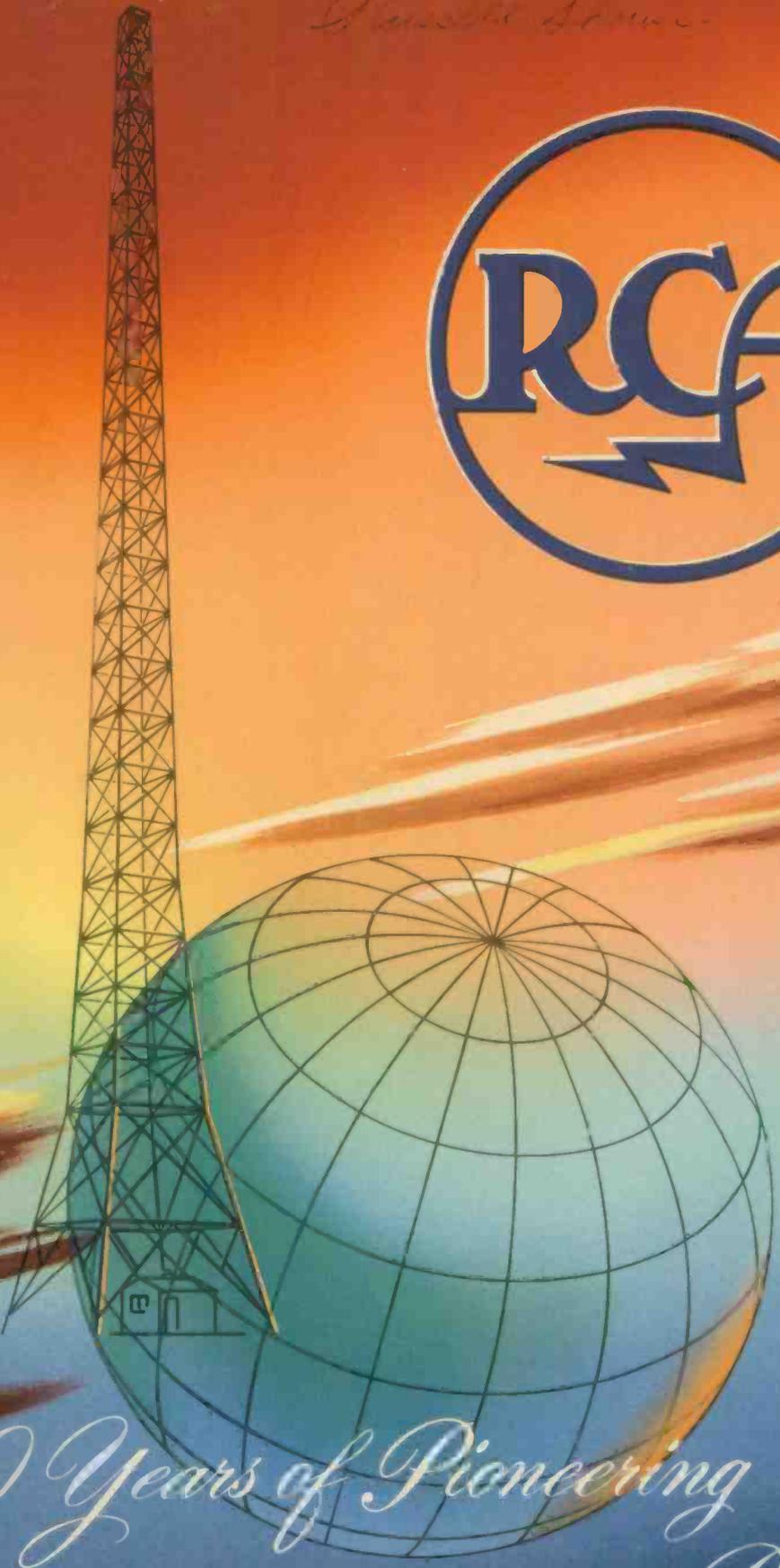


*Radio Town*



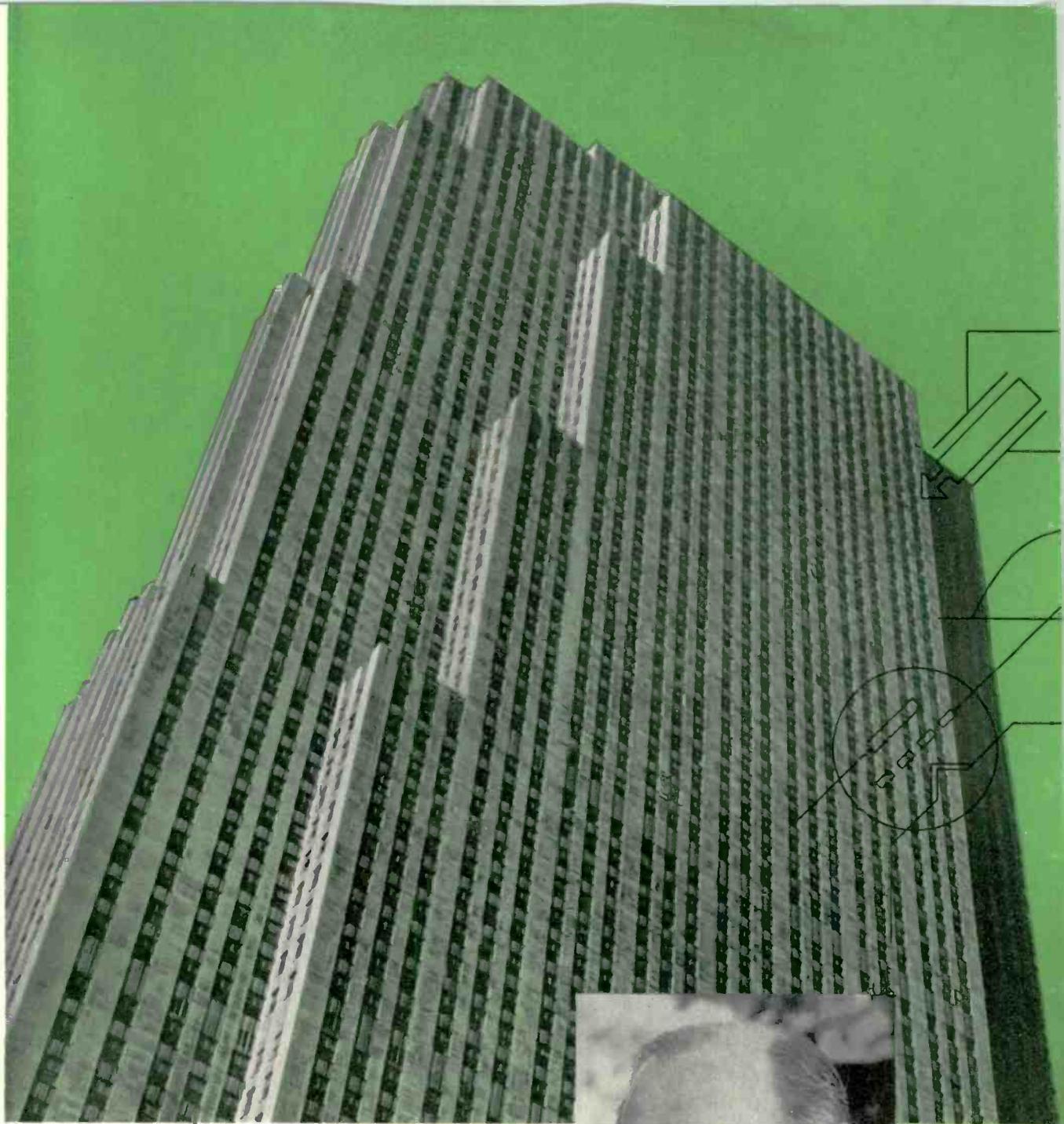
*30 Years of Pioneering  
and Progress*



30 years of pioneering and progress in radio and television



*Published by the Department of Information*  
**RADIO CORPORATION OF AMERICA**  
RCA BUILDING, 30 ROCKEFELLER PLAZA, NEW YORK 20, N.Y.  
*Copyright 1949, Radio Corporation of America*



*Only through adventurous thinkers can the search for new knowledge succeed. Without this knowledge, the world would stagnate as a pool without an inlet; neither would there be an outlet for its progress.*



DAVID SARNOFF

Chairman of the Board  
Radio Corporation of America



## FOR E W O R D

**R**ECENT years have taught us, as never before, that frontiers for exploration and development of radio, television and electronics extend far beyond the man-made boundaries of world geography. Today research extends to the outermost reaches of space. Radar echoes that come back from the moon measure to some extent the vastness of radio's laboratory and the scope of research.

Scientific pioneering moves as a vanguard of progress. Particularly is this true in the realm of radio. No industry in this country in the Twentieth Century has made greater strides than radio and television, or contributed more extensively to the pleasures and information of people everywhere. It is the research of today and tomorrow, rather than the inventions of yesterday, that chart the future of radio and determine its destiny.

Thirty years ago—when the Radio Corporation of America was formed to insure the pre-eminence of the United States in radio communications—this new art and industry, though possessing promising aspects, left much to be desired. World-wide radiotelegraph communication circuits were yet to be established. There were no national broadcasting networks, no efficient system of marine radio communications. There were only a few electron tubes. Electronic phonographs, talking pictures, radar and television were still unknown. All have been developed since RCA began its epic pioneering in radio. RCA scientists, engineers and executives accepted the challenges and translated their explorations and experiments into products and services that are at the forefront of world progress. Today no nation surpasses America in inter-

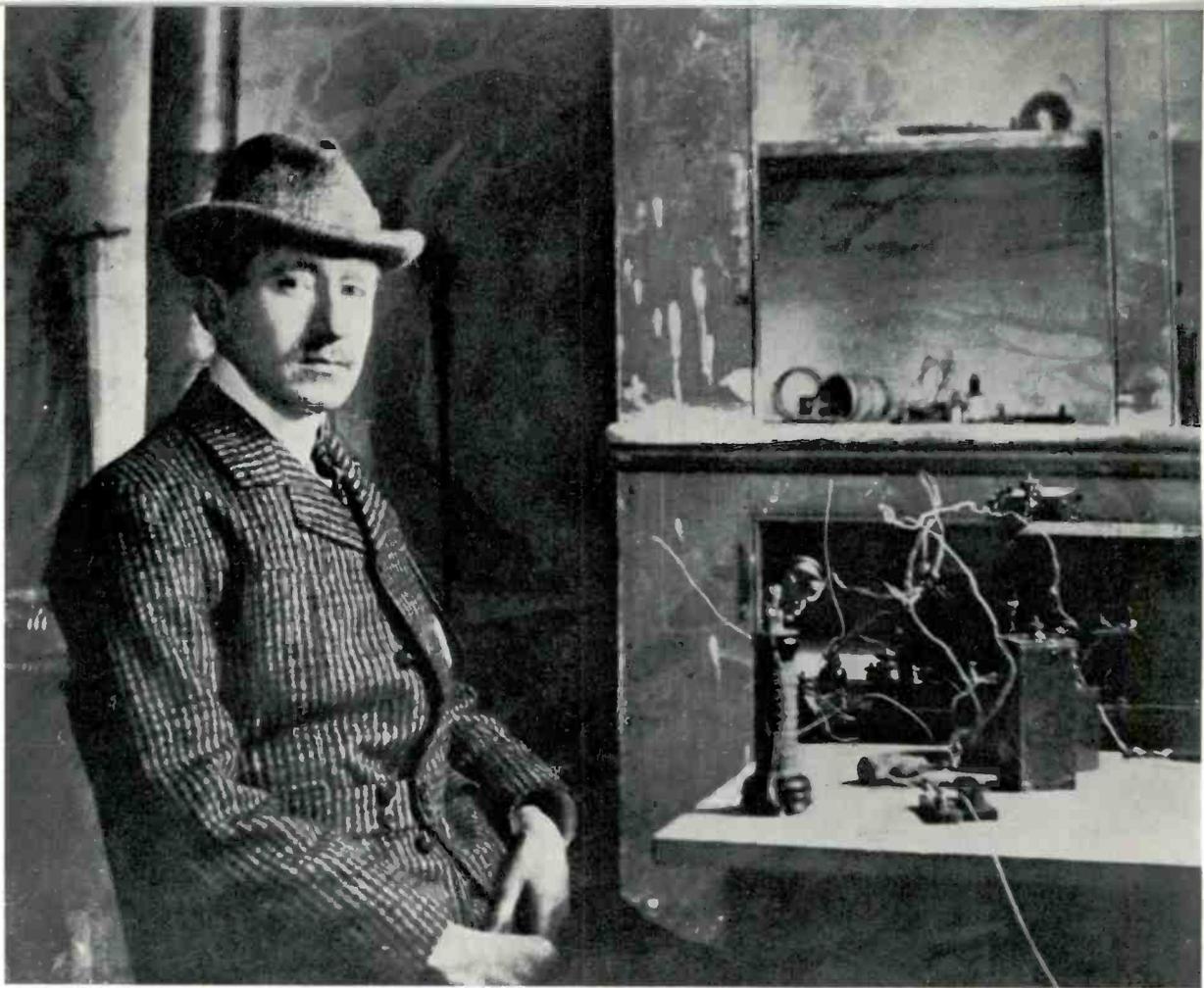
national and marine communications, broadcasting, mobile and aviation radio, facsimile, radar, industrial electronics, television, or any other application of radio techniques.

When RCA was formed in 1919, it began operations with 457 employees. Today, it employs more than 40,000. Total assets of RCA at the end of its first year of operation in 1920 amounted to \$25,112,945. Total assets at the end of its 29th year in 1948 amounted to \$248,224,476, nearly ten times that of the first year. Valuation of plants and equipment increased from \$8,901,674 in 1920 to \$68,001,846 in 1948. Net income of RCA during the past ten years increased from \$8,082,811 in 1939 to an all-time high of \$24,022,047 in 1948. During this ten-year period, dividends paid to stockholders amounted to \$65,074,717.

Services and products of RCA have grown steadily in public favor. RCA's scientists can be justly proud of their pioneering record. They have answered the call to war and contributed greatly to victory through their achievements. They now fulfill their peacetime obligations to society and contribute generously to the advance of radio-television as a science, art and industry in service to the public.

Journeying down the corridors of these past thirty years provides an impressive view of radio's advance. It also reveals the immensity of the challenges and opportunities still ahead. May our quest for new knowledge and progress be unending, and our achievements bring increasing enlightenment, entertainment and understanding to all people, never relinquishing for a moment our efforts to strengthen the security of this Nation.

*David Sarnoff*



Marconi with apparatus which he used to receive the first transatlantic wireless signal on December 12, 1901.

In the meantime, Marconi had added success to success by increasing the range of his invention. Ship and shore stations were equipped. Ships of war as well as ships of commerce used the invisible method of signaling, and soon the wonder of wireless was front-page news throughout the world. The *S.S. Republic* disaster in 1909 and the tragic sinking of the *S.S. Titanic* in 1912 revealed the great usefulness of wireless on the oceans.

The Marconi Wireless Telegraph Company of America, organized on November 22, 1899, contributed much to the advance of wireless as the years went by. It served the Nation in peace and in war.

### War Revolutionizes Radio

When the Armistice ended the First World War on November 11, 1918, wireless was generally confined to dots and dashes. But during the war a great transformation had taken place — radio had found an electric tongue; it had learned to talk and to sing. New vacuum tubes had been developed as keys to major advances in the development of radiotelephony and in harnessing the short waves which prior to the war had been considered beyond the range of usefulness. The war had changed all that. Radio emerged from the conflict revolutionized. As a science and an art, radio was on the threshold of a new era.



Kite used by Marconi in historic 1901 wireless test is shown by his associate, G. S. Kemp.

Because the Marconi companies and the Marconi inventions were to a large extent in British control, the United States faced the danger that this revolutionary method of wireless communication, with all its international implications, would be in foreign hands. The war had revealed the power over world communications as represented by the foreign ownership of the transoceanic cables. Wireless telegraphy in the hands of the United States Government had given the Nation an independent wartime communication service that spread across the hemispheres.

But Congress declined to sanction the continuance, in peace, of such a Government service. Restoration of the Government stations to the Marconi Company meant possible foreign control — even though American inventors such as DeForest, Alexander-son, Fessenden, Tesla, Edison and others had contributed immeasurably to the radio art.

*G. Marconi*

## THE TRANSATLANTIC TIMES.

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VOLUME I
NUMBER I
BULLETINS

THE TRANSATLANTIC TIMES

Published on board the "ST PAUL," at sea, en route for England, November 15th, 1899.

One Dollar per Copy in aid of the Seamen's Fund.

Mr. W. W. Bradfield, Editor in Chief. Mr. T. Bowden, Assistant Editor. Miss J. B. Hillman, Treasurer. Mr. H. H. McClure, Managing Editor.

Through the courtesy of Mr. G. Marconi, the passengers on board the "St Paul" are accorded a rare privilege, that of receiving news several hours before landing. Mr. Marconi and his assistants have arranged for work the apparatus used in reporting the Yacht in New York and at

The most important dispatches are published on the opposite page. As all know, this is the first time that such a venture as this has been undertaken. A Newspaper published a Sea with Wireless Telegraph messages received and printed on a ship going twenty knots an hour!

This is the 32nd voyage eastward of the "St Paul." There are 375 passengers on board, counting the extinguished and extinguished.

The days' runs have been as follows:—

Nov. 9th	435
" 10th	436
" 11th	425
" 12th	424
" 13th	421

1.50 p.m. . . . . First Signal received, 66 miles from Needles

2.40 " Was that you "St. Paul"? 50 miles from Needles.

2.50 " Hurrah! Welcome Home! Where are you?"

3.30 " 40 miles, Ladysmith, Kimberley and Mafeking holding out well. No lag battle. 15,000 men recently landed.

3.40 " At Ladysmith no more killed. bombardment at Kimberley effected the destruction of ONE TIN POT. It was auctioned for £300. It is felt that period of anxiety and strain is over, and that our turn has come."

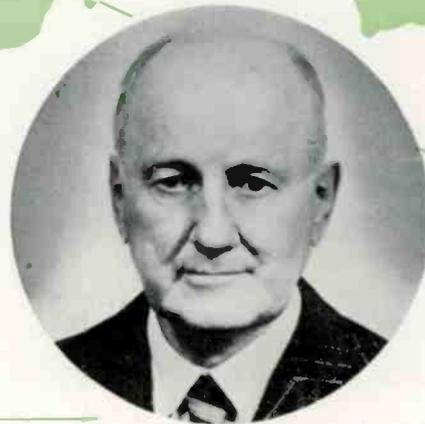
Cruiser

One of the first wireless bulletins to be published received Marconi's endorsement.

1. TO SEND AND RECEIVE SIGNALS, MESSAGES AND COMMUNICATIONS . . .
2. TO CREATE, INSTALL AND OPERATE A SYSTEM OF COMMUNICATION WHICH MAY BE INTERNATIONAL . . .
3. TO IMPROVE AND PROSECUTE THE ART AND BUSINESS OF ELECTRIC COMMUNICATION . . .
4. TO RADIATE, RECEIVE AND UTILIZE ELECTROMAGNETIC WAVES . . .
5. TO CREATE AND MANUFACTURE CONSUMER GOODS, AND TO HOLD PATENT RIGHTS IN RADIO, ELECTRONICS AND OTHER FIELDS . . .



Edward J. Nally  
First President of RCA, 1919-1923.



Lt. Gen. J. G. Harbord  
Second President of RCA, 1923-1930.

### The Formation of RCA

It was at this juncture, in 1919, that the Radio Corporation of America was formed by the General Electric Company, as a result of suggestions by officials of the United States Navy, in order to provide an all-American communications company. On November 20, 1919, the business and property of the Marconi Wireless Telegraph Company of America were acquired by the Radio Corporation of America, to which a charter had been granted on October 17, under the corporation laws of the State of Delaware. Then General Electric turned over rights under its own radio patents to the new company, which was to carry on the

business of wireless communications as well as to develop new inventions and new radio apparatus.

On December 1, 1919, RCA began business as an all-American organization, with Owen D. Young, Chairman of the Board; Edward J. Nally, President, and David Sarnoff, Commercial Manager. Primarily, the purpose of RCA was to give the United States pre-eminence in radio communication, independent of all other countries. The aim was not only to send and receive signals and messages on an international scale but also to improve and advance this new system of electric communication; to conduct progressive research and to create and manufacture



*Spark transmitter which played an important role in the early evolution of wireless.*

consumer goods — all with the purpose of serving Americans everywhere. Great possibilities for expansion of wireless service at sea as well as for communication between and within nations were foreseen.

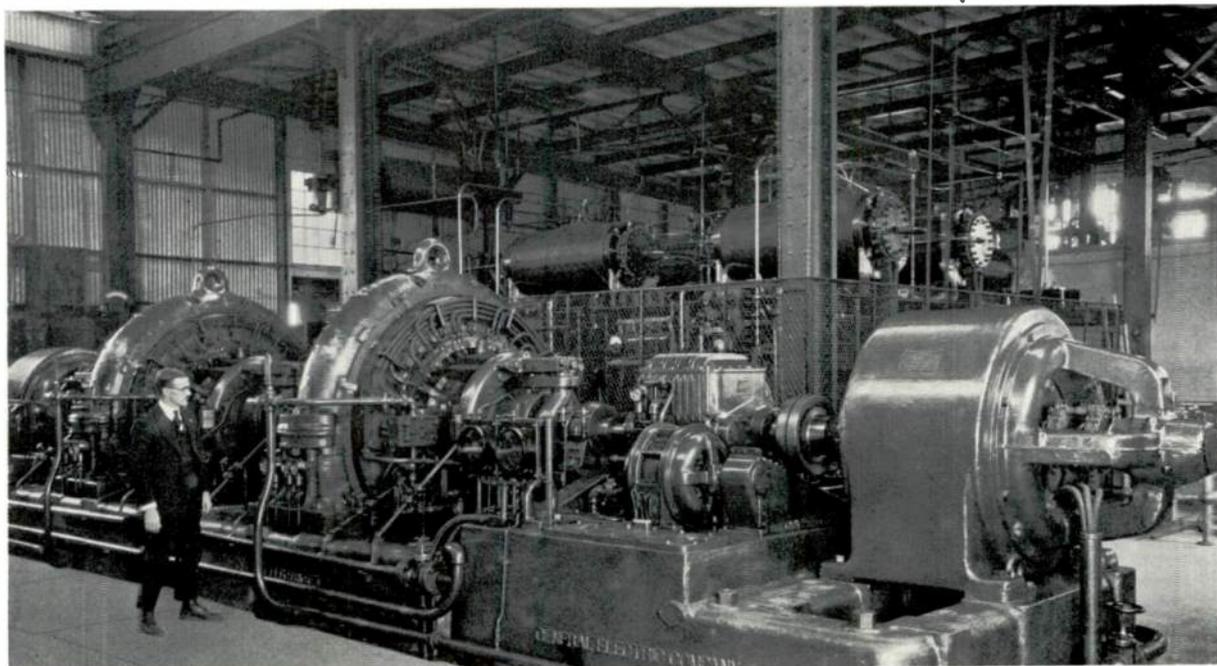
The wireless stations which the Government had taken over from the American Marconi Company during the war were turned back to the new RCA in February, 1920. One of the principal stations was at

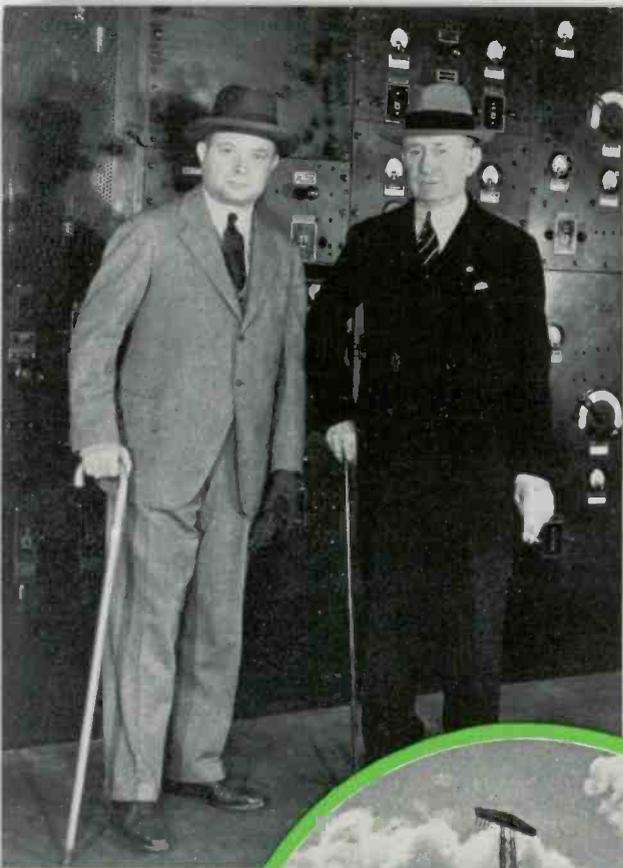
New Brunswick, New Jersey. There Uncle Sam had found his “radio voice” and had become a power in the international air during the World War when the Alexanderson high-frequency alternator went into action. Incidentally, it was from this station that President Wilson’s Fourteen Points, which served as the basis of the Armistice, were transmitted to Germany.

Commercial long-distance radio communication between the United States and foreign countries was inaugurated by the Radio Corporation of America on March 1, 1920, when the first messages over RCA transatlantic circuits were sent between New York and London. Before the end of 1920, service had been established with England, France, Norway, Hawaii, Japan and Germany.

Radio engineers and contractors soon were busy building a “Radio Central” on a 10-square-mile tract at Rocky Point, Long

*The 200-kilowatt Alexanderson alternator which revolutionized radio during World War I.*





*David Sarnoff and Guglielmo Marconi on a visit to "Radio Central" in 1933.*



*RCA Communications transmitting center at Rocky Point, Long Island, with its beams aimed to all parts of the world.*



*One of RCA's 340-foot radio towers at Rocky Point.*

Island, dedicated to world-wide communication. The receiving station was located 25 miles away at Riverhead. When construction had been completed, President Harding, on November 5, 1921, formally opened this great new center of radio by sending a radiogram addressed to all nations. The 200-kilowatt Alexanderson alternators now whirled to achieve new communication records in peacetime.

It was an achievement, indeed, when by the end of 1921 RCA had succeeded in ex-

tending five transoceanic radiotelegraph communication circuits from the United States. These circuits then communicated through the air with Great Britain, Norway, Germany, France, and through Hawaii, with Japan. This was the forerunner of an expansion that was to make America the center of world-wide radio communications. Coincidentally, introduction of radio communications brought about the first reduction in international message rates in 38 years, undercutting cable tolls from 5 cents to as much as 48 cents a word.

## Broadcasting Begins

Up to that time, the primary use of radio had been for point-to-point telegraphic communications, in which the comparative secrecy of the wireless code was sufficient to protect ordinary telegraphic confidences. For private telephone conversations, the radio was then far too public, and that fact gave false strength to the idea that radiotelephony was a limited field.

But this very "defect" created a far greater usefulness. If a far-flung audience could hear a radiotelephone message at the same time, here was a radically new means of mass communication. If radio could carry speech, it could also carry music. Out of the realization of this idea broadcasting was born. The pioneer experiments of Frank Conrad, over KDKA, the Westinghouse station at Pittsburgh, had been so successful that the Harding-Cox election returns of 1920 were broadcast to a limited number of nearby amateur receivers. News of this triumph of radio kindled the broadcasting "craze," which spread like wildfire across the country. Immediately, endless possibilities were foreseen for broadcasting, and, quickly, hundreds of stations were on the air. Almost overnight radio listening became a national pastime.

## Sarnoff's "Radio Music Box"

All this and more too had been envisaged in 1916 by David Sarnoff, then Assistant Traffic Manager of the Marconi Wireless Telegraph Company of America. In a memorandum to E. J. Nally, the General Manager, Mr. Sarnoff proposed a "radio music box" and outlined its future as follows:

I have in mind a plan of development which would make radio a household utility in the

*One of the first "Radio Music Boxes" equipped with an electron tube.*

same sense as a piano or phonograph. The idea is to bring music into the house by wireless . . . for example, a radio telephone transmitter having a range of say 25 to 50 miles can be installed at a fixed point where instrumental or vocal music or both are produced . . . The receiver can be designed in the form of a simple "radio music box" and arranged for several different wave lengths, which should be changeable with the throwing of a single switch or pressing of a single button . . .

The same principle can be extended to numerous other fields—as, for example—receiving lectures at home, which can be made perfectly audible; also events of national importance can be simultaneously announced and received. Baseball scores can be transmitted in the air by the use of one set installed at the Polo Grounds. The same would be true of other cities.

This proposition would be especially interesting to farmers and others living in outlying districts removed from cities. By the purchase of a "radio music box" they could enjoy concerts, lectures, music, recitals, etc., which may be going on in the nearest city within their radius . . . Should this plan materialize, it would seem reasonable to expect sales of 1,000,000 "radio music boxes" within a period of three years. Roughly estimating the selling price at \$75 per set, \$75,000,000 can be expected.



Since the early days of broadcasting, electron tubes have advanced the art of radio transmission and reception.



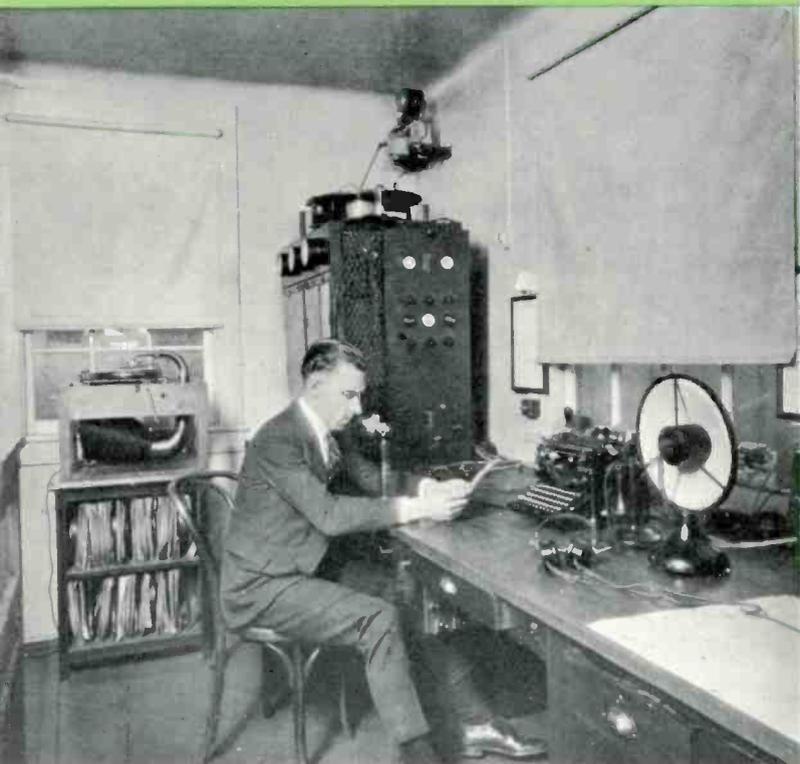
ing?\*

The Princeton-Chicago football game was the first broadcast from the gridiron in 1922, and the New York Philharmonic Orchestra, heard on the air for the first time on November 22, gave noteworthy recognition to radio as a new medium for the presentation of music.

Radio history was being made almost daily. In the first eleven months of 1921, General Electric and Westinghouse produced for sale by RCA 5,000 tubes a month; production in June, 1922, totalled 200,000 tubes. In 1922, the American public spent between \$75,000,000 and \$100,000,000 for radio sets, tubes, headphones and batteries. On October 15, 1922, high-power vacuum tubes were used for the first time in RCA transmitters handling traffic between New York, England and Germany. The vacuum tube had grown to 20-kilowatt power! Broadcasting stations increased from 30 to 556 between January 1, 1922, and March 1, 1923. Americans spent \$175,000,000 for radio instruments in 1923.

Radio reception was destined for a sensational change by the announcement in 1923 that the superheterodyne circuit, developed during the war, had been designed as a commercial product, and that RCA would introduce it for home use. Because of its marked efficiency, sharp tuning and sensitivity, the "super" became a universal receiver; it superseded the regenerative set as effectively as the "regenerator" had sent the crystal detector into discard.

In 1923, Lieut. General J. G. Harbord, who commanded the Second Division in the First World War and had been General Pershing's Chief of Staff, was named President of the Radio Corporation of America. David Sarnoff, then General Manager, became Vice President and General Manager.



Pioneer broadcasting stations depended largely on recorded music.

\*September 7, 1922, a talk on real estate sponsored by the Queensborough Corporation at the rate of \$100 for ten minutes.

**FIRST PROGRAM**  
**Daily Schedule**  
**Is Announced for**  
**Radio Broadcast**  
**Oct 9 - 1927**

FOR the information of those who already have receiving sets or those who may install them during the week, following is the time schedule of the numbers on the daily broadcasting schedule:

1:45 P. M.—World Series, play by play.  
 8:05 P. M.—Baseball comment and an analysis of the World Series game.  
 8:15 P. M.—Summary of the day's important news dispatches.  
 8:30 P. M.—Concert program of musical and vocal selections.  
 On Friday night at 7 o'clock fairy stories told by The Man in the Moon and three musical numbers especially selected for children.  
 The sending of the World Series reports, of course, is governed by weather conditions. In the event that rain may prevent the game taking place, announcement of that fact will be made at several intervals during the afternoon.



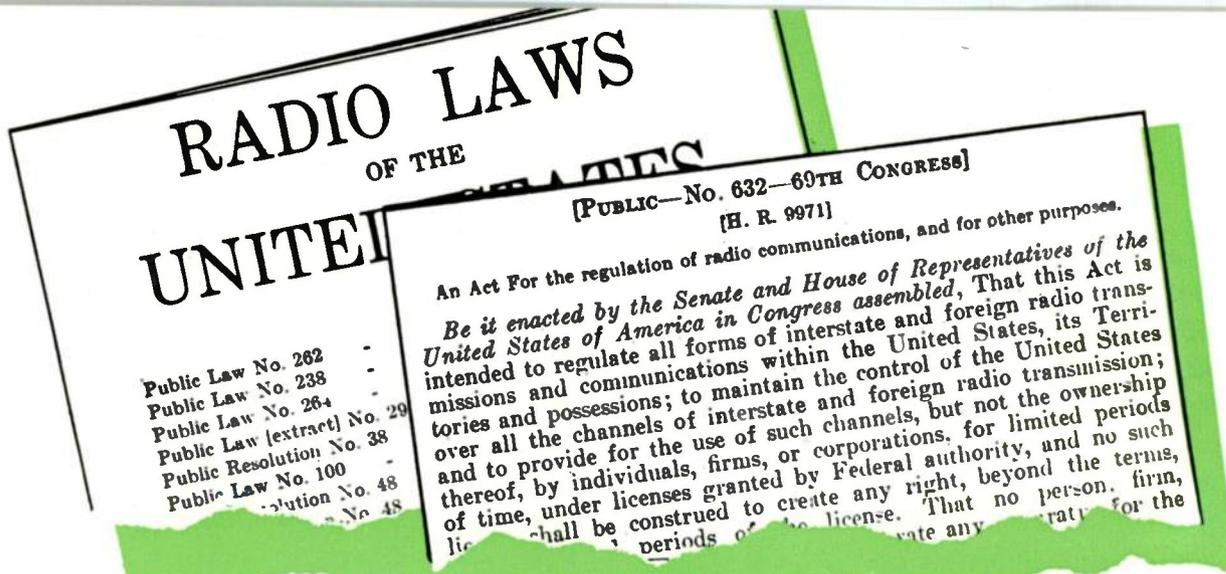
*Will Rogers was one of the first top-flight entertainers to recognize the potentialities of radio broadcasting.*

*Olga Petrova, noted actress, in 1921 appeared before the radio microphone in costume as actors do today before television cameras.*

### **New York Becomes Radio Center**

Station WJZ, acquired by RCA in the spring of 1923, moved from Newark to New York to share with WJY new modernistic studios in Aeolian Hall on 42nd Street. This put broadcasting near to the theatrical center and Broadway talent, thus making it convenient for performers to reach the microphone. Predictions were heard that a nationwide network would some day carry New York programs to all the country. Hope was stimulated by the first multiple-station network that linked WEAJ, New York, WGY, Schenectady, KDKA, Pittsburgh, and KYW, Chicago, in June, 1923.





The Dill-White Radio Bill signed by President Coolidge in 1926 provided for the regulation of radio communications.

### 1926 — A Year of Milestones

The year 1926 was destined to see many new milestones erected in radio. On the first day of the year John McCormack, noted Irish tenor, and Lucrezia Bori, star of the Metropolitan Opera, made their debuts over WJZ. It was an historic broadcast, the success of which encouraged other noted artists, who theretofore had frowned upon broadcasting, to go on the air. They were convinced by the quality of the McCormack-Bori concert that radio could do justice to their art; furthermore, radio had found a means of paying them — the commercial radio sponsor.

Broadcasters could now offer widespread "circulation"; their audience numbered millions. Advertisers grasped a new opportunity to go on the air to advertise and gain good will for their products through entertainment. They linked their trademarks with the names of popular performers and orchestras, speakers and news. Radio became a powerful advertising medium — the Fifth Estate.

Interference by overlapping stations, resulting from five years of disordered growth of broadcasting, was put to an end when President Coolidge, on February 23, 1926,

signed the Dill-White Radio Bill. Up to that time, the old Wireless Act of 1912 written before anyone had dreamed of nation-wide broadcasting, had been used to regulate the new art. It could not cope with the rapid expansion of broadcasting, and chaos had resulted on the wavelengths. The Dill-White Bill and the creation of the Federal Radio Commission restored order.

The way was cleared for increased service on all wavelengths. The picturegram of a check was sent through the April air of 1926 via the RCA system from London to New York, where it was honored and cashed. On April 30, RCA sent the first radiophoto across the Atlantic on a commercial basis; it was a picture of the Pilgrim Society dinner in London radioed to New York for publication in *The New York Times*.

Radio activity also spread to far corners of the earth as aviation tested its wings on flights over remote areas. The Byrd-Bennett plane, *Josephine Ford*, flew to the North Pole carrying a 44-meter radio transmitter. That was in May, 1926, the same month that the dirigible *Norge* sailed over the Arctic and sent the first wireless message directly from the North Pole.

Sports continued to reveal the popularity of its alliance with radio, and on September

23 of that year, the Dempsey-Tunney championship fight was broadcast by long and short waves to all parts of the world; again the World Series was broadcast by WJZ's nation-wide hookup.

In 1926 the silent motion picture became a talkie. Electronics gave the film a sound track — and sound being the stock in trade of radio — it had a close relationship with the talking picture. It was natural, therefore, that in 1928, RCA organized the R.C.A. Photophone, Inc., and entered the talking picture apparatus field.\*

### NBC Goes On the Air

September 9, 1926, became an historic date in the annals of radio — the National Broadcasting Company was organized as a service of RCA. It was announced that the aim of the NBC “will be to provide the best programs available for broadcasting in the United States,” and to accomplish its purpose NBC had two key stations in New York — WJZ and WEAF.\*\* It was stated that the National Broadcasting Company would not only broadcast its programs through WEAF, but also it would make them available to



Control room at WNBC's transmitter, Port Washington, Long Island

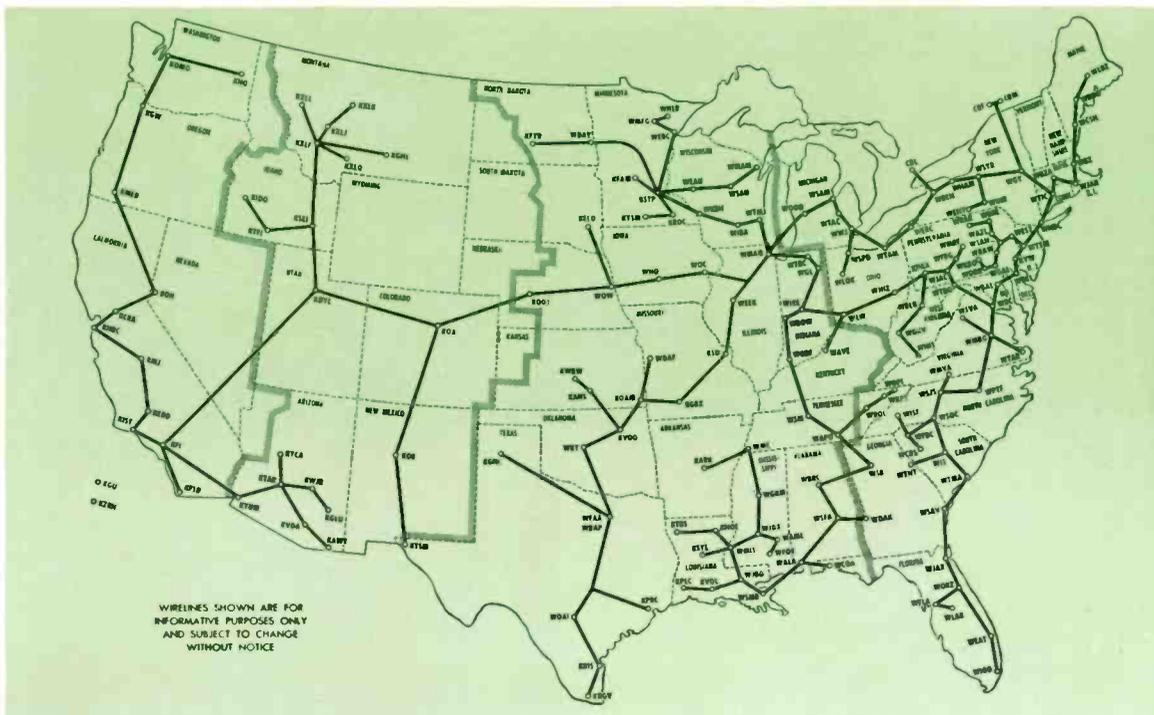
other broadcasting stations throughout the country as far as it was practicable to do so.

It was recognized that the market for receiving sets in the future would be determined largely by the quantity and quality of the programs broadcast. The aim of RCA was to make available radio receiving sets of the best tonal quality at prices which would enable all to buy. Success in this achievement inspired David Sarnoff to re-

\*Now, more than 6,000 theatres in the U.S. are regular users of the RCA theatre-sound system.

\*\* On July 1, 1926, RCA entered into an agreement to purchase WEAF from the Broadcasting Company of America, Inc., to which the station had been transferred by the American Telephone & Telegraph Company, and RCA commenced operating the station on November 15, 1926.

Map showing extent of NBC radio network coverage.



# Announcing the National Broadcasting Company, Inc.

National radio broadcasting with better programs permanently assured by this important action of the Radio Corporation of America in the interest of the listening public

THE RADIO CORPORATION OF AMERICA is the largest distributor of radio receiving sets in the world. It handles the entire output in this field of the Westinghouse and General Electric factories.

It does not say this boastfully. It does not say it with apology. It says it for the purpose of making clear the fact that it is more largely interested, more selfishly interested, if you please, in the best possible broadcasting in the United States than anyone else.

## Radio for 26,000,000 Homes

The market for receiving sets in the future will be determined largely by the quantity and quality of the programs broadcast.

We say quantity because they must be diversified enough so that some of them will appeal to all possible listeners.

We say quality because each program must be the best of its kind. If that ideal were to be reached, no home in the United States could afford to be without a radio receiving set.

Today the best available statistics indicate that 5,000,000 homes are equipped, and 21,000,000 homes remain to be supplied.

Radio receiving sets of the best reproductive quality should be made available for all, and we hope to make them cheap enough so that all may buy.

The day has gone by when the radio receiving set is a plaything. It must now be an instrument of service.

## WEAF Purchased for \$1,000,000

The Radio Corporation of America, therefore, is interested, just as the public is, in having the most adequate programs broadcast. It is interested, as the public is, in having them comprehensive and free from discrimination.

Any use of radio transmission which causes the public to feel that the quality of the programs is not the highest, that the use of radio is not the broadest and best use in the public interest, that it is used for political advantage or selfish power, will be detrimental to the public interest in radio, and therefore to the Radio Corporation of America.

To insure, therefore, the development of this great service, the Radio Corporation of

America has purchased for one million dollars station WEAF from the American Telephone and Telegraph Company, that company having decided to retire from the broadcasting business.

The Radio Corporation of America will assume active control of that station on November 15.

## National Broadcasting Company Organized

The Radio Corporation of America has decided to incorporate that station, which has achieved such a deservedly high reputation for the quality and character of its programs, under the name of the National Broadcasting Company, Inc.

## The Purpose of the New Company

The purpose of that company will be to provide the best program available for broadcasting in the United States.

The National Broadcasting Company will not only broadcast these programs through station WEAF, but it will make them available to other broadcasting stations throughout the country so far as it may be practicable to do so, and they may desire to take them.

It is hoped that arrangements may be made so that every extent of national importance may be broadcast widely throughout the United States.

## No Monopoly of the Air

The Radio Corporation of America is not in any sense seeking a monopoly of the air. That would be a liability rather than an asset. It is seeking, however, to provide machinery which will insure a national distribution of national programs, and a wider distribution of programs of the highest quality.

If others will engage in this business the Radio Corporation of America will welcome their action, whether it be cooperative or competitive.

If other radio manufacturing companies, competitors of the Radio Corporation of America, wish to use the facilities of the National Broadcasting Company for the purpose of making known to the public their receiving sets, they may do so on the same terms as accorded to other clients.

The necessity of providing adequate broad-

casting is apparent. The problem of finding the best means of doing it is yet experimental. The Radio Corporation of America is making this experiment in the interest of the art and the furtherance of the industry.

## A Public Advisory Council

In order that the National Broadcasting Company may be advised as to the best type of program, that discrimination may be avoided, that the public may be assured that the broadcasting is being done in the fairest and best way, always allowing for human frailties and human performance, it has created an Advisory Council, composed of twelve members, to be chosen as representative of various shades of public opinion, which will from time to time give it the benefit of their judgment and suggestion. The members of this Council will be announced as soon as their acceptance shall have been obtained.

## M. H. Aylesworth to be President

The President of the new National Broadcasting Company will be M. H. Aylesworth, for many years Managing Director of the National Electric Light Association. He will perform the executive and administrative duties of the corporation.

Mr. Aylesworth, while not hitherto identified with the radio industry or broadcasting, has had public experience as Chairman of the Colorado Public Utilities Commission, and, through his work with the association, and, through his work with the industry, has a broad understanding of the technical problems which measure the pace of broadcasting.

One of his major responsibilities will be to see that the operations of the National Broadcasting Company reflect enlightened public opinion, which expresses itself so promptly the morning after any error of taste or judgment or departure from fair play.

We have no hesitation in recommending the National Broadcasting Company to the people of the United States.

It will need the help of all listeners. It will make mistakes. If the public will make known its views to the officials of the company from time to time we are confident that the new broadcasting company will be an instrument of great public service.

# RADIO CORPORATION OF AMERICA

OWEN D. YOUNG, Chairman of the Board

JAMES G. HARBORD, President

Historic advertisement announcing formation of the NBC in 1926.

The transmitting tower of NBC's key station WNBC, New York, is located at Port Washington, Long Island.



mark, "The richest man cannot buy for himself what the poorest man gets free by radio."

The best available statistics indicated that 5,000,000 homes were radio-equipped, and that 21,000,000 homes remained to be supplied. The day had passed when the radio receiving set was a plaything; it had become an instrument of service — a household utility. There could be no doubt that the future of radio broadcasting would be dependent largely upon the character of the programs.

### Growth of Network Broadcasting

It soon became apparent that a single network service was not enough to satisfy the demands of the radio audience for diversified programs of national interest and importance. Station owners, particularly in cities where their competitors had made program service arrangements with the NBC

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\*For 15 years NBC operated the "Red" and "Blue" networks. The "Blue" was organized as a separate company on January 9, 1942, becoming a wholly-owned subsidiary of RCA. Conforming with new regulations of the FCC restricting the ownership by one organization to a single network in the standard broadcasting band, the "Blue" was sold on July 30, 1943, by RCA to the American Broadcasting Company, Inc.

or "Red" network, pressed for network affiliations. To accommodate this demand and the public interest, less than two months after the first NBC network service began, a second network — the Blue\* — with WJZ, New York, as the key station, was formed.

Gradually, the radio network stretched out across the country from the East and from the West, finally connecting at Denver so that the football game in the Rose Bowl at Pasadena was broadcast over a 4,000-mile hookup on New Year's Day, 1927. This was soon followed by the first coast-to-coast broadcast of the opera "Faust" from the stage of the Chicago Civic Auditorium; and by the first transcontinental, 50-station hookup which carried President Coolidge's Washington's Birthday address, the initial broadcast from a joint session of Congress. The return of Charles A. Lindbergh to the United States, after his historic flight to Paris, was broadcast by the largest network of stations ever assembled up to that time.

Again to illustrate the pictorial capacity of radio, RCA picked up radiophoto pictures and messages as they arrived from London and Honolulu at a Massachusetts Institute of Technology dinner on June 11, 1927, in New York.



*Maestro Arturo Toscanini directing the NBC Symphony Orchestra.*



## Radiomarine Is Formed

Despite all these triumphs across the hemispheres, radio never relinquished or neglected its direct link with the ocean. The primary use foreseen for wireless in the Nineties was for communication to and from ships at sea. RCA had been engaged in marine communication since its formation. As the business expanded, the Radiomarine Corporation of America was formed on December 31, 1927, with Charles J. Pannill in charge. It has since served as a subsidiary of RCA entirely devoted to marine radio activities — to the production and installation of radiotelephone and radiotelegraph equipment on American ships, as well as the maintenance of communication with them through its coastal stations.

In 1927 RCA inaugurated its policy of licensing competitors. This policy was to permit RCA's competitors to avail themselves not only of the valuable inventions represented by RCA patents but also of important patents of others which RCA obtained the right to use and to permit its licensees to use. Within a short time, the radio sets sold by these competitors exceeded —in number and in value—those sold by RCA. The availability of these radio inventions to other manufacturers has been an important factor in putting more radio sets into American homes than are used in all the rest of the world.

## Radio Changes Political Tactics

Predictions made in 1924 that radio would revolutionize politics and play a vital part in the 1928 presidential campaign came true. As Herbert Hoover and Alfred E. Smith

campaigned across the country, the microphone went with them, and drastically changed the strategy of political rallies and the style of oratory.

It was estimated that by this time home-radio sets had multiplied to 8,500,000 from 3,000,000 in 1924, and the great increase from 29,022,261 to 36,879,440 in the number of votes cast was attributed to the interest radio injected into the campaign. The radio industry profited by the demand for receivers, as indicated by the fact that in 1928 the radio business was in excess of \$500,000,000; in 1920 it had been less than \$2,000,000.

In science, radio continued its advance. RCA introduced the screen-grid tube, permitting greater sensitivity of receiving sets with fewer tubes. Automobile radios were introduced; new electron tube developments, including all-metal tubes, made practical more compact, efficient receivers. Listening in on the highways was added to the pleasure of motoring. Soon millions of motor cars were radio-equipped, and success in this field led to the development of rugged radio equipment for mobile and mechanized military units as well as for aircraft.

## RCA Communications, Inc.

To increase efficiency and keep pace with the extension of service, RCA Communications, Inc., was organized as a separate company on January 3, 1929. It became a subsidiary, instead of a department of RCA, engaging primarily in international message (radiogram) communication. Success of the high-frequency alternators, rapid development of high-power transmitting tubes and the harnessing of short waves had greatly



expanded world-wide communication. In 1927, paid words handled as transoceanic traffic totalled 38,662,500; in 1920 it had been 7,000,000.\*

At the opening of 1930, radio was handling approximately 30% of transatlantic message traffic; 25% of South American and 50% of transpacific traffic. Brokerage offices on ocean liners were supplied Wall Street ticker service by RCA wireless. During the stock market crash, these wavelengths were extremely active. And so were the transatlantic wavelengths. In November, 1930, when an earthquake snapped twelve cables on the bed of the North Atlantic, radio efficiently and expeditiously handled a greatly increased volume of traffic.

\* In 1948, message traffic of RCA Communications, Inc., totalled 193,016,723 words.



*Messages in tape form from abroad clear through the central radio office of RCA in New York for transfer to branch offices.*

*Only one manual processing is required for the RCA tape-transfer method of handling overseas messages.*

23

## Sarnoff Elected President

When, at the age of 39, David Sarnoff became President of the Radio Corporation of America, on January 3, 1930, the world faced economic chaos. The radio industry had been badly hit by the business depression. RCA's income reflected the downward economic spiral; gross income of \$182,000,000 in 1929 dropped to \$127,000,000 in 1930; \$102,000,000 in 1931; \$67,361,143 in 1932 and \$62,333,496 in 1933.\*

So rapid were the developments and changes in the art of broadcasting that by 1929 it became apparent that RCA's business should be reorganized so that it could combine manufacturing with sales under a unified management. The agreements which were made at the formation of RCA provided that the General Electric Company and Westinghouse Electric and Manufacturing Company would manufacture the radio products and Radio Corporation of America would sell them.

Therefore, to obtain manufacturing facilities as well as an established phonograph and record business, RCA in 1929 acquired the Victor Talking Machine Company.\*\* The

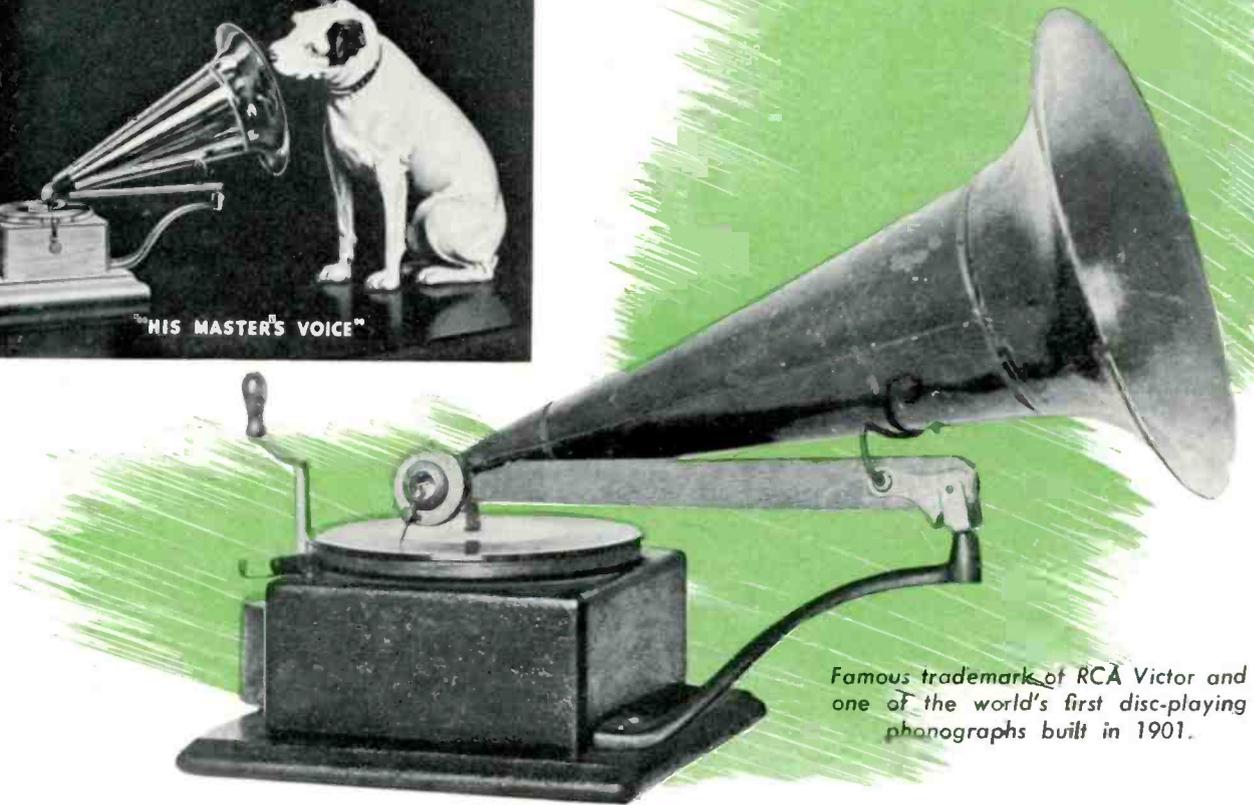
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\*Since 1933 the gross income of RCA has expanded substantially, reaching \$357,617,213 in 1948.

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\*\*RCA Victor in 1946 established a new peak of phonograph record production of 93,100,000 discs.



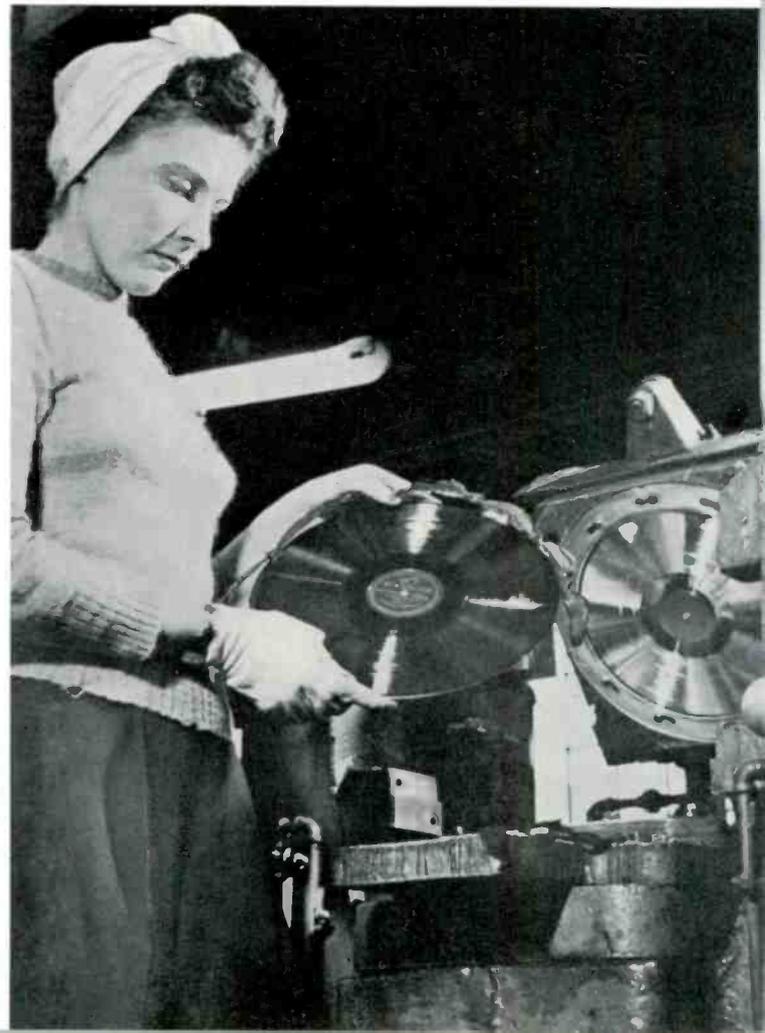


Famous trademark of RCA Victor and one of the world's first disc-playing phonographs built in 1901.

catalogue of Victor Red Seal and Bluebird records of "the Music America Loves Best," performed by the great artists of the world, became an outstanding reservoir of entertainment. Agreements were made in 1930 whereby RCA acquired manufacturing facilities from the General Electric and Westinghouse companies. RCA's manufacturing activities date from 1930. In the latter part of 1933, the various units—the RCA Victor Company and RCA Radiotron Company—engaged in the manufacture and sale of RCA products were brought together as the RCA Manufacturing Company, a newly formed, wholly-owned subsidiary.\*

\*Effective December 31, 1942, RCA Manufacturing Company, Inc., was consolidated with Radio Corporation of America, becoming the RCA Victor Division of the company.

*Thousands of phonograph records of "The Music America Loves Best" are produced by RCA Victor.*



## The Advent of Television

All RCA activities in radio communications naturally led to television. In 1928 television station W2XBS, New York, was licensed to RCA, with the transmitter located at the laboratory in Van Cortlandt Park. As early as 1925, definite steps had been taken in the laboratory to test the possibilities of mechanical and electronic television as a service to the public. The iconoscope, which became the "eye" of the television camera, was invented by Dr. V. K. Zworykin, Associate Research Director of RCA Laboratories. The kinescope, which serves as the "screen" of home-television sets, also was developed by Dr. Zworykin. He publicly demonstrated the use of the kinescope for reproduction of television pictures on November 18, 1929, at a meeting of the Institute of Radio Engineers at Rochester, N. Y.

Revealing success in its television experiments on January 16, 1930, RCA showed pictures on a 6-foot screen at the RKO-Proctor's 59th Street Theater in New York. The images were transmitted from station W2XBS, which had been moved from Van Cortlandt Park to 411 Fifth Avenue.

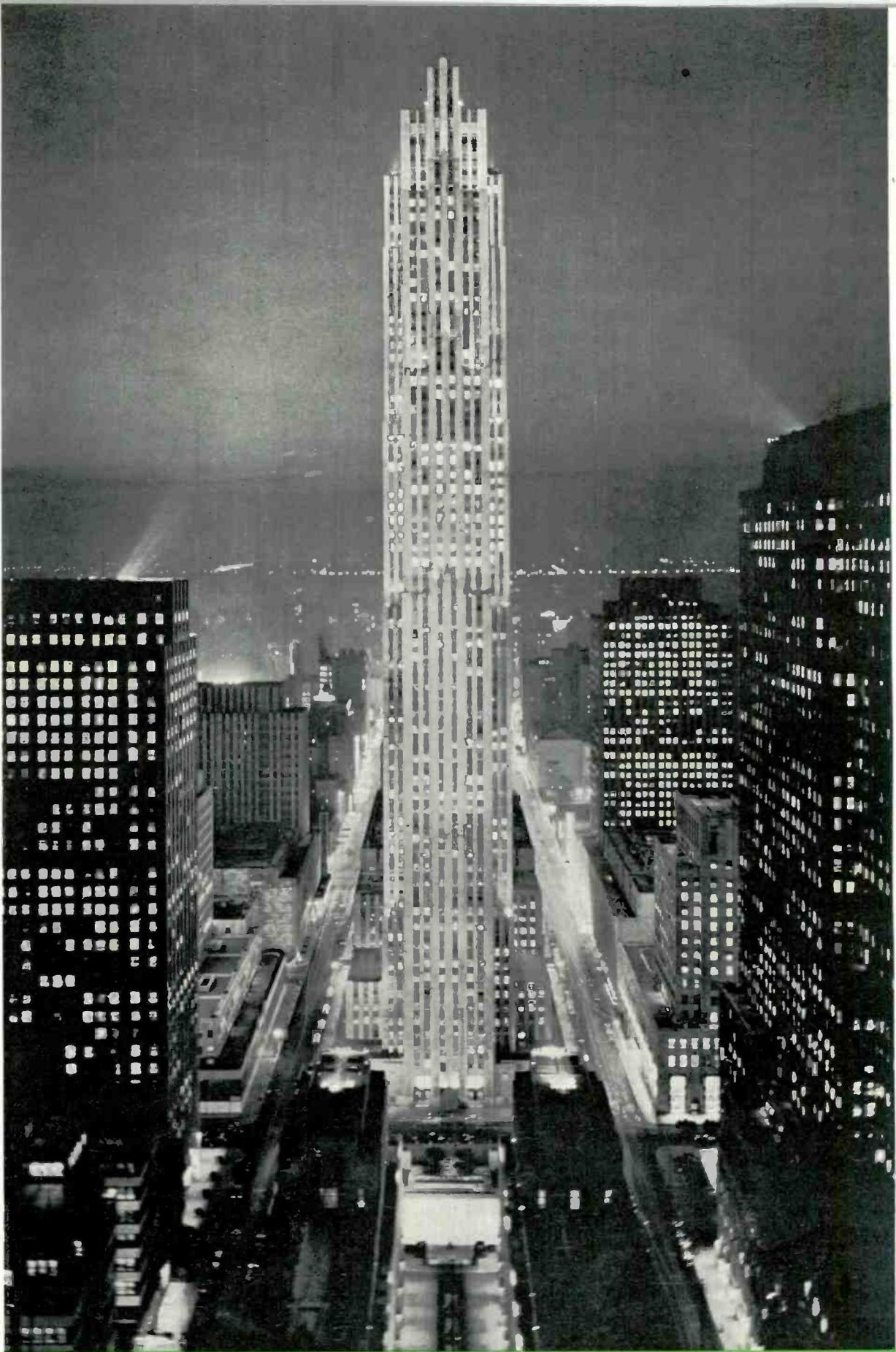
## Radio City Is Planned

Despite the economic slump throughout the world, research and pioneering continued. On April 30, 1930, Marconi, on board his floating laboratory, the yacht *Elettra*, near the Italian coast conducted a two-way radiophone conversation with David Sarnoff in New York. Progress on many fronts was in the news. Plans were announced for a \$250,000,000 Radio City to be built on Manhattan Island by the John D. Rockefeller, Jr., interests, with the RCA

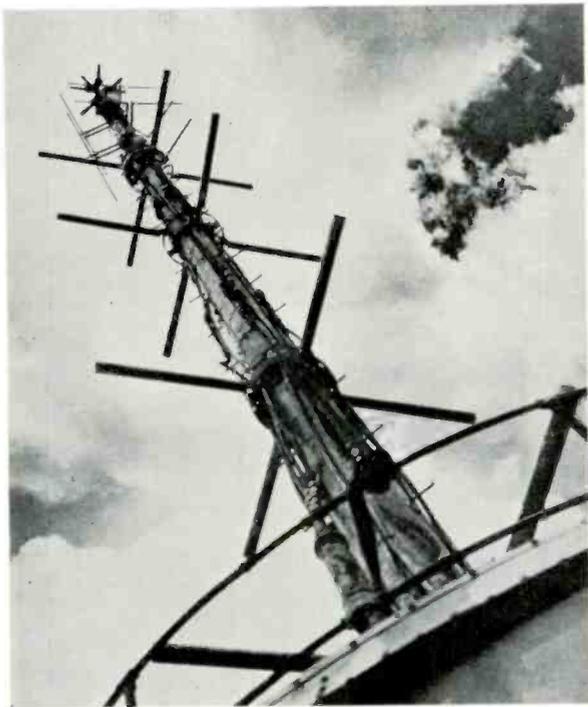


In 1929, Dr. V. K. Zworykin demonstrated the first electronic television receiver using the Kinescope, or picture tube, which he developed together with the famed Iconoscope, "eye" of the camera.

Building to be the predominant skyscraper of this modern acropolis. World-wide broadcasting became more effective, and radiotelegraphy further extended its circuits on December 6, when RCA established direct radio communication with China, linking San Francisco and Shanghai. The year 1930 ended with television gaining space in the news, but it was still apparent that years of experimentation were ahead before a "television Christmas" would be made possible by Santa Claus delivering video receivers to the home.



*World center of radio and television—the RCA Building in Radio City, New York. It is the home of the Radio Corporation of America and the National Broadcasting Company.*



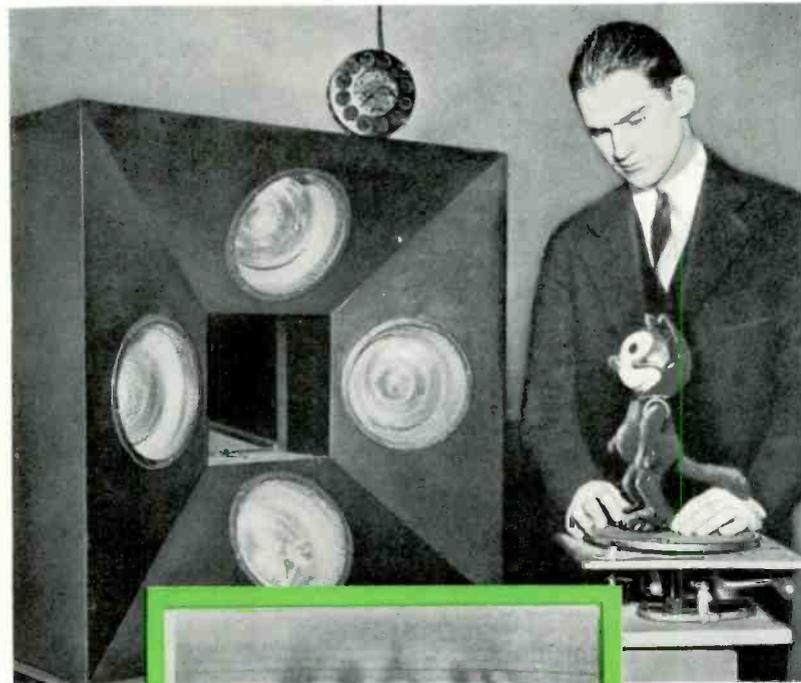
Television antenna atop the Empire State Building, world's tallest structure and site of the NBC pioneer television station WNBT.

### Skyscraper For Television

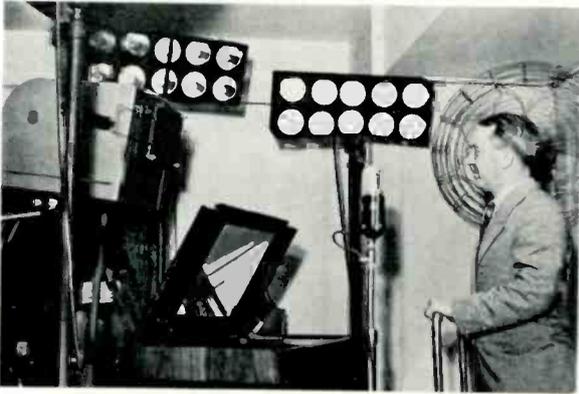
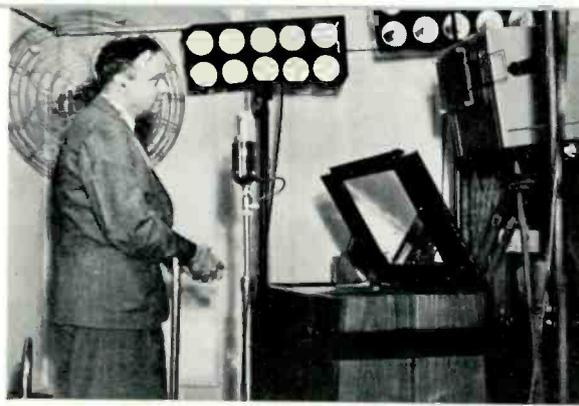
The year 1931 definitely took television out of the laboratory when it was announced that the Empire State Building, the world's highest skyscraper, had been selected by RCA-NBC as the site for a television station that would use ultra-short waves. The station began experimental field tests in October. Predictions of television possibilities were intensified, and some envisaged the Metropolitan Opera as a telecast. But this was a bit premature, for it was not until December 25, 1931, that "Hansel and Gretel" was the first opera broadcast directly from the stage of the Opera House—with sound but not with sight—through the combined NBC networks.

Further advances in television were revealed in 1932 when field tests of 120-line

Felix the Cat made a television debut in the late 20's as engineers experimented with early pick-up devices.



television were made by RCA at Camden, with signals relayed by radio from New York through Arney's Mount, New Jersey. The novel feature of this test, conducted on May 25, was that the pictures were automatically relayed for the first time, thus giving rise to the promise that such relay stations might



*First experimental television "conversation" in which performers at different locales viewed one another.*

some day dot the countryside to "bounce" television pictures from city to city without the use of wire networks. These experiments and other tests that followed inspired Mr. Sarnoff to predict that radio eventually might dip into the mail bags and flash facsimiles of printed and handwritten letters as well as other documents, delivering them across

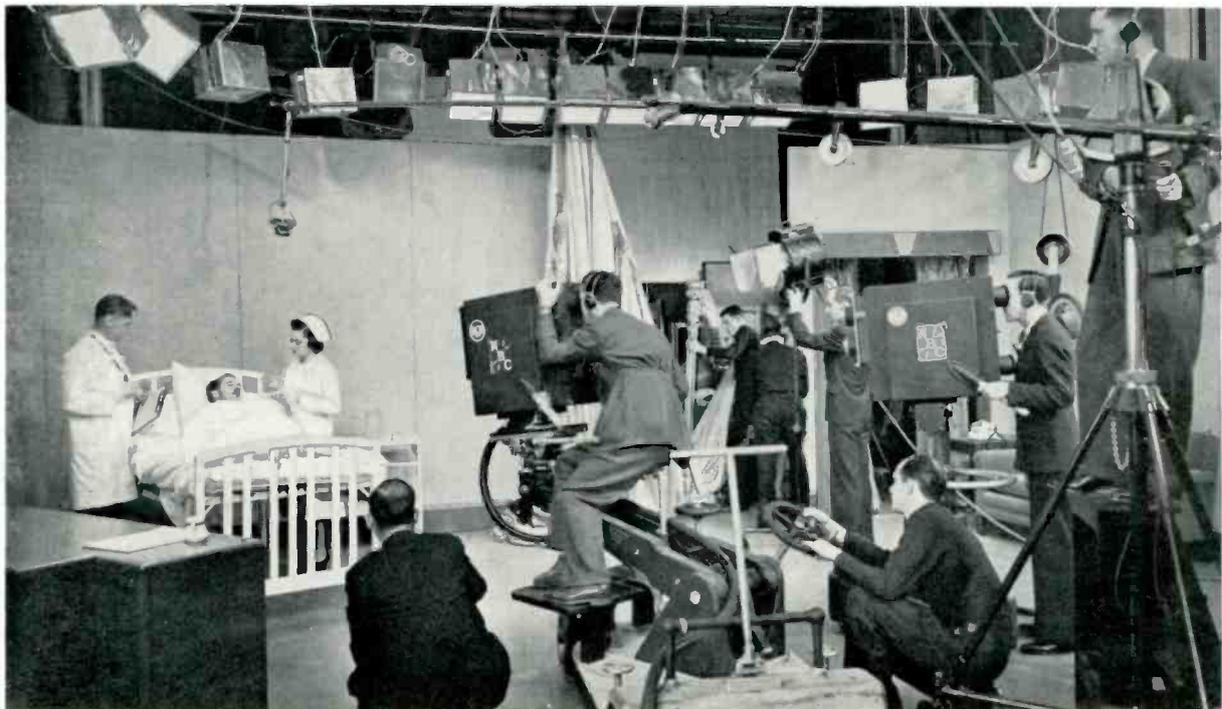
the country and over the seas, thereby competing with the air mail.

The summer air in 1932 vibrated with the Republican and Democratic National Conventions and campaigns. Roosevelt and Hoover were the contestants as the Democratic band played "Happy Days Are Here Again." The final count was 22,821,857 votes for Roosevelt; Hoover, 15,761,841.\*

As the radio cavalcade moved into 1933, the Roosevelt inaugural was broadcast internationally. Called the "Radio President" because of his excellent radio voice, Roosevelt seemed to be inseparable from radio. No President had ever made such use of the broadcasting facilities of the country. On March 12 of that year, in his first "fireside chat" on the Banking Moratorium, Roosevelt revealed the great power of radio in reaching the people. His "fireside chats" became historic, and before the end of 1933 he had delivered four of them.

\*In 1920 (no broadcasting) vote totalled 26,705,346; in 1932 it was 39,816,522 or 3,000,000 more than in 1928. Receiving sets in the U.S. totalled 18,000,000 in 1932; 33,000,000 in 1936; 50,100,000 in 1940; 60,000,000 in 1944; 75,000,000 in 1948. Total ballots cast in 1948 were 48,489,217.

*An early NBC television studio with cameras scanning a dramatic scene for transmission across the New York metropolitan area.*



## Important Steps of Progress

As a symbol of material progress, Radio City in New York was completed despite the depression, and on November 11, 1933, the new studios of the National Broadcasting Company were dedicated to the service of the American public. Scientific developments continued to emerge from the laboratories of RCA. A self-contained portable ultra-high frequency knapsack transmitter was built by NBC for use in broadcasts of outdoor events and for military scouting in the field. It was the forerunner of "walkie-talkie" and "handy-talkie" wartime radio outfits. The electron multiplier tube, capable of amplification hundreds of thousands of times within a single tube, was developed and demonstrated by RCA engineers. An



Dr. V. K. Zworykin with the Iconoscope which he invented as the television camera's all-electronic "eye."



Deluxe television receiver introduced by RCA before World War II.

Postwar progress in television receivers shown by three basic RCA models. From left to right: table model with 10-inch glass tube; table model with 16-inch metal core tube, and a projection type console.



automatic SOS alarm for use of vessels not having a radio operator on constant watch was introduced by the Radiomarine Corporation of America. The first ultra-high frequency automatic radio relay circuit was opened by RCA between New York and Philadelphia, transmitting simultaneously facsimile and multiple radiotelegraph messages. Further to reveal the flexibility and tremendous range of radio, Marconi's 61st birthday was celebrated on the air in a broadcast which featured salutes from ships at sea, from Admiral Richard E. Byrd in the Antarctic and from the *Graf Zeppelin* flying over the South Atlantic.

As evidence of its faith in the future of television, RCA on May 7, 1935, announced a plan to spend \$1,000,000 for field tests of television.\* At Camden on April 24, 1936, RCA demonstrated outdoor television with local firemen as the actors; the broadcast was on a 6-meter wave over the distance of a mile. This was soon increased. On June 29,

RCA's television field tests got under way from atop the Empire State Building, and radio manufacturers were given a demonstration featuring radio artists and films, seen 50 miles away. As further indication of the widespread activity of radio, the NBC maintained two-way communication with a United States Army stratosphere balloon while listeners throughout the country heard the conversations. To another extreme, the rumble of Mt. Vesuvius was broadcast to America for the first time through a microphone suspended over the rim of the crater. Radio receiving sets were now all-wave also, by merely pressing a button the listener could tune in stations in the broadcast band. For the fourth time radio went to the national political conventions; the summer breezes pulsed with politics as Roosevelt and Landon campaigned on the wavelengths.

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\* RCA has spent more than \$50,000,000 in developing and introducing television.



Television requires efficient mobile units for outdoor pickups. Shown here are two types of equipment designed and developed by RCA to meet the needs of the swiftly advancing art.

## History Made On The Air

The year 1936 ended with one of the most dramatic events which ever took place on the international stage. King Edward VIII abdicated. His farewell to the British people on December 11, following his renunciation of the throne, was heard by what was then believed to have been the largest audience that ever listened to a single voice.

The next day the first proclamation of King George VI to the British Empire was read on the radio by the heralds. On May 12, 1937, the Coronation of George VI and Queen Elizabeth was a world-wide broadcast — the first such event to be on the air. At the same time, the first telecast of a coronation was estimated to have been seen by 50,000 viewers over an area of 7,500 square miles in Britain.

Dr. Zworykin and his associates in RCA Laboratories kept up their constant development of television and perfected an electronic projector which “painted” television pictures on an 8 by 10-foot screen. For the first time, mobile television vans appeared on the streets of New York, developed by RCA and operated by NBC. These stations on wheels soon proved their usefulness by relaying outdoor track meets, baseball, football, prize fights and parades to the main NBC transmitter in the Empire State Building.

## Ominous Sounds of War

Over Europe the clouds of war were darkening. Reverberations of the impending storm thundered on the radio from Europe. Hitler on February 20, 1938, was heard in a three-hour broadcast talking defiantly of the future — warning other nations “hands off” in a “steel and blood” speech. Prime Minister Chamberlain in an emotional inter-



*President Roosevelt in "Fireside Chat."*



*Winston Churchill broadcasting from London.*

national broadcast announced Britain ready to fight any power seeking to dominate the world by force. As “a man of peace to the depths of my soul,” he pledged every effort to preserve peace until the last moment. Then, on September 30, 1938, all the world listened to him as he stepped from a plane at Heston Airdrome on his return from the meeting with Hitler at Munich, when he dramatically announced he had gained “peace for our time.”



*Left, NBC television cameras scan opening ceremony at New York World's Fair. Below, view of President Roosevelt as seen by the television audience.*



## Birth of Television Industry

In America, the New York World's Fair opened on April 30, 1939. The ceremony, televised by NBC, featured President Roosevelt as the first Chief Executive to be seen as well as heard on the air.

Standing before a microphone at the RCA exhibit at the Fair, Mr. Sarnoff announced the birth of a new industry — television. "Now we add sight to sound," he said. "It is with a feeling of humbleness that I come to this moment of announcing the birth in this country of a new art so important in its implications that it is bound to affect all society. It is an art which shines like a torch in the troubled world. It is a creative force which we must learn to utilize for the benefit of all mankind. This miracle of engineering skill which one day will bring the world to the home, also brings new American

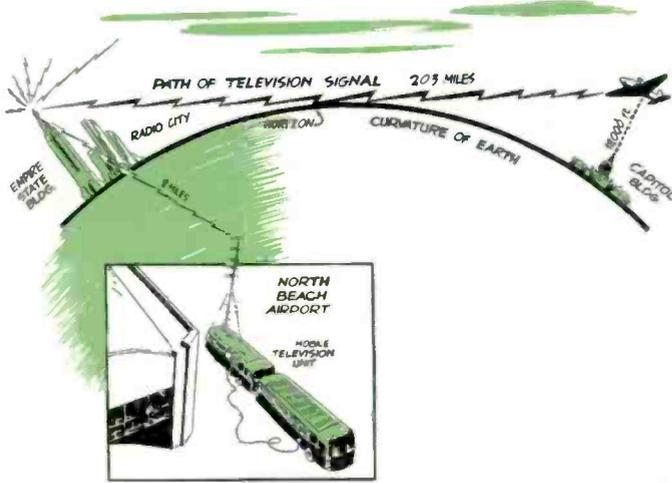
industry to serve man's material welfare. Television will become an important factor in American economic life."

Events of "first magnitude" came fast after that. The Columbia-Princeton baseball game was televised by NBC as a "first" from the diamond at Baker Field. As far away as Schenectady, 130 miles from New York, people who had television sets saw King George VI and Queen Elizabeth at the New York World's Fair. The Brooklyn Dodgers-Cincinnati Reds baseball game at Ebbets Field was televised as the first big league game to be seen on the air. The Fordham-Waynesburg football game in New York was the first gridiron contest to be telecast.

In order to follow the ultra-short waves which left the horizon on a tangent, RCA sent a television-equipped plane on a flight to Washington. It was found that the plane had to go up 18,000 feet over the Capitol



At the left, General Sarnoff introduces television to the American public in historic pickup at the New York World's Fair on April 30, 1939. Above, RCA's exhibit at the Fair.



to see television from New York, 200 miles away. Mr. Sarnoff sat before a television camera in Radio City and as he talked to the airmen, they saw him on the television screen in their plane. Continuing experiments linking television and aviation, RCA placed special camera and transmitting apparatus in an airliner, and on March 6, 1940, a bird's-eye view of New York City was telecast.

A year later, to test the usefulness of television at sea, RCA installed receiving sets on board the *S.S. President Roosevelt* and, while the ship was enroute to and from Bermuda, television pictures broadcast from New York were viewed clearly 250 miles at sea.



Television went aloft in 1939 when RCA demonstrated to the press reception aboard an airliner between New York and Washington.

## War On The Radio

Then war assumed an all-important place on the radio. Germany invaded Poland on September 1, 1939. England and France declared war on Germany, and all of the momentous events that ensued had first place on the radio programs of each day; the world listened as news became history.

Radio flashed Italy's entrance into the war on June 10, 1940; on the 14th, there came the announcement that the "German Army is inside Paris." A week later, a stunned world listened to the historic broadcast from Compiègne when Hitler and his staff handed armistice terms to French plenipotentiaries in the famous Armistice Car of World War I.

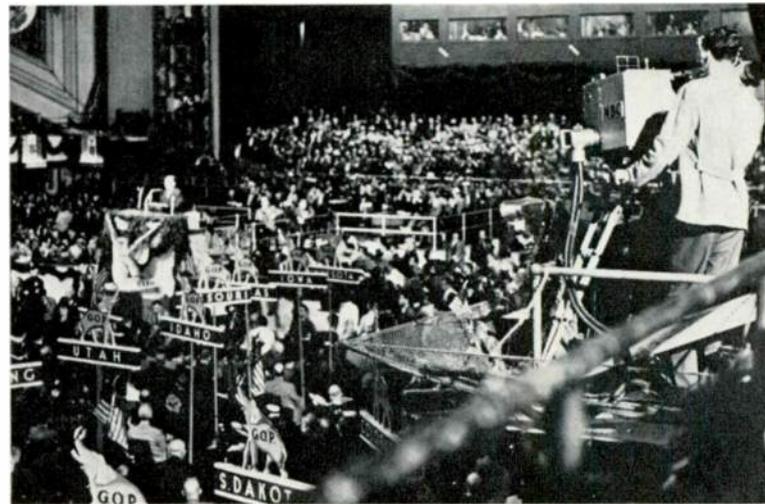
## Television "Eyes" Convention

Television was blacked out in London, while developments were rushed in the United States as farsighted radio men saw the possibility of great use for television should war come to America. At Camden, RCA demonstrated color television to the Federal Communications Commission on February 6, 1940. From Madison Square Garden, hockey, basketball and intercollegiate track meets were televised by NBC, while plays and tabloid versions of opera and religious services were telecast from Radio City. The opening game between the Giants and Dodgers and the Ringling Brothers, Barnum and Bailey Circus were seen on the air. But the curtain dropped on May 27, 1940, when the FCC changed the rules it had previously announced to permit "limited commercial operation" and relegated television back to an experimental existence.

Without the advantages of commercial operation, experimental television continued as the Republican Convention in 1940 was



*NBC television cameras covering Army-Navy football classic.*



*1940 Republican convention was the first event of its kind to be scanned by television cameras.*

telecast through NBC, New York. Coaxial cable linked the camera in the political arena at Philadelphia with the transmitter at the Empire State Building in New York. Films of the Democratic Convention at Chicago were rushed by plane to New York for telecast. President Roosevelt was televised by NBC at a Democratic Rally in New York, and Wendell Willkie, the GOP candidate, was

seen at a Republican Rally. For the first time, election returns were telecast by NBC when the camera scanned the press teletype machines as they tapped off the bulletins.\*

## FM Gets Under Way

Coincident with these developments in television, work on frequency modulation (FM) was in progress. RCA had worked on FM since 1924 and made notable contributions to its development. Its pioneering in this field has never stopped.

Before any type of FM broadcasting could commence, the higher radio frequencies had to be explored. New vacuum tubes had to be created to work on those frequencies. Transmitters, antennas and receivers had to be developed to meet the hitherto unexplored characteristics of the higher frequencies. RCA was a leader in this development work and in it RCA engineers spent years of exploration, research, invention and engineering.

During the years 1930 to 1933 RCA engaged in extensive research on FM transmissions between California and New York. Certain findings based on this research were basic to the development of FM. During the period from 1934 until the War, extensive research was carried out by RCA on specific FM circuits, on propagation characteristics of the very high frequencies used in FM, and on component elements required for FM broadcasting. Among the more important FM inventions made by RCA engineers during those years were the Seeley discriminator for FM receivers, the Crosby FM transmitter, and the FM turnstile antenna of Brown, Carter and others. In 1939, ex-

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\*NBC also telecast films of the 1944 National Conventions; the newsreels were flown from Chicago to New York. In 1948, the National Conventions were telecast directly from the Convention Halls.

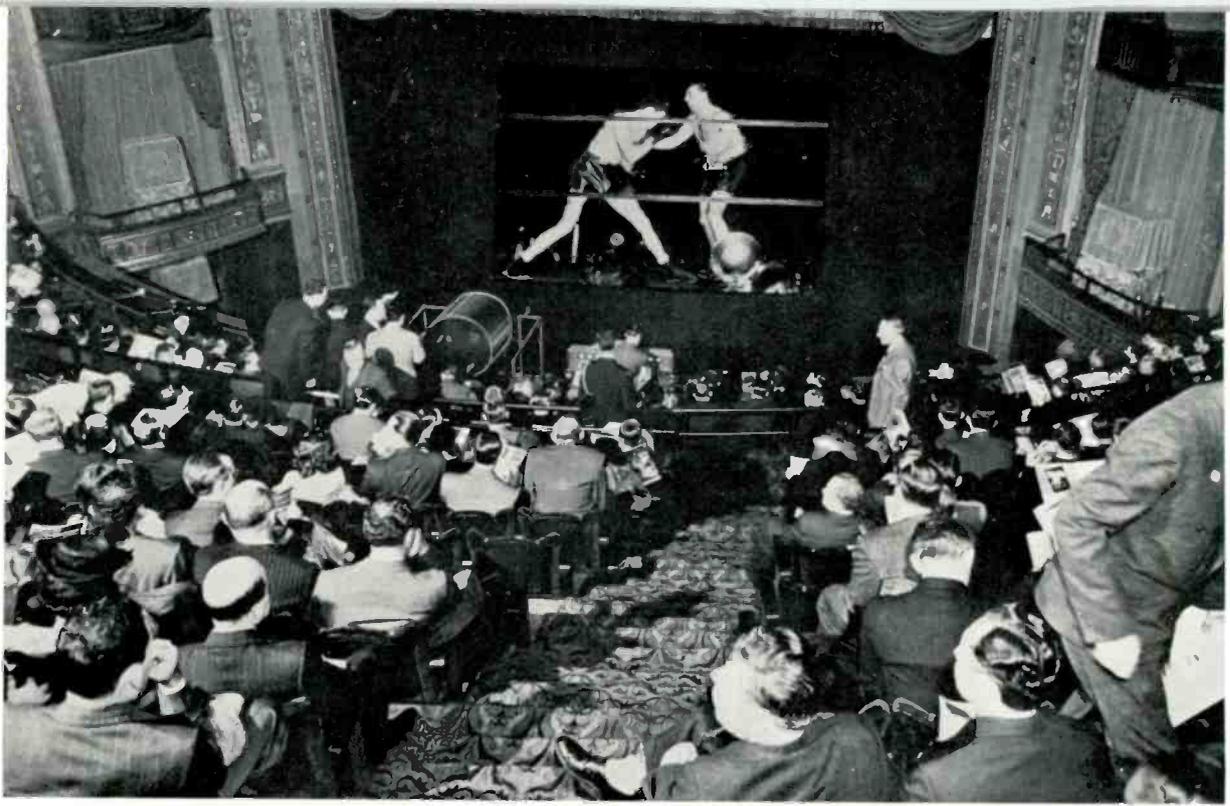
tensive field tests of FM broadcasting were carried out by NBC.

In July, 1939, NBC applied to the Federal Communications Commission for an FM station license. It was the first of the major networks to do so. In May, 1940, the Federal Communications Commission authorized FM broadcasting on a commercial basis and shortly thereafter RCA was offering FM transmitters for sale.

RCA engineers developed an improved FM receiver utilizing what is called the Seeley ratio detector. FM receivers with ratio detectors have had rapid acceptance. The ratio detector provided for the first time an economical FM circuit making possible the production of good FM receiving sets in the lower-price ranges. One important result of this RCA contribution has been to stimulate the mass production of FM receiving sets by the radio industry.

The year 1941 opened with President Roosevelt's third inaugural broadcast by more than 500 stations. The number of radio sets in the United States was estimated to total more than 56,000,000. New small tubes and associated devices developed by RCA, in 1939, extended development of portable radios to include camera-size, "personal" sets carried in the hand or on shoulder straps. Gone were the copper webs of antenna wires that had overspread roof-tops. Now loop antennas were used inside portable cabinets, while "fishpole" type antennas simplified auto-radio installations. The combination radio-phonograph gained in popularity as the vogue for "music you want when you want it" became increasingly popular. It was estimated that in the New York area there were approximately 5,000 combination radio-television instruments capable of all-wave broadcast reception.





First showing of RCA theatre television was at the New Yorker Theatre in May, 1941, when scenes from the Soose-Overlin middleweight championship fight were projected on a 15 by 20 foot screen.

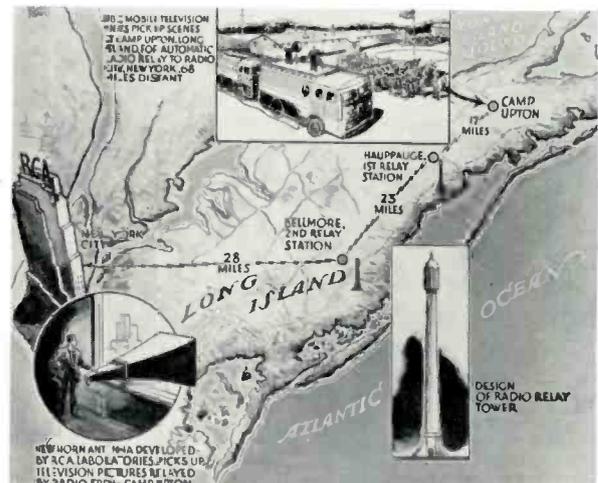
### A Post-War View of Television

As if to paint a pattern for the future, RCA on January 24, 1941, demonstrated to the FCC home-television receivers with 13½ by 18-inch translucent screens; television on a screen 15 by 20 feet in the New Yorker Theater; pictures automatically radio-relayed from Camp Upton on Long Island to New York; also facsimile multiplexed with a frequency-modulation sound broadcast. A month later, television pictures in color were first put on the air by NBC from the Empire State Building transmitter. But it was not to be the destiny of television that these developments should quickly come into the service of the public. War postponed them to the post-war era.

The FCC, however, on May 2, 1941, authorized commercial television effective July 1, and on that day WNBT, the NBC pioneer television station in New York, began commercial operation.

Paralleling television developments, the first radiophotos ever received on this side of the Atlantic from Moscow were picked up by RCA Communications, Inc., on July 8, 1941, and were printed in newspapers throughout the country.

Radio relays are used to "bounce" television programs on ultra short waves from city to city.



## RCA Converts to War



AS early as September, 1939, RCA manufacturing facilities were being converted to supply equipment for the armed forces of the United Nations and for civilian defense. A program of conversion of plant, machinery and manpower from commercial to war production was planned and instituted. The process of conversion continued at a greatly accelerated rate in 1940-41.

To centralize its scientific research for national defense as well as for the post-war period, RCA in 1941 brought its research and invention activities together into a single division of the company, known as RCA Laboratories. On August 8, 1941, ground was broken for the new laboratory buildings at Princeton, New Jersey, designed to become the foremost center for radio-electronic research in the world. It was dedicated "to increase the usefulness of radio and electronics to the Government, to the public and to industry." The cornerstone was laid on November 16, 1941, less than a month before the flash from Hawaii that Japan had attacked Pearl Harbor.



Lieut. General J. G. Harbord, laying the cornerstone of RCA Laboratories, Princeton, N. J., on November 16, 1941.



*War halted production of all RCA Victor home instruments in April, 1942.*

### In Service of The Nation

As President of RCA, Mr. Sarnoff, on December 7, sent a radiogram to President Roosevelt at the White House:

ALL OUR FACILITIES AND PERSONNEL ARE READY AND AT YOUR INSTANT SERVICE. WE AWAIT YOUR COMMANDS.

In the final days of the year, war dominated every phase of radio activity. President Roosevelt on December 8 was heard in an international broadcast asking Congress to declare war on Japan; again on December 11, against Germany and Italy. In each instance, the prompt response of Congress was heard by a world-wide audience.

The Radio Corporation of America now was at the service of the Nation in the most gigantic task ever assigned to industry. By the end of 1941, more than 100 manufacturers were licensed by RCA to use its inventions and patents, thereby stimulating competition and opening channels of supply for successful conduct of the war as well as for commercial use. RCA at the request of the War and Navy Departments entered into a license agreement with the United States Government, effective July 1, 1942, for the

duration of the war and six months after cessation of hostilities. The Government was licensed under RCA patent rights to make, and to have others make, various types of radio apparatus for war use.

As one of the first steps to establish improved communications with the South Pacific, RCA Communications, Inc., on December 25 opened the first direct radiotelegraph circuit between United States and Australia, soon to be supplemented by a direct radiophoto circuit.

The War Production Board notified the radio manufacturing industry that it must be converted 100% to war production within four months and that manufacturing of civilian radios must stop. The making of radios and phonographs for civilian use terminated on April 22, 1942.

### RCA Laboratories Dedicated

RCA Laboratories were dedicated at Princeton, New Jersey on September 24, 1942, at which time Major General Dawson Olmstead, then Chief Signal Officer of the Army, said:

"The RCA, like the Signal Corps, has pioneered in communications. For two decades it has been among the foremost in the new developments of the radio art. When the Radio Corporation of America was formed in 1919 one of its main purposes was to establish a world-wide American radiotelegraph system that would give the United States pre-eminence and a degree of independence in radio communication. The pres-

ent crisis proves the value of the company's developments in communications, broadcasting, research, engineering and manufacturing in rendering service of tremendous importance to our Government and to those nations who are our allies in this war . . .

"The Signal Corps plays a most important role in this highly mechanized war. It provides for our rapidly expanding army the most modern design for radio, telephone and telegraph communications equipment. And the RCA may well be proud of its contribution to the war effort in assisting and making possible for us the finest military com-

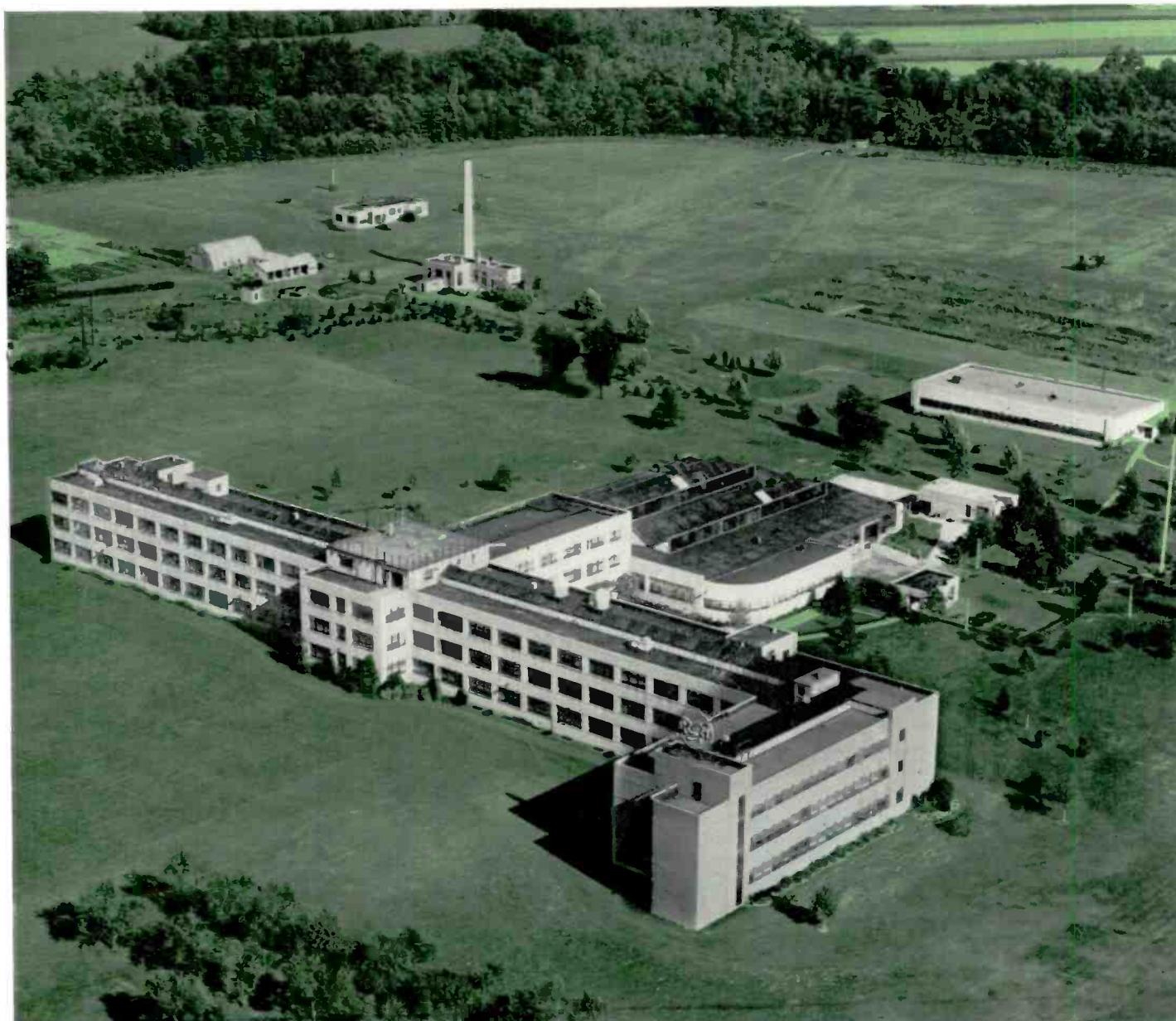
munication system of any army in the world.

"It is well known that there has never been a time in its history when the research and experiment in RCA Laboratories slackened, or when new products and services were not in the process of development. The result of the work done by the men and women of RCA and the significant part in the hidden battlefront of research, is entirely worthy of America's finest pioneer traditions."

Commander A. M. Granum, representing the U. S. Navy, said:

"This enterprise is very close to the heart

*RCA Laboratories, Princeton, N. J., world center of radio-electronic and television research.*





*Looking down a 500-foot corridor in the main RCA Laboratories building at Princeton.*

of the service. We have it impressed upon us daily when our fellow officers and men come in from the combat zones, what radio and electronics mean to them in conflict with the enemy. We realize we are in competition with our enemy not only in the field of combat but in their scientific and engineering research. In this competition we need teamwork. It is inspiring to see a laboratory of this sort set up where the best talent and genius of a great organization are brought together to work as one team."

Speaking as an army officer in active service, Colonel David Sarnoff said:

"Our admiration for these Laboratories is based upon more than their obviously fine qualities of architecture and construction. We are moved by the deep respect in which we hold the virtues of scientific accuracies and intellectual integrity. These are virtues possessed to a high degree by the type of men who will work within these walls. These are

the qualities which are helping to preserve our civilization and which in turn make our civilization worth fighting for.

"The day of victory will surely come, and the words 'Peace on earth, good will to men' will again ride the radio beams of all the world. The American men of science will draw upon their wartime research to develop finer and more useful products and services for peacetime purposes. Out of the ashes of war, they will bring forth implements for a new and better civilization."



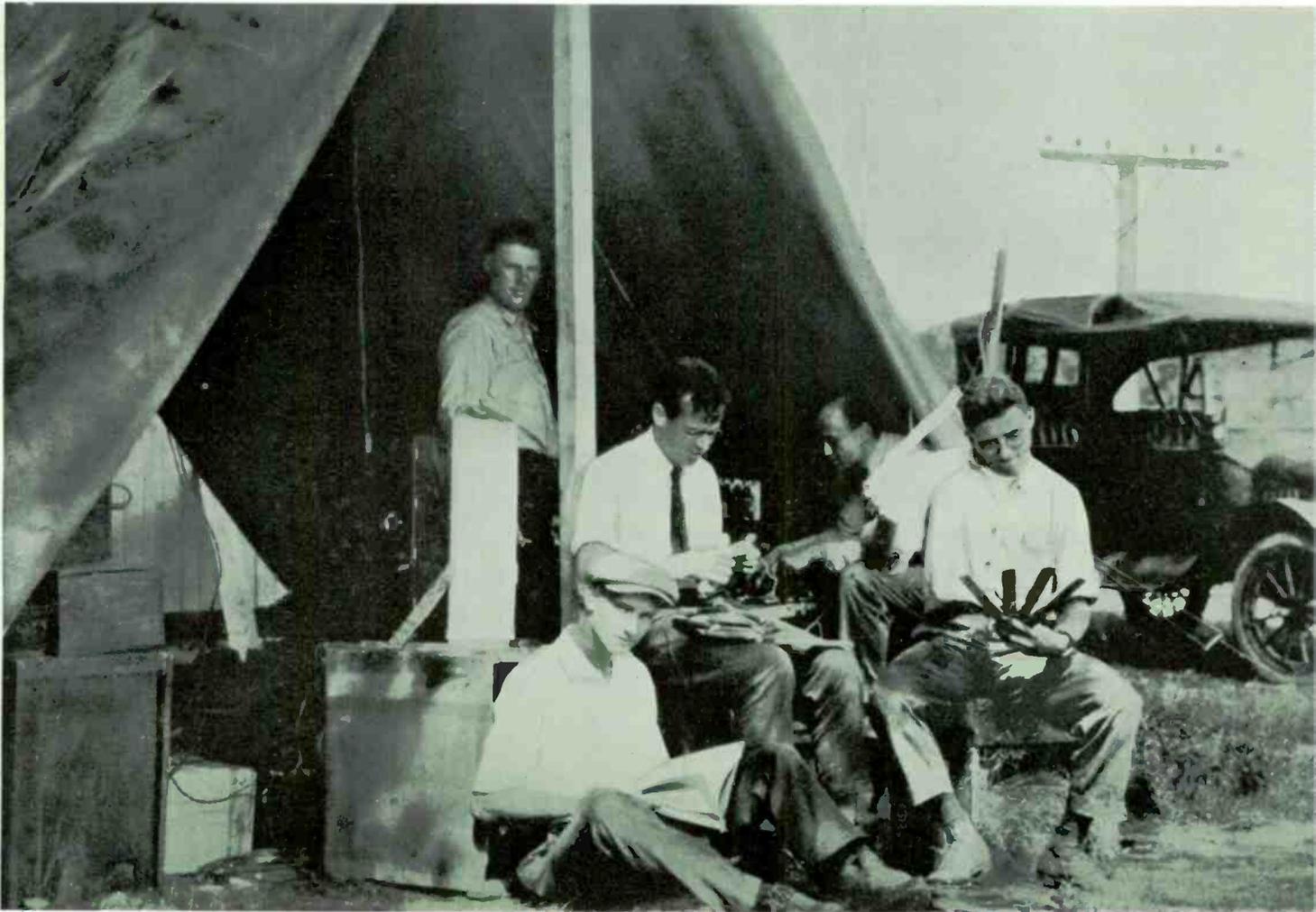
*Scientific ideas take shape on drafting board.*



*Electronic counters developed by RCA have many military and peacetime applications.*

The many activities of RCA Laboratories revealed how far radio was spreading into broader fields — electronics, acoustics, physics, mechanics and optics. At the same time, continuous laboratory research enabled the older, established services of radio to continue to improve and to keep in stride with the swift progress of the art. The electron tube became a master key to open new fields for scientific exploration, expanding the services of radio and the usefulness of its products in science, industry and the arts.

*The first RCA laboratory in 1919, was located in this tent at Riverhead, Long Island.*





*Thousands of RCA Victor employees gathered in Camden, N. J., to pledge cooperation in the company's efforts to "Beat the Promise" in producing radio, sound and electronic equipment for the Armed Forces.*

### **RCA In All-Out War Effort**

RCA had a distinguished record in World War II. All divisions of the Corporation — research laboratories, manufacturing plants, broadcasting and communications facilities — devoted their entire operations to the war effort. The company's early slogan, "Beat the Promise," was fulfilled in every instance, and its production of radio, sound and electronic equipment for the Armed Forces of the United States and the United Nations received highest praise. RCA personnel reached a peak of 42,000 during the D-Day year of 1944.

RCA executives, research men, engineers and radio operators were among specialists called into service to fulfill wartime duties. Their contributions won commendations on many fronts. By the time the war ended, 8,559 employees of RCA had joined the Armed Forces of the United States, and 145 of these men had given their lives for their country.

Government recognition of the war production achievements of RCA's work on the home-front was evidenced by an array of Army-Navy "E" flags, star studded for each six months of continued excellence. These flags were awarded to plants of the RCA



Victor Division and the Radiomarine Corporation of America, as well as to RCA Laboratories. Radiomarine also won the U. S. Maritime "M" pennant and the Victory Flag. RCA Communications received the Certificate of Appreciation of the War Department and RCA Laboratories was honored by a U. S. Navy citation.

Individual awards for distinguished service during the war were made to a number of RCA executives and scientists. These included Certificates of Appreciation from the War Department, Certificates of Merit from the President of the United States, Medals for Merit from the President and the War Department's Legion of Merit. Certificates of Individual Production Merit were awarded by the War Production Board to a number of RCA workers engaged in manufacturing radio equipment for the war.

In addition to his leadership as President of RCA, David Sarnoff was on active military duty twice during the war. He served first as a Colonel in the Office of the Chief Signal Officer in Washington, D. C. On March 17, 1944, he was assigned to overseas duty, receiving the appointment of Special Consultant on Communications at Supreme Headquarters of the Allied Expeditionary Force. On October 11, 1944, he was awarded the Legion of Merit, and the War Department's recommendation for his promotion was sent to the White House. He was nominated Brigadier General by President Roosevelt on November 21, 1944, and the rank was confirmed by the Senate two weeks later. On February 8, 1946, President Truman presented General Sarnoff with the Medal for Merit for services of "inestimable value to the war effort."



Plans for handling D-Day press communications being discussed by General (then Colonel) Sarnoff and J. H. Brebner, of the British Ministry of Information in London.

Array of flags awarded to RCA for superlative production efforts on display at the 1944 stockholder meeting in New York.



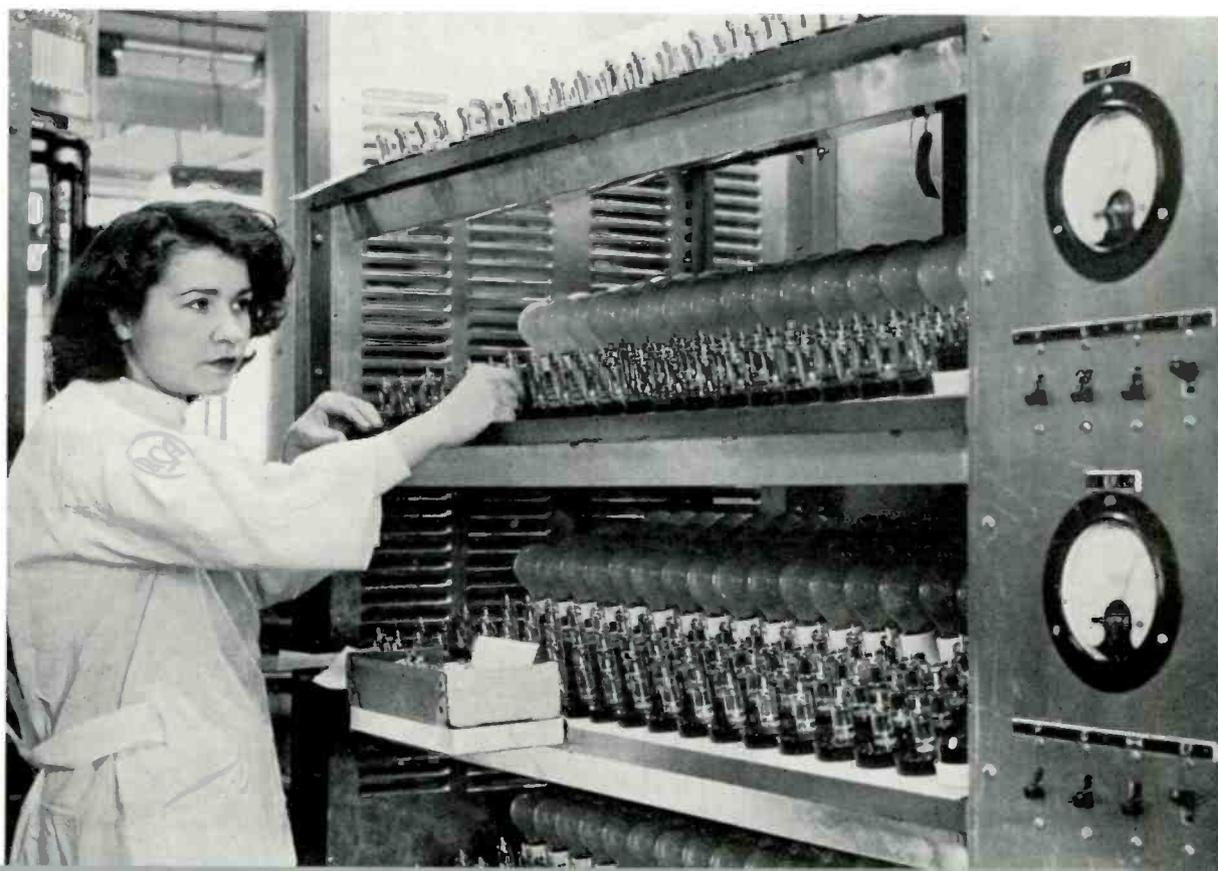
One of the first industrialists to enter Government service during the defense period prior to World War II, Frank M. Folsom served as a member of the National Defense Advisory Commission upon its formation in 1940 and became Assistant Coordinator of Purchases where he served through 1941. He then was appointed a special assistant to the Under-Secretary of the Navy and Chief of the Procurement Branch of the Navy. He also served as Chairman of the Procurement Policy Board of the War Production Board which was the coordinating agency for procurement policy of all war services and agencies. For outstanding service with the Navy, Mr. Folsom was awarded the Medal for Merit by President Truman and received the Distinguished Civilian Service Award, the Navy's highest civilian honor.

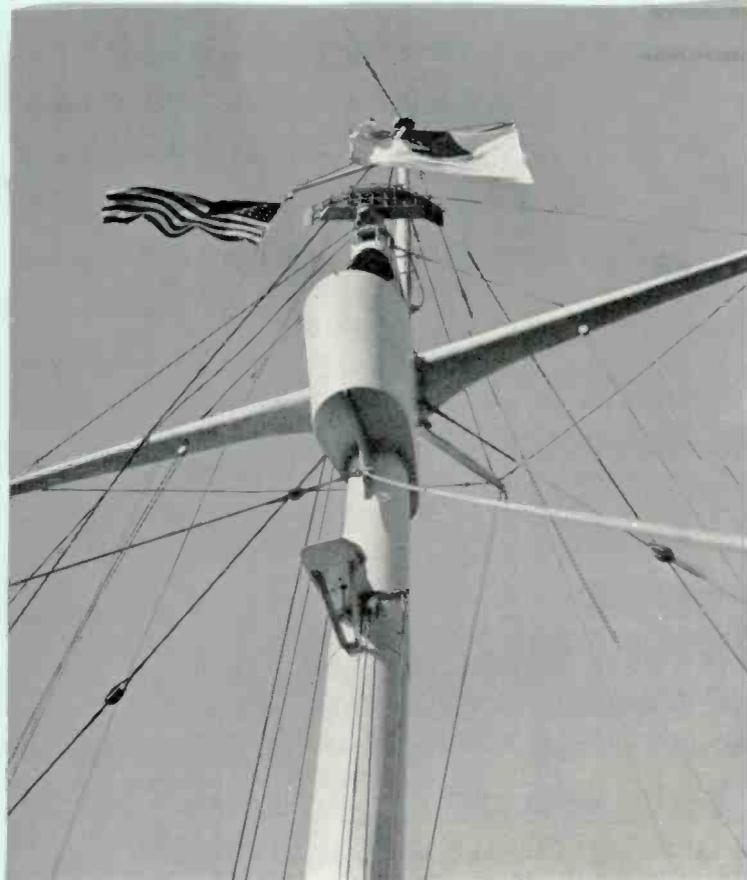
Efforts of all RCA groups were so unified in their purpose that it is difficult to separate

their achievements from the whole fabric of the Corporation's contributions to the war. The record reveals superb development and production of RCA radio communication and electronic equipment used by all branches of the Armed Forces. Some of this equipment provided Army and Navy headquarters instantaneous contact with the far-flung battle fronts. Other radio-electronic devices, prominent among them — radar, warned of the approach of enemy aircraft and vessels, guided planes to their destinations through overcast skies and darkness, directed gun fire and exploded shells at pre-determined distances from their targets for maximum effectiveness.

RCA contributed instruments for testing, sorting, controlling, annealing, hardening and drying which speeded up industrial war production. It provided the Armed Forces with electronic eyes which saw at great distances and which guided missiles to their targets.

*Miniature electron tubes — an important contribution to the war effort — were thoroughly tested before applied to war uses.*





*RCA radar antennas held a high place of importance in World War II.*

Globe-encircling radio systems of RCA provided vital radiotelegraph and radiotelephone communications. International broadcasts using RCA facilities sustained the morale of our Allies and our troops abroad. Broadcasting stations of the NBC network gave the American people on-the-spot accounts of the progress of the war.

RCA research, engineering and production groups were qualified by experience to take on the most complex radio and electronic projects of the war and to give advice and assistance as it was sought by the Army, Navy and the Office of Scientific Research and Development. These groups made special studies for the services and served on many Government committees. RCA experts were present at every theatre of the war to offer their skills and knowledge toward increasing the effectiveness of modern weapons as well as communications.

45

*Snooperscopes and Sniperscopes pierced enemy lines in darkness with devastating effectiveness.*

## **RCA Renders Valuable Aid**

The Corporation handled more diverse radio, television and electronic projects for the armed services than any other single organization in the industry. Some assignments dealt with pure research. The majority of scientific projects reached the production stage and provided valuable aid at the war fronts.

Prominent in RCA's war work was the development and production of the now famous systems of sonar, loran and shoran. Out of RCA Laboratories came additional instrumentalities which made history. These included infra-red communication, the celebrated sniperscopes and snooperscopes, airborne television, and a multitude of electron tubes, employed successfully in secret communication systems, deception and diffusion techniques, jamming and anti-jamming methods to destroy the effectiveness of the enemy's communications and a vast array of other applications.



When the curtain of secrecy was lifted from wartime radar, it was revealed that RCA not only had substantially assisted in its development, but also had participated outstandingly in many phases of its development and manufacture. When the United States entered the war, all radar equipments in the service of the Navy were those of RCA. As the war advanced, radar became one of the chief production items in the electronic field. The purchases by Government agencies of radar eventually totalled \$3,700,000,000, with contracts apportioned among various companies in the radio and electrical field, for it was a gigantic task to meet the tremendous demands for this new type of apparatus.

RCA assisted in producing many special types of radar equipment. The most effective applications included: warnings of the approach or presence of enemy aircraft and surface vessels; determination of the range and bearing of enemy planes and ships; providing information for accurate control and firing of anti-aircraft and naval guns; use in obtaining altitude measurements aboard war planes, and as a navigation aid to planes and ships in fogs, darkness or through dangerous channels.

During the latter stages of the war, RCA created the highly effective system of radar known as shoran. It was employed with devastating results in blind bombing. Operating on an echo-timing principle, shoran demonstrated that it was capable of equalling visual bombing in accuracy under normal conditions and surpassing it by far when the latter suffered from target identification difficulties. On occasion, shoran made possible rolling barrages of fragmentation bombs only a few hundred feet ahead of our advancing troops. The demoralizing effect of

such a barrage, from planes completely hidden in a clouded sky, was tremendous. In peacetime, shoran becomes a new radar "yardstick" for world mapping, so perfected that it can measure distances up to 250 miles with almost pin-point accuracy.

There were occasional instances in World War II where a prewar development became adaptable to totally different usage. An example of this is the RCA light-splitter developed originally to meet the problem of recording sound on film. Basically, it is an optical device which is in effect a color selective filter. Through the insight of RCA engineers, it was modified for extremely valuable application in optical range finders used in military and naval operations.



*RCA workers assembled radio-electronic apparatus used on the many war fronts.*

## Widening Extent of RCA Projects

RCA research and development work covered such diverse fields as lens and glass coating processes, production of synthetic quartz crystals, building of training devices for use in anti-aircraft firing techniques, improvement of shipboard battle announce systems, radio devices for exploding mines, and perfection of a super-sonic communication system among others.

In 1943, a large group of workers at the RCA plant in Bloomington, Ind., daily were producing thousands of radio sets about the size of a pint milk bottle. Incredible as it may seem, none of the workmen on the assembly line had an inkling of the purpose of these miniature instruments. They knew them only as "Madame X." To the Armed Forces, however, they were the celebrated VT-fuse and to the British, they were known as "the proximity fuse." The "fuse" made history through its devastating ability to explode shells at the moment of maximum destructiveness. Before war's end, RCA had produced more than half of the total production of 10,000,000 of these remarkable instruments.

Under contract with the Navy, RCA had begun an intensive development of underwater sound detection and ranging apparatus as early as 1934. Out of this project came several of the most effective types of sonar used in the war in the campaign against enemy submarines and enemy mines. RCA engineers also developed a compact lightweight underwater detection device which could be carried by swimmers and divers. The device, so sensitive that it could detect an object as small as a quarter-inch steel rod ten inches long at a distance of 50 feet, was used successfully in amphibious operations in the war zones. It was often called



*One of the Navy's flying weapons which employs television "eyes" to guide it to the target.*

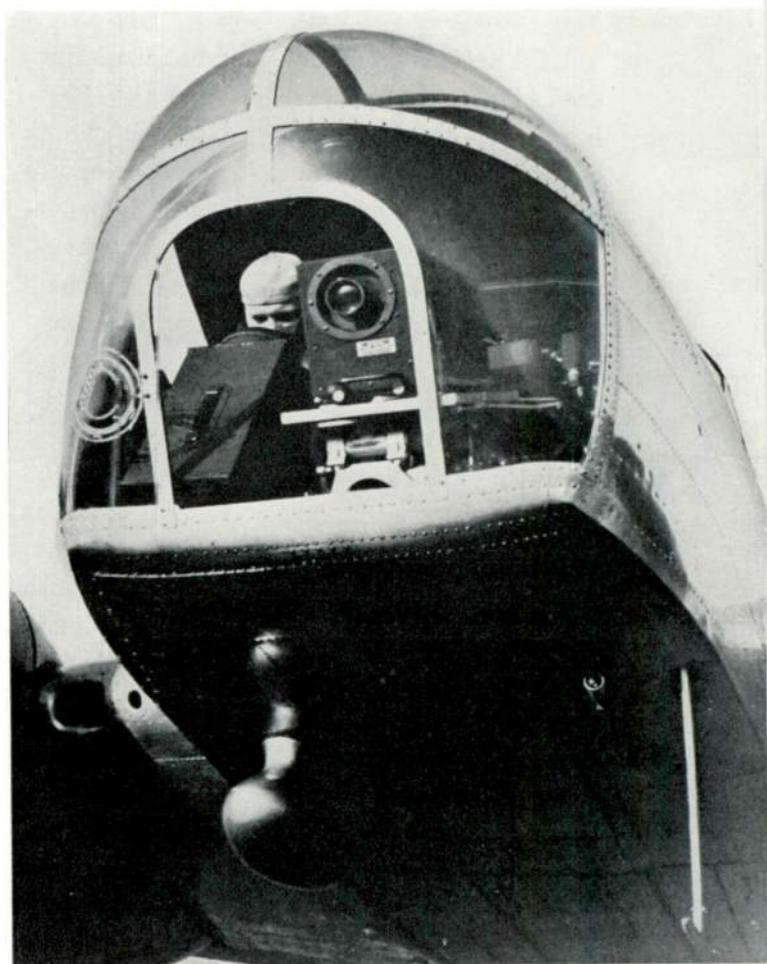
"usdar" rather than sonar. In all, RCA completed 54 sonar contracts for the Government during the war.

Highly secret television projects completed by RCA played an important role in the war. In addition to functioning as an aid to the navigation of pilotless planes, television was employed to direct crash boats loaded with explosives against enemy targets; to guide free falling, radio-controlled aerial bombs, flying torpedos and assault drones; for general artillery spotting, gun control and map making from observation planes, and to transmit messages, maps and charts between ships and aircraft. Airborne television was envisaged as early as 1934 by Dr. V. K. Zworykin of RCA Laboratories.

The first airborne project, identified as "Block I," was delivered to the Army in April, 1941, for flight testing. It was prepared for use in guiding glide bombs and in radio-controlled war-weary bombers. Experience gained in the tests resulted in a modified model known as "Block III," more than 4,000 of which were manufactured by RCA Victor for the armed services.

Another airborne television equipment was developed for the Navy. It was identified as project "Ring." This equipment was designed for reconnaissance use in heavy planes and had a range of more than 200 miles at an altitude of four miles. These projects were complete secrets until March 21, 1946, when a public demonstration was conducted by RCA in cooperation with the Navy at the Naval air station, Anacostia, D. C. The demonstration showed that airborne television represented a major step in widening television's scope of service, particularly in wartime.

Additional evidence of the extent of airborne television capabilities was revealed at the atom bomb tests at Bikini. There, television was given two valuable applications — one for telemetering and the other provided close-up views of the bomb explosion to observers located at a safe distance. In the telemetering applications, Army planes equipped with television cameras and remotely radio-controlled, flew through the atomic cloud, immediately after the explosion. One television camera was located on the cockpit instrument board of the pilotless plane, and the other was in the nose of the plane to show the view directly ahead. In the second Bikini test, television cameras were installed on Bikini Island three miles from the explosion. Observers on television-equipped planes and on Navy vessels sta-

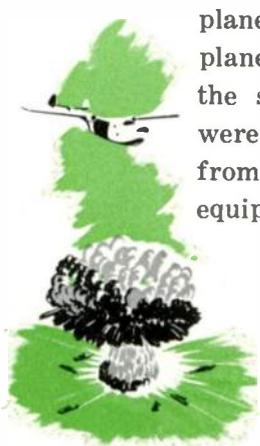


*Airborne television developed by RCA.*

tioned at safe distances were thus provided with the same view of the explosion as though they were on Bikini.

### **Use of Loran Hastened**

RCA design engineers played an important part in hastening to military use the famed loran systems for use as an electronic aid to long-range navigation aboard aircraft and surface ships. They were provided with a bench model of a loran receiver developed by the Radiation Laboratory of the Massachusetts Institute of Technology and



requested to produce a pilot model for mass production. Making use of knowledge and skills attained from work on television and radar, these RCA development groups built a production model which incorporated important improvements in circuits, ruggedness and accuracy.

Although developed prior to the war with peacetime usefulness in mind, the RCA electron microscope proved to be one of the most important scientific tools in World War II. With a magnification of more than 100,000 diameters, this instrument enabled Government and civilian scientists to probe deep into submicroscopic worlds to better understand metals, oils, chemicals, foods and many other materials. It was employed with success on the highly secret Manhattan Project from which evolved the atom bomb. It aided immeasurably in the development of synthetic rubber and other vital war needs, and it aided medical research on many fronts.

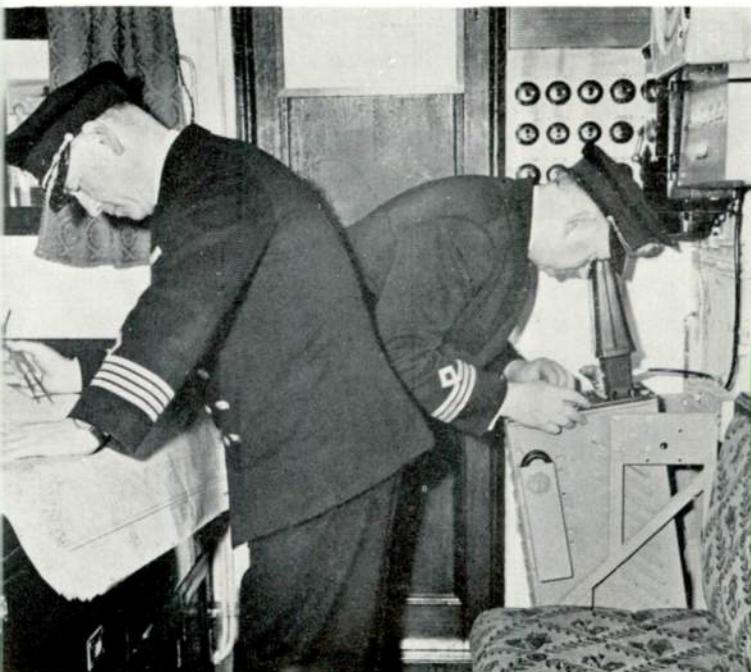
RCA developed and produced electronic fire control boards for use aboard naval vessels and instruments for measuring the speed of projectiles with great accuracy. The measuring devices enabled the ordnance

experts to detect defective guns and ammunition and to correct or discard the defective types. They also made possible the ascertaining of relative effectiveness of old and new types of explosives.

An invaluable wartime outgrowth of RCA research was radio-frequency heating which speeded industrial processes, reduced costs and produced better products. It was found that laminated wood structural parts and sections could be bonded more satisfactorily and rapidly with radio-heat than by any other means. Going still further, research engineers produced high-frequency equipment that made possible the all-wood plane.

Other applications of radio-heat included case hardening, riveting, welding, melting of rare metals and the molding of plastics. RCA developed a radio sewing machine that solved the problem of bonding thermoplastic materials for war uses. Radio-heat was also used in the dehydration of vital drugs and chemicals to prevent deterioration at the war fronts. Applying radio-heat, RCA engineers succeeded in speeding the process in the production of penicillin, and opened the way for many uses in peace as well as in war.

*RCA kran equipment is recognized for its accuracy in long-range navigation.*

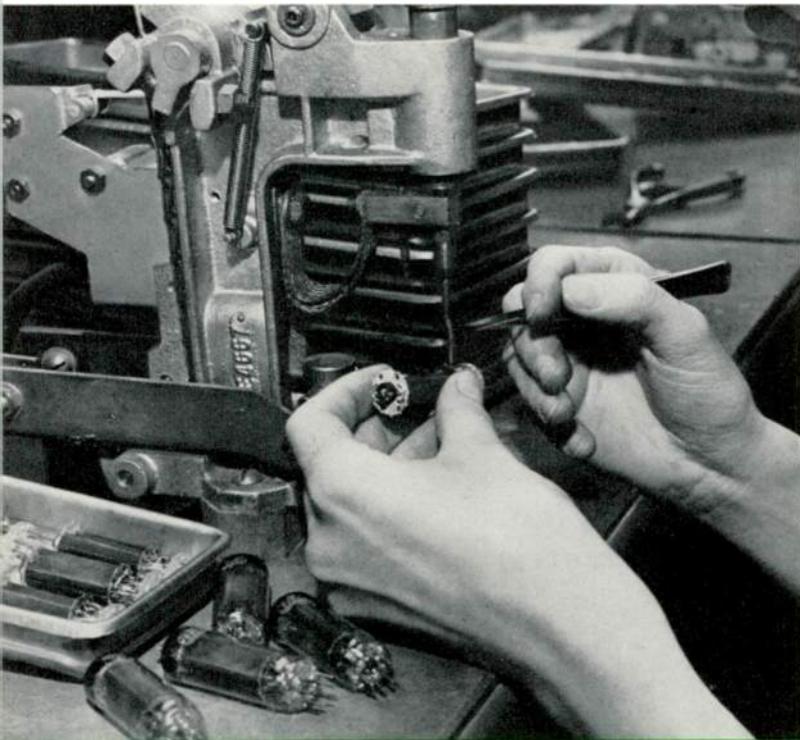


*Radio sewing machine developed during the war stepped-up production and usage of thermoplastic garb.*



## Urgent Problems Solved

The planting of land mines by the enemy constituted one of the major menaces to the advance of ground forces. Wide-spread damage was caused before a magnetic locator was developed, which made it relatively easy to detect metallic mines. The enemy became aware of this, however, and changed to non-metallic mines with such serious consequences that in 1943 the Army called



*Each job and radio product assumed added importance as the war progressed.*

desperately for a solution. An RCA engineer came up with an answer in the form of an electronic detector which was 90% effective in locating enemy mines and was standardized by the Army for this purpose. The Army

instituted a production program of 34,000 of the RCA-designed detectors for the D-Day invasion of Europe.

Public address systems built and installed by RCA in factories, shipyards, docks, loading platforms and elsewhere on the home production front were credited with speeding the war effort and stimulating the morale of workers. Programs of music were carried over the systems to workers on the production line, and timely announcements concerning the progress of the war kept them informed. Two hundred installations were completed by RCA Victor before the end of the war, and most of the disc records being used over the systems carried the RCA Victor seal. RCA also produced the majority of recordings and recording apparatus used in the various branches of the Office of War Information in this country and abroad.

As a pioneer in the field of talking picture equipment, RCA was well prepared to supply the armed services with picture recording and reproducing equipment. Before Pearl Harbor, RCA Victor was the largest single supplier of such equipment to the Army and Navy which made purchases in quantity for use in training schools, aboard battleships and in Army posts. It is reported that more than 630,000 Army men and women attended motion pictures daily through RCA facilities supplied to 1,250 points during World War II. On a typical day — October 1, 1943 — the largest audience numbered 15,000 in an open air theatre in New Guinea; the smallest, eleven men in a bleak outpost on the Aleutian Islands. Sound pictures of combat action on land and sea served the military strategists in Washington and elsewhere with a comprehensiveness far exceeding written reports. Films of action on the fighting fronts also stimulated war workers.

## Wartime Communications

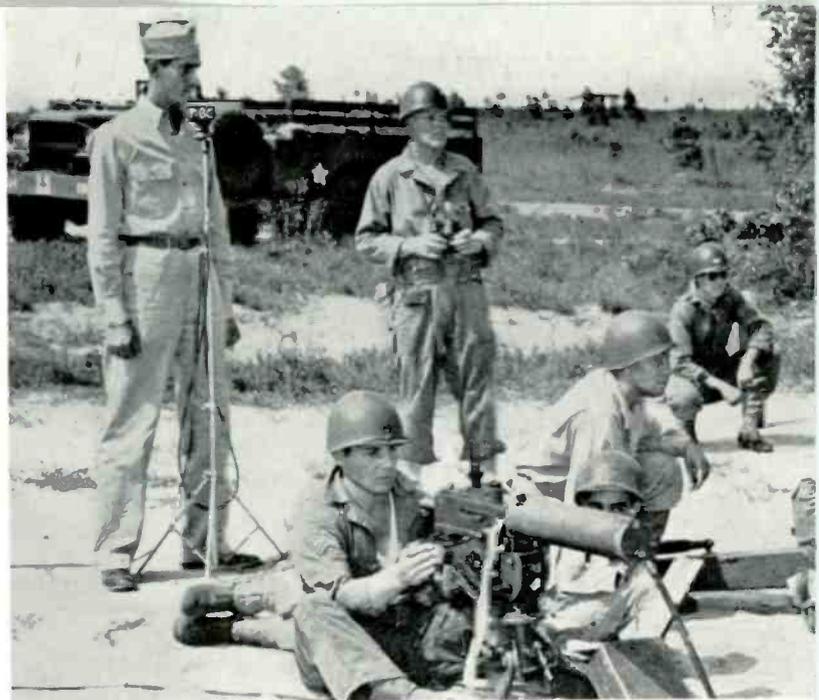
RCA's pioneering in the field of international radio communications provided a backbone for the immediate needs of war and proved of invaluable help to the armed services in coordinating military operations in the widely separated theatres of war. RCA had established world-wide circuits which were transformed easily to war usage by all Government departments as well as the press services. In addition, the knowledge and experience of RCA communications engineers facilitated development and production of new and vital types of equipment for war usage.

By 1944, RCA's international traffic had reached an all-time high of 150,000,000 words. But even that record was broken the following year when 250,000,000 words were transmitted. Prewar transmission speeds of 30 words per minute were raised nearly twenty-fold to 600 words a minute. This World War II traffic was handled through three RCA terminals — 66 Broad Street, New York, which was linked with RCA transmitters at Rocky Point, and receivers at Riverhead, Long Island; at 28 Geary Street, San Francisco, which maintained remote control lines to stations at Point Reyes and Bolinas, Calif.; and at 233 King Street, Honolulu, connected by nine lines with RCA stations at Koko Head and Kahuku.

During the early days of the war, new direct radiotelegraph circuits were established by RCA between the United States and French West Africa, Iran, Ecuador, Bermuda, New Zealand, New Caledonia and Kunming and Chengtu, China, increasing the total to more than fifty.

Besides the military and official message traffic, RCA international circuits carried

*Direct radiotelegraph circuits with Latin America, Europe and the Far East served as vital wartime communication links.*



*NBC war correspondents covered firing ranges and battlefronts.*

a vast amount of press copy and radiophotos for American news services and newspapers. Also carried were tens of thousands of Expeditionary Force Messages (EFM), a quick and economic means of communication between overseas soldiers and their families.

RCA installed, staffed and operated a number of long-distance short-wave stations for the Army. The first of these was Station "X" which was opened soon after American troops landed in Italy. As they advanced into Europe, additional stations were put into operation, eventually serving the armies in France, Southern Germany and Austria. In the Pacific, a station manned by RCA personnel was opened at Manila and another at Seoul, Korea, for the Army.





*Radiomarine's self-powered lifeboat radio.*

### Marine Radio

Throughout World War II, Radiomarine Corporation of America maintained its leadership in production of marine radio apparatus and in equipping and servicing merchant vessels. More than 5,570 vessels were constructed, and Radiomarine provided a large percentage of them with modern communications equipment. In addition, many special designs of radio transmitters were built for military use. Before the war's end, Radiomarine had produced more than 40,000 major units of marine radio installations comprising 42 different types of apparatus. Among these were radio direction finders, advance types of radio equipment for lifeboats and emergency use, automatic distress alarms, "packaged" radio installations for the Merchant Marine and radiotelephone equipment. High praise went to Radiomarine for its lifeboat equipment capable of radiating distress signals over increased ranges from 200 miles to 1,000 miles, with facilities provided for both voice and code communication.

### Voice of The Nation At War

Radio broadcasting became increasingly important as the voice of the Nation at war. The Government and the armed services were afforded direct and simultaneous contact with the people of the United States and with other nations. Two decades of development of the American system of broadcasting, based upon American traditions of free speech and free enterprise, prepared radio broadcasting for an unprecedented wartime role. Radio rallied the Nation, broadcast vital information, aided civilian morale, and helped to unite the American people in the single purpose of winning the war.



*Radar antenna developed by Radiomarine increased the effectiveness of shipboard operations.*

A leader in this service to the Nation, the National Broadcasting Company devoted more than 10,000 hours of network time to the war effort. When an address by the President or announcements of national interest conflicted with network schedules, NBC donated time and cancelled the commercial revenue which it would have received.

To provide on-the-spot news to its listeners, NBC maintained a large staff of correspondents to cover virtually every war sector. They gave eye-witness accounts of the big events of war as they occurred, and when the tide of battle turned, they reported the advance of Allied forces across Europe and in the Pacific. Scores of NBC's wartime programs were of direct aid to the war effort and received official acclaim. Some of the programs that will be long remembered include "The Army Hour," "For This We Fight," "The Editors Speak," "Music at War," "They Call Me Joe," "Words at War," "The Pacific Story," "Dear Adolph," and "The Land of the Free."

Further participating in the war, NBC entered into a contract with the Government through which the network's short-wave facilities and personnel were devoted to a daily total of 15 hours in eight languages—French, German, Italian, Swedish, Danish, Spanish, Portuguese and English. News programs

*Broadcasting front-line reports in the "Battle of the Bulge."*



*NBC microphones could be spotted on many of the Army's maneuvers which were covered with first-hand accuracy by correspondents.*



*Niles Trammell (right) visited General Mark Clark's headquarters in the Italian theatre of operations.*



*Radio dramatically carried the voices of British refugee children from New York to Great Britain in 1941 under the direction of Ben Grauer, NBC staff announcer.*

were beamed across the Atlantic and to Latin America and included news, special events, interviews with outstanding personalities, as well as symphonic concerts, opera and other musical entertainment. Programs beamed to Europe were arranged and short-waved in collaboration with the Office of War Information; those to Latin America, with the Coordinator of Inter-American Affairs. In addition, NBC participated in the broadcast of programs especially designed for the entertainment of American troops abroad. These included recordings or relayed transmissions of popular programs regularly heard by listeners at home.

Members of the engineering staff of NBC assisted Government agencies on many important wartime projects, most of which were secret in nature. They assisted in the development of airborne television equip-

ment and developed a telemetering system for pilotless planes. In all, NBC engineering staff undertook more than 30 different research projects for the Army, Navy and Office of Scientific Research and Development. Of valuable aid to the Government was the experience of NBC personnel in the fields of acoustics, sound recording, television and radio transmission and reception.

Throughout the war, the NBC Radio Recording Division was active in preparing, producing and distributing transcriptions and V-Discs (special types of records suitable for phonograph or broadcasting use) for the entertainment of overseas forces and civilian personnel. All the Nation's well-known bands, singers and musicians recorded for the doughboy discs. At its peak, V-Disc production reached 3,000 records a month.





## Resuming Peacetime Operations

SO numerous and so full of opportunities for public benefit were the wartime advances in radio and electronics that victory brought no breathing spell. RCA research began operating on a three-point program: *First*, to develop projects speedily applicable to civilian needs and commercial production. *Second*, to conduct research providing for the constant flow of new technical knowledge and developments in radio and electronics. *Third*, to continue close cooperation with the military service of the United States, maintaining appropriate liaison for specific military research in radio and electronics to help guarantee the scientific preparedness and security of this Nation.

In the final quarter of 1945, the great momentum of wartime production slackened sharply, and reconversion of the RCA manufacturing plants was begun with a determination to accomplish the transition to peacetime operations as quickly as possible. It became clear that the future of radio as an art and as an industry would be based upon advances in science which promised expansion of commercial radio activity through

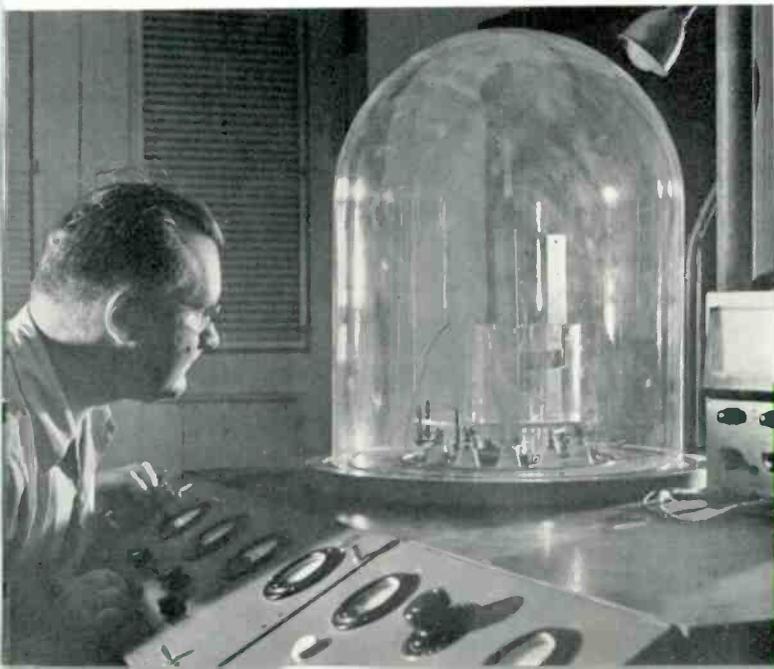


Frank M. Folsom  
President of RCA

new services, new products and new processes.

Hundreds of new electron tubes, developed to meet the needs of war now are available for peacetime use in communications, transportation and industry. Miniature radio tubes which RCA originated and used in prewar portable radios, were widely used in radar and other wartime services as evidenced by the fact that from 1942 to the end of the war RCA manufactured more than 20,000,000 of them, including many new types.

RCA Victor's initial postwar line of home instruments consisted of nine models, including a new and more compact "personal" radio, attractively styled table models of



*Scientific observations and tests at RCA Laboratories hasten radio's peacetime advances.*

Victrola radio-phonographs and radios and console types of Victrola radio-phonographs. The plant at Monticello, Ind., was recon-verted for the building of radio cabinets, and the plant at Hollywood, Calif., resumed commercial production of RCA Victor records. Plants at Bloomington, Ind., and sections of the plant at Camden had begun production of radios within eight weeks after V-J Day. Commercial tube production was resumed at Harrison, N. J., and the tube plant at Lancaster, Pa., which was built and operated by RCA for the Navy during the war and purchased by the Corporation after victory, was being converted to provide tubes for television, broadcast transmitters and industrial uses. A cabinet factory was acquired at Pulaski, Va.

With the reconversion and modernization of the Camden plant, it was better prepared than ever for the manufacture of precision, technical apparatus and engineering products. Soon after the war, deliveries were started for a new line of improved FM broad-

cast transmitters and other broadcasting equipment. Manufacture also was begun on a complete new line of emergency communications apparatus for police and commercial vehicles.

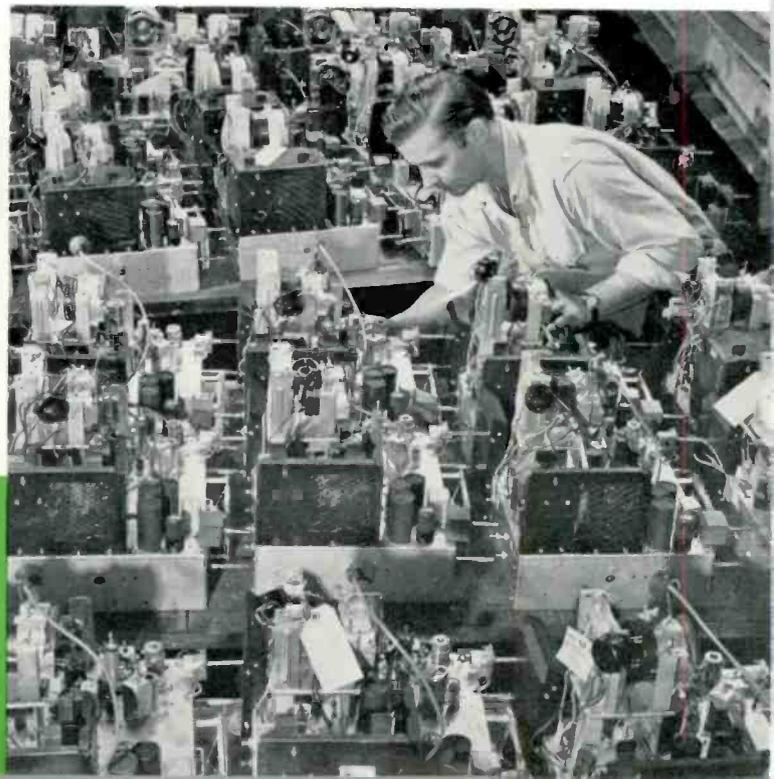
Production of RCA motion picture theatre reproducing and sound-film recording equipment, which for four years was devoted to the needs of the Armed Forces, was rechan-nelled to the commercial market. Acquisition of additional manufacturing facilities at Detroit, Mich., was one of the first steps taken to provide increased manufacturing capacity for theatre projection equipment. A new and improved 16-mm sound-film projector, incorporating wartime developments, was marketed with success in this country and abroad.

Utilizing radar principles, RCA Victor developed two forms of highly accurate altimeters, both of which are widely used by the Army, Navy and commercial airlines in peacetime operations. These altimeters enable planes to fly safely through overcast at



*First professional-type magnetic recorder produced by RCA Victor.*

*Final inspection of television receiver chassis preparatory to assembly.*





*Assembly line production of RCA Victor's new 45 rpm record player.*

low altitudes or high altitudes. Moreover, the Division now is developing in cooperation with the United States Air Force an air navigation and traffic control system known as teloran, which combines radar and television to provide pilots with composite pictorial information showing route, terrain, land marks and weather conditions.

Since the war, RCA Victor has run its total production of RCA electron microscopes up to more than 300 which are being used by leading manufacturers, Government bureau, hospital and college laboratories and in important scientific research projects throughout the world.

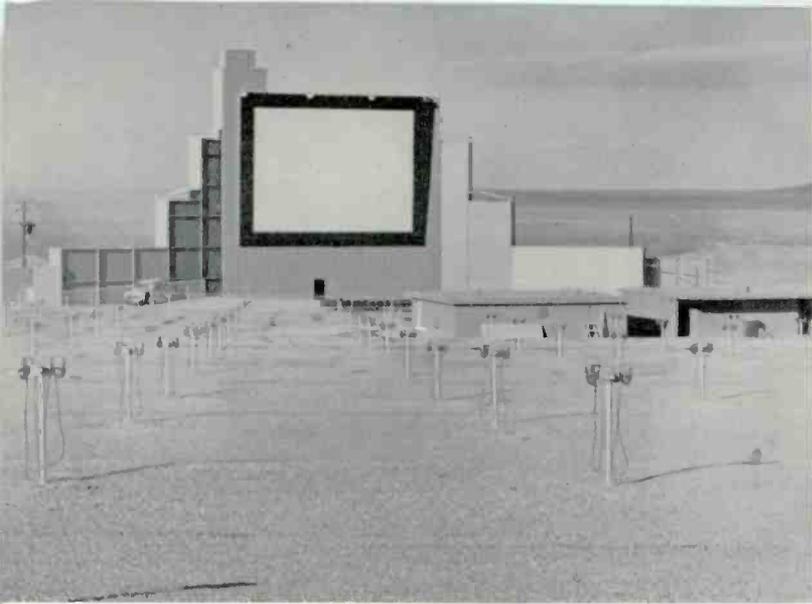
Early in 1949, RCA Victor introduced a completely new record playing system for reproducing recorded music in the home. Featuring an advanced type of record and record changer, it reproduces music at 45 rpm with unexcelled quality and clarity of tone. The instrument is compact and plays light-weight non-breakable records which, although less than seven inches in diameter, play for more than five minutes. The same



*The "45" attachment with the fastest automatic record changer ever produced.*



*Rigid inspection is given new light-weight, non-breakable vinylite "45" records for music of unexcelled quality.*



*Drive-in theatre RCA-equipped on the outskirts of Albuquerque, New Mexico.*

selections also will be available on standard 78-rpm records for which there is expected to be a continuing demand in all classifications for many years to come.

Radio-frequency power generators of the type built by RCA Victor for wartime industrial use found widespread peacetime application in industries utilizing controlled heat. As a pioneer in radio-heat, RCA had developed equipment which sped manufacturing processes in many of the new postwar fields, including plastic molding, drying of synthetic yarns, seaming thermoplastic materials and laminating wood.

### **RCA Exhibition Hall**

Opened in 1947, the RCA Exhibition Hall at 36 West 49th Street, Radio City, New York, has attracted more than 2,500,000 visitors. This "World's Fair" of radio, electronics and television is on view daily and Sundays, free to the public. Tens of thousands of out-of-town visitors have seen television for the first time at the exhibit and have themselves been televised at the RCA Victor display which includes the latest



*Television is becoming a valuable aid in teaching surgical techniques.*



types of television home receivers, Victrola radio-phonograph combinations, radios and other home instruments. Nearly 100,000 of the visitors have come from points outside of the United States.



RCA Exhibition Hall in Radio City is a "World's Fair" of radio, electronic and television.

### RCA International Division

Foreign trade activities of Radio Corporation of America were consolidated in the RCA International Division, effective on February 1, 1945. This Division became responsible for the distribution outside of the United States of products manufactured by RCA and certain non-affiliated companies, for operation of foreign associated companies, and for coordination of all RCA international activities.

During the war, a large part of RCA's foreign activities involved supply, through the operation of lend-lease, of radio-electronic instruments and equipment for the



Spanish distributors proclaim the superiority of RCA products in sales mart.

armed forces of the United Nations. At the same time, the Corporation's foreign manufacturing plants were largely occupied with the production of goods essential to the war effort. With the resumption of world trade after the war, RCA expanded its foreign activities.

### Postwar Research Highlights

Scientific research at RCA Laboratories has resulted in major advances in radio, electronics and television, since World War II. Investigations encompassed broader fields giving full consideration to the new dramatic factor of nuclear physics as well as reaching farther into the upper radio spectrum, developing new types of tubes, non-vacuum tube devices and electronic computers.

Research devoted to the "why" of certain wartime discoveries brought revolutionary concepts and a wider range of thinking with regard to radio and electronics. Basically, new theories and research activities were



*Work in nuclear research by RCA scientists brings into use many new instruments.*

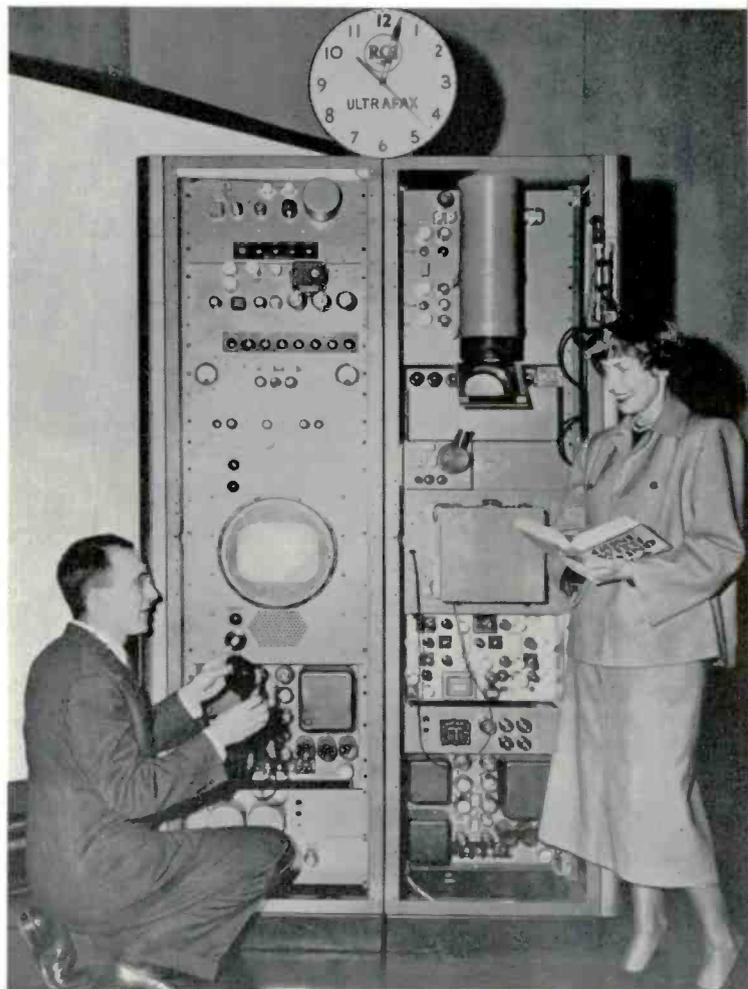
evolved. For example, more was being learned about the behavior of electrons in solids. Study and application of this new knowledge and additional information related to other fields of science hold promise of important developments.

### **Ultrafax**

One of the outstanding research and engineering projects at RCA Laboratories was the development of an advanced system of communications known as Ultrafax. This system combines television, radio relay and photography to handle huge volumes of widely diversified traffic at speeds up to a

million words a minute. When fully developed, this system will be capable of transmitting, in facsimile, the equivalent of 40 tons of air mail coast-to-coast in a single day. Ultrafax, which splits the seconds and utilizes each fraction for high-speed transmission of intelligence, promises to be as significant a milestone in communications as was the splitting of the atom in the world of energy.

*RCA Ultrafax — view of the receiver of the communications system capable of handling written and printed messages at the rate of a million words a minute.*

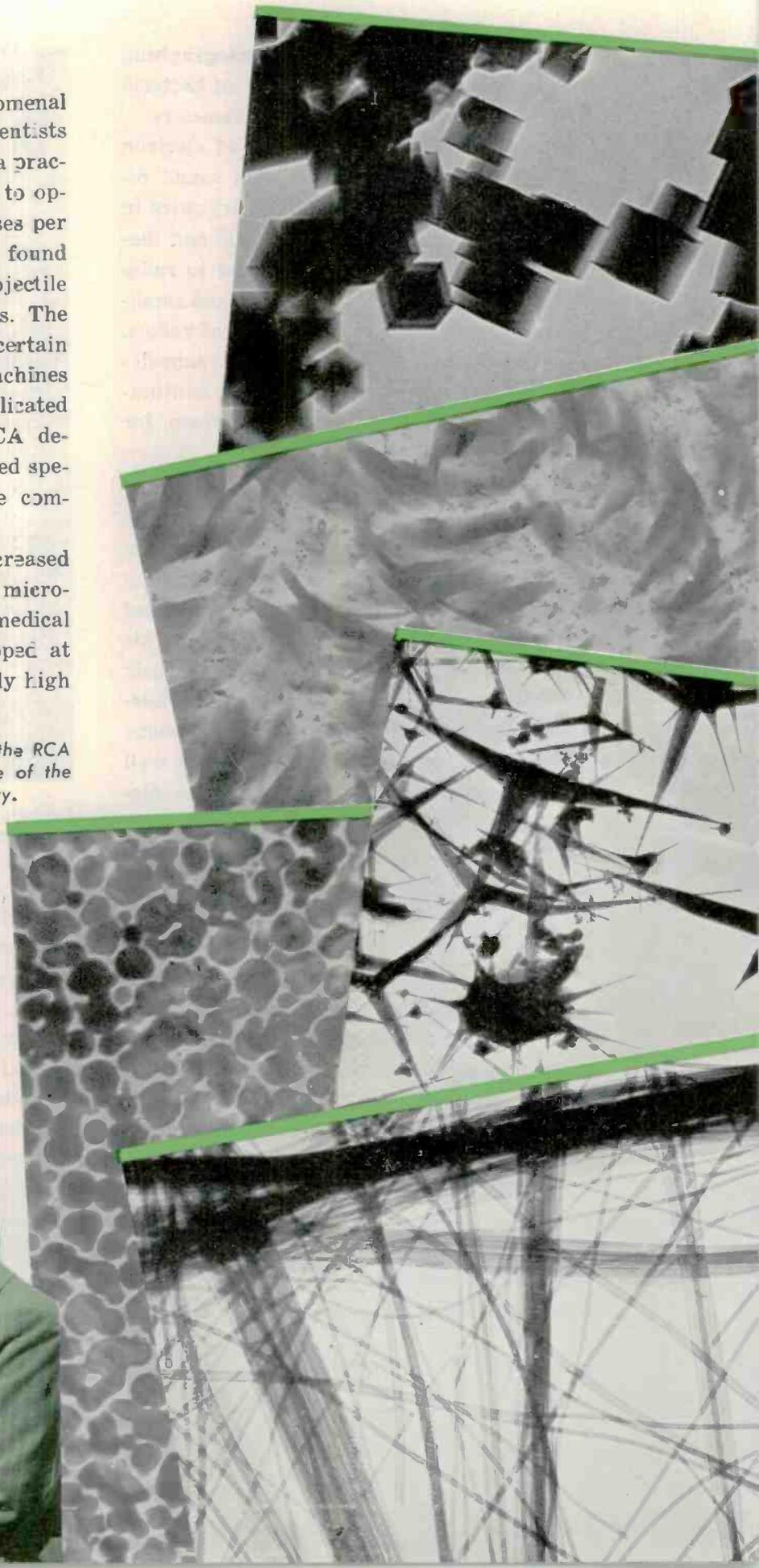
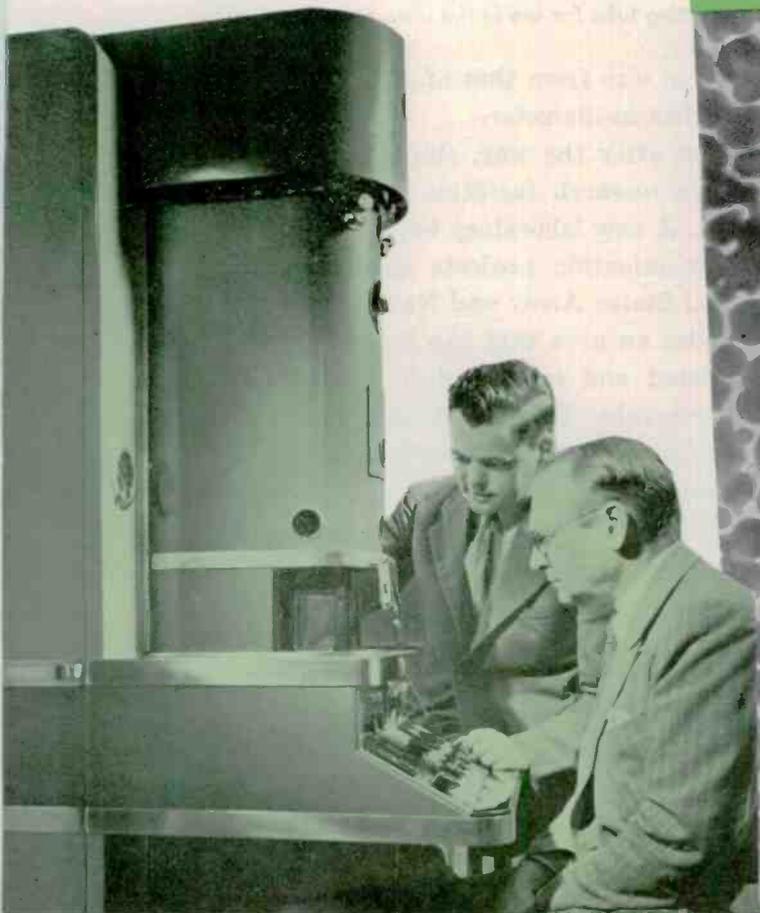


## Electron Microscope

Another advance, utilizing the phenomenal speed of radio, was achieved by scientists at RCA Laboratories who worked out a practical design for an electronic counter to operate at the rate of ten million impulses per second. An early form of this counter found use in World War II for checking projectile speeds in tests of ammunition and guns. The principles of this counter are basic to certain parts of the large calculating machines which are being built to solve complicated mathematical problems. Another RCA development is a "memory" tube, designed specifically for use in these large scale computers.

Improved techniques and devices increased the effectiveness of the RCA electron microscope as an aid to industry and medical science. A new "double lens" developed at the Laboratories provides an extremely high

*Views of submicroscopic realms as seen by the RCA electron microscope which is hailed as one of the greatest scientific tools of this century.*

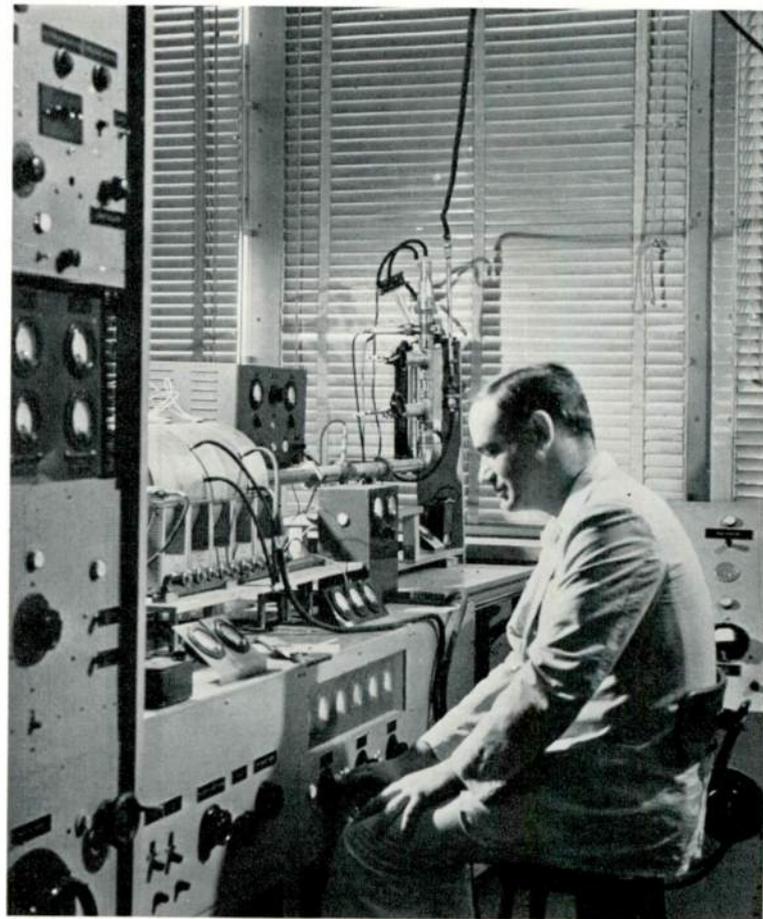


degree of light contrast in photographing viruses and the internal structure of bacteria at magnifications up to 200,000 diameters.

New and improved circuits and electron tubes for television, FM and AM sound receivers have come from RCA Laboratories in the postwar period. New magnetic and dielectric materials have been applied to radio circuits, resulting in more efficient and smaller components for use in all types of radios. Investigation of the use of non-vacuum devices as amplifiers and oscillators is continuing with the aim of developing them for special applications.

After twenty-two years of research and development, RCA perfected an automatic unattended microwave radio relay system. Western Union proposes to use this system to send telegraph messages between principal cities without the use of poles or wires. This relay system can transmit simultaneously over the same circuits — radiophoto, television, voice broadcast programs, telephone conversations and other intelligence, as well as telegrams. The radio beams span distances up to 50 miles.

Research in acoustics at RCA Laboratories has resulted in many improvements in radio reception and phonograph reproduction. It has hastened development of better microphones for radio and television. An outstanding postwar achievement is a special light-weight microphone for use in sound motion picture studios. It is unidirectional, weighs only half as much as the standard microphone of this type and has double the power output. Two other new microphones consist of a velocity type, designed for simplicity and low cost, and a pressure type which makes use of an exceedingly small loudspeaker mechanism. RCA also has pioneered in developing loudspeakers, which



*Intricate tests ascertain the efficiency of a high-power transmitting tube for use in the ultra high frequencies.*

range in size from that of a silver dollar to 16 inches in diameter.

Soon after the war, steps were taken to enlarge research facilities at RCA Laboratories. A new laboratory building was erected for scientific projects conducted under United States Army and Navy contracts. It provides an area that can independently be restricted and controlled to meet security requirements. The second construction project added a 3-story wing to the main Laboratories building. Tube testing facilities were established at Newark, N. J., under the direction of the RCA Industry Service Laboratory.

## Peacetime Broadcasting Progress

While the momentous events which crowded the pages of history during the war years were sharply reflected in the operations and public services of the National Broadcasting Company, the end of the conflict marked the beginning of a peacetime phase of activities that strengthened the leadership of the NBC network.

The broadcasting services of radio and television continued to grow and to supplement each other. While the rapid advance of television and its ever-increasing popularity with the public attracted widespread attention, it was recognized that sound broadcasting must continue to serve millions of people for many years to come.

Recognizing this, NBC advanced and maintained its high standards of programming in both fields of operation. NBC draws upon its experience and techniques in the field of sound to enhance its program service

in television. It continually develops new talent and new ideas for both sound and sight.

Through the continuing popularity and high standards of its programs, and the technical excellence of its network facilities, NBC maintained its position as "America's No. 1 Network." In 1948, total revenue from the sale of network and station time to advertisers in radio broadcasting was the largest in the 22-year history of the company.

The rapidity with which the new medium of television was growing in public favor and in the estimation of advertisers is indicated by the increasing proportion of sponsored programs on NBC's eastern television network. In January, 1948, 33 per cent of network television program hours were commercially sponsored; the remaining 67 per cent were non-commercial. By December, 63 per cent were sponsored; 37 per cent non-sponsored.



*Master control of the National Broadcasting Company network on the fifth floor of the RCA Building.*



*Largest studio in the world — famed Studio 8H of NBC in Radio City.*

## Advances in Communications

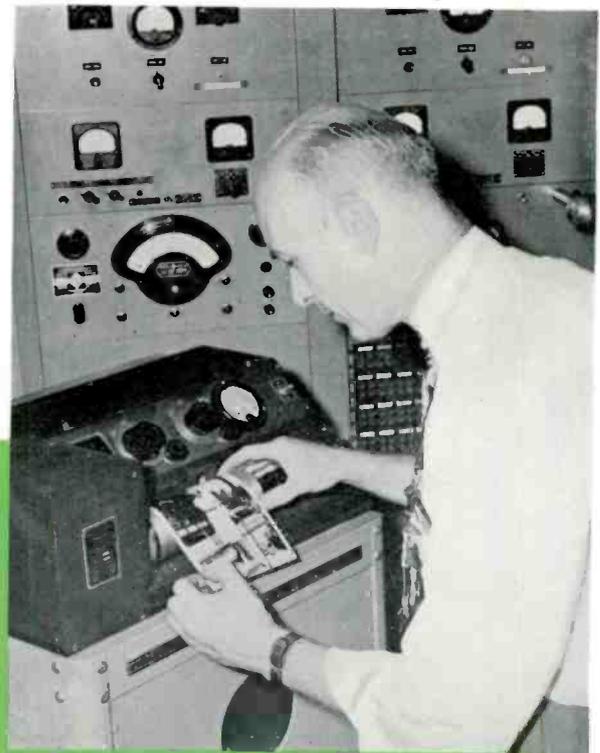
Applying new operating techniques and methods developed during World War II, RCA Communications continued to pioneer in modernizing radio's international service. The answer to greater speed and efficiency in handling increased volumes of traffic was found to be mechanical processing of messages and world-encircling, automatic radio relays. This advanced system employs time and motion-saving tape relay operation, and its aim is to achieve maximum speed of service at low cost with minimum risk of errors. This is accomplished by eliminating letter-by-letter manual processing except at the point where a message is prepared for original transmission.

Before the end of the first year after the war, RCA had reopened all direct circuits suspended during the conflict and had extended its service by opening additional radiotelegraph, radiotelephone and radiophoto circuits. RCA built and operated a powerful relay station at Tangier which provided uninterrupted communication with countries to which operations on regular radio paths were often difficult because of adverse atmospheric conditions. Instantaneous automatic or semi-automatic tape relay is used by this

station in speeding messages to Bulgaria, Egypt, Greece, Turkey, Iran, Lebanon, Norway, Sweden and Russia. During times of atmospheric disturbance, service through Tangier can be made available to Austria, Czechoslovakia, Finland, Germany, Holland, Poland, Liberia, the Union of South Africa and the Belgian Congo.

The RCA multiplex system, providing four to eight channels of communication on a single radio frequency, has been expanded to provide service between the United States and many other countries. This has greatly increased traffic handling capacity of the circuits. At the start of 1949, 81 international radio circuits linking the United States with 66 countries were operated by RCA Communications. In addition to radiotelegraph traffic, the circuits handle international broadcast programs, and the company

*Modern mechanized radiotelegraph equipment of RCA speeds messages to and from overseas terminals.*



*RCA operates radiophoto circuits linking the United States with foreign lands.*



*Radiotelephones place yachtsmen in instant contact with land terminals.*

*Compact radio direction finders are valuable to small craft.*



*Many passenger vessels employ RCA loran for long-range navigation.*

operates 23 radiophoto circuits. Other special services include radio-teletype communications for the United Nations between Lake Success, Geneva and Paris; informational transmissions for the State Department and lease of radio printer channels to American firms desiring direct communications with their offices abroad. These special services account for an average of 10 per cent of revenue.

Postwar research has led to development of an electronic method of converting cable signals, widely used in British systems, into 5-unit characters for the RCA tape-transfer method of operation. This achievement substantially speeds the transfer of telegraph messages between British and American communications systems throughout the world.

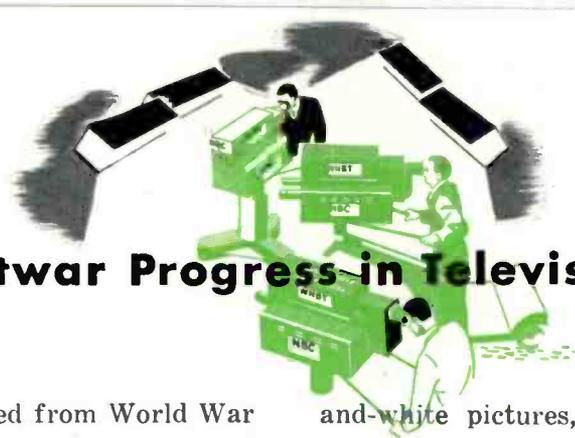
### **Advances of Radiomarine**

Radio communications and electronics aids to navigation on the oceans, Great Lakes and

inland waterways were greatly advanced by wartime developments. Radar equipped vessels now navigate safely through fog-bound channels and rivers and into ports where prior to the war, under such weather conditions, they would have been forced to anchor. Engineers of Radiomarine Corporation of America, alert to practical peacetime application of these new inventions, designed and added radar apparatus as well as loran and other electronic navigational aids to its line soon after the war.

During June, 1949, Radiomarine completed a contract to install 217 radar units aboard ships of the Army Transport Service, highlighting its success in this field. Meanwhile, the Coast Guard had purchased 68 units of a new direct view loran indicator, and many other units were sold elsewhere. Radiomarine continued successful operation of its ship-to-shore services, radiotelegraph and radiotelephone services and its coastal stations.





## Postwar Progress in Television

TELEVISION emerged from World War II as a wide-eyed harbinger of world change and progress. Although television operations were largely curtailed by the conflict, it became evident that many of the scientific advances in radio and electronics would be applicable to this new art and industry. On December 13, 1945 — less than three months after the end of the conflict — RCA staged a demonstration to reveal to the public the postwar status of television and to show the results of its continued pioneering.

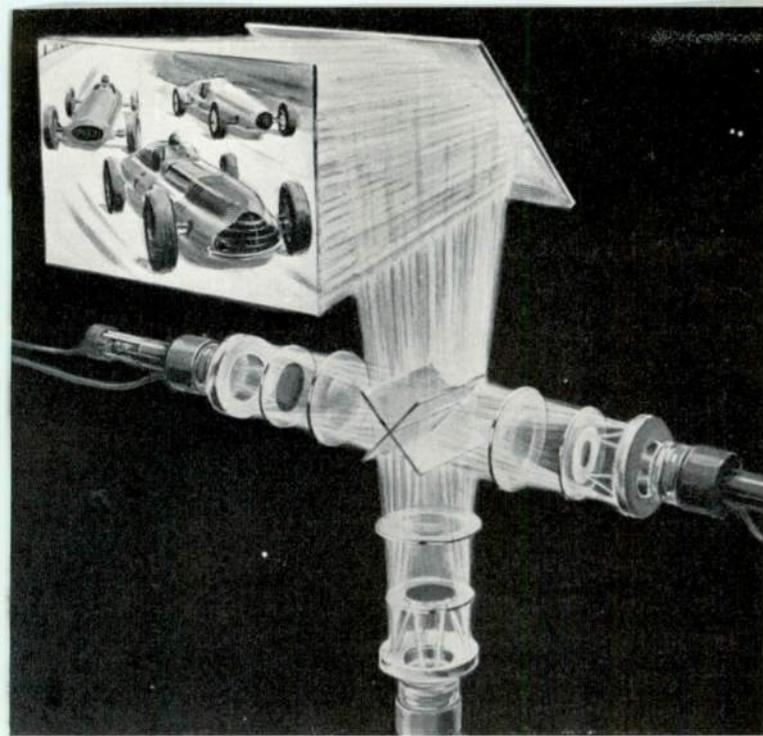
In this demonstration, held at RCA Laboratories, the latest developments were revealed, including vastly improved black-and-white television pictures and mechanical color images in three dimensions. The black-

and-white pictures, produced by the RCA all-electronic system, featured greater detail, brilliance and contrast than ever before achieved in television—all of which was made possible by receivers containing new and improved kinescopes, or picture tubes. These television images, bright enough to be seen in a fully lighted room, were received at Princeton by radio from WNBT, the National Broadcasting Company's pioneer station atop the Empire State Building in New York, a distance of 47 miles. The clear reception of these pictures in motion on a screen as large as a newspaper page proved beyond a doubt that the RCA black-and-white system of all-electronic television was ready for the home.

Coincident with the demonstration, the postwar television policies and plans of RCA and its subsidiaries were outlined. High lights of this important document showed (1) that the RCA organization was prepared to continue research and development in all phases of television, including black-and-white, color, transmission, reception, network distribution and programming; (2) that RCA Victor Division—a pioneer in television engineering and design—would manufacture the finest possible television equipment for sale to broadcasters and the public; (3) that NBC—a pioneer in television broadcasting—would continue development of its programming service and work for establishment of a nation-wide network; (4) that RCA would continue to make available to its licensees all of its patents in this new field of television as it has done in other fields of radio and electronics.



*NBC television camera scans the entrance to the White House, Washington, D. C.*



*RCA all-electronic color television receiving system using projection Kinescopes, reflective optics and dichroic mirrors.*

### Electronic Color Television

On October 30, 1946, RCA demonstrated publicly for the first time a flickerless, all-electronic color system. While still in a laboratory stage, the new RCA method of color transmission established a principle that had long been the dream of radio scientists.

Demonstrations of this system showing transmission through the air were held for the Federal Communications Commission at Princeton, N. J., on January 29, 1947. Three months later, it was shown at The Franklin Institute in Philadelphia, where color television pictures were projected on a 7½ by 10-foot screen.

On August 25, 1949, RCA announced an epoch-making advance—the development of an all-electronic, high definition color television system, completely compatible with existing black-and-white television. The new system—the fruit of years of research and development by RCA—required no changes in transmission standards of existing black-

and-white television. It operated within a 6 megacycle channel and enabled black-and-white television sets to receive color programs in monochrome without any modification whatever, and color programs could be viewed either on new color receivers or on existing receivers equipped with a color adapter.

Transmitting stations could change at will, either from color to black-and-white or the reverse, without disturbing the viewers of either the existing receivers or color receivers, without requiring adjustments to either type of receiver and, therefore, without any loss of audience. The color camera at the transmitting end produced three signals, one for each of the primary colors of green, red and blue. These signals were sampled electronically in rapid sequence and combined. The mixture was then broadcast as a single signal. At the receiver, the mixture was separated so that the signal representing each color went to an electron tube which produced a picture in that particular color. The green signal was fed to the green kinescope, while the red and blue signals were applied to their individual kinescopes. The three colors were then projected to be viewed simultaneously to produce the completed picture in perfect color register.

A regular schedule of color television programs was inaugurated in Washington, D. C., by RCA to demonstrate its new system during hearings on color television before the Federal Communications Commission in the fall of 1949. Transmissions included live studio programs and motion pictures over WNBW, Washington television station of the National Broadcasting Company. Reception of the color programs was arranged at a Washington location readily accessible to the Commission and others.





*Kinescopes, or television picture tubes, on the production line at the RCA plant, Lancaster, Pa.*

*On June 7, 1949, the one millionth Kinescope picture tube came off the production line at the RCA plant, Lancaster, Pa.*



## Improved Television Tubes

Cathode-ray tubes, long a specialty of RCA television research and development, found wide use in radar and other wartime services. More than 500,000 of these tubes were manufactured by RCA and much was learned about luminescent materials that led to improvement of pictures. A few months after the war, RCA introduced the image orthicon as a new pick-up tube, 100-fold more sensitive than any previous television camera eye.

RCA kinescopes likewise emerged from the war greatly improved, and the company, foreseeing rapid growth of the television industry, established facilities to meet the expected demands for these all-important picture tubes. During the first three postwar years, RCA voluntarily carried a heavy part of the load of supplying the kinescopes used by the television set industry. It is the only manufacturer of television sets, parts and tubes to have done so much to promote television expansion.

Early in 1949, RCA introduced the first of a line of television receivers using its newly developed 16-inch metal-cone tube for large direct-view television pictures. This kinescope presents a 126-square-inch picture, more than 200 per cent more viewing area than the glass 10-inch tube. With this addition, RCA Victor had a complete line of television receivers, all distinguished by advanced engineering features and ranging in screen areas from the 10-inch direct-view model to a projection type console having a 15-by-20 inch screen.

The "T-Day" introduction of the RCA Victor television home receivers to the public in September, 1947, signaled the start of a period of unprecedented expansion of the



*Automatic radio relay tower used to transmit television signals from point-to-point.*

new art. Almost immediately it became apparent that television had become the most important new factor in radio. Enthusiasm of the American people for television justified the years of pioneering and the investment of many millions of dollars by RCA in its development as a service to the public.

The first split screen television image in which two pictures of different originating points appeared side by side on the same picture tube was displayed by NBC as a further advance of importance. Kinescope recording by motion picture photography from a face of a television picture tube was perfected by NBC engineers to a point where recorded television programs could be supplied regularly to NBC affiliates without network connections.

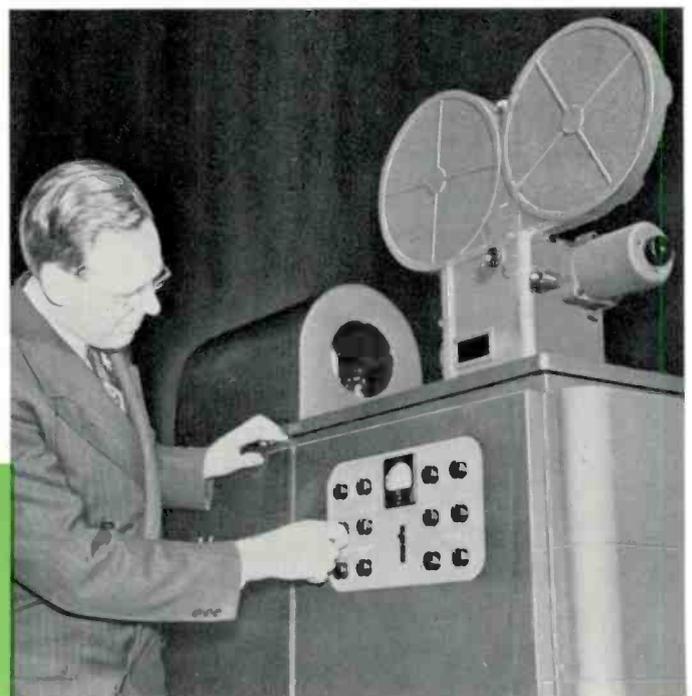
Television network operations of NBC were extended early in 1949 by completion of a coaxial link joining stations in the East and Midwest. The new interconnected net-

work consists of 19 stations, 12 of which are in the East. As the first television broadcaster to develop a video network, NBC continues to pioneer in expanding television service to the public. Its network will eventually reach from coast-to-coast and be comprised of independent stations plus the five stations owned and operated by NBC—the limit of ownership permitted by the FCC for any one company.

### **RCA Today And Tomorrow**

Thirty years of scientific pioneering and industrial achievement in radio, television, and electronics have established for the Radio Corporation of America an outstanding record of service to the people of this Nation and abroad. As a result the RCA monogram is a symbol of progress throughout the world, a recognized mark of quality and dependability.

Entering its fourth decade the Radio Corporation of America looks forward with renewed confidence in the future, backed by the knowledge, skills, experience and accomplishments that have made RCA *World Leader in Radio—First in Recorded Music—First in Television*. As the parent company of RCA Laboratories Division, RCA Victor Division, RCA International Division, Na-



*Kinescope recordings are made on film for syndicating television programs.*



*RCA Victor television receivers on the production belt.*

tional Broadcasting Company, Inc., RCA Communications, Inc., Radiomarine Corporation of America and RCA Institutes, Inc., it is prepared through diversification of its operations to strive continually for advances in research, engineering, manufacturing, broadcasting and world-wide communications.

The year 1948 was the most successful in the history of the Corporation—either during peace or war. Volume of business was higher, profits earned were larger, wages paid to workers were higher, and dividends paid to stockholders were greater than in any other year since RCA was founded in 1919.

Gross income in 1948 was \$357,617,000. Net profit, after providing \$17,049,000 for Federal income taxes, was \$24,022,000. Dividends paid during the year to RCA stockholders amounted to more than \$10,000,000. Holders of preferred stock received \$3,152,000 and more than \$6,900,000 was paid to the holders of common stock. The dividend on the common stock was increased from 30 to 50 cents a share.

During the past ten years, RCA has paid in dividends to stockholders more than \$65,000,000. This is equivalent to 53% of the



*RCA Victor's Anniversary Model television set.*

net profits, after taxes, earned during that period. Approximately \$31,820,000 was paid on the preferred stock and \$33,254,000 on the common stock. The amount at which the net worth of the Corporation is stated, increased by \$60,000,000 during these ten years and is now stated at more than \$127,000,000.

Today the stockholders of RCA number approximately 206,000 and represent individuals, business organizations and institutions covering a wide range of interests throughout America.

As General Sarnoff has pointed out: "The strength of RCA is found in its scientific research and diversification. Throughout our history, from time to time, one unit or another of our organization has been up or down according to the exigencies of the times. But the consolidated picture has consistently shown earnings commensurate with progress. Radio is a constantly changing art and industry in which the pattern of the future at no time can be charted with certainty. Yet the public's needs for its products and services never cease. . . ."

"From time to time, we have heard voices raised against ownership of broadcasting stations and manufacturing plants by the

same organization. But now we are witnessing practical proof of the value of this ownership to the Nation, to the public and to the industry. For instance, if the National Broadcasting Company had not gone on the air with television stations and programs before manufacturing of television sets got underway on a mass production basis, television might never have been started. Certainly, the growth of television would have been retarded and the pleasures derived by



the public from television would have been delayed. As the broadcasting business is being readjusted to conform with new patterns dictated by the addition of sight and sound, it has become quite clear for all to see that diversification is a sinew of industrial strength."

Moreover, behind all RCA products and services stands RCA Laboratories, one of the



*NBC telecasts from the Navy aircraft carrier Leyte at sea in 1948 demonstrated the progress of television in military communications.*

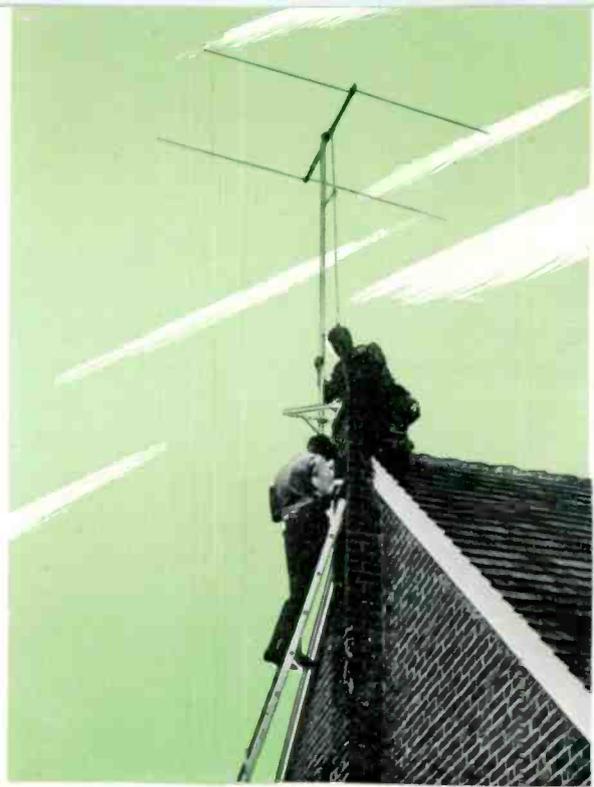
world's foremost centers of radio and electronic research. In war and in peace these laboratories provide a source of constant discovery and invention, strengthening radio and electronics as a bulwark of national preparedness and industrial progress. For 30 years, RCA has proved the incalculable benefit of a close alliance between science and industry.

The RCA Victor Division with headquarters in Camden, N. J., operates manufacturing plants in 11 cities. In addition it supervises two domestic subsidiaries, RCA Service Company, Inc., and RCA Victor Distributing Corporation. Manufacturing facilities comprise more than 100 buildings, with 6,000,000 square feet of floor space. The plants are in operation in Camden and Harrison,

N. J., Lancaster and Canonsburg, Pa., Indianapolis, Bloomington and Monticello, Ind., Detroit, Mich., Pulaski, Va., New York, N.Y., and Hollywood, Calif.

Foreign trade activities of RCA are consolidated in the RCA International Division which operates associated companies in Canada, Great Britain, Australia, India, Argentina, Brazil, Mexico and Chile. The Division functions through more than 130 major distributors, associated companies and field representatives. In addition to RCA products, the Division handles exports of industrial power equipment and electrical appliance lines manufactured by other companies.

More than 170 radio stations are affiliated with the National Broadcasting Company—as America's No. 1 Network. Six of these stations are owned by NBC and include the key station, WNBC, New York; WRC, Washington, D. C.; WTAM, Cleveland; WMAQ, Chicago; KOA, Denver and KNBC, San Francisco. NBC station WNBC-FM is the first FM station established in New York by any network broadcaster. In television, NBC as a pioneer operates five stations,

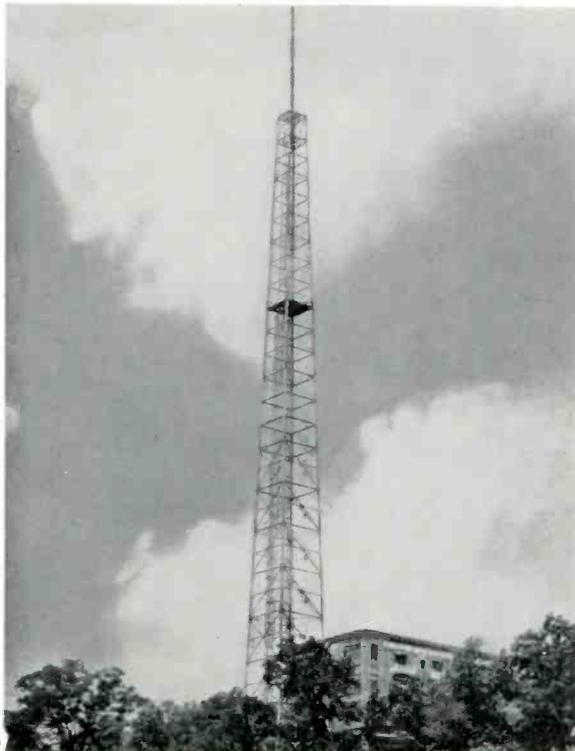


*RCA servicemen erecting a television antenna.*

WNBT, New York; WNBW, Washington, D. C.; WNBK, Cleveland; WNBQ, Chicago and KNBH, Los Angeles. The NBC television network comprises 47 stations.

RCA Communications, Inc., operates more than 80 international radio circuits linking the United States with 66 countries. It operates radiophoto circuits with 20 foreign cen-

*Antenna of NBC station WNBW, Washington, D. C.*



*Television enables Americans to eyewitness Congress.*



ters and a program transmission service to bring broadcasts from overseas to American stations.

Radiomarine Corporation of America produces and services marine radio communications equipment and electronic navigational devices, as well as operating an extensive coastal radiotelegraph service with ships at sea and a radiotelephone and telegraph service for vessels on the Great Lakes and inland waterways. Radiomarine dealer appointments exceed 160 and handle such products as shipboard radar, loran, radiotelegraph transmitters and receivers, radiotelephones and specialized equipment for work boats and pleasure craft.

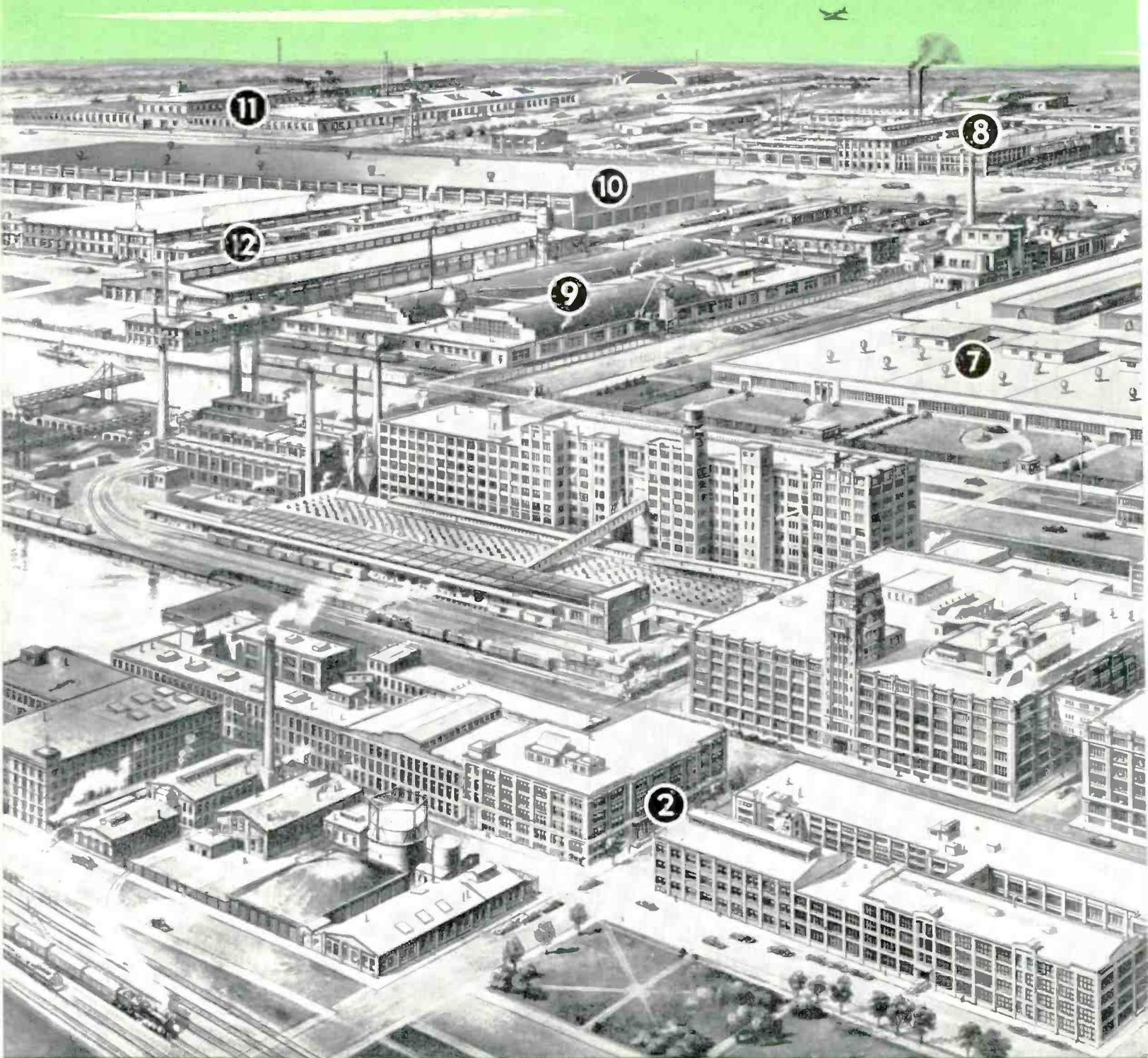
RCA Institutes, Inc., has trained thousands of radiotelegraph operators and radio technicians in the 30 years that it has been part of the company. Founded in 1909 as the Marconi School of Instruction, it is the oldest

radio technical training school in the United States.

Thus, in the 30 years since its formation, the Radio Corporation of America has endeavored in every way to extend radio's usefulness to people in every walk of life. While the success achieved represents a fascinating chapter in this rapidly expanding art, other magic trails beckon; new potentialities become evident from day to day. Exploration and development of each potentiality call for vision and imagination of the type that have brought television into American homes and put the voice of the United States within listening range of every person on earth. Greater opportunity for service lies ahead of RCA in its resolve to continue scientific pioneering and exploration as well as industrial progress and communication services for the benefit of mankind.



# RCA VICTOR MANU



**1** CAMDEN-MAIN PLANT  
NEW JERSEY

**2** HARRISON  
NEW JERSEY

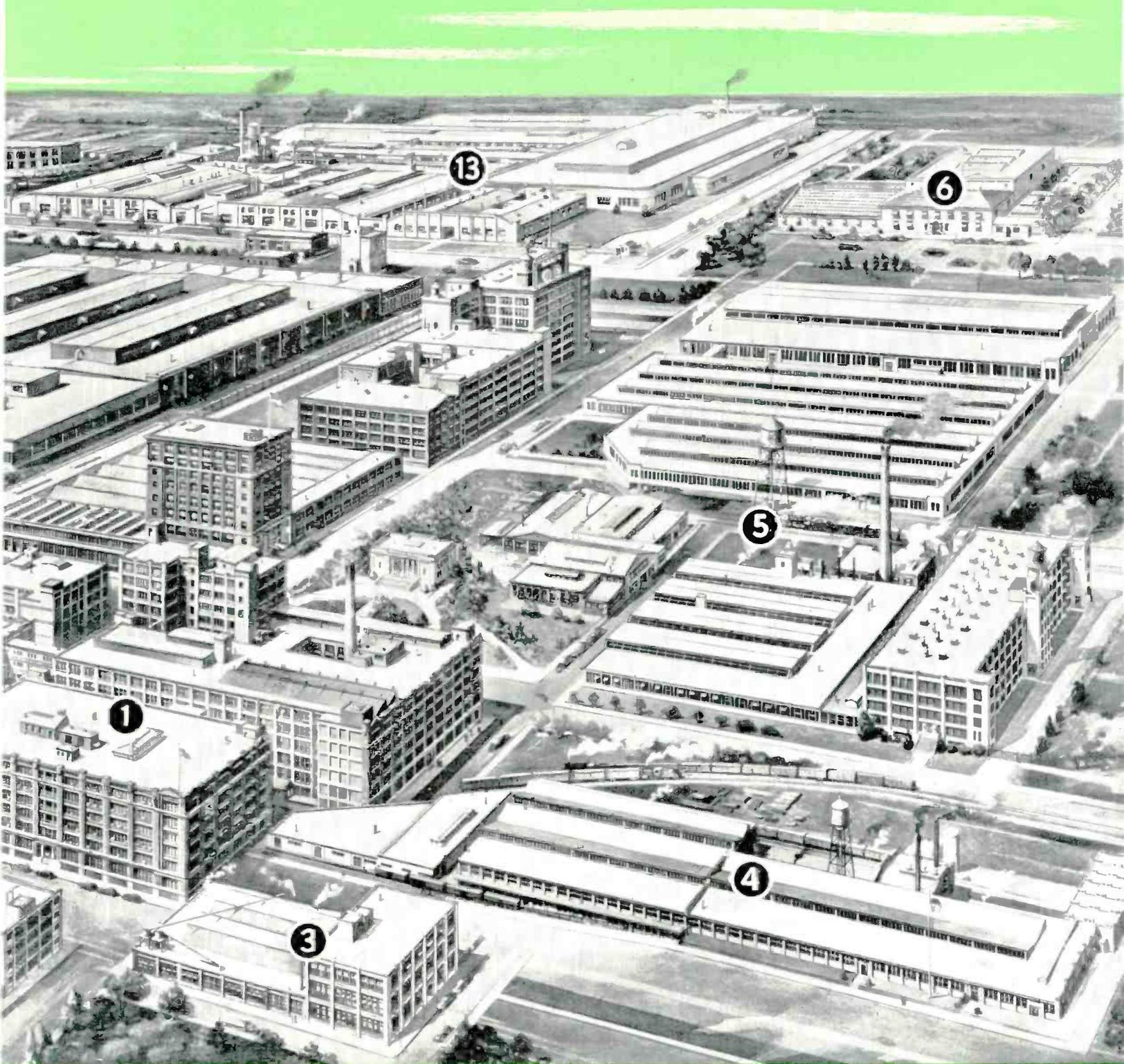
**3** DETROIT  
MICHIGAN

**7** LANCASTER  
PENNSYLVANIA

**8** PULASKI  
VIRGINIA

**9** MONTICELLO  
INDIANA

# FACTURING PLANTS



**4** BLOOMINGTON  
INDIANA

**5** INDIANAPOLIS  
INDIANA

**6** HOLLYWOOD  
CALIFORNIA

**10** CANONSBURG  
PENNSYLVANIA

**11 12** CAMDEN-OUTLYING  
NEW JERSEY

**13** MARION  
INDIANA

## HISTORIC ADVANCES IN RADIO AND TELEVISION ACHIEVED BY RCA IN THIRTY YEARS

### INTERNATIONAL COMMUNICATIONS

Organized in 1919 primarily to give the United States pre-eminence in international radio communications, RCA accomplished that purpose through creation of a world-wide system of more than 80 direct radiotelegraph circuits between the United States and foreign countries. Through pioneering and exploration in all branches of radio, coupled with new engineering developments and improvements in technical equipment, RCA continually has increased the efficiency of its communications service and extended its usefulness to the Nation and the public in peace and war.

### MARINE RADIO

One of the first aims of RCA was the improvement of communications services for ships at sea. RCA has held steadfastly to that task and has succeeded in developing, installing and operating unexcelled ship-and-shore radiotelegraph, radiotelephone and direction finder equipment, as well as modern shipboard radar, loran receivers, lifeboat radios and other valuable electronic aids for all types of vessels.

### BROADCASTING

Pioneering in every phase of public broadcasting, RCA put its first station, WDY, on the air in December, 1921, at Aldene, N. J. In 1922, RCA established a nation-wide sales and distribution system and began merchandising radio broadcast receivers and electron tubes for home use. Today more than 600 broadcasting stations in the United States use RCA transmitters while hundreds of others use RCA studio equipment, electron tubes and associated apparatus. RCA has installed 195 FM transmitters and 51 television transmitters.

### RADIO RECEIVERS

Radio sets for the home, styled in hundreds of models, have been developed by RCA since the advent of broadcasting, enabling the public to enjoy the latest improvements in radio and television receivers.

### RADIOPHOTOS

Successful transmission of radiophotos across the Atlantic was made by RCA on November 30, 1924. Transmissions of photographs, printed matter and weather maps were pioneered by RCA, which inaugurated the first commercial radiophoto-facsimile service between New York and London on April 30, 1926. Today RCA operates 21 radiophoto circuits between this country and foreign cities in seven countries.

### RADIO-PHONOGRAPH

Combining radio and the phonograph in 1925, RCA made "the talking machine" an ever-popular musical instrument. High-fidelity phonograph recording and a new process of electrical transcription created by RCA added perfection to the recording of music. Early in 1949, RCA introduced an entirely new system of reproduction of recorded music in the home, based on a vinylite record,  $6\frac{7}{8}$  inches in diameter and a fast changing record player operating at 45 rpm. This combination of record and record-player provides distortion-free music of unprecedented brilliance and clarity of tone.

### ALL-ELECTRIC RADIOS

The all-electric home receiver, utilizing the light socket as a source of current supply instead of batteries or external current-supply devices, was

introduced by RCA in 1925. The next major advance was the introduction of all-wave receivers which brought to the listening public a greatly increased horizon of radio reception.

### **RADIO-FACSIMILE**

Receivers for recording radio-broadcast newspapers and other graphic material in the home were demonstrated by RCA in February, 1938, before the National Association of Broadcasters, Washington, D. C., and were in operation at the New York World's Fair, 1939-1940; in 1941, radio-facsimile multiplexed with FM-sound was demonstrated.

### **NETWORK BROADCASTING**

America's first nation-wide public broadcasting service came into being when RCA formed the National Broadcasting Company on September 9, 1926, "to provide the best programs available for broadcasting in the United States." NBC has continued to lead in quality of programs and in audience appeal from coast-to-coast.

### **OVERSEAS BROADCASTING**

Experimental transmissions in relaying transatlantic broadcasts initiated by RCA in 1925 led to exchange of programs with Europe. In 1929, RCA inaugurated an international program transmission service which it has maintained as a regular and continued operation. Experimental international short-wave broadcasts begun by NBC in 1928 were forerunners of a regular program service introduced in 1937 between the United States and other countries. Throughout the war these international facilities provided important as well as timely service to the Nation and kept the public thoroughly informed.

### **SHORT-WAVE RECEPTION**

Investigations by RCA engineers of the effect of sun spots upon short-wave propagation, and discovery of the simultaneous variation of the earth's magnetic disturbances led to the development of methods of forecasting the hourly and daily efficiency of short-wave transmission. The diversity reception system, which contributes to the stability and reliability of short-wave communication, was introduced by RCA in 1928.

### **ELECTRONIC TELEVISION**

The all-electronic television system, featuring the Iconoscope — "eye" of the television camera — invented by Dr. V. K. Zworykin of RCA Laboratories, and the Kinescope—the picture tube of the receiving set—developed by him, became the practical and most popular method of television as a service to the home. Interlaced scanning was introduced to minimize flicker; fluorescent screen materials were developed; certain principles of the Schmidt-Kellner astronomical camera were applied and plastic lenses were developed to project television pictures on large size screens in homes and theatres; and a new process was developed to reduce reflections on certain glass surfaces used in television equipment. A 16-inch metal-cone receiving picture tube was introduced in 1949.

### **MICROPHONES**

As a pioneer in the development of microphones, RCA in 1931 perfected the velocity microphone which became the standard of broadcasting stations throughout the world. The unidirectional microphone introduced in 1932 found wide use in film recording as well as in broadcasting, television and in phonograph recording.

### **RADIO RELAYS**

Automatic ultra-short-wave radio stations designed to relay television pictures as well as other forms of radio communication from city to city were first demonstrated by RCA in 1932. Since then, they have come into extensive use in television, supplementing telephone and telegraph interconnection lines.

### **ULTRA-SHORT WAVE EQUIPMENT**

Fundamental research in radio-wave propagation and advance developments in electron tubes by RCA Laboratories opened the ultra-short and micro-wave spectrums for new services. Ultra-short-wave equipment for use by the police and in the emergency field was developed and its use initiated; quartz crystals were applied to control high-frequency transmitters.

### **ELECTRON TUBES**

Numerous electron tubes for transmission and reception have been introduced by RCA as keys to major advances in radio; for example, alternating

current tubes, screen-grid, pentode, and beam-power tubes, electron multipliers, photo tubes, the orthicon (a highly sensitive television pickup tube operated at low voltages), cathode-ray tubes and oscilloscopes. The "acorn" tube introduced in 1933 opened the way for remarkable advances in the use of ultra-short waves in peace and war. Development of miniature battery-operated tubes, together with miniature components, made possible the "personal" receiver of small size and easy portability. All-metal electron tubes introduced in 1935 facilitated the development of radios for airplanes and mobile units, as well as commercial and home receivers. More recent additions have included the image orthicon, a supersensitive pickup tube, the special "memory" tube, and a tube transducer which acts as a super-detector of vibrations.

### **PORTABLE RADIOS**

Development by RCA-NBC of the knapsack transmitter and other portable instruments, including receivers, for use by announcers at sports events and parades were the forerunners of portable wartime equipment.

### **ALL-RADIO SYMPHONY**

NBC Symphony Orchestra with Maestro Arturo Toscanini, conductor, was organized in 1937 as the first full-size symphony orchestra devoted exclusively to radio broadcasting. During its twelfth concert season in 1948, the orchestra was televised for the first time with outstanding success.

### **ELECTRON MICROSCOPE**

The RCA electron microscope — one of the most revolutionary scientific instruments of the Twentieth Century—magnifies infinitesimal objects of the sub-microscopic world and permits photographic enlargement of more than 100,000 diameters. Today, more than 300 RCA electron microscopes are in use throughout the world in industry, science and medicine.

### **RADAR**

Basic research on radar instituted by RCA Laboratories as early as 1932 led to important wartime applications. Those in which RCA figured prominently included warnings of the approach or presence of enemy aircraft and surface vessels; determination of the range and bearing of enemy

planes and ships; providing information for accurate control and firing of anti-aircraft and naval guns; use in obtaining altitude measurements aboard war planes, and as a navigation aid to planes and ships in fogs, darkness or through dangerous channels.

### **TELEVISION SERVICE**

Television as a new industry and a public service to the home was introduced by RCA at the opening of the New York World's Fair, April 30, 1939, when President Roosevelt was televised as the first Chief Executive ever to be seen on the air. NBC television station W2XBS began tests July 7, 1939. After an extensive series of field tests and experiments from various antenna sites including the top of the Empire State Building, the NBC station WNBT—New York's pioneer television station—began commercial operation on July 1, 1941. Theatre television on a 15 by 20-foot screen was demonstrated by RCA in January, 1941. NBC network television operations began in 1946, and by 1949 there were 47 stations affiliated for service to the public.

### **COLOR TELEVISION**

Color television, produced by electronic and optical means, was demonstrated to the Federal Communications Commission by RCA at Camden, New Jersey, on February 6, 1940. No mechanical or rotary parts were used. Television in color, using a sequential mechanical system, was first put on the air experimentally by NBC on February 20, 1941. It was shown in three dimensions by mechanical means at RCA Laboratories on December 13, 1945. An RCA all-electronic simultaneous system of color was demonstrated there on October 30, 1946. Theatre-screen color television using this system, was shown on April 30, 1947, at The Franklin Institute in Philadelphia. Development by RCA of an all-electronic, high-definition color television system, completely compatible with existing black-and-white television, was disclosed on August 25, 1949. This system requires no changes in transmission standards of present black-and-white television. It operates within a 6-megacycle channel and enables present television sets to receive color programs in black-and-white without any modification. Color programs can be viewed

either on new color receivers or on existing receivers equipped with a color adapter.

### **FM BROADCASTING**

Much of the research and development work that made FM (Frequency Modulation) possible was conducted by RCA engineers, who pioneered in exploring the very high radio frequencies and also in developing the apparatus which made these frequencies available for practical service. The NBC station W2XWG, which began operation on January 11, 1940, was the first FM station established in New York by any network broadcaster. FM transmitters for broadcasters were manufactured by RCA before and after the war. A new FM radio circuit, called the ratio detector, was revealed by RCA at a meeting of the Institute of Radio Engineers, October 3, 1945.

### **RADIOTHERMICS**

Radiothermics—the application of heat generated by radio waves—was pioneered by RCA, which designed and built equipment that speeds and increases the efficiency of various industrial processes. Radio-heat “cooks” plastics to molded perfection, seasons, glues and bonds impregnated materials, “tacks” plywood, dries rayon, treats textiles, and sews thermoplastic materials, solders, rivets, welds and tempers, among other industrial applications.

### **AIRBORNE TELEVISION**

Emerging from its wartime secrecy, airborne television was demonstrated by RCA-NBC in cooperation with the U.S. Navy, U.S. Army Air Forces and National Defense Research Council on March 21, 1946, at Anacostia Naval Air Station. Television, in military use, also served as electronic “eyes” of guided missiles, remote controlled aircraft and sea-going crash boats, as well as a means of observation of gunfire in reconnaissance.

### **TELERAN**

Combining television and radar techniques, RCA created a new system of air navigation and air traffic control known as teleran. It was first de-

scribed before a technical symposium in New York, December 8, 1945.

### **SHORAN**

RCA revealed on January 22, 1946, development of a precision radar system known as shoran which served during the latter stages of the war as an effective aid to blind bombing. It has widespread peacetime applications as a “yard-stick” for world mapping of uncharted areas and in geophysics. So precise is shoran that it can measure distances up to 250 miles with almost pin-point accuracy.

### **SNOOPERSCOPE AND SNIPERSCOPE**

Effective darkness penetrating devices known as the snooperscope and sniperscope were made possible by an electronic infra-red image tube developed by RCA Laboratories. These instruments were first reported by the Army on April 21, 1946, as having proved extremely valuable in the Pacific theatre of operations. By means of the sniperscope, riflemen are able to see targets in darkness, and the snooperscope permits observation of enemy positions at night and military drivers to drive by an invisible spotlight.

### **ULTRAFAX**

A system of high-speed communications capable of transmitting and receiving written or printed messages and documents at the rate of a million words a minute was disclosed by RCA on June 23, 1947, and demonstrated publicly for the first time on October 21, 1948, at the Library of Congress, Washington, D. C. This system is called Ultrafax—a combination of television, radio relays and photography.

### **ATOMIC ENERGY AND ELECTRONICS**

In the field of nuclear physics RCA research covers the relationship of atomic energy to activities within the scope of the Corporation's operations. This interest centers first on the use of electronic instruments in projects involving atomic radiation; second, on the utilization of the products of nuclear research in radio and electronic apparatus.

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