short wave facilities radiate a signal which can be picked up over distances of 1,000 miles or more.

### *SOS Flashed Automatically*

In addition to the conventional voice and code facilities, the transmitter incorporates a fully automatic cycle of operation. When the master switch on the panel is placed in the "Automatic" position and the hand generator is cranked, an ingenious, fully automatic, keying device transmits groups of SOS signals to summon aid and special "long dash" signals for radio direction finder bearings. The same keying mechanism also changes the transmitter frequency back and forth between 500 kilocycles and 8,280 kilocycles, while the generator is being cranked. This insures that the signals are radiated to cover both short and long ranges without further attention on the part of operating personnel.

When two-way communication is needed, the master switch is used to switch the radio receiver into the circuit. This receiver is pre-tuned to the distress frequency of 500 kilocycles and also can be tuned to sweep the short wave band from 8,100 to 8,600 kilocycles. Once communication with ships or shore stations has been established, the two way feature permits the drifting lifeboats to exchange information that will expedite rescue operations. In addition, because of the two-way radiotelephone facilities, the men in the lifeboats may communicate directly with one another and thereby plot their course so as to approach rescuing craft.

In the past the antenna system used with lifeboat radio installations has consisted of a short length of wire supported by the sailing mast, and fastened to the bow and

stern of the boat as an inverted "V" antenna. While satisfactory over short distances, such an antenna has limited the maximum transmission and reception range of the lifeboat apparatus.

This limitation, like the others previously mentioned, has been removed in the design of the outfit. Each Radiomarine installation is now equipped with a collapsed rubber balloon, hermetically sealed in a metal container, and a cylinder of compressed helium gas for inflating the balloon. The use of helium gas is an important step forward, as it eliminates the hazards of hydrogen gas sometimes used to inflate radio antenna balloons. After the balloon has been removed from the container, it may be easily connected to the helium gas cylinder and inflated in a few minutes to a diameter of four feet. Special strong, lightweight, antenna wire from the reel on the set is then attached to the balloon and the balloon released to a height of about 300 feet. The diffusion of gas through the balloon rubber fabric is extremely small so that the balloon will remain aloft for a week or more.

As a further precautionary measure, a collapsible box kite is supplied with each installation. This kite, which weighs only 13 ounces, may be quickly assembled to carry aloft 300 feet of antenna wire under wind conditions which would not be suitable for flying the balloon.

Each lifeboat installation is equipped with a compact watertight spare parts box which contains spare parts, tools, the helium cylinder, the balloon, and the kite. As a result, each lifeboat may be considered to have a complete radio station, which includes telephone and telegraph facilities, automatic transmission, built-in power supply, and an efficient antenna system.

The progress which has been achieved in the design of modern lifeboat radio equipment is exemplified by a comparison with one of the older models. For example, previous radio installations in the motor lifeboats of passenger vessels involved several units with a total weight of 450 pounds. Such equipment did not incorporate any short-wave facilities, required skilled radiotelegraph operating personnel, and contained no provision for radiotelephony. The new equipment weighs less than 160 pounds and includes all of the modern advances described in this article. It is so constructed that it may easily be transferred from one lifeboat to another simply by lifting the set through handles and bolting the housing to the floor of the other boat.

*The new lifeboat radio is shown here as it would appear if installed in a boat and ready for use. The reel which releases the antenna wire as the balloon floats aloft is in the lifted cover of the binnacle. Power is obtained by cranking the self-contained generator using the handles on each side of the case. All automatic operations for sending SOS and direction finding signals as well as two-way radiotelephone communication are controlled by the knobs on the sloping panel.*

## TRAMMELL ELECTED TO BOARD OF DIRECTORS

*NBC President Succeeds General Dawes on RCA Board*

THE resignation of General Charles G. Dawes from the Board of Directors of Radio Corporation of America and the election of Niles Trammell, President of the National Broadcasting Company, to fill the vacancy, were announced Feb. 2 by Brigadier General David Sarnoff, President of RCA, following a meeting of the Directors.

General Dawes, former Vice President of the United States and Ambassador to the Court of St. James had been a Director of RCA since January 28, 1938.

Frank M. Folsom, Vice President of the Radio Corporation of America in charge of the RCA Victor Division, was elected a Director of the National Broadcasting Company, replacing General Dawes on that Board.

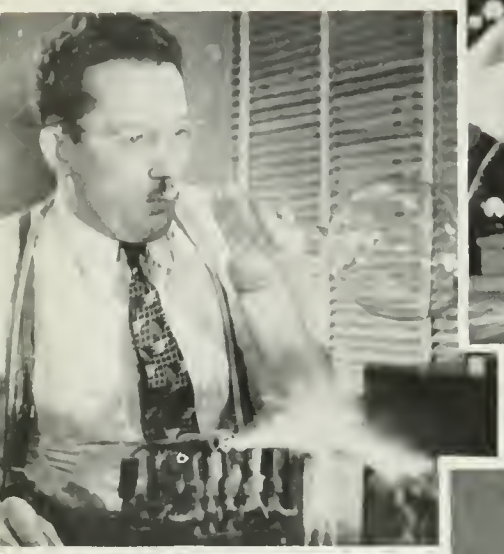
## RCA AND NBC HOSTS TO BRAZILIAN MISSION

*Scientists Visit U. S. Research Centers to Observe Latest Developments in Science and Industry*

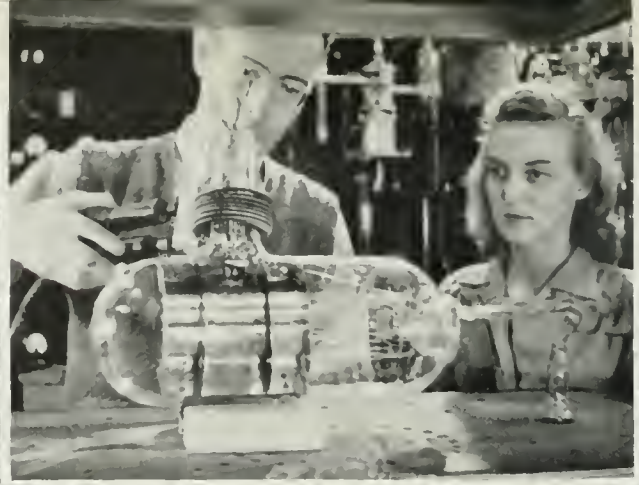
BRAZIL envisages a new great era of industrial expansion and is looking to the United States for first-hand information in preparing for this post-war development, Doctor Alano da Silveira, Professor of Metallurgy of the National Engineering School of Rio de Janeiro, disclosed at a luncheon for members of a Brazilian mission given by the Radio Corporation of America at the Hotel Waldorf Astoria. The mission, comprised of six professors of leading Brazilian scientific institutions, has been touring colleges and research laboratories in this country since December.

Dr. Harvey N. Davis, President of Stevens Institute of Technology, who was official host for the mission on its visit to the New York area, and Dr. James Rowland Angell, Public Service Counselor for the National Broadcasting Company, also spoke. The luncheon was followed by a tour of the NBC studios and a visit to the RCA Laboratories, at Princeton, N. J.

# SCENES FROM RCA LABORATORIES



THE GLASS-BLOWING ART IS USEFUL IN DEVELOPMENT OF NEW ELECTRON TUBES.

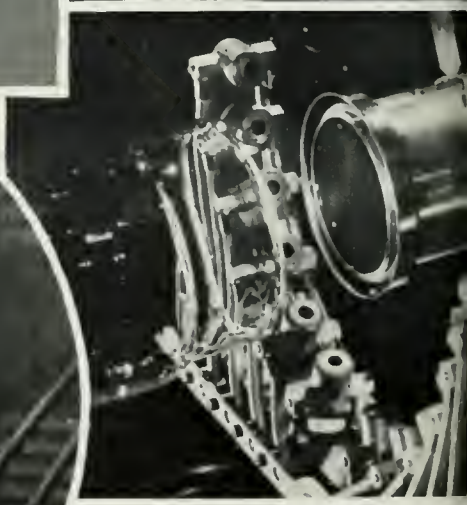


RADIO-HEAT AIDS IN THE MAKING OF AN EXPERIMENTAL ELECTRON TUBE.

AN EXPERIMENTAL RADIO-FACSIMIL MACHINE.

THE "NEEDLE" OF THE ELECTRONIC SEWING MACHINE IS A LITTLE WHEEL.

DEHYDRATING PENICILLIN BY MEANS OF RADIO-HEAT.



RADIO-HEAT APPLIED THROUGH NO ZLES, WELDS GLASS AND METAL.

GRINDING LENSES FOR TELEVISION.

TESTING A MICROPHONE.

EXPERIMENTING WITH AN ICONO SCOPE, OR TELEVISION "EYE".

# Music Radiophotoed from Moscow

*FIRST PART OF A NEW MUSICAL SCORE BY SHOSTAKOVICH IS SPEEDED TO NEW YORK FOR PREMIERE ON NBC—TRANSMISSION STRIKES A NEW NOTE IN MUSICAL HISTORY*

IN THE FIRST transmission of its kind involving a major musical composition, the title page with part of Dmitri Shostakovich's latest score was flashed to New York directly from Moscow by radiophoto over the circuit of RCA Communications, Inc., in January. The transmission, which attracted wide attention, presages the speeding of compositions by the world's great musicians from one continent to another by radiophoto as soon as completed.

The newest score by Shostakovich, composer of the celebrated Leningrad Symphony, was brought to New York for its American premiere over WEAF and the network of the National Broadcasting Company on March 10. It is a composition for piano, violin and cello, entitled "Trio". Arrangements with the Russian composer for the broadcast and plans to hasten arrival of the score in the United States, were concluded by Samuel Chotzinoff, Manager of the NBC Music Division, immediately after he learned of its completion in Moscow.

Mr. Chotzinoff, who described the radiophoto transmission as "revolutionary in the realm of music," assigned three artists of the NBC Symphony Orchestra to participate in the premiere. Selected for the honor were Mischa Mischakoff, first violinst; Benar Heifetz, first cellist, and Earl Wild, NBC pianist and composer.

It was arranged for the three NBC musicians to visit RCA Communications headquarters, at 66 Broad Street, to see how the first page of "Trio" was transformed from radio signals to photo negative to positive print through the magic of the radiophoto system. They saw in the final result a perfect photographic reproduction of the original musical score in Shostakovich's own hand, and this was used in their preparation for the radio premiere.

### *Two Leningrad Graduates*

For two of the musicians, Mr. Heifetz and Mr. Mischakoff, the occasion took on added significance because of their musical schooling at Leningrad Conservatory, where Shostakovich more recently studied. In addition, both had performed at the Moscow Opera, where his latest work had its Russian premiere.

Rarely, they pointed out, did musicians have the good fortune to work from the equivalent of an original score by a great composer who also happened to be a compatriot and a fellow alumnus of a school 4,000 miles away.

The nearest approach to the speed of the radiophoto transmission—and itself a record-breaking event in musical history—occurred when a microfilm of the great Shostakovich Leningrad Symphony was flown to this country for its American premiere over the NBC network on July 9, 1942.

### *Score Sent in Sections*

In actual transmission time, it took twenty-four minutes for the first page of the latest score to come from Moscow over the RCA receiving radiophoto machine. To facilitate handling, the photograph of the composition was sent in four sections of six by eight inches each, and these were cut into a mosaic of standard musical page size for the positive print. The microfilm air-mail transit of the Leningrad Symphony took nearly three days, and musical scores carried by ordinary mail often require several weeks to travel that distance.

In addition to the Moscow circuit, which has been in operation since July, 1941, the RCA radiophoto system works directly between New York and Cairo, London, Stockholm, Berne and Buenos Aires; and between San Francisco and Melbourne and Honolulu on the Pacific side.

Before the war, RCA Communications operated radiophoto circuits with Berlin, Tokio, London and Buenos Aires, the first commercial service having been established by the Company on April 30, 1926.

While the primary function of the system in wartime has been the rapid transmission of news photographs from the various theaters of fighting, the circuits can be used to flash radio facsimiles of important documents, charts and drawings.

LEFT: OPERATOR INSERTS NEGATIVE FILM IN RADIOPHOTO RECEIVING UNIT. BELOW: SECTION OF SHOSTAKOVICH SCORE IS INSPECTED AFTER RECEIPT FROM MOSCOW.

# LARGE-SCREEN TELEVISION

*RCA Demonstrates Advanced Model—Four Technical Developments Make Possible Brighter, Clearer Pictures on 16 by 21 Inch Screen*

AN advanced development model television receiver reproducing pictures brighter, clearer and five times larger than were obtainable on pre-war sets was demonstrated March 15 by the RCA Victor Division of the Radio Corporation of America, with the cooperation of the National Broadcasting Company.

A special program of live talent and films presented by NBC was viewed on the receiver model, which features a new type of screen, 16 x 21⅓ inches, made of surface-treated plastic. In a brief talk preceding the demonstration, Dr. C. B. Jolliffe, Vice President in Charge of the RCA Laboratories, explained technical details of the receiver.

Bill "Bojangles" Robinson headed the list of entertainers on the half-hour variety show. In addition to the veteran tap dancer, NBC presented a dramatic sketch, "Birthday," featuring Jimsie Somers, 8-year-old television actress; Frances Dee, Philip Foster, and Ed Jerome, all well known to stage and radio. Russell Patterson, artist, sketched models as they paraded before the television camera, and two film shorts, showing various athletic events and the U. S. landing on Corregidor, completed the entertainment.

According to Frank M. Folsom, Vice President in Charge of the RCA Victor Division, television sets of the type demonstrated will not go into production until wartime restrictions on manpower and materials are removed. He said that the company expects to make large-screen receivers available within about one year after civilian production is resumed.

Console models, containing projection-type television, FM and standard broadcast receiving facilities, Mr. Folsom added, will cost approximately $395. RCA Victor will also have several models equipped with direct viewing picture tubes, and at least one table model priced at about $150.

The large screen television receiver, Dr. Jolliffe said, was made possible by four pre-war technical developments by RCA scientists and engineers. These include an im-

THREE STAGES OF TELEVISION RECEIVER PROGRESS: LEFT—RECEIVER WITH A MECHANICAL SCANNING DISK, USED IN THE LATE 20'S. BELOW AT LEFT —PRE-WAR MODEL GIVING 7 BY 9-INCH PICTURE. BELOW RIGHT—RCA'S ADVANCED DEVELOPMENT MODEL PRESENTING A 16 BY 21-INCH PICTURE.

proved high voltage projection tube; a unique optical system of high efficiency; a new type of plastic viewing screen and an automatic frequency control circuit.

Some of these principles, Dr. Jolliffe pointed out, were used in RCA's demonstration of large-screen theater television at the New Yorker theater in New York in 1941. The entry of the United States into the war and the immediate conversion of RCA Victor facilities to war production halted the commercial development of large-screen home television receivers embodying these developments.

Large-size reproduction of the images on a screen built into the receiver cabinet is made possible primarily by a special optical system developed by a group of scientists and engineers working under the supervision of Ioury G. Maloff, of the RCA Victor Division, and David W. Epstein, of RCA Laboratories.

The optical system, Dr. Jolliffe said, consists of a bowl-shaped mirror and molded plastic lens of special design which delivers to the back of the viewing screen about six times as much light as could be obtained with a conventional F:2 movie projection lens. In the model demonstrated, the cathode ray receiving tube is mounted face downward in the lower part of the cabinet, with the bowl-shaped mirror below it and facing upward. Light from the face of the tube is reflected upward from the mirror through the plastic lens to a flat, inclined mirror near the top of the cabinet, from which it is thrown upon the back of the viewing screen. The vertical mounting makes it possible to install the entire receiver and optical system in a cabinet not much larger than a standard radio console.

### *Special Cathode-Ray Tube Used*

The second RCA development which contributes to the exceptional brightness, clarity, and high definition of the large-screen pictures is a special high-voltage type of cathode ray tube. This tube, designed to operate at 27,000 volts, produces a much brighter original image on its face than could be obtained with the lower voltages used for the purpose before the war. The new tube has a diameter of five inches.

The third advance which enhances the quality of the pictures is an automatic frequency control developed by RCA Victor engineers, which eliminates picture distortion caused by "noise" interference.

Augmenting these improvements, the fourth advance introduced in the demonstration was RCA Victor's new translucent plastic viewing screen. Special features incorporated in the design of the screen provide even distribution of light over the image area and proper distribution of transmitted light within the normal viewing angle. The screen thus assures a picture of maximum brightness and natural light contrasts.

Dr. Jolliffe emphasized that the receivers exhibited were development models, and were being demonstrated to "afford a glimpse into the future.

"Until Victory is won," he said, "our resources and facilities will be devoted completely to the war effort. In looking forward to peace, we look forward to conversion of our research and manufacturing facilities to the production of radio and electronic equipment — which, of course, includes television — to give new and improved services to the American public."

---

# PRESS APPLAUDS LARGE-SCREEN TELEVISION

COMMENTS appearing in the press after representatives of major publications in the United States had witnessed the demonstration of RCA's large screen television receiver were universally favorable.

"Compared to pre-war models," said the *Associated Press*, "its reproduction was remarkable. Pictures actually could be described as rivalling the home movie in detail and brilliancy as well as size."

*The International News Service* said, "Remarkably clear . . . presaged a limitless horizon for the world of tomorrow, visible with the turn of a dial in the comfortable surroundings of your own living room."

Arnold Blum, *PM:* "It was far superior to anything seen before the war or to anything visible today on picture-tube sets. There was only microscopic distortion, even from acute angles and then only rarely; the picture was brilliant and the definition excellent. It was as good in these respects as a Grade A home-movie."

Ben Gross, *New York Daily News:* "What I saw was a tremendous improvement over all the old pre-war television showings. It was possible to sit back some distance from the receiver and enjoy the presentation without eye-strain."

*New York Herald Tribune:* "The images . . . were bright enough to be seen in clear detail from all parts of the demonstration room which was about twice the size of an average living room."

*Time:* "Last week in Manhattan, RCA Victor demonstrated its postwar answer (to demands for large-screen television home receivers). . . . The RCA set produced a clear, bright picture."

*New York Times:* "The first definite indication of the television to be seen immediately after the war is provided by the Radio Corporation of America in a receiver, identified as 'an advanced development model.' To mince no words, it offers the largest and brightest pictures yet shown the layman."

*Editor & Publisher:* "RCA's program was topped off with a playlet televised from the studio so cleverly that many in the audience believed it to be a movie film."

# Studies In Sound

*EVERY MODERN FACILITY FOR RESEARCH INTO THE VAGARIES OF ACOUSTICS IS AVAILABLE AT RCA LABORATORIES*

By Dr. Harry F. Olson

RCA Laboratories,
Princeton, N. J.

ROOMS with sound characteristics that would both delight and dismay housewives and Swiss yodelers are only part of the scientific marvels that comprise the Acoustic Laboratory of the new RCA Laboratories at Princeton, N. J. One of the rooms is so devoid of echoes that the blood stream in a visitor's ears hisses ominously in the eerie silence of the place; a second is constructed in such a manner that a single burst of sound swells into a cacophony of noise.

These unusual compartments, termed Free Field Sound Room and Reverberation Chamber respectively, together with a Sound Stage, a Magnetic Laboratory, a Living Room which can be adjusted to become either "dead" or "alive", and a Field Laboratory used for the outdoor testing of sound systems designed for operating in the air and under water, make it possible for RCA experts to carry out a wide range of precision tests on newly developed equipment.

Acoustics, the science of sound behaviour, is the very heart of radio reproduction and as such plays a basic role wherever loud speakers and microphones are used. As a direct result of this unremitting search for better materials, methods and component parts, the public has enjoyed a continuous improvement in the tone quality of radio receivers. Other important applications benefited by this specialized branch of research are phonographs, sound motion pictures, television, public address systems, world wide communications and many special wartime projects on land and sea.

Possibly the most interesting of all rooms in the group, in appearance and use, is the Free Field Sound Laboratory.

The expression "free field", in this instance, means freedom from reflections, an essential condition in the testing of electro-acoustic transducers, better known as microphones and loud speakers. And in the design of this Free Field Laboratory, RCA Laboratories' experts have reached as close to perfection as the most sensitive instruments can determine.

### *An Oddly Designed Room*

Acoustic engineers will tell you that the most obvious and direct solution of this problem of controlled reflections would be to make the measurements out of doors at a great distance from the earth and from any hill, house, or other reflecting surface. But the elements, natural and man-made, are unpredictable noise makers and only by conducting the outdoor tests at great elevation could these objections be overcome. For these reasons a free field sound room becomes an almost indispensable part of an acoustical laboratory.

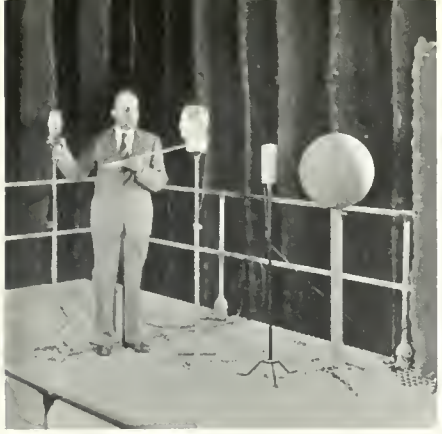
Designers of the room commenced with one basic objective, viz., to reduce to a negligible amount all reflections from the boundary surfaces. This called for a room of considerable size with walls constructed of materials that would absorb instead of reflect sound waves. The combination of these two factors resulted in an acoustic measurement laboratory which immediately impresses the casual visitor as a creation straight out of the Walt Disney imagination.

### *Walls Heavily Baffled*

In constructing the room, engineers began with floor dimensions of 48 by 36 feet surrounded by walls 36 feet high. Inside these outer limits, one foot from walls, floor and ceiling, another structure was built of ozite one inch thick. Then a series of ozite strips, called baffles, eight feet in depth and spaced two feet apart were hung at right angles to the room surfaces. And finally, sandwiched between the baffles, the builders added still other baffles of the same material, four feet in depth. With these construction details completed, the laboratory measured 32 feet long, 20 feet wide and 20 feet high. A platform of steel grillwork 12 by 24 feet, elevated 11 feet above floor level and supported on cushioned legs to absorb vibration, provides working space for personnel and test set-ups.

How successful the acoustical engineers were in their execution of the room is best indicated by tests made after its completion. Meas-

OUTDOOR TESTS OF SOUND EQUIPMENT ARE CONDUCTED AT THIS FIELD LABORATORY AT RCA LABORATORIES, PRINCETON, N. J.



LEFT: DR. H. F. OLSON ARRANGES APPARATUS FOR ACCURATE TESTS OF AN ARTIFICIAL VOICE IN RCA LABORATORIES' FREE-FIELD SOUND ROOM. RIGHT: IN THIS ROOM ENGINEERS WATCH INSTRUMENTS WHICH RECORD THE QUALITY CHARACTERISTICS OF A LOUDSPEAKER UNDER TEST.

urements showed that less than three tenths of one percent of the sound energy striking the baffled and padded walls is reflected. This trace of reflected energy, while undesirable, represents such a small part of the total that any error it might introduce into actual tests would be less than the error of good electrical measurements.

Measuring equipment used in conjunction with the free field sound room is located in the adjoining laboratory. The apparatus includes means for measuring the response frequency, power frequency, and directional characteristics of electro-acoustic transducers. Signal lines connect the free field sound room with the adjacent laboratory, as well as all other rooms in the Acoustic Laboratory.

### *Noise Absent at Night*

Spurious noises reaching the room from the outside are only slightly above the threshold of hearing even when the laboratories are in normal operation, but at night, with the shops closed down, the noise level decreases to 0 db, the absolute threshold of the normal ear. The room is heated by hot air forced through openings in the floor but the thermal insulation is so complete that even on the coldest days, the heating system must be operated only one third of the time to hold the temperature within a 3 degree variation.

Many complex factors influence the collection of sounds by microphones and the dispersion of sound by loudspeakers. Therefore, after either form of these electro-transducers has been developed, the next step is a test under actual operating conditions. These tests require a sound stage with acoustic characteristics that can be altered as desired.

The RCA Laboratories include such a stage, 48 feet long, 36 feet wide and 24 feet high. Two large monitoring rooms on the side give an unimpeded view of the stage through sound proof windows.

### *Walls and Ceilings Padded*

The walls and ceiling of the sound stage are finished in one-inch Absorbex, backed by four inches of rock wool blanket. The stage floor, for practical reasons, is covered with asphalt tile with practically no absorption. An abuse-resisting wainscot extends up four feet from the floor. The reverberation time of 0.4 second is quite low and is about one-half that recommended for a normal broadcast studio of this volume (40,000 cubic feet). The reverberation time is made low so that flexible acoustic characteristics may be obtained. For example, in sound motion pictures and television, the standard practice is to build sets upon a sound stage with very low reverberation time. Under these conditions, the acoustics of the collected sound is determined by the set. Added realism is attained by this expedient because the acoustics of the collected sound corresponds to the picture depicted on the screen. For tests under normal broadcast acoustic conditions, the reverberation time of the sound stage may be increased to optimum values by introducing reflecting surfaces on the walls. In this case "V'ed", polycylindrical or other dispersing surfaces may be used. This sound stage provides a means for testing the acoustical properties of these surfaces.

A low noise level is another essential requirement of a sound stage. The noise level in the sound stage when the laboratories are in normal operation is 20 db.

The sound stage is designed so that it may be employed as a small theater for the reproduction of sound. For these tests, the room may be "livened" by increasing the reverberation time. This is done by introducing reflecting surfaces along the sides and in the ceiling.

Radio receivers and phonographs, as used in the home, constitute the largest number of complete sound-reproducing systems. For this reason, the performance of a loud speaker in a relatively small room is an extremely important problem.

### *Duplicates Living Room*

The living room laboratory is designed to be the acoustical equal of the average living room. It is 24 feet long, 20 feet wide, and 8 feet 6 inches high. Audio frequency signal lines connect the living room with measuring equipment permanently installed in other parts of the Acoustic Laboratory. These lines are essential when it is desired to obtain objective data on response frequency, non-linear distortion, spatial distribution, intensity level and transient characteristics of sound reproducers operating in the living room.

Dust-free rooms are highly desirable for the assembly of the

magnetic structures of microphones, loudspeakers and other electro-acoustic transducers. In these chambers at RCA Laboratories, all incoming air is carefully filtered to remove suspended matter and each room is maintained at a slightly higher atmospheric pressure than the adjoining room. This precaution definitely bars the way to the entrance of dust particles which might contaminate the delicate equipment being assembled.

The two remaining rooms in the Acoustic Laboratory suite possess characteristics almost diametrically opposite. One, the live room, is used to study reverberations or echos. Here in a space 24 feet by 18 feet with a 13 foot ceiling, engineers investigate the sound absorbing properties of different materials. So "alive" is the chamber that a sound will rebound back and forth from one surface of the room to another for upwards of four seconds.

Contrast this with the sound proof room which is so well insulated that loud speakers under test may be operated at very high levels without annoying workers in adjacent rooms. Its walls are built of double masonry and sealed with two heavy doors. Here again audio frequency signal lines lead to other parts of the laboratory for convenience in making measurements.

### *An Outdoor Laboratory*

But standard radio and public address practice also calls for the outdoor use of certain types of sound instruments. To test these products, a field laboratory was erected on relatively open, flat ground some distance from the main laboratory structure. Nearby, a hoist provides means for lifting equipment 40 feet above ground, when such a position is needed to simulate actual operating conditions.

Occasionally it becomes necessary to conduct studies of sound propagation and reception under water. To make this possible and thereby complete the comprehensive facilities of the laboratory, a pond one fifth of an acre in area and 20 feet deep in the center was created artificially from nearby springs. A mud bottom and sloping banks reduce reflections from these submarine surfaces. Apparatus needed for these subaquaeous tests is set up in the field laboratory building and fed from lines brought out to the pier overlooking the pond.

Out of this galaxy of rooms, the like of which would never be found nor wanted in a dwelling, have come fundamental improvements in sound pick-up and reproducing equipment which will be embodied in the design of RCA postwar products intended for the entertainment and service of the public. Only through these intensive, precise analyses of the behaviour of intangible sound waves is it possible for science to attain the high degree of perfection in loud speakers and microphones that will typify the sound systems of tomorrow.

## RCAC Reopens Circuits

Reopening of direct radiotelegraph service between New York and Brussels on March 4 was followed the next day by resumption of service between this country and the Netherlands. In making the announcement, Lieutenant Colonel Thompson H. Mitchell, Vice President and General Manager of RCA Communications, Inc., explained that both circuits had been closed since the German occupation of the respective countries. At present, only Government and press messages will be handled but commercial service is to be resumed later.

The Brussels circuit, operated at its foreign terminus by the Belgian Telegraph Administration, was the third to be completed by RCA Communications with liberated European capitals in eight months. Direct radio connection with Rome was resumed June 13, 1944. The New York-Paris circuit was returned to use on September 16.

The Netherlands terminus of the restored circuit is being operated, as before the German invasion, by the Netherland Postal and Telegraph Administration.

Nationals of the two countries located in New York expressed their appreciation of the restored services. Henri Fast, of the Belgian Information Center of New York said: "This is a visible outside demonstration of the liberation of Belgium—for a country is free only when it can communicate freely and quickly with the rest of the world."

Ambassador A. Loudon, Netherlands envoy to the United States, filed the first message over the completed circuit to his native country. It was addressed to General Kruls, Chief of the Netherlands Military Government, and said in part: "To be able to communicate again directly and openly with the homeland is a source of great joy. The Dutch living abroad are grateful that the days of separation are over and that the magic of radio enables them to feel and come closer to their compatriots who have sacrificed so many and so much in their dogged perseverance and resistance and who have suffered so deeply through the cold, disease and starvation."

## JOSEPH V. HEFFERNAN ELECTED VICE PRESIDENT

Election of Joseph V. Heffernan as Vice President and General Attorney of the Radio Corporation of America was announced by Brigadier General David Sarnoff, President of RCA, following a meeting of the Board of Directors on April 6.

Mr. Heffernan, who was appointed General Attorney of RCA by the Board of Directors on January 2, 1945, joined the company in June, 1940, after having been associated for five years with the New York law firm of Cahill, Gordon, Zachry & Reindel, General Counsel of RCA. From 1937 to 1939, he was manager of the firm's Washington office. On leave from RCA, Mr. Heffernan served as a Lieutenant with Air Force Atlantic Fleet, United States Navy, from 1942 to 1944.

Born in Washington, Indiana, on December 23, 1905, Mr. Heffernan was graduated from St. Louis University and received an L.L.B. degree from Indiana University.

# Radio and Films In India

*Fazalbhoy, of Bombay, Reports Great Prospects for Extension of Broadcasting and Motion Pictures — Sees Vast Opportunities for Education.*

INDIA's film industry has plans for a great step-by-step expansion after the war to help educate the country's illiterate masses, according to M. Akbar Fazalbhoy, managing director of RCA Photophone Equipments, Ltd., of Bombay, who recently came to the United States in the interest of Indian motion picture producers, distributors and manufacturers.

Mr. Fazalbhoy, who was a member of the Indian delegation at the International Business Conference, held at Rye, N. Y., in January, reported that RCA equipment will play an important part in the project, which envisages the building and operation of 1,000 additional film houses in India during the next four years. Eventually, he disclosed, the Indian film industry hopes to have 10,000 motion picture theatres and touring units to bring films to all urban and rural sectors of the country.

At the present time, Mr. Fazalbhoy declared, India's 400,000,000 men and women are served by less than 2,000 film houses, as compared with 17,000 in this country of a third that population. The plan calls, first, for an expansion to 3,000 cinemas; then an increase to 5,000 in another four- or five-year period, and a further boost of 5,000 possibly within fifteen years after the war.

Also incorporated in the expansion, he revealed, are plans for the increase of motion picture production to service these show places. It would require the annual production of 300 feature films, 104 instructional shorts and 52 weekly newsreels. Each film house program, as now outlined, would consist of a feature film, a short, and a newsreel.

In carrying out this program, India needs the help of the American motion picture industry, Mr. Fazalbhoy said. In addition to training Indian technicians, skilled American experts could assist in setting up factories in India for the manufacture of everything required for the production and projection of motion pictures.

### *Task of the Film Industry*

The Indian film industry, according to the visitor, recognizes that it has a task to perform in bringing Indian art, learning, and culture not only to its own people but to people in other countries throughout the world. There exists a need to offset inaccurate and perhaps strange notions of India harbored by people in other countries. For this reason, it is planned to produce films in the English language for international trade.

The progress of visual education in this country, Mr. Fazalbhoy declared, illustrates the vast opportunities for the education of the Indian masses by use of motion pictures in school systems throughout that country.

Though the Indian film industry is planning for greater post-war expansion, it was pointed out that India is now the second largest producer of films in the world, second only to the United States. Production amounts to about 150 films a year, compared to 400 produced in America and 60 in Great Britain.

Service men of the U. S., who are stationed in India are showing much interest in the India of today, Mr. Fazalbhoy reported, describing it as an interest that will be communicated to their families at home. In this connection he disclosed, a film is now in production at the Temple of Art in Bombay which he feels will be a contribution to Indo-American understanding. This film is "The Story of Dr. Kotnis," a saga of a young man who left his obscure little Indian town to serve humanity in war-torn China.

### *American Films Featured*

The popularity of American films in India is growing, and some are playing to turn-away crowds, Mr. Fazalbhoy said that Indian producers are looking forward particularly to the making of technicolor films.

But he described the theater equipment situation as deplorable in India, asserting that only a scant amount has been available for civilian trade. One of his missions to this country was to set up with American governmental agencies new theater equipment quotas for export to India.

M. A. FAZALBHOY (CENTER) AND A FRIEND ARE SHOWN THROUGH NBC'S TELEVISION STUDIO BY FRED BATE, MANAGER OF NBC'S INTERNATIONAL DIVISION.

ARCHITECT'S DRAWING OF NEW RCA HEADQUARTERS IN BOMBAY, INDIA.

# COMMUNICATIONS WITH WINGS

*Aviation Radio, After 25 Years of Research, Becomes Indispensable In Modern Warfare—Many Improvements Are Secret*

By H. M. Hucke

*Manager, Aviation Radio Sales*
*RCA Victor Division*

AS the United Nations intensify their offensives against enemy forces, with swarms of bombers and supporting fighters daily growing in number, aviation radio becomes increasingly important in military strategy and tactics. Without adequate radio equipment to guide the planes and direct their activities, the extent of the powerful blows would be severely limited. With these aids, difficult missions are carried out with complete success.

And yet, startling as the development of aviation radio has been during wartime, behind today's accomplishments are 25 years of unceasing research.

While records show that both radio and aviation had their beginnings in the earliest days of this century, nearly two decades passed before these great mediums of communications were united for practical use. The Wright Brothers made aviation history at Kitty Hawk in 1903 and Marconi transmitted the first trans-Atlantic wireless message in 1901, but little progress was made in practically adapting radio to planes until 1919, the year the Radio Corporation of America was founded.

Radio transmission and reception in planes had been tried earlier but only in telegraph code. At the end of World War I, the use of two-way voice communication was in its first stage of development. Engineers faced severe handicaps. Radio equipment was bulky and heavy; planes had little available space and less weight-carrying ability, and the range of the most powerful transmitting sets was extremely limited. But, as plane designers improved their craft, radio kept pace until today the communication needs of the aviation industry can be met to the highest degree by radio apparatus tailor-made to the requirements, whatever they may be. How the two vital communication mediums continued to march ahead in step during the past quarter century is best told in a brief history of air transportation.

In the early 1920's, the U. S. Post Office Department began to carry mail between a limited number of Eastern cities. At first the pilots operated their routes without the aid of radio but shortly, radio equipment salvaged from the war, was installed. Results were only fair.

### *Pioneer Tests in 1919*

Radio first demonstrated its place as an adjunct to plane travel in May 1919 when the Navy flying boat NC-4 flew the Atlantic via Newfoundland and the Azores. Through its transmitting and receiving equipment, the big plane maintained communication with ground stations on both sides of the Atlantic and with Navy destroyers and other vessels stationed along the water route. One of the radio operators assigned to that history making hop was Harry Sadenwater, now engineering products sales manager of RCA's New York Regional Office.

Results of the flight pointed up the necessity for a network of ground stations to make up for the low power of the plane's transmitters and the use of low frequencies which travelled only short distances. Eventually, the development of short waves, which reflect from the Heaviside layer, made it possible to cover great distances with a minimum of power. This was demonstrated in 1925 when the Navy dirigible *Shenandoah*, equipped with short wave apparatus, communicated with amateurs in all parts of this country as it soared from coast to coast.

AIRCRAFT RADIO EQUIPMENT IS SUBJECTED TO ARCTIC WEATHER IN A CHAMBER COOLED TO —40°C.

Two years later, Maitland and Hegenberger flew from San Francisco to the Hawaiian Islands with the aid of long wave radio beacons. These "radio lighthouses" were the forerunners of the system installed by the Department of Commerce on all domestic airways in 1930.

After the Post Office Department contracted with commercial airlines to carry the mail, additional compensation was provided the carriers to cover the cost of installing two-way radio equipment. This resulted in the installation of complete two-way voice systems on most of the routes. A few continued to use code, a practice that is retained today on trans-oceanic lines.

### *Voice Transmission Favored*

On domestic routes voice transmission was preferable. It gave the pilot man-to-man contact with the dispatcher and weather man on the ground. It also increased the payload by eliminating 160 pounds of radio operator.

Up to the time the commercial airlines entered the picture, the development of aviation radio had been carried on by the U. S. Signal Corps, the Navy and to some extent by amateurs and an occasional adventurous small manufacturer. These Government departments were kept short-handed by the small appropriations of a peace-minded Congress and like the bulk of the aviation pioneers, were

forced to get along with the salvaged left-overs from World War I.

Airmail income, however, stimulated the airlines. They had sufficient funds even in the depression years of 1931-1935 to maintain substantial radio laboratories. For this reason, the period from 1929-1940 might be called the "Airline Era." Radio designs and procedures progressed; Congress opened its purse to the Bureau of Air Commerce and its successor, the Civil Aeronautics Authority, and many worthwhile radio refinements resulted.

### *Radio Compass Widely Used*

One of these new developments, the long-wave radio beacon, has been mentioned. Others were the two-way voice system, the radio compass, the shielded loop and the automatic direction finder.

At first the two-way voice system had only a single channel. This was inconvenient due to the necessity of having separate frequencies for day and night. With only one channel, pilots were forced to stop at daybreak and again at dusk to retune transmitter and receiver. Consequently, the two-channel quick frequency shift was a natural advance in design. Later the airline traffic increased so greatly that many frequencies were needed in crossing the continent. Today, ten quick shift channels are used in both aircraft and ground stations.

The radio compass provided means for homing on broadcast stations or radio beacons. Private flyers who flew off airway routes adopted it at once because of its value in using broadcast transmitters as guides. The Army became still another enthusiastic booster for the compass and for the same reasons.

Airlines remained satisfied with the beacon system until RCA first suggested that they try the anti-static qualities of the metallically shielded loop which had been developed by the Radio Marine Corporation of America for use on steamships. Tests were successful and the Civil Aeronautics Authority, in 1937, made its use mandatory as a safety feature. This step brought aural-null direction finding into use on all airlines.

About that time RCA and Sperry Gyroscope Co. combined their talents to develop the automatic direction finder. This soon found favor with the airlines, since it gave an immediate azimuth indication without changing the course of the airplane as was necessary with the radio compass. It also retained the anti-static properties of the metallically shielded loop without the necessity for turning it by hand.

### *Sky-wave Effect Reduced*

One of the first refinements in the radio beacon was the Adcock system, which greatly reduced sky-wave course distortion. The Adcock also had a sharper cone of silence indication over the station and it became necessary to develop a more positive system for indicating when the pilot had reached his destination. Fortunately, the ultra-high frequencies had been developed by that time and a 75-megacycle ground transmitter which sent a vertical beam upward solved the problem. The airplane receiver was relatively simple except that its output was arranged to turn on a light when the airplane passed through the beam.

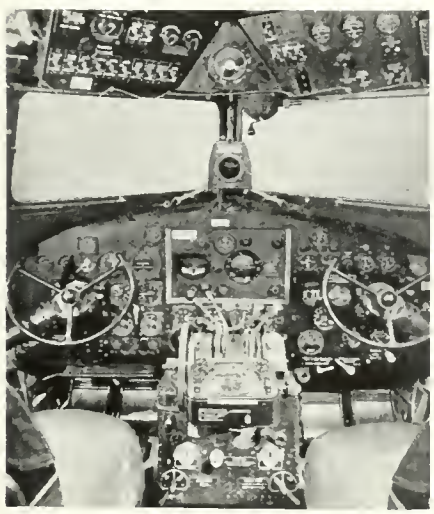
During the early part of the "Airline Era" the manufacturers, airlines and Army and Navy made various efforts to develop equipment for testing radio apparatus under simulated altitude, temperature, vibration and humidity conditions. Such efforts are still in progress, but in 1939 the C.A.A printed Manual 16 which represented the combined thinking of the various interests. This manual set certain standards by which good aviation equipment could be judged and represents a contribution as important to the art as a new transmitter or receiver.

Landing by instruments on a fog-bound airport has been the subject of much research since the beginning of the "Era." Many systems have been proposed and all found wanting until comparatively recently. Practically all systems consisted of a localizer beam which gave indications to the left and right of the runway and a glide path which gave an up-and-down indication to bring the airplane down a slanted path which ended at about the center of the runway. The localizer beam was developed early, but the glide path was delayed until ultra-high frequency techniques were advanced sufficiently to provide a satisfactory beam path. This has been achieved and will be used by the commercial services after the war.

### *Radio Altimeter Developed by RCA*

Just prior to World War II there appeared two developments which we will hear more about when the war is over. The first of these is the radio above-terrain altimeter. During the war, RCA has advanced this device tremendously and its use commercially after the war is assured. The second is the ultra-high frequency omni-directional radio range. This RCA development is destined to reappear in new forms after the war and may replace all existing types of range systems.

*American Airlines, Inc.*



INSTRUMENT PANEL OF TRANSPORT PLANE SHOWS RADIO COMPASS CONTROL APPARATUS IN THE LOWER FOREGROUND. BELOW: RCA VICTOR'S FLYING LABORATORY TAKES OFF FOR ANOTHER TEST OF AIRCRAFT EQUIPMENT.

# "INVASION" BY RADIO

*Twenty-Three RCA Short-Wave Transmitters Have Been Shipped Abroad to Play Important Part in the War of Words*

THREE shortwave radio transmitters completed and shipped recently by the RCA Victor Division were the last of twenty-three 50-k.w. transmitters supplied by the company during the past two years to carry on the war of words against Germany and her satellites. These shipments are believed to exceed in number and power classification the output over a similar period of any manufacturer in the history of radio.

First to "invade" the axis and satellite nations, with words for weapons, short-wave radio transmitters helped to pave the way for the physical invasion. Keeping up a constant bombardment of news, education, and counter-propaganda heard and felt around the world, they helped and are helping to consolidate Allied gains and facilitate Allied victories.

Among the RCA transmitters now on the air are seven operated for the Office of War Information, including five on the East Coast of the United States, one on the West Coast, and one in North Africa. Three of the East Coast stations are being operated for OWI by the National Broadcasting Company, a subsidiary of RCA; the other two by the Columbia Broadcasting System. The West Coast station is being operated for OWI by Associated Broadcasters.

First of the list of 23 stations to be installed was a transmitter purchased by the Brazilian government for Radio Nacional, government-operated station at Rio de Janeiro, which went on the air during the winter of 1942-43. John Dawson, RCA field engineer, supervised the installation.

Next came Radiodiffusion Nationale Belge (the "Voice of Free Belgium"), at Leopoldville, in the Belgian Congo, and Radio Brazzaville, operated by the French National Committee for Liberation, in Brazzaville, French Equatorial Africa. These transmitters went on the air in the spring of 1943, Leopoldville preceding the Free French station by about a month. The Leopoldville installation was supervised by Walden Shaw, Brazzaville by Paul C. Brown. Both are RCA field engineers.

Development of this type of transmitter was begun about a year before Pearl Harbor, when the increasing importance of high-power international broadcasting became apparent.

Rectifier, audio, and control circuits of the 50-kilowatt RCA short-wave transmitter are much like those developed for the RCA standard broadcast transmitter of the same power rating.

The inclusion of two separate and complete radio frequency channels is a feature of the shortwave unit which experience has proved valuable as a means of quickly setting up or changing frequencies to any point in the range from 6 to 22 megacycles.

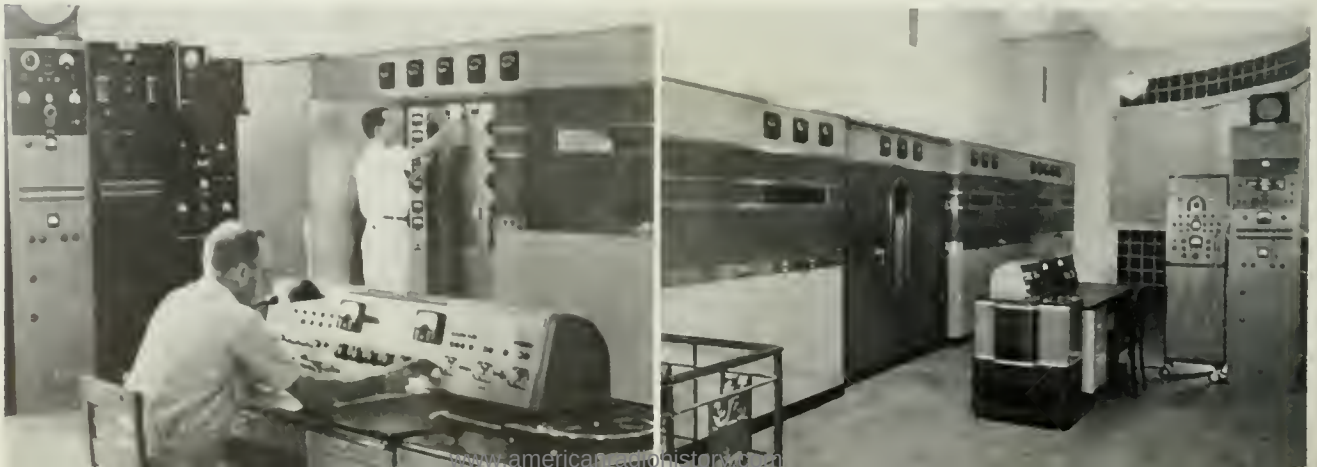
RADIO TRANSMITTERS ADD THEIR VOICES TO THE WAR OF WORDS DIRECTED AGAINST GERMANY.

## SCHMIT AND BEERS MOVE UP IN RCA VICTOR

Appointment of D. F. Schmit as Director of Engineering was announced recently by Frank M. Folsom, Vice President in charge of the RCA Victor Division. Mr. Schmit, formerly assistant chief engineer, will fill the post vacated by Dr. C. B. Jolliffe, now Vice-President of the Radio Corporation of America in charge of RCA Laboratories.

Mr. Folsom also announced the appointment of George L. Beers as Assistant Director of Engineering in charge of Advance Development. He was formerly on the engineering administrative staff.

LEFT: TRANSMITTER PANELS AND CONTROL DESK AT LEOPOLDVILLE, BELGIAN CONGO. RIGHT: ANOTHER RCA 50-KILOWATT TRANSMITTER IS OPERATING FROM RIO DE JANEIRO.



# TUBES IN MINIATURE

*Development of Tiny Electron Tubes Forecasts Design of Smaller Radio Sets and More Compact Television Receivers.*

DEVELOPMENT of a complete line of new miniature electron tubes by the laboratory and engineering departments of the Radio Corporation of America may make possible the design of smaller radio receivers and compact radio-television-record player combinations. The tubes, a wartime accomplishment in which the best features of two types have been combined, were revealed by R. L. Kelly and N. H. Green of RCA Victor Division before a recent winter meeting of the Institute of Radio Engineers.

Typical savings of 20 to 40 percent in equipment size are expected to result from the reduced size of the miniature tubes, some as small as the little finger. Only the further development of power output amplifier tubes and rectifier tubes in miniature envelopes, a project already showing promising progress, remains to complete the types needed for the full tube complement of home receivers.

Today according to the joint authors, these tubes are helping maintain instantaneous communications in a swift-moving global war; tomorrow they will help provide improved television, FM radio, facsimile, personal radio and other communications equipment.

The cathode-type miniature tube, now playing an essential role in military and naval communications, came into being shortly before our entry into the war. It originated as an outgrowth of separate lines of peacetime scientific research and commercial development in RCA's laboratories and factories.

### *Two Features Combined*

The "wedding" of the acorn type tube, developed by RCA as part of a program of research in the ultra-high frequency field, and the filament-type miniature tube, developed and introduced by RCA in 1938, as the heart of the RCA personal radio receiver, produced the first cathode type miniatures in 1940. By merging special features of the two earlier types, the efficient high frequency performance of the acorn was combined with the smaller size and lower cost of the miniature.

Since small size and efficiency at high frequencies are both important requisites of military and naval equipment, a vital need for large quantities and numerous variations of this type of tube arose with our entry into the war.

"At the rapid pace at which our armies and navies move in this war," Mr. Kelly pointed out in the paper, "most of their communication equipment must be transportable, if not actually installed, in vehicles, planes, or ships, and must, therefore, be small and lightweight. For this reason, the 1.4-volt filament-type miniature tubes, introduced by RCA in 1938, were adopted early in the war for use in the so-called 'Walkie-Talkie' equipment.

"Meantime, the development of ultra high frequency equipment had revealed that both metal and glass types of standard broadcast receiving tubes had definite frequency limitations. The filament type miniature tubes offered appreciable advantages in reducing the size and weight of equipment, but their electrical characteristics were not well suited for operation at the higher frequencies.

"Equipment designers therefore turned to the well-known acorn types, but while these tubes gave excellent performance at high frequencies, the chassis area required for their ring-type sockets presented a serious limitation to reductions in the size of equipment."

### *Less Chassis Space Needed*

Recognition of these problems led to the development of an entirely new line of RCA tubes in which the cathode-type inner structure of the acorn, designed for high frequency operation, was combined with the small envelope and base which had been used for the filament-type miniature. This type of base, having vertical contact pins instead of the radial pin arrangement characteristic of the acorn tube, requires considerably less chassis area than the latter.

LEFT: MANY MINIATURE TUBES ARE NEEDED TO MAKE A HANDFUL. BELOW: A CHECKER INSPECTS SCORES OF SMALL TUBES BEFORE THEY ARE SHIPPED.

# NETWORK POLICIES REVISED

*Changes Necessary, Niles Trammell, President of NBC, Announces, If Program Quality Is to be Maintained.*

CERTAIN network policies on commercial programming have been revised to improve service in the public's interest, Niles Trammell, president of the National Broadcasting Company, has announced in a letter and brochure sent to advertisers, advertising agencies and affiliated stations.

Revisions comprise discontinuance of the Abeyance List; full approval by the network of replacement programs; elimination of control of time periods by artists and a ban on references to programs on other networks.

In discussing the discontinuance of the Abeyance List on August 30, 1943, Mr. Trammell pointed out that thereafter, whenever a period of time became open, the program chosen for that period was selected on the basis not of its seniority on a waiting list but of program quality, and with reference to the requirements of a balanced network program structure. As a direct result, he said, "we have been able to schedule several outstanding programs which are now contributing greatly to the over-all listening of the NBC network."

### *Obligation to Listeners*

Covering the announcement on "Replacement of Programs," Mr. Trammell said, "In line with the same philosophy, we believe that whenever an advertiser discontinues a certain program but wishes to retain the same period of time, we have an obligation to our listeners, our other sponsors and our stations to make certain that the replacing programs shall be as interesting and entertaining as the one discontinued, or more so."

In explaining the network's decision dealing with the control of broadcast time by talent, Mr. Trammell stated that with a single exception, such control or assignment has never been authorized by NBC.

"The exception occurred a number of years ago when, with the full consent of his sponsor, the period occupied by an artist was assigned to him, completely subject of course to the approval by NBC of his future sponsorship and programs. The circumstances which warranted this arrangement at that time were unprecedented and their recurrence is altogether improbable. In the future, no such control will be sanctioned."

### *Provides Maximum Audience*

The decision to eliminate "Cross References to Programs on Other Networks," with the exception of certain guest artists being identified with their own programs on other than NBC broadcasts, was taken, Mr. Trammell explained, to provide all advertisers with the maximum NBC audience and to treat all alike.

He pointed out that "some ten years ago one of our customers bought time on another network and then requested the privilege of calling attention to his other program by means of announcement on his NBC show. On a more or less experimental basis we agreed to a somewhat indirect type of announcement, which called attention to the other program and directed the listener to consult his local newspaper for time and station. This type of announcement has been used in similar cases ever since.

"We have now reached the conclusion that this practice is inconsistent with our efforts to provide all advertisers with the maximum NBC audience, and to treat all alike, regardless of the number of programs they may have on the air. In this connection we are not referring to guest artists who may be identified on an NBC program by reference to the sponsor of their regular program that is scheduled on another network."

In a more detailed account of NBC's procedure covering "Replacement Programs and Their Acceptability," Mr. Trammell said, "We will not enter into any more so-called automatic renewal facilities contracts, and have terminated all existing agreements of that particular type."

By discontinuing the automatic renewal feature, he pointed out, "every NBC contract will again be on the original basis of 52 weeks (or less), with 13-week cancellation privileges to the advertiser.

"By fulfilling the public demand for creative entertainment of the highest quality, each program will do its share to maintain and increase the overall listening to the network and enhance the network's value to all listeners and consequently to all advertisers."

Concluding the announcement, Mr. Trammell said, "We feel sure that all NBC clients will recognize in the principles outlined and procedure announced herein a reasonable effort on our part to fulfill our obligations to the public, and to our many customers who serve the public well by maintaining the highest possible level of program quality."

### *Middle Commercials Eliminated*

In another order issued by Mr. Trammell on March 15, all commercial announcements in the middle of newscasts, originated by NBC and its owned and operated stations, were eliminated effective immediately. The action was taken, the announcement said, "because news today is our Number One public service obligation and commands the eager interest of all ages and classes." It was pointed out that the move is in line with a policy already in force under which NBC sponsors cooperate in eliminating middle commercials, or upon occasion, commercials of any kind, from news broadcasts during events of supreme interest.

Under the new ruling, sponsors of news programs have been requested to include their commercial announcements within the first two minutes and the last three minutes of all fifteen minute news periods.

Mr. Trammell paid tribute to network advertisers whose support has made a constantly greater volume of worldwide news coverage possible and expressed his belief that the new step would receive the same wholehearted cooperation.

DR. C. B. JOLLIFFE

OTTO S. SCHAIRER

# Jolliffe Moves Up

*HE IS ELECTED VICE PRESIDENT IN CHARGE OF RCA LABORATORIES—MR. SCHAIRER IS STAFF VICE PRESIDENT*

DR. C. B. JOLLIFFE, Chief Engineer of the RCA Victor Division, has been elected Vice President of Radio Corporation of America in Charge of RCA Laboratories, Brigadier General David Sarnoff, President, announced following the March 2 meeting of the Board of Directors. Dr. Jolliffe succeeds Otto S. Schairer, who was elected Staff Vice President of RCA at the Board meeting. Mr. Schairer will be consultant and advisor on matters pertaining to research, development, patents, trademarks and licenses.

The Board also authorized Ewen C. Anderson, Commercial Manager of RCA Laboratories, to execute license agreements under domestic patent rights and to coordinate the commercial activities of RCA Laboratories with those of the RCA Victor Division.

A native of Morgantown, West Virginia, Dr. Jolliffe was graduated from West Virginia University with a B.Sc. degree in 1915 and received the M.S. degree in 1920. He was awarded the Ph.D. in 1922 at Cornell University, where he was instructor in physics from 1920 to 1922. His Alma Mater conferred the honorary degree of LL.D. in 1942.

From 1922 to 1930, Dr. Jolliffe served as physicist in the radio section of the Bureau of Standards, resigning to become chief engineer of the Federal Radio Commission. He remained for five years with the FRC and its successor, the Federal Communications Commission, and then joined the Radio Corporation of America as engineer-in-charge of the RCA Frequency Bureau. In 1941, he was appointed chief engineer of RCA Laboratories, and early in 1942 he was made Assistant to the President of RCA. In September, 1942, he was appointed chief engineer of the RCA Victor Division, Camden, N. J.

While with the Bureau of Standards, the FRC, the FCC and later with RCA, Dr. Jolliffe attended most of the international radio conferences as technical advisor or delegate. During the war he has been active on several Government wartime committees including Division 13 of the National Defense Research Committee of the Office of Scientific Research and Development, which he served as chairman from 1940-1944; as secretary of the Industry Advisory Commitee of the Board of War Communications and as a member of the Engineers Defense Board. He is a member of Phi Beta Kappa and Sigma Xi. His home is at Princeton, N. J.

Mr. Schairer joined RCA in 1929 as Director of Patent Development following 27 years with the Westinghouse Electric and Manufacturing Company, which he entered in 1902 after graduation from the University of Michigan with an E.E. degree.

Soon after affiliation with RCA, Mr. Schairer was placed in charge of the combined patent and license departments. In 1930, he was elected a Vice President of the Company.

Plans for a great research center in radio and electronics, which he had fostered for many years, materialized in 1941, when the Radio Corporation of America built RCA Laboratories at Princeton, N. J. Mr. Schairer, as Vice President in Charge of RCA Laboratories, supervised the plans and construction, and since the dedication in September, 1942, has directed extensive research and developments concerned almost exclusively with war projects.

## Beal Elected Vice President of RCA Communications

Ralph R. Beal, Assistant to the Vice President in Charge of RCA Laboratories and for nine years Research Director of the Radio Corporation of America, was elected Vice President of RCA Communications, Inc., in Charge of Engineering, Brigadier General David Sarnoff, President of RCA, announced following a meeting of the Board of Directors on April 6.

Mr. Beal joined the Radio Corporation of America in 1926 as its Pacific Division Engineer, and in 1934, he was transferred to New York as Research Supervisor of RCA. Three years later, he was made Research Director.

Mr. Beal is a Member of the Institute of Radio Engineers and a Fellow of the Society of Motion Picture Engineers. For the past two years, he has been a member of the Microwave Committee of the National Development Research Committee of the Office of Scientific Research and Development.

# Opera by Television

*BY COMBINING SIGHT AND SOUND, NBC HAS PROVED THAT THE AGE-OLD CLASSICS CAN BE FURTHER POPULARIZED*

By Dr. Herbert Graf
*Director of Operatic Production, National Broadcasting Company*

TELEVISION has taken the first definite step to lift opera out of the "old fashioned" phase into the form that makes it acceptable to Broadway standards. This pioneering move, made by NBC through its television station WNBT, will, I feel certain, have the same popularizing effect upon opera that standard radio has exerted upon concerts. Thousands of people, to whom the best music was something intended only for a select group of erudite music lovers, are now regular listeners to symphonies and recitals. By combining sight with sound, television makes the picture of an opera performance complete.

After many weeks of experiments and trial rehearsals, NBC, late in 1944, produced several scenes from "La Boheme." Success of this attempt was followed in turn by a dramatized aria from "Barber of Seville"; a condensed version of an entire grand opera, "Carmen," with a cast selected mostly from members of the Metropolitan Opera Company, and a condensed version of an entire light opera, Johann Strauss' "The Bat." Later, we produced Stephen Foster's "Swanee River."

The writer adapted these productions into English, using spoken dialogue where desirable and employing stage sets designed to television studio requirements.

These experiments proved that opera can be a "natural" and that television forces it to become so. For one thing, we learned that the new medium requires methods of production different from those usually applied in legitimate operatic presentations.

### *Good Looks Essential*

Television, we discovered in our early rehearsals, calls for a different type of singer. Good looks is one prime requisite for the new medium; a relaxed facial expression while singing is another. It is not a simple matter to find vocalists who have this combination of good voices, good looks, and good acting abilities and who also have the inherent ability to memorize new versions and the willingness to work long rehearsal hours for comparatively modest remuneration.

From these pioneering experiments we have learned much about the methods of television opera production. For the finest development of the art we must have fewer productions, and better quality of voice, diction and gesture and an attractive appearance.

Television, in my opinion, settles by itself the long debated question about the language of opera. For television, being a technique which stylistically lies midway between opera comique and film, is a natural technique favoring realism more than the usual grand opera production. Television, too, gives preference to dialogue over the recitative and to the use of the native language of the audience rather than to the language in which the original was written. Grandiloquent gestures which have been considered natural to opera also must be replaced in television versions by realistic action.

### *All Details Must Be Planned*

But this is not all. Television will reach its ultimate audience acceptance only when it is able to present a well-rehearsed ensemble with exact planning of all details including the placing of every detail of action for the establishment of camera shots. In television, unlike the making of films, a "shot" cannot be greatly changed once the performance is under way. This situation practically excludes last minute improvisations by the stars, however brilliant these same improvisa-

STUDIO SETTINGS RECREATE THE ATMOSPHERE OF PUCCINI'S "LA BOHEME" IN THIS SCENE FROM A RECENT TELEVISION PRODUCTION.

tions might be on the operatic stage. Thus the opera artist desirous of working in television must be willing to subordinate himself to the ensemble idea.

In our work so far in adapting operas to television, we have been reminded frequently that we must use extreme care in modernizing old operas lest we ruin them. There is more than a substance of truth in this warning. If we are to succeed we shall need people who know operatic technique of the past and yet have the courage to go ahead on the new basis.

Television opera creates a wide new field for producers, writers, composers and artists. The medium offers a real and promising opportunity to the wealth of vocal talent now available in this country.

I am convinced that television will not, as some believe, bring harm to the traditional form of opera. Rather, it will do as radio already has done: it will enhance opera by further extending the public interest in its exploitation.

In short, television will be the democratizing force which will force opera to take off its top hat and speak the language of the people. In so doing it will help decisively to make opera a popular art in America for Americans.


THE TELEVISION CAMERA TAKES A "CLOSE-UP" OF A VOCALIST IN AN EXCERPT FROM "THE BARBER OF SEVILLE."

## FRENCHMAN PRAISES AMERICAN RADIO SET

*News Picked Up by 1934 Model Receiver, Bolstered Family's Morale, Correspondent Writes*

AN American made radio set, built in 1934 but still giving yeoman service 11 years later, was the means by which a French family in enemy-held territory retained faith in ultimate freedom through dependable news of the outside world supplied by U. S. short wave stations. In a letter written recently from Paris, Maurice Gilon, owner of the receiver, an RCA model 141, expressed his gratitude for the French language broadcasts "which helped us in great measure to endure four years of German occupation and oppression."

Addressing his letter to "Dear Friends of NBC", M. Gilon wrote:

"What a joy it is to be able at last to write you freely and express all our gratitude to you for your broadcasts in French, which helped us in great measure to endure four years of German occupation and oppression.

"As to myself, I am the father of a family and one of your faithful listeners from a long way back. I have listened to short wave in Morse code since 1923 and tuned in the first American amateur stations. In 1934, I bought an RCA set, model 141. For the last ten years, often under the worst possible conditions, this set has always given me complete satisfaction, in spite of its thousands of hours of operation.

"During the war, 1939-40, and my imprisonment in Germany, 1940-41, my wife and children listened every evening to the voice of America.

"When I got home from captivity in August 1941 (released because I was a veteran of the 1914-1918 war), I took up again my regular listening to American and British short wave. The countless broadcasts over the 'W' stations laughed at Boche jamming, and thanks to them we were kept posted, hour by hour, on what was happening. Thanks to them, we were able to hold steadfast in the midst of terror and lies.

"In the name of my sons, my wife and myself, I say again: thank you. I hope a day is coming soon when I shall be able to tell you this same 'thank you' in New York itself, in NBC's magical 'City of the Air Waves'."

## Buy War Bonds

## Prize Winners Announced

THE two prize-winning compositions in the first Western Hemisphere string quartet competition sponsored by the Washington Chamber Music Guild in cooperation with RCA Victor received their world premiere in Constitution Hall, Washington, D. C., on February 27.

Recipients of the $1,000 awards donated by the RCA Victor Division of Radio Corporation of America were Robert Doellner, Hartford, Conn., music teacher, whose composition, "String Quartet No. 1" was adjudged best among North American entries, and Camargo Guarnieri, young Brazilian composer and musician, winning contestant from Latin American countries. The compositions were performed by the Chamber Music String Quartet of Washington.

Because of the contest's international cultural aspects, Latin American diplomats and high ranking government officials attended the concert, which was broadcast to Latin American countries by arrangement with the Coordinator's Office of Inter-American Affairs.

Of the more than 300 string quartet compositions submitted in the competition, many were from men in the armed forces, according to Marcel Ancher, Guild founder.

THE REVEREND ROBERT I. GANNON, PRESIDENT OF FORDHAM UNIVERSITY, PRESENTS THE "ONE WORLD" AWARD TO BRIGADIER GENERAL DAVID SARNOFF AT THE AMERICAN NOBEL CENTER'S FIRST ANNUAL "ONE WORLD" DINNER IN MEMORY OF WENDELL WILLKIE.

# "One World" Honor

## *GENERAL SARNOFF RECEIVES AWARD FOR HIS ACHIEVEMENTS AS "MOULDER OF WORLD OPINION THROUGH RADIO"*

THE "One World" medal, established in honor of the late Wendell Willkie was awarded to Brigadier General David Sarnoff, at the first annual dinner of the American Nobel Center, February 18, at the Hotel Astor. In presenting the award, the Reverend Father Robert I. Gannon, S.J., president of Fordham University, who presided as toastmaster, said that General Sarnoff had been chosen for the honor because of his work as "a moulder of world opinion through the radio and as the promoter of popular culture that knows no State or national boundaries."

Responding to the presentation, General Sarnoff, spoke on "Science and Peace" and discussed "the role of radio in the achievement of peace in One World."

"Throughout the ages," he said, "history has written in letters of blood, that the ultimate principle of man's moral code must be an enlightened altruism. If he is to remain a civilized creature his goal must be the common good.

"The great problems which lie before us must be solved and the results coordinated if we are to have peace and security. Education is one vital factor in that solution. Communication is another. With a free press, and a free radio the methods of communication which science is constantly enlarging will enable us to enlighten a waiting world.

"I believe that through the amazing progress in electronics the peoples of the World will know each other better. Today American radio, because of the constant messages of courage and good-will, truth and sincerity, which it has broadcast in the name of Liberty to oppressed populations, is acclaimed overseas as 'the Voice of Freedom.' It can also be 'the Voice of Peace.'

"For radio belongs to the people of all Nations. By its very nature it is the essence of Freedom. It bestrides the continents and leaps across frontiers to reach all men, rich and poor alike. The size of the earth has been shriveled and distances annihilated, making this planet a mere community, and all people neighbors in One World. Europe's relation to America is no longer the 'detached and distant situation' that George Washington noted in his Farewell Address. There is no national exclusiveness in radio; no trace of narrow isolation in waves that carry friendly voices to every Nation and into many millions of homes at the speed of light.

"Science can give to the essential Freedoms the wings needed to reach people everywhere—simultaneously! Therein lies radio's great role in the establishment and perpetuation of Peace.

"Today, radio and the press are inseparable in the defense of freedom of speech and expression. Liberty is the watchword. To this end America must have more powerful facilities and more effective international programs to serve a world at peace. We must have sufficient world-wide radio circuits to carry news and pictures freely and directly to and from all corners of the earth.

"Radio has given freedom of expression a new dimension. Consider how President Roosevelt and Prime Minister Churchill have inspired untold millions by their voices in

space! From them the world has caught new hope for freedom. In radio, freedom of worship finds a true voice for all creeds. Again the electrified word extends the influence of the pulpit and the printed word by carrying the gospel to all people.

"To the Four Freedoms, I would add a Fifth—Freedom of Science. It is essential to the maintenance of world unity. Political and social limitations and expediencies must not fetter the application of scientific knowledge, nor stop the quest for it. Man must be free to think; free to conduct research, free to develop his ideas, free to invent and to produce.

### *Influence for Good*

"The impact of enlightened public opinion upon individual thought can be a vast influence for good. It can stimulate ideas. It can strengthen belief. It can bring hope. It can inspire courage.

"But false propaganda, as we have seen in the Axis nations, can degrade public opinion, brutalize millions of people, and touch off a wave of fanaticism that leaves half the world a barren desert. We need more than merely the better means of world communications which science has given us. We need more than the easy ability to communicate with each other in this One World we all envisage. We need most to keep the channels of that communication *free* so that man's noblest thoughts, untrammeled by censorship, may best serve mankind.

"In the cooperative relationship of radio, press and motion pictures, we find an excellent example of how each contributes to the other, and the total effort becomes one of progress in greater service to the public. The press associations supply news to the broadcasters just as broadcasters often give historic news to the press. On the newsreels in theatres, the public sees the events brought to life which they have read in the press or heard over the radio.

"Scientific wartime developments promise a rapid postwar expansion of television, wherever Governments encourage its use. As one of the foremost steps toward international solidarity we should study the promising uses of television in helping preserve the peace.

### *World-Wide Television*

"Let there be no doubt that the world eventually will have international television. It will be a new educational force with a double appeal to eye and ear, put at man's disposal by science, to give him a new and more intimate understanding of his neighbors. Pictures are an international language. They convey clearer and quicker impressions than words spoken in a foreign tongue, or written in a foreign language. Nations will then see themselves as others see them, for the world is destined to go sightseeing by radio. People everywhere will understand, as never before, how freedom functions in Democracies.

"Not only a greater hope for lasting peace, but a greater opportunity for economic freedom—freedom from want—is embodied in science. On every hand we see evidences of man's ingenuity to create new products to fulfill his basic needs by mastery of Nature through science. At the moment he is looking upward to the air which already offers him new and speedier means of communication and transportation.

### *Universe Unexplored*

"The vast universe is still unexplored. To advance civilization we must continue to go up—and so we will—as man becomes the master of Nature.

"When Victory comes, the men who have been applying science in the laboratories for war on the battlefronts, will direct their talents and skills to science for peace. These scientists will go onward in their conquest of space. Through their genius, I believe, science will provide in ever-increasing abundance, the necessities, the comforts, the luxuries of life and will enable civilization to triumph over hardship, famine and disease."

---

## Radio Engineers Honor Dr. Beverage

DR. H. H. BEVERAGE, (RIGHT), ASSOCIATE RESEARCH DIRECTOR OF THE RCA LABORATORIES, RECEIVES FROM DR. W. L. EVERITT, PRESIDENT OF THE INSTITUTE OF RADIO ENGINEERS, THE IRE MEDAL OF HONOR "IN RECOGNITION OF HIS ACHIEVEMENTS IN RADIO RESEARCH AND INVENTION, OF HIS PRACTICAL APPLICATIONS OF ENGINEERING DEVELOPMENTS THAT GREATLY EXTENDED AND INCREASED THE EFFICIENCY OF DOMESTIC AND WORLD-WIDE RADIO COMMUNICATIONS, AND OF HIS DEVOTION TO THE AFFAIRS OF THE INSTITUTE OF RADIO ENGINEERS." THE PRESENTATION WAS MADE DURING THE INSTITUTE'S 1945 WINTER TECHNICAL MEETING.

# COVERING THE WAR FRONTS

*Back from a Survey of Battle Areas, NBC News Head Praises Radio, Press and Communications Personnel Working with Troops*

By William F. Brooks

*Director, News and Special Events, National Broadcasting Co.*

AT NO TIME in history have the American people been so well informed about what is going on in a war time world as they are at present. Radio, press and communications people have combined in a super team to bring news and background material to the home front almost as the action itself is taking place.

In the past three months I have traveled to fleet headquarters in the Pacific and to General Dwight Eisenhower's supreme headquarters in Europe. I have ridden behind the western front in France from the Vosges Mountains in the South to central Belgium, making a survey of NBC staff and facilities, and it is impossible to escape this conclusion. This is a radio war. Not a plane flies, or tank moves, or ground force begins an assault without the link of radio communications with headquarters. The U. S. Army Signal Corps has worked closely with broadcasters and newsmen everywhere in order that on-the-spot reporting may inform American listeners and readers.

When I left Europe five years ago after nine months of war I did not believe technical facilities would ever be permitted or developed to provide the wide scope of coverage which now prevails. As Managing Director of the Associated Press of Great Britain, Ltd. and The Associated Press, GmbH, Germany, I had watched the preparations of the various foreign powers for all-out war. Neither the British nor the French had the conception of the power of news and communications that then existed in Germany.

The German propaganda bureau was holding daily meetings with German radio, newsmen, and photographers. Their needs were embodied in battle plans by the German general staff and when the Boche swept into Western Europe on their initial thrust facilities for on-the-spot coverage went along with the spear-head forces. At Dunkirk airplanes equipped with photographic darkrooms shuttled photographs back to Berlin on an every hour schedule so that they could be radioed to the United States and other countries.

### *Provided Own Facilities*

After the entry of the United States into the war it appeared for a time that we would follow in the footsteps of the British and the French insofar as providing news facilities was concerned. But this attitude, fortunately, was changed.

The most signal change came with the invasion of France last year. Plans developed in preparation for this event made it possible for radio and newspapers to give it the greatest coverage in the history of the world.

Several months before the invasion a special Signal Corps public relations mission arrived in England. This mission was headed by Brigadier General David Sarnoff, then on leave as president of the Radio Corporation of America. The mission plunged into the situation and set a pattern for facilities which was so successful that it has been carried into succeeding operations and into other theaters.

At one time we radio broadcasters were crying our eyes out for transmitters at various points. Now the situation is reversed in a way. Only recently one army group headquarters messaged the war department that it now had a beautiful transmitter but no radio reporters to go with it. NBC answered the call and Edward Haaker was dispatched from his London post to Sixth Army Group headquarters in the south of France to provide on-the-spot coverage over RCA facilities.

The invasion pattern also has been followed in the Pacific. When General MacArthur steamed into Leyte and Luzon and went on to Manila, a portable radio transmitter, installed on shipboard, accompanied the troops. Aboard were George Thomas Folster and Pat Flaherty of NBC. Col. Edward Kirby of the Radio Branch of the Public Relations Section of the War Department says this ship has been described as the "ship with the singing masts" for it is loaded with radio equipment and a transmitter beamed to San Francisco.

From this ship Folster and Flaherty flashed word of the liberation of Santo Tomas, the fall of Manila, and the recapture of Corregidor.

Similarly, when U. S. troops went into Iwo Jima, Wilson K. Foster of NBC and other radio news men were permitted to broadcast from a battleship just a mile or so off shore.

### *Conferred With Staff*

I flew from New York to Paris. After conferences with NBC personnel and communications officers in SHAEF I rode down the Meuse valley to a point behind the Colmar pocket, which General Devers' troops had just cleaned up. It is with this Army Group that Army Signal Corps and RCA technicians under the supervision of Thomas D. Meola, have set up a complete commercial short wave radio station over which U. S. broadcasters and newsmen transmit.

I went up the Moselle, through Nancy, Metz and Thionville, to Luxemburg. Then I drove north to Central Belgium for a conference with General Omar Bradley of the Twelfth Army Group and back for a talk with General George S. Patton, colorful commander of the U.

S. Third Army. All of these officers and their staffs seemed fully conscious of the morale value of getting news back home, and particularly radio's part in the job.

### *A Talk With Patton*

General Patton said he thought the Signal Corps and the truck drivers deserved special mention for their less spectacular, but just as important, work. To illustrate, he said he was driving around the front on what is known as Skyline Drive. This is a road along a bluff immediately across the river from German positions. It was under more or less constant shelling from enemy guns. Army drivers customarily speed as fast as possible along this stretch. The General's driver was no exception. Suddenly they went around a curve and there were two Signal Corps trucks parked in full view of the Boche. Two linesmen were unconcernedly perched on top of poles repairing a broken line. The General stopped and called out to the men.

"Don't you fellows know this road is under fire," he asked.

"Sure," said one of the linesmen, "but this blankety blank wire has to get fixed."

The General said this was typical of the spirit of the troops in keeping communications at top efficiency.

I can testify to the difficulty of working under even less dangerous conditions. I was interviewed by NBC's David Anderson in a broadcast over the Army transmitter at Luxemburg. We had written our script and at the last minute one paragraph was eliminated. Anderson, and Lt. Col. Howard Nussbaum, formerly of NBC and radio officer for the Twelfth Army Group, who made the trip with me, both cautioned that I should maintain a slow pace in order to fill the time.

We had been on the air about three minutes when a bomb dropped down the street. When I looked up next, everybody in the studio was signaling me to slow down. I had accelerated my speech so that we were headed for a quick ending. This happened three times during the broadcast with the result that we had to "return to the NBC newsroom in the United States" about a minute and a half too soon. We were unable to ad lib anything because of censorship but fortunately the newsroom staff in New York quickly stepped into the emergency and filled the extra time with news bulletins.

### *Planning in Paris*

Back in Paris, Stanley Richardson, NBC London manager; Paul Archinard, NBC Berne representative, and other staff members held conferences outlining plans for broadcasting coverage from Berlin after its capture.

A 60,000 watt transmitter, mounted in sections on 17 Army trucks, is prepared to travel with American troops driving into the German capital and it is expected that first on-the-spot broadcasts from there will be transmitted over this facility.

Other facilities and plans were discussed and put into operation for broadcasting V-E Day, if the war ends at any set time, and for post-war broadcasting from European points.

To strengthen our war end coverage various shifts in NBC personnel were arranged:

Paul Archinard was transferred from Berne, Switzerland, to be Office Manager of NBC's Paris headquarters in the Scribe Hotel. Tom Hawkins, A. P. war correspondent with wide experience in the European theater, replaced Archinard in Switzerland. Roy Porter, former NBC reporter in Chungking, has been sent to Paris and W. W. Chaplin, widely known NBC commentator in New York, is enroute to the western front. John MacVane, David Anderson, and Edward Haaker are assigned to various armies and Max Jordan, who had years of experience in Europe before the war, is on a roving assignment. Bjorn Bjornson has left Stockholm for the western front and has been succeeded by Sven Norberg.

### *Newsmen Face Greatest Task*

With these men, and others to be assigned later, NBC hopes to interpret the momentous events which will follow the war in Europe. Contrary to the opinions of some people, I believe that post-war events will be more newsworthy, in many respects, than the actual war coverage. The peak of European confusion is yet to come.

When military censorship is lifted and news from vast countries again is available, American newsmen will face their greatest task.

Radio newsmen should dedicate themselves to the cause of freedom of access to news everywhere. There should never again be permitted a situation whereby selfish rulers can blackout whole countries in news as was done in Germany, Italy, Japan and, to a lesser extent, in France and Spain. Radio can play an ever increasing part in bringing understanding and friendship between nations.

WILLIAM F. BROOKS DISCUSSES RADIO AND PRESS COVERAGE OF THE WAR WITH LIEUT. GEN. JACOB L. DEVERS, SOMEWHERE IN EUROPE.

# New Advances in Radio Foreseen

DR. C. B. JOLLIFFE SEES GREAT POSSIBILITIES FOR RADIO RELAY STATIONS—TELEVISION IS ENVISAGED AS FIVE TO TEN BILLION DOLLAR ENTERPRISE IN THIS COUNTRY

REMINISCENT of conditions which existed at the end of World War I when sound broadcasting came into being as a revolutionary medium of progress, a new radio frequency spectrum opened by scientific developments in this war promises even greater advances, embodying the formation of vast new industries and services for the American people, Dr. C. B. Jolliffe, Vice President in Charge of RCA Laboratories, declared in an address before a joint meeting of the American Institute of Electrical Engineers and the Institute of Radio Engineers at Indianapolis, on March 23.

### *Awaits Public Demand*

"At the end of this world war we will have all of the conditions necessary for an explosive mixture," Dr. Jolliffe said. "If the spark of public demand for new things is struck, we will be in on a much larger explosion than that which occurred with the start of sound broadcasting."

Asserting that the impending allocation by the Federal Communications Commission of all frequencies from 10 kilocycles to 30,000 megacycles will be "one of the important milestones in radio history," Dr. Jolliffe said it will determine the future of many possible uses of radio, including applications of radio frequency power which do not require FCC allocations or authorization.

"Sound broadcasting revolutionized our ideas of entertainment and altered our way of living," Dr. Jolliffe declared. "Television can provide a second revolution of entertainment and affect our mode of living to an even greater degree. The application of electronics can revolutionize manufacturing. In air transportation the use of new developments in radio aids to navigation and communications will change our conception of the reliability of air transportation and make it a really true competitor to surface transportation. 'Citizen's radio' is an entirely new concept of the use of radio communications in everyday life and it may extend enormously the use of radio equipment.

"Each of these applications of radio may create a new industry which may affect other industries. The men who have made radar useful for the complicated business of war certainly can be relied upon to conceive of many uses of the new radio techniques used in this field."

Dr. Jolliffe, declaring that radio manufacturers are now able to build transmitters, receivers and antennas which "will give a very satisfactory television performance for the home," emphasized the necessity of having definite frequency assignments and a well-organized system of distribution of programs.

### *Foresees Huge Industry*

"With frequency allocations definitely set, with program sources organized, and with networks in operation — in other words, with a system organized—this one industry can completely revolutionize our way of life," Dr. Jolliffe said. "It does not take much imagination to see this industry as a possible *five or even ten billion dollar enterprise*, employing thousands of men, either directly or indirectly."

Expressing a desire to avoid controversy as to the merits of whether television should be below 300 megacycles or above 500 megacycles, Dr. Jolliffe remarked that the question which needs to be answered is "whether we want television or not." He said that if the public wants it, technically it can be produced below 300 megacycles. He added that, on the other hand, if the belief prevails that the public does not want television "then let us honestly postpone its inauguration and not hide behind the probability of possible new developments."

Extensive field tests in several large metropolitan areas have established the fact that "very satisfactory entertainment" can be provided by television broadcasting service using six megacycle channels and carrier frequencies below 300 megacycles.

"Having obtained a television system with this degree of performance," Dr. Jolliffe continued, "the television engineer is faced with the problem of determining the extent to which television images must be improved before the public will be conscious of the improvement and be willing to pay a higher price for television receivers.

"What is the nature of the improvement which will be most acceptable to the television audience?" Dr. Jolliffe asked. "Should some new broadcast service be added, for example, the transmission of odors, good and bad? All of these additions may be desired by the public, but each improvement represents an increase in the cost of the receiving instrument and also requires an additional cost in terms of valuable space in the frequency spectrum."

### *Engineers Must Not Be Satisfied*

Dr. Jolliffe emphasized that as the television industry develops, engineers have the obligation to see that the public gets better and better service and that the new developments which would be brought about by the stimulation of use are integrated into an over-all system.

"Engineers should not be satisfied that their television job is done," Dr. Jolliffe asserted, "until they have made it possible to project in the home pictures of adequate size in color, and also for anyone to attend — by television — all major happenings wherever they occur, in the United States or in

any other part of the world. These objectives may be accomplished in a few years, or many years may be required."

Another important field of radio development is in aviation, Dr. Jolliffe pointed out, stressing the necessity of continuing advances in this work after the war to insure the safety and expansion of the great air transportation for public and private use. He added:

"Radar has been publicized chiefly for its use as an instrument for increasing the destructive power of aircraft. It can be and is used, however, to guide and land planes under the poorest visibility conditions. Radio instruments can look ahead and warn the pilot of obstacles in the path of the plane and tell the pilot at all times the height of the plane above the ground. Vacuum tubes (electronics) can make the operation of flight instruments more accurate and dependable. Radio communications, of course, can keep the pilot and passengers in touch with persons on the ground and in other planes. Radio then can make flying a safe and reliable service; therefore, it can be an important part of another big industry."

### *Outlook for "Citizen's Radio"*

Dr. Jolliffe in his address foresaw the day when "citizens' radio" —personal radio communication— will have a prominent role in our lives. He recalled how the walkie-talkies and other portable radio apparatus have demonstrated their usefulness in the war, and reminded his listeners that the FCC has already planned frequencies for their peacetime counterparts.

"Regulations for this service," he said, "will be so simple that anyone can use the apparatus without restriction; only simple licenses will be required. A farmer's wife can talk to her husband while he is riding his tractor; a construction superintendent on a skyscraper can give direction to his workers; a doctor can keep in touch with his office. These are examples—the possible uses are as extensive as the human mind can imagine."

### *New Uses for Portable Equipment*

Use of portable radio equipment in police work, forest protection and in new public service communications, Dr. Jolliffe stated, are all due for rapid expansion. But he added that two new applications of radio deserve special mention.

"We are accustomed to think of telephone and telegraph traffic being carried by wires," Dr. Jolliffe said. "Recent developments in ultra-high frequency radio have shown that radio relays can also do the job. Directive beams in the ether can carry messages as well as wires. Using frequencies of 1,000 megacycles or more, it is possible to use the technique of wire communications without many of its limitations.

"It is not fantastic to imagine long telephone and telegraph lines being replaced by lines of towers spaced 25 to 40 miles apart with small automatic radio transmitters and receivers carrying many messages simultaneously through the ether from coast to coast. A single communications channel may carry telegraph, telephone and television messages or programs simultaneously with less maintenance or service than simple wire lines."

The second application, which Dr. Jolliffe said promises "great impact on industry," is the use of radio frequencies for heating. He reported that the development of radio heating has gone forward rapidly in recent years and is being used to speed and improve the efficiency of many industrial processes.

In conclusion, Dr. Jolliffe said: "I want to emphasize again that we, as engineers, have a responsibility not only for the creation of the apparatus that is useful in new industries but also for the organization of this apparatus into systems and services that can be the basis for new industries and new employment. Also, we must continue to recognize our responsibility to the Government in peace as well as in war, and do our part to provide adequate technical preparedness as a practical measure to insure the permanence of peace."

## RCA FORMS DIVISION FOR FOREIGN SALES

*John G. MacKenty Appointed to Head International Group Which Will Supervise Company's Activities Abroad*

A NEW RCA International Division has been formed by the Radio Corporation of America to supervise foreign sales and other activities of the Company and its subsidiaries outside of the United States, Brigadier General David Sarnoff, President of RCA, has announced. Headquarters of the Division will be in New York.

John G. MacKenty, Vice President and General Manager of Radiomarine Corporation of America, has been appointed Managing Director of the RCA International Division. Mr. MacKenty has been associated with the Company for more than twenty-three years and has held important posts at home and abroad.

The International Division will have charge of the export of all products manufactured and sold by RCA companies and divisions, and will supervise RCA interests abroad.

ARCHIBALD MAC LEISH AND DEAN ACHESON, ASSISTANT SECRETARIES OF STATE, OPEN NBC'S SERIES OF PEACE PLAN DISCUSSIONS.

# "Our Foreign Policy"

### THE STATE DEPARTMENT AND CONGRESSIONAL GROUPS JOIN WITH NBC TO PRESENT SERIES OF PEACE PLAN DISCUSSIONS

FOR the first time in the 25 years of radio's history, the Department of State, the Senate Foreign Relations Committee and the House Committee on Foreign Affairs, the three major governmental bodies charged with the formulation and execution of America's international policy, are participating in a joint broadcast discussion of plans for building the peace. The exclusive series, part of the NBC University of the Air, started February 24 and is heard each Saturday at 7.00 p.m., EWT., under the title, "Our Foreign Policy."

Secretary Edward R. Stettinius, Jr., was expected to launch the opening program but attempts to pick up his broadcast from Mexico City, where he was attending an Inter-American conference, failed. In his absence, his address was read by Assistant Secretary Archibald MacLeish, who acted as chairman throughout the seven programs which represented the State Department's portion of the series.

Following the conclusion of the State Department participation, twelve or more additional programs devoted to American international policy are to be conducted by the legislative branch. Among the members of the Senate and House Committees who are scheduled to appear are Chairman Tom Connally and ranking minority member Hiram W. Johnson of the Senate Committee, Chairman Sol Bloom and ranking minority member Charles A. Eaton of the House group. Legislators who are not members of the two committees but who represent various shades of opinion will be heard in later programs.

Titles of individual programs and the speakers who participated indicate the wide scope of the series:

"MAIN ST. AND DUMBARTON OAKS."

Under-Secretary of State Joseph C. Grew; Alger Hiss, Secretary of Dumbarton Oaks Conference.

"WORLD TRADE AND WORLD PEACE."

Assistant Secretary of State William Clayton; Assistant Secretary of State Dean Acheson.

"WHAT ABOUT LIBERATED AREAS?"

Assistant Secretary of State James C. Dunn; Charles Taft, special assistant to Clayton.

"WHAT ABOUT ENEMY COUNTRIES?"

Under Secretary of State Joseph C. Grew.

"AMERICA'S GOOD NEIGHBORS."

Assistant Secretary of State Nelson Rockefeller, Ambassador to Brazil Adolph A. Berle; Ambassador Spruille Braden.

"IT'S YOUR STATE DEPARTMENT."

Secretary of State Brigadier General Julius Holmes; Michael McDermott.

Following the Roosevelt-Churchill-Stalin meeting at Yalta and the announcement that the next United Nations Conference would be held in San Francisco, directors of "Our Foreign Policy" decided to make the west coast city the originating point of the broadcasts for the duration of the Conference.

The NBC University of the Air has announced that a book containing texts of the broadcasts by the State Department and the two Congressional Committees will be available in the summer. Plans have been made to make this volume a permanent reference work on international relationships and peace.

"Our Foreign Policy" has been endorsed by four of the major Protestant denominations, and 47,000 ministers of the Presbyterian, Congregational, Baptist and Methodist churches have been urged to listen to the broadcasts.

## 4th Star for Radiomarine

A fourth star for the company's Army-Navy "E" Flag in recognition of continued excellence in production has been awarded the Radiomarine Corporation of America. In notifying Charles J. Pannill, President of Radiomarine, of the award, Admiral C. C. Bloch, USN (Ret.), Chairman of the Navy Board for Production Awards, congratulated Radiomarine employees for their "splendid production record" and stressed the urgency for continued support of all war workers to back up America's fighting forces.

Admiral Bloch also wrote that "in view of your excellent record, the Army and Navy have decided that your company may retain the flag for a year before being considered for the next renewal." It has been customary for continuation of the award to be decided on the basis of production over a six-months period.

# RELAYING BY RADIO

*Towers Spaced Across the Nation Will Act as Repeater Stations to Carry Television and Other Services—First Tests Begun in 1923*

By C. W. Hansell

*RCA Laboratories, Rocky Point, L. I.*

SLENDER towers standing like lighthouses on the peaks of high hills and stretching in parade-file over flatlands hold promise today of becoming the means by which television programs will be made available to the entire nation. Using this medium, television signals comprising the sound-and-sight entertainment of the future will be "bounced" by radio from one tower to another, leaping gaps of 20 to 50 miles at each jump. Now that research scientists and engineers have brought television to a point where it is ready to create a new American industry, the planning and erection of these repeater stations is the next logical step.

For the past twenty years, the Radio Corporation of America has conducted experiments in radio relaying. Beginning with a radio carrier frequency of 182 kilocycles, research and development have gradually increased the utilized frequency to 500 megacycles. At the same time modulation bands have increased in width from 2000 cycles to four megacycles.

In 1923, RCA began the development of a radio relay station at Belfast, Maine. Its purpose was to intercept longwave transoceanic telegraph signals at a location where directional reception would reduce interference from lightning storms and to relay intercepted signals on another frequency to the RCA receiving station at Riverhead, Long Island. A year later, a second relay transmitter was completed at Belfast to operate on frequencies around 3 megacycles. This transmitter is believed to be the second one in the world equipped for quartz crystal frequency control, and the first to be put to practical use. By means of this unit the first broadcast programs were brought from London to New York for rebroadcast purposes. For RCA, it marked the beginning of shortwave equipment development and propagation tests which contributed to the present world-wide networks for international radio communication.

### *Four Firms Cooperate*

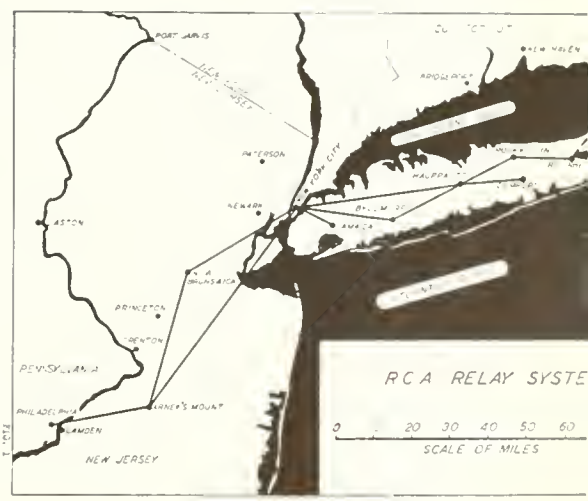
Soon thereafter, an experimental station was installed in the Empire State Building in New York City. It was at this stage of progress that the ultimate necessity for a television network, with which to carry programs from city to city, became apparent. Consequently, RCA and NBC, in cooperation with the General Electric Company and Westinghouse, undertook in 1932 the development of a relay station to carry experimental television from New York to Camden, New Jersey. A site on Arney Mount near Mt. Holly, New Jersey, was selected for the repeater and its 165 foot tower.

Although the apparatus was demonstrated successfully in 1933, using images with a fineness of 120 lines, tests soon convinced engineers that the relaying of television transmissions would have to be done at far higher frequencies than could be utilized at that time due to the lack of suitable vacuum tubes.

However, by the end of 1939, enough progress had been made in the development of new vacuum tubes for use at very high frequencies, and in the correlated development of radio repeaters and relay stations, to permit the establishment on Long Island of several radio relay stations operating in the vicinity of 450-500 megacycles. This relay system, which repeatedly "hopped" signals from the Empire State Building to a receiver in the RCA Laboratory at Riverhead, accommodated the full band-width permitted by television standards then in force. Later the addition of a third repeater station at Bellmore, Long Island, made it possible to relay signals from New York to Riverhead and back to Radio City.

A striking characteristic of properly designed radio relay systems, operating on frequencies above 500 megacycles, is that they require much less amplification in a given distance than concentric cable systems, when both are required to meet the present and future television modulation band-width requirements.

As television broadcasting moves to the higher frequency portions of the spectrum and as it becomes possible to include color, it is natural that the band-width required for transmission will be increased. For this reason it seems probable that radio relaying will receive greater recognition as the most promising means, technically and economically,




EXTENSIVE RADIO RELAYS OPERATING BETWEEN NEW YORK, EASTERN LONG ISLAND AND CAMDEN, N. J., IN 1939, LAID THE GROUNDWORK FOR NATION-WIDE RELAYS NOW IN PROSPECT.

ANTENNAS TOPPING HIGH TOWERS SIMILAR TO THE ONE SHOWN HERE WILL RELAY TELEVISION AND OTHER SERVICES ACROSS THE COUNTRYSIDE.

for the distribution of television programs.

In establishing a radio relay system, a major portion of the cost is represented by sites and towers. It is a fortunate circumstance that no development foreseen at present will destroy the value of these investments. Moreover, it is anticipated that future developments will make it possible to utilize higher radio frequencies thus providing more perfect reproduction of modulations without requiring substantial alterations in sites and towers.

Before the war the development of vacuum tubes and repeaters had been carried far enough to make it practical to utilize frequencies for television relaying in the range of about 300 to 1000 megacycles. It is anticipated that as soon as restraints due to the war are removed, the frequency range will be extended upward until eventually, frequencies of 3000 megacycles or more may be used.

### *Some Applications*

Since the only justification for investing large sums of money in radio relay systems, and for getting involved in the toils of technical development, business promotion and government regulation, is the usefulness of the systems, it is appropriate to consider some of the applications.

Radio relays have so many outstanding technical and economic advantages for television distribution that eventually they should be regarded as essential for this service. However, the costs of adequate radio relay systems are substantial and, unless the outlay for relay station sites, towers and facilities can be spread over a number of channels and services, the financial burden may delay the initial spread of television service.

In holding unit costs down, it is essential that the relay stations be designed and equipped to provide several television channels, all utilizing the same towers. It is also essential that investment and operating expenses be shared with as many secondary services as possible.

In general, relay stations will occupy the highest points of land or buildings and provide the highest towers in each community. They are therefore the natural choice for location of radio broadcasting stations. By combining relaying and broadcasting, where this is possible, both can benefit.

### *High Towers are Attractions*

High towers are natural gathering places for pleasure seekers and the curious. In many cases observation platforms, television theatres, restaurants and other entertainment facilities might be installed at the top of the relay towers to give a greater public service and to help in paying the costs.

One of the most natural secondary services, from a technical standpoint, will be that of facsimile communication, the transmission of any sort of picture or message which is to be recorded at the receiving end as a copy of the original. An adequate television radio relay circuit has a potential speed of transmission of 108,000 pages per hour.

There are as many uses for facsimile service as there are for existing telegraph and mail services. It is a means for giving the services with far greater speed and less effort. Soon, for example, facsimile could provide nationwide newspaper delivery faster than papers can now be printed.

There is another probably important use for future radio relay systems which is closely related to the struggle just beginning to obtain the use of frequencies above 30 megacycles. It is that of providing radio services to airplanes.

As airplanes increase in number, the demands for aviation radio service will increase to such a degree that it will be unreasonable to expect that radio frequencies and facilities can be provided so that all airplanes flying over land may communicate by radio over long distances. Furthermore, as the speed and efficiency of airplanes have increased, it has become more unreasonable to equip planes with either large protruding antennas, or powerful equipment, both of which are needed to operate on the frequencies required to reach great distances.

### *Looking to the Future*

Looking ahead it seems inevitable that much of the communication with aircraft must be limited to short distances and carried out on higher frequencies with more compact equipment and without protruding antennas. This will require a large number of ground stations, spread out along the air routes, and because these same routes will be followed generally by the radio relay systems, radio relay stations are natural sites for airline radio ground stations.

Railroads, long distance bus and truck lines and portions of the traveling public have communication needs similar in character to those of the airlines. Radio relay systems might very well contribute to the fulfillment of these needs.

To make radio relaying a great new American industry requires a more general understanding of its value; a well-defined and stable licensing policy; a relaxation of restraints which not only dampen the hope of expansion and profit but discourage joint action by those in need of relay service, and a few promoters who have caught the vision.

# from NBC...

## *the finest in Music*

The National Broadcasting Company in broadcasting fine music . . . music in infinite variety . . . meets the challenge and opportunity to make its network an instrument of pleasure and cultural entertainment for its vast listening audience. Week after week, NBC takes music lovers on many stirring musical adventures provided by the greatest artists in music. For example:

**MUSIC OF THE NEW WORLD** (Thursdays, 11:30 p.m. EWT) traces the influences and contributions to musical culture of Western Hemisphere urban centers . . . authentically recreates "Music in American Cities."

**THE GENERAL MOTORS SYMPHONY OF THE AIR** (Sundays, 5 p.m. EWT) features the NBC Symphony Orchestra under the batons of world famous conductors . . . Toscanini, Ormandy, Sargent.

**ORCHESTRAS OF THE NATION** (Saturdays, 3 p.m. EWT) presents the symphony orchestras of Chicago, Indianapolis, Baltimore, Kansas City and Rochester, directed by their distinguished conductors.

**FIRST PIANO QUARTET** (Saturdays, 11 a.m. EWT) offers gifted performers in a wide repertoire of remarkable four-piano arrangements.

**THE TELEPHONE HOUR** (Mondays, 9:00 p.m. EWT) gives listeners great artists . . . among them Kreisler, Anderson, Iturbi, Pinza and Hofmann . . . as soloists with Donald Voorhees' symphonic orchestra.

**THE VOICE OF FIRESTONE** (Mondays, 8:30 p.m. EWT) brings the concert vocalists Richard Crooks and Gladys Swarthout, with Howard Barlow's orchestra and brilliant guest artists.

*Programs heard over the National Broadcasting Company enrich the lives of radio listeners, not only in the field of fine music but in those of history, literature and other cultural subjects.*

**National Broadcasting Company**

**America's No. 1 Network**

A SERVICE OF RADIO CORPORATION OF AMERICA

## How Television Got Its Electronic "Eyes"

As revolutionary as airplanes without propellers—that's how much electronic television differs from the earlier mechanical television!

Whirling discs and motors required for mechanical television were not desirable for home receivers. Pictures blurred and flickered.

But now, thanks to RCA research, you will enjoy all-electronic television, free from mechanical restrictions—"movie-clear" television with the same simplicity of operation as your radio receiver.

Such "let's make it better" research goes into everything produced by RCA.

At RCA Laboratories, world-famous scientists and engineers are constantly seeking new and better ways of harnessing the unbelievable forces of nature . . . for mankind's greater benefit.

Electronic television is but one example of the great forward strides made possible by RCA research—opening the way for who knows what new miracles?

When you buy an RCA radio or phonograph or television set or any RCA product, you get a great satisfaction . . . enjoy a unique pride of ownership in knowing that you possess the finest instrument of its kind that science has yet achieved.

**Dr. V. K. Zworykin, Associate Research Director** and E. W. Engstrom, Director of Research at RCA Laboratories, examining the Iconoscope or television "eye"—developed in RCA Laboratories for the all-electronic television system you'll enjoy tomorrow.

**RADIO CORPORATION of AMERICA**

*PIONEERS IN PROGRESS*

RCA