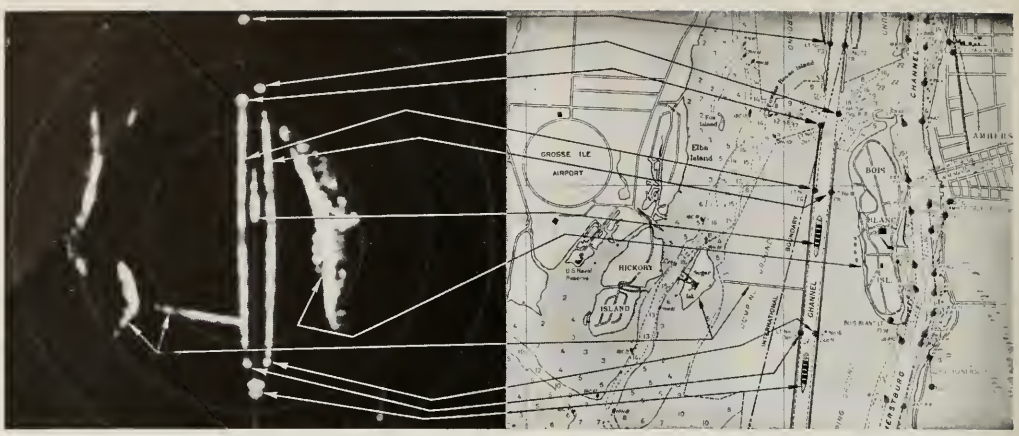
RADIO AGE

RESEARCH · MANUFACTURING · COMMUNICATIONS · BROADCASTING

RCA

APRIL
1947

HOSPITAL TELEVISION



Radiomarine's Radar Scope Picture (approximately ¼ actual size). 1½-mile range.

Matching Navigation Chart, same area. Southbound. Livingston Channel, Detroit River.

You need *RADIOMARINE's* 3.2 cm *RADAR* for large, sharply defined pictures

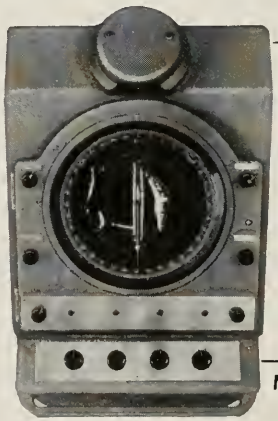
Only in the 3.2 cm super-high frequency band utilized by Radiomarine's Radar do you receive exceptionally clear, and large pictures of high resolution and definition.

With a Radiomarine Model CR-101 Radar, the area scanned by the antenna is easily viewed on a 12-inch diameter "scope." Closely spaced objects are shown separately in sharp detail, free from blurring.

For close-in navigation, when operating on the shortest range, you can accurately pick out low-lying targets from 80 yards to 1.5 miles. When navigating at sea or making landfalls, the longer ranges of 5, 15, and 50 miles enable the navigator to distinguish between surface objects —read their bearings and distances accurately.

Reproduced above is a Radiomarine Radar "scope" picture taken while navigating a narrow channel in the Detroit River. A standard navigation chart of about the same scale shows how accurately the radar picture portrays the same area. Compare the channel lights, the land contours, the low earthworks—in both the radar picture and the chart. See how clearly the ship's position is indicated with water visible between the ship and the earthworks in a channel only 500 feet wide.

Radiomarine's Radar is postwar designed from the ground up to meet the rigid requirements of today's commercial shipping. *We're taking orders now!* FOR PRICES AND FULL INFORMATION WRITE TO: Radiomarine Corporation of America, Dept. 9-C, 75 Varick Street, New York 13, New York.



CHECK THESE OUTSTANDING FEATURES:

- Exceptional detail and sharpness
- Use of super high-frequency band (3.2 centimeters)
- Unexcelled range and bearing resolution
- Instant choice of true or relative bearing presentation
- Electronic heading and range indications
- Four ranges: 1½, 5, 15, and 50 miles. Close-in ranges as low as 80 yards
- Provision for radar beacon operation
- Suppressor for rain, snow or sea return
- AC or DC Power Supply

MODEL CR-101, SHIPBOARD RADAR

RADIOMARINE CORPORATION of AMERICA

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RADIO AGE

RESEARCH • MANUFACTURING • COMMUNICATIONS • BROADCASTING • TELEVISION

OVER

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VOLUME 6 NUMBER 3 APRIL 1947

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RADIO CORPORATION OF AMERICA
RCA Building, New York 20, N. Y.
DAVID SARNOFF, *President*
LEWIS MACCONNACH, *Secretary* ARTHUR B. TUTTLE, *Treasurer*

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

RADIOTELEGRAPH MESSAGES IN MORSE CODE ON TAPE ARE AUTOMATICALLY TRANSLATED INTO TELETYPE CODE BY THIS MACHINE AT RCA COMMUNICATIONS, INC.

SCIENCE AT NEW ALTITUDES

Inventions Open New Vistas and Widen Man's Communication Range Beyond the Surface of Our Planet, Brig. General Sarnoff Tells Scientists at Cincinnati Meeting.

Address delivered by Brigadier General David Sarnoff, President, Radio Corporation of America, at Cincinnati Technical and Scientific Societies Council, Cincinnati, Ohio, February 11, 1947.

TODAY is the 100th Anniversary of the birth of Thomas A. Edison. It is a special privilege and a great pleasure to be with you on this day for it was Ohio that gave Edison to the world.

It is particularly fitting that the Cincinnati Technical and Scientific Societies Council should observe the great inventor's birth. With his Centennial as a keynote, this day in Ohio history inspires us to look ahead and to survey the great forces of science which mankind now commands as a result of pioneering instituted by Edison.

Exploration and discovery are woven through the pattern of Ohio's history. First the Indian tribes explored and inhabited its fertile expanse. Later—in the 17th Century —came the first French and English traders. As smoke signals and footrunners were their only "lines of contact", they were lost to the world as far as communication was concerned.

In our own times wireless had not been in existence long, before Ohio cities felt the beat of electromagnetic pulses in earphones at Cleveland, Toledo and Ashtabula, as ships on Lake Erie first began to spark their invisible messages to the shore.

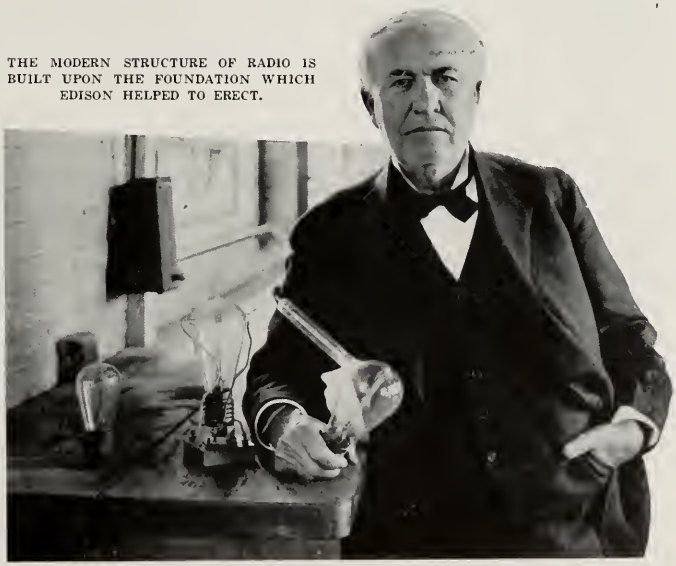
With the advent of broadcasting, Ohio quickly took to the air. It became an important center of radio as the unseen waves carried words and music over the neighboring communities of Kentucky, West Virginia, Pennsylvania and Indiana. Cincinnati, with its powerful transmitter radiated the name and fame of Ohio to nationwide listeners. Today there are 37 broadcasting stations in Ohio, and 33 of them are linked in coast-to-coast networks.

Ohio is called the mother of Presidents. In Canton, McKinley introduced "front porch campaigning" in 1896, but his voice could not carry beyond his lawn. At that time there was no broadcasting. Now from any porch or portico, the presidential candidate can address the entire electorate. Before many years pass the entire country will see him by television.

President William Howard Taft, a native son of Ohio, approved and signed the Communications Act of 1912, the first law to recognize the importance of radio communication in the United States.

Ohio was the first State from which a Republican National Convention was broadcast. That was in 1924 when Calvin Coolidge was nominated at Cleveland. The wonder of that day was that twelve States, as far west as Kansas City, were linked into a network! President Warren G. Harding, the first Chief Executive to broadcast while in office, was born in Ohio. So we see that the history of radio, in its service to the Nation and its people, is not only linked with this State through science, but also through its social and political life. All these have had an important influence on the growth of America.

THE MODERN STRUCTURE OF RADIO IS BUILT UPON THE FOUNDATION WHICH EDISON HELPED TO ERECT.



DURING THE WAR, SCIENCE REACHED SKYWARD AND A MIRACULOUS INVENTION CALLED RADAR SAVED ENGLAND IN THE BLITZ.

As a boy in the little town of Milan, Edison must have been imbued with the spirit of the pioneer which Ohio engendered as trails were blazed westward. Imagination, dynamically related to a persistent soul, never discouraged by defeat, comprised the sinew of his fame. Every disappointment, every failure of an experiment was a new challenge to his curiosity, a new spur to his determination to succeed. He triumphed through creative thought and left the world a rich inheritance of knowledge. His tireless efforts and his creative genius now shine out across the earth. It was electricity, harnessed by this native son of Ohio, that made this State a shrine of science through the electrification of communications, agriculture and industry. Edison created new industries and new employment for millions of people. He lighted and enlightened the world.

The modern structure of radio is built upon the foundations which Edison helped to erect. His discovery in 1875 of mysterious sparks that diffused or spread in all directions, he called "etheric force." His discovery in 1883 of elusive electrons at play within the incandescent lamp led to the development of the electron tube detectors, amplifiers, and oscillators. History records that phenomenon as "the Edison Effect."

Edison's storage battery, his dynamos, motors, microphones and the phonograph all became vital parts of radio. Now the motion picture, which he made an accomplished fact in 1889, is finding a new and widespread medium of expression in television.

Telegraphy Without Wires

So close was Edison to the invention of wireless, that in 1885 he took out a patent on "telegraphy without wires." He called his system "grasshopper telegraph", but he said he was "too busy with other things" to devote more time to complete the invention of wireless. It remained for a young man in Italy to do that. When Marconi received the first transatlantic signal in 1901, Edison remarked that he would like to meet "the young man who had the monumental audacity to attempt and succeed in jumping an electric wave across the Atlantic!"

So staggering is the list of Edison's inventions, and so practical is their usefulness, that he is recorded in history not only as the "lamplighter", but as "the supreme inventive genius of the industrial age." The applications of his inventions to peacetime pursuits reveal the tremendous potentialities of science for the benefit of mankind. For science lifts man's burdens, saves his time, adds to the comforts and the pleasures of his life.

Mankind Looks Upward

Edison left us fifteen years ago. Those who have followed him in science have travelled close to trails which he blazed. Within the past decade, they have succeeded in meeting the demands of global war. As a result, science emerged from the war as a powerful force that created new instrumentalities and promised many others for use in peacetime, if man would only direct his thoughts to peace instead of war, and his scientific research to higher elevations.

Spiritually, mankind has always looked upward for guidance and eternal truths. It is not strange therefore that the physical sciences should strive also to explore the higher altitudes in the search for scientific truths.

During the war, science reached skyward and a miraculous invention called radar saved England in the blitz, guided bombers to their targets, doomed the U-boat, and aimed the big guns of battleships to fire with deadly accuracy, even in the dark.

Aside from radar, post-war dictionaries have many new words that spring from radio and electronics, such as sonar, shoran, teleran and the proximity fuse. None of these inventions would have surprised the wizard of the Electrical Age, who himself unleashed incredible forces to startle the world, and then coined new words to explain them. The end of his life marked the end of an era.

Through his genius he helped to establish the era to follow—the Electronic Age.

Edison's life was a drama of the lone inventor, toiling alone, often in meager circumstances. Today, science has the benefits of organized, industrial research affording inventors every facility, cooperation and comfort, for work and for study. Without it, World War II might have been lost. Industrial research conducted by private enterprise is a bulwark of the United States; it promotes victory in war and assures progress in peace. It is a safeguard of civilization.

New Frontiers of Science

All nations now are eager to cultivate science and never were scientists in greater demand. Never has there been greater willingness to follow the onward and upward march of the exploring scientist; for 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.

We who are veterans in radio, as well as those in other fields of scientific endeavor, are continually encouraged by the fact that there are as many new frontiers of research as there were one hundred or a thousand years ago. The crossing of a frontier in science always leads to another. Each discovery, each invention spearheads a new and undreamed of advance. Today, through radio and electronics, scientists are finding encouragement to believe that some day they may be able to detour storms, to dissipate clouds and fog, to produce rain and snow, and thus measurably to control the weather.

Let us scan the horizon of 1947 and compare it with that which the Edison pioneers beheld as they pushed forward across the old frontiers of the Mechanical Age.

Edison's conquest was largely confined to wires, mechanical and electrical machines. Today the frontiers of that science spread above and throughout the universe, far into unfathomed space—into that vast invisible fabric which separates the heavens and the earth. The sky is a canopy over untapped reservoirs of new knowledge. Man's thoughts have been given wing; he is challenged to explore the stratosphere and the ionosphere with the same imagination and persistence with which he has won scientific conquests on the earth and on the sea.

Scientists, especially mathematicians, for centuries have been enchanted by the immensities of time and space; by gravitation, by the propagation of light, the theory of relativity, by electromagnetic radiation and radioactivity. But laymen have looked into the heavens and referred to "the emptiness of space." They have described the vacuum tube as "a glass bottle full of nothing." Now, thanks to science, we know that space is not empty, and that a vacuum tube is far from being filled with "nothing."

Radio and electronics have given space and the vacuum a new meaning. Scientists are learning how to snap the switch that will bring them the sounds and pictures of the universe. They are challenged by science to keep their eyes on the stars. Both astronomers and radio scientists scan the blue dome of the world. In the glow of the sunrise and the sunset there is far more than is visible to the eye. Both of these colorful panoramas are crisscrossed with intelligence, vibrant with human thoughts and emotions carried by radio, by cosmic rays and by other unseen wonders of Nature. The sun rises and sets with spectacular brilliance, yet it is a drama enacted as quietly as if performed with an electron tube which also merely seems to glow! But within it there may be a voice from Melbourne, news from London, or music from Paris. Turn on a television cathode-ray tube, and its face lights up with a picture of the United Nations meeting in New York, or the 80th Congress opening in Washington, or the Army-Navy football game in Philadelphia. No longer is the electron tube full of nothing!

New tools of science are opening man's eyes in the realm of the invisible. But we need not see to be convinced that science is a vivid reality beyond the range of human sight and hearing. Science works in no such narrow spectrum. We perceive evidence of this in new forces which extend the range of man's optic and auditory nerves. By radio, man now can hear even a whisper or the buzz of a bee across the seas; through the electron microscope, he peers into the realm of the molecule and the atom. By television, he sees beyond the horizon.

OHIO WAS THE FIRST STATE FROM WHICH A REPUBLICAN NATIONAL CONVENTION WAS BROADCAST. THAT WAS IN 1924 . . . AT CLEVELAND.

While these are inventions that open new vistas and widen man's earthly range beyond the microscope and telescope, we have ample proof that these forces are not confined to the surface of our planet. This world of ours actually spins in a boundless, inexhaustible laboratory. Radio beams flash through the ozone layer to probe through the dust of interstellar space. The plane that soars 40,000 feet to learn the secrets of cosmic rays, or the rockets that carry automatic recording instruments more than 100 miles into space, are but feeble short-distance efforts of man to pierce the upper atmosphere.

Radio is Relative of Light

Planes and rockets are mechanical devices and they meet the resistance of Nature. But radio, radar and television, travel on wings more closely allied with Nature. They will encounter less opposition as they mingle with meteors, the nebulae and galaxies. Radio, like sunlight, travels 186,000 miles a second. Indeed, radio is a relative of light and the shorter the radio waves, the more their kinship becomes apparent.

The radar "peep" that echoed from the moon was more than a faint signal of hope to radio scientists and astronomers. To them it was as important as the first feeble transatlantic signal to Marconi's ears when he plucked the letter "S" from the ocean air. That flash of three dots in the Morse code told him that world-wide radio communication was possible. Similarly, the radar signal from the moon proved that man might some day reach out to touch the planets; it revived speculation on interplanetary communication and inspired great hope for interstellar scientific exploration. With electronic computers, sensitive photoelectric cells and infrared eyes that see in the dark, the mystery story of the upper altitudes will become available for man to read. The telescope with its giant mirrors is no longer the only exploring eye for discovery above and beyond the earth. Man's perspectives and concepts of the universe are rapidly being broadened by science.

TURN ON A TELEVISION CATHODE-RAY TUBE, AND ITS FACE LIGHTS UP WITH A PICTURE OF THE UNITED NATIONS MEETING IN NEW YORK, OR THE 80TH CONGRESS OPENING IN WASHINGTON, OR THE ARMY-NAVY FOOTBALL GAME IN PHILADELPHIA.

Radio and radar have proved that space is not empty and we know now that it is accessible to man. He may even learn how to use the moon and the planets as radio sounding boards and reflectors, to bounce or relay broadcasts and to mirror television pictures. The moon is only 240,000 miles, or radiowise less than 2 seconds away. It looks like a good radio concession! We may find future broadcasters staking claims for Saturn, for Jupiter, or for Mars and Venus as well.

If it is within the scope and power of the inhabitants of another planet to eavesdrop on our radio and television broadcasts as well as on the multiplicity of radiotelegraph messages and news, our planetary neighbors must have a comprehensive idea of what sort of people we are and what sort of a place this world has turned out to be. It would be interesting to learn what our neighbors above really think of us below.

New Opportunities

Let no youth of today deplore the lack of opportunities. Look up at the Milky Way and behold a myriad of challenges for any lifetime. Science through radio and radar is providing new tools with which to explore electronics, chemistry and physics. New resources are to be found in space which may be captured and brought to earth, to be harnessed or synthesized for the welfare of mankind.

The chemistry of the atmosphere with its nitrogen, carbon, oxygen, hydrogen, the "noble gases" and perhaps other yet to be discovered elements or particles, represents intriguing continents of exploration. We now hear of a new component — the meson — believed to result from the interaction of the primary cosmic ray with atoms in the atmosphere. The so-called meson is estimated to have a mass 200 times that of the electron. Herein may exist a clue to devising a new source of energy to be harnessed and controlled by man.

The mystery of the atom, including its nuclear physics and the curious chemical isotopes, traces unlimited frontiers that beckon youth, just as the telegraph instrument enchanted the newsboy Edison. The dots and dashes that imprinted messages on his imaginative mind now find their modern counterpart in the explosions of atomic fission— in radar pulses and in the impact of cosmic rays.

Science is soaring to new altitudes. In the upper atmosphere there are new wonders of the future, new benefits for the welfare of all people, new power for industry and transportation. In the stratosphere lie swift routes between nations and broad highways to new continents in physics and chemistry.

Air Has Become Common Medium

The explorer who now seeks, as Columbus did, a new passage to India, or a Northwest passage as did Sir John Franklin, must traverse high altitudes. The links to world union will be welded in space. Today, the air is the common passageway of mankind where once it was the land and the water. The air, of course, has been ever present, but man did not learn how to use it until the turn of the century when radio and aviation were born. As a result of the vision of Marconi and the Wrights, and others who followed them, the air has become a common medium that brings nations together. By radio, Moscow and Chungking are as near to Washington as Cincinnati and New York. By airplane the great cities of the world are only hours apart.

Radio now spans the gaps of the hemisphere, leaps frontiers, ignores boundaries and cannot be stopped by any man-made political "curtain." For radio goes everywhere — and through word and picture can bring information and understanding to all peoples of the world.

Already we are on the threshold of individual radio communication. A motorist on the streets of New York may talk with a friend in Bombay, or with a relative on a ship somewhere on the Seven Seas. The day is coming when radio will speak man to man, and television will place them face to face in New York, London or Shanghai. All this is the essence of one world.

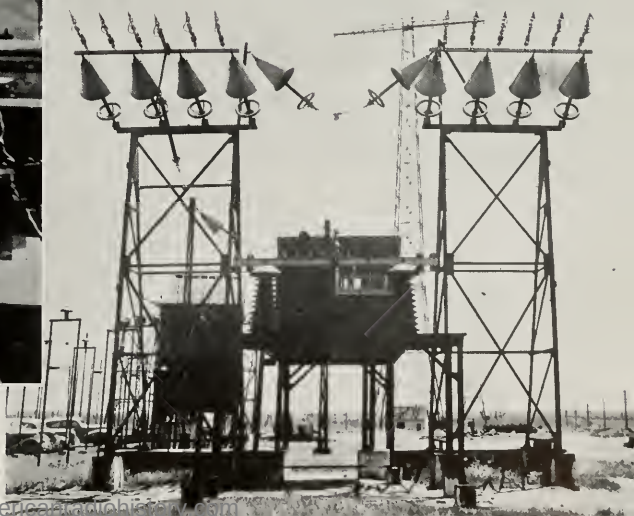
Distance Is No Security

These remarkable advances of science emphasize the importance of the United Nations and its responsibilities to world welfare. Space has been a formidable fort throughout the ages. Enemies had to get within range by arrow, shot or shell in order to wage warfare. But science has shrunk space, and distance no longer provides protection or national security. Today's weapons are not confined to a range of a few miles as in the past. In World War II, big guns showered projectiles across the English Channel. Robot bombs and rockets travelled even greater distances and were directed to their targets by radio. Shells carried radio proximity fuses which caused them to explode when close to the target, whether it was a ship or a plane.

Now, if a missile is launched into the stratosphere to travel at 3,000 miles an hour as predicted for the decade of the Fifties, then space completely fades as a bulwark of defense. Hindenburg, Maginot, and Siegfried Lines are crumbled fables of the past. Trench, channel, river, mountain or forest are part of the past's outmoded military strategy, rendered impotent by science. By radio and radar a high-speed missile, loaded with germs or explosives, can be guided with such precision that the Atlantic and Pacific are no more effective in preventing attack than was the Delaware River when Washington crossed it.

RADIO NOW SPANS THE GAPS OF THE HEMISPHERES, LEAPS FRONTIERS, IGNORES BOUNDARIES AND CANNOT BE STOPPED BY ANY MAN-MADE POLITICAL "CURTAIN".

THE RADAR "PEEP" THAT ECHOED FROM THE MOON . . . WAS AS IMPORTANT AS THE FIRST FEEBLE TRANSATLANTIC SIGNAL TO MARCONI'S EARS WHEN HE PLUCKED THE LETTER "S" FROM THE OCEAN AIR.



ROBOT BOMBS AND ROCKETS WERE DIRECTED TO THEIR TARGETS BY RADIO.

A nation that is complacent and ignores the swift advances of science courts disaster; for ignorance and weakness lead to destruction. Therefore, America must foster research, advance its industry and continually bolster its national defense with modern science. We must maintain our strength and thus help to preserve our national security. Law and order, based on strong foundations can best protect the peace. Our country staunchly believes in the United Nations and has given proof of its willingness to cooperate fully in efforts to achieve international understanding and world peace. But the United States must remain a mighty power so that its world-wide policies and its international relations are not based upon fear. Fear itself can destroy our freedom. Freedom of science must prevail. Research must be stimulated and advanced through the scientific training of American youth in Government, industrial and university laboratories. The pursuit of science is a task that never ends.

The world has had a war in which science was predominant. As the months turned on the calendar of 1946, it became more and more apparent that the world needs a peace in which science will play the constructive role. Science in wartime proved that it possesses immense and dynamic power for good or for evil; it can advance or destroy civilization. The new forces which science has released must be made to serve the ends of peace. And the path to peace must be found by men of good will whose capacity for leadership is matched by courage, vision and imagination. Such qualities of heart and mind would recognize the need for organized research in the social as well as the physical sciences — research that reaches for higher altitudes and points the way upward in man's eternal quest for peace and plenty, freedom and happiness.

But to achieve these blessings, it is not enough for mankind simply to explore in the vastness of space for new material conquests. Man must also raise his social sights. At the new altitudes he must seek and find the faith and inspiration that will enable him to express the true purpose of science—which is to provide for all mankind a good life and a lasting peace.

RESEARCH MUST BE STIMULATED AND ADVANCED THROUGH THE SCIENTIFIC TRAINING OF AMERICAN YOUTH IN GOVERNMENT, INDUSTRIAL AND UNIVERSITY LABORATORIES. THE PURSUIT OF SCIENCE IS A TASK THAT NEVER ENDS.

TYPICAL SCENE IN WEATHER FORECASTING OFFICE SHOWING SOME OF THE INSTRUMENTS THAT WILL SUPPLY INFORMATION TO ELECTRONIC COMPUTERS.

CAN STORMS BE CONTROLLED

Dr. V. K. Zworykin Discusses Possibilities of Weather Control and Significance of the Electronic Computer.

CONTROL of hurricanes, prevention of killing frosts, and precipitation of rain in dry areas are possibilities of an electronic weather forecaster now in its early stage of development, Dr. V. K. Zworykin, Vice President and Technical Consultant of the RCA Laboratories Division, Princeton, N. J., told a joint meeting of the American Meteorological Society and the Institute of Aeronautical Sciences at the Hotel Astor, January 30.

Pointing to the great economic significance the new development may have for transportation, agriculture, and the saving of human life, Dr. Zworykin disclosed that the electronic forecaster also holds promise for accurate weather predictions over the entire globe.

The success of any overall system of weather prediction and control, Dr. Zworykin emphasized, will "require an increasing degree of cooperation between the peoples of the world. Only as a world-wide service can it attain its maximum effectiveness and yield its greatest benefits."

The principles of an electronic computer now being developed at RCA Laboratories, with the cooperation of Dr. John von Neumann of the Institute for Advanced Study at Princeton, N. J., Dr. Zworykin said, can be used in the construction of an electronic forecaster. This would enable the making of reliable weather forecasts for days ahead in a matter of minutes. But even more important, Dr. Zworykin pointed out, may be its application in the control of weather, not over vast areas but in modifying such local conditions as dangerous storms, droughts, frosts, and fogs.

At present, the meteorologist has two methods upon which he bases his predictions, Dr. Zworykin explained. They involve application of the laws of physics and comparisons of new weather maps with old ones, and are based on information gathered at meteorological stations covering an extended area. In practice, accurate forecasts require a synthesis of the two approaches. However, Dr. Zworykin continued, if all the information is considered to its fullest extent, the prediction cannot be completed in time to be of value.

Previous methods of changing the weather, he said, have been successful only on a small scale because of their cost and the fact that it has been impossible to determine where the control should be applied for maximum effect. The electronic forecaster, he said, will supply this guidance.

"The hope for effective weather control rests in the fact that the condition preceding many of the weather processes which it may be desirable to control is essentially unstable or metastable, characterized by the accumulation of large amounts of potential energy during an extended period," continued Dr. Zworykin. "Thus, while the energy finally released may be enormous, that required to trigger the release may be quite modest. Furthermore, the magnitude of the triggering energy required will greatly depend on the time and place at which it is applied. Since the electronic forecaster should make it possible to observe the effect of applying given amounts of energy at different points of the weather map almost instantaneously, it will point the way to the most economic measures which will lead to the desired change in the evolution of the weather.

"Consider as a specific application the control of tropical hurricanes which periodically wreak havoc in Florida and along the Gulf coast. These storms originate in the Belt of the Doldrums, off the west coast of Africa and a few degrees north of the equator. Two possible ways offer themselves for affecting the evolution of the hurricane. The building up of the hurricane can be prevented by interfering with the storage of energy within the storm area, or the hurricane once formed can be deflected into regions where it is allowed to dissipate itself with the least damage."

Where these counter measures should be put into effect, Dr. Zworykin said, could be determined beforehand by a series of model experiments on the electronic forecaster, which will be a computing

WEATHER CONDITIONS IN THE UPPER AIR ARE RECORDED BY SENSITIVE INSTRUMENTS CARRIED ALOFT BY BALLOONS.

device capable of automatically handling vast amounts of weather calculations.

Two methods are available, Dr. Zworykin explained, for providing the energy needed to alter the evolution of weather changes. A combustible substance such as oil might be spread on water over a considerable area and ignited. This would add energy directly to the air, causing an updraft and affecting the air movement in the surrounding region. Similar results, he said, might be obtained by using the sun's radiations to modify weather conditions. This, he said, could be accomplished in several ways.

Weather control patches blackened by deposits of carbon could be established at strategic points to act similarly to the large burned-over blackened land areas in South Africa which have been found to be centers of repeated thunderstorms. In contrast, he said, these same areas could, at will, be converted into highly reflecting areas by covering them with artificial fog using techniques widely applied in the war. Here again, Dr. Zworykin pointed out, the electronic forecaster could be used to deduce the most advantageous location and the required magnitude of such patches to produce the desired effect.

In subsequent comments on the electronic computer and the myriad facts that it will be called upon to handle, Dr. Zworykin used as an example, the relatively simple atmospheric phenomena that produce rainfalls.

He pointed out that the sun's rays, striking the earth, raise the temperature of the soil which causes the moisture to evaporate. This vapor rises into the air to a height of a mile or more. As the moisture moves upward through the rarified air, it expands and is chilled, forming clouds. As the chilling continues, the moisture condenses into droplets which fall to the earth as rain.

This process is affected by a multitude of factors including the constantly changing temperatures of earth and air, variations in air pressure and humidity, and the velocity and direction of wind currents at different altitudes.

Although much of this information is available today, Dr. Zworykin said it would take so long to collect and interpret it fully, using existing methods and machines, that the weather would undergo a complete change before the computations could be completed, even though the forecast were limited to a small area.

For long-range forecasting, he added, meteorologists are supplied with only a small fraction of essential data. For that reason, they must make approximations based on their knowledge of atmospheric changes which are known to have resulted from a combination of similar factors.

GLASSFORD APPOINTED TO EUROPEAN POST

Vice-Admiral William A. Glassford, U.S.N. (Ret.), has been appointed European Manager for activities of the Radio Corporation of America in the United Kingdom and on the Continent of Europe. His headquarters will be at 43 Berkeley Square, London.

Admiral Glassford served with distinction in World War I and World War II, and upon conclusion of the latter conflict became Commander of U. S. Naval Forces in Germany, in control of sea communications for the U. S. Army of Occupation. He participated in negotiations with the British, French and Germans in solving German and Austrian inland water-way problems, and was American representative on the Tripartite Commission with the British and Russians for division of the German Fleet and Merchant Marine.

Admiral Glassford's retirement from the Navy became effective on March 1, after 45 years of service.

NEW TELEVISION SCREEN GIVES BRIGHTER IMAGES

Projection-type home television receivers providing pictures two and one-half times brighter than earlier large-screen models, made possible by a newly-developed screen, were shown publicly for the first time before the New York Section of the Institute of Radio Engineers on April 2. Antony Wright, Chief of the RCA Victor Television Receiver Design Section, and Edwin L. Clark, Senior Engineer of the Section who jointly conducted the demonstration, revealed that the new screen will be employed in RCA's projection television receivers which are scheduled for commercial distribution this year. The large pictures of greater brilliance provided by this screen are expected to extend television's usefulness in public places, schools and auditoriums, and in the home.

The screen is a development of the RCA Laboratories Division and is based on a new application of plastics. Incorporated in a console type receiver, it presented a picture 15 x 20 inches, about the size of a standard newspaper page.

HOW RECORDS ARE MADE

Today's Discs are Produced by the Finest Musical Talent, Combined with Expert Factory Skills using Ingredients from Many Countries.

By W. T. Warrender

General Plant Manager, RCA Victor Record Dept.

A TURBANED man raising bugs in India and the leader of a symphony orchestra or jazz band have a share in producing the music records of today. So do electrical engineers, sound engineers, chemists, clay diggers in the midwest, gold miners in the Far West, music directors and air-conditioning experts.

In fact, that plain-looking little black disc that music lovers have taken for granted for so long is the end-result of a complicated series of operations that reach to the four corners of the globe. The job of producing it is a combination of the exotic with the matter-of-fact operations of a giant industry.

The making of a record can be broken down into three main phases: the complex science of reproduction of sound; the artists whose performances are recorded, and the materials that go into the physical structure of the record itself.

Chief ingredients of a disc are shellac, which comes mainly from the secretion of an insect cultivated in India; gums from the Philippines and Africa; fine limestone from Indiana; red slate from Pennsylvania; carbon black and many other materials.

First step in the making of a record, of course, takes place in the studio where the performance is placed on the master record, and here one sees the scientific side of the job developed to its finest point. In the RCA Victor studios in New York, as an example, one notes upon entering that walls and ceilings have been carefully processed to achieve acoustical perfection. At the end of a room is a glass-enclosed booth, the control room, nerve center of the establishment. In this room is the monitor panel, where the control engineer controls the quality and loudness of the music. In this room also are the amplifiers which increase the volume of sound picked up by the super-sensitive RCA microphones outside, where musicians or other artists operate. Here also are the recording machines, which cut the master record.

In the studio outside the control room a popular band is "warming up" for a recording. There is an informal atmosphere as the musicians get into the mood. The selection to be recorded is rehearsed until it meets the approval of the leader, who is inside the control room with the engineers, listening to the music as it will sound on a record.

Through the control room window the band leader gesticulates to his musicians as the amplifiers register the results of their rehearsals. The instrumentalists are moved back and forth until the desired balance is attained. Then the number is played through as it would be played for the record. The control engineers, the recording supervisor, the band leader and the players are satisfied. Now they're ready to make a recording.

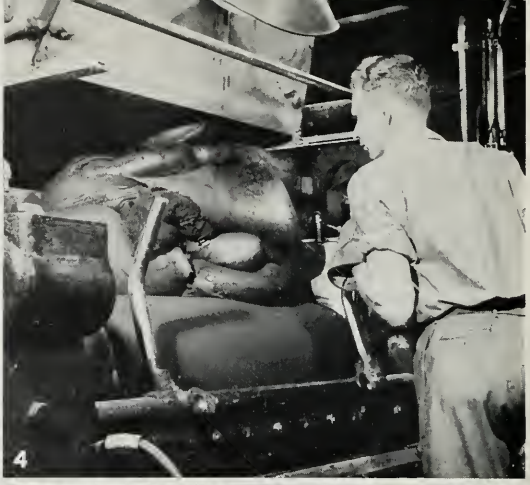
Preparing to Make a Record

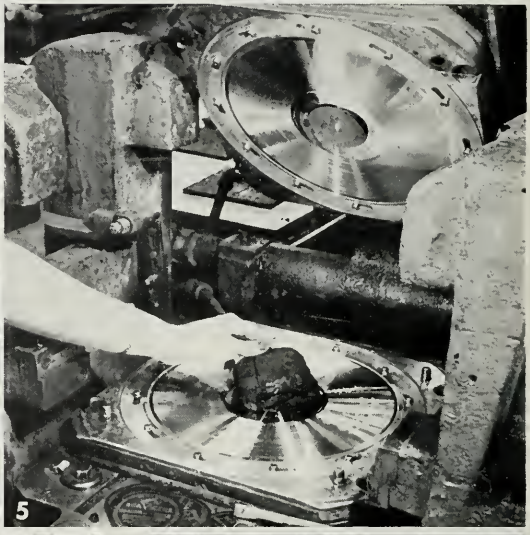
It's a far cry from the RCA Victor recording studio, where a big name band is about to impress a tune on wax, to a big industrial plant, a cross-roads diner, an isolated farm or a luxurious apartment where the record is spinning out the tune. It's a far cry but it starts this way:

A saxophone player in the band takes off his shoes, places them beside his chair in the recording studio and wiggles his toes. A

STOP WATCH IN HAND, A RECORDING ENGINEER CHECKS ON AN ORCHESTRA AS IT "CUTS" A RECORD IN AN RCA VICTOR RECORDING STUDIO.

THE RECORDING ENGRAVED ON THE LACQUER DISC IN FOREGROUND IS TRANSFERRED TO WAX DISCS IN THE REAR.





couple of other instrumentalists linger over bottles of soda pop. Another peels off his coat and rolls up his shirt sleeves, while the band leader moves nonchalantly about.

Technicians in the glass-enclosed control room meanwhile watch the bandmen; they're waiting until the players are in "the Groove" or sufficiently relaxed to go ahead with the session. Finally the band is drawn together; it runs through the tune several times. With sound engineers, recording supervisors and players satisfied with rehearsals, one or more test records are made and played back so that the performers themselves can hear just how their rendition sounds. This allows, too, for the last minute changes. Now the men in the control room go into action. Onto a turntable goes a master lacquer disc. Then the signal for the final recording is given. A buzzer sounds. A light flashes on.

Outside, in the studio proper, the band begins to play, and as the microphones carry the vibrations from studio to control room turntable, a stylus cuts into the disc on the revolving turntable, registering vibrations produced by the music.

When the recording is finished, the next step is to transfer the cutting on the master to several wax coated discs. Each disc then undergoes a "gold-sputtering process." First the wax is cleaned with nitrogen. Then it is placed in a vacuum chamber in which there is a large sheet of 24-karat gold. An electric current of 2,500 volts is turned into the chamber and for 12 minutes this current produces a vapor of gold that covers the wax impression. The gold, being of molecular structure, fills in the most minute grooves of the record. It is so thin as to be transparent, about two millionths of an inch.

Copper Applied to Wax Surface

Next step in the process is to apply electro-chemically, a thick layer of pure copper to the gold-covered wax surface. It is only when every part of the wax surface has been made electrically conductive by the gold sputtering that it can receive the copper plating. The wax is suspended in a copper plating solution which is constantly circulated and filtered. The wax disc is kept rotating in this solution in order to insure a uniform coating. When the disc is removed after four hours, it has a perfect copper coating 20 thousandths of an inch thick over the gold surface.

To produce the huge number of RCA Victor Records demanded by the public it is necessary to make duplicate molds and record stampers. This is accomplished by stripping the gold-faced copper master, which has been produced, from the wax disc. The gold surface is then treated, nickel is plated on it and copper plated against the nickel through electroplating baths. Now the two surfaces are separated, creating a nickel mold and a gold master. The latter goes into RCA Victor's priceless treasure vault of masters while the mold is nickel plated and the same process repeated. Next the two nickel surfaces are separated or stripped, leaving the original nickel mold and a new nickel stamper which is used to press out the finished record. The mold may be used to make any number of stampers.

Following the making of the "master record" at the studios, and from that the duplicate matrices or metal stamping discs at the factories, the making of a record becomes a matter of combining the ingredients of which the disc is composed and pressing out the finished product.

With infinite care the workmen carefully mix and blend the dozen ingredients. After a precise screening operation, the blended materials are drawn off in a powdered form and dumped into one of the most amazing machines in the record industry—the Banbury mixer.

In the Banbury mixer, the record ingredients are thoroughly blended and fused into a black, plastic mass resembling asphalt. Steaming hot, this material is dropped on a rolling machine which kneads it back and forth like a monster rolling pin, finally sheeting it on a long conveyor belt on which it moves through a set of revolving knives that cut it into sections known as "biscuits", each biscuit containing sufficient material to make a record.

The operation now moves into the pressing department. As previously explained, metal stampers have been formed from the duplicates made from the master record, the number of stampers being determined by the number of records to be made and the speed with which an order is to be filled.

Two metal stampers are required

(Continued on Page 31)

HOW RECORDS ARE PRESSED

1—THE WAX DISC, COVERED WITH A THIN FILM OF GOLD, IS LOWERED INTO A COPPER PLATING BATH TO MAKE IT MORE RIGID.

2—THE GOLD-FACED MASTER RECORD WITH COPPER BACKING IS STRIPPED FROM THE WAX DISC, AFTER WHICH IT IS NICKEL PLATED AND AGAIN COVERED WITH COPPER.

3—INGREDIENTS THAT GO INTO THE COMMERCIAL DISC ARE CAREFULLY WEIGHED AND MIXED.

4—AFTER MIXING, THE COMPOUND IS RUN THROUGH ROLLERS AND PRESSED TO THE CORRECT THICKNESS.

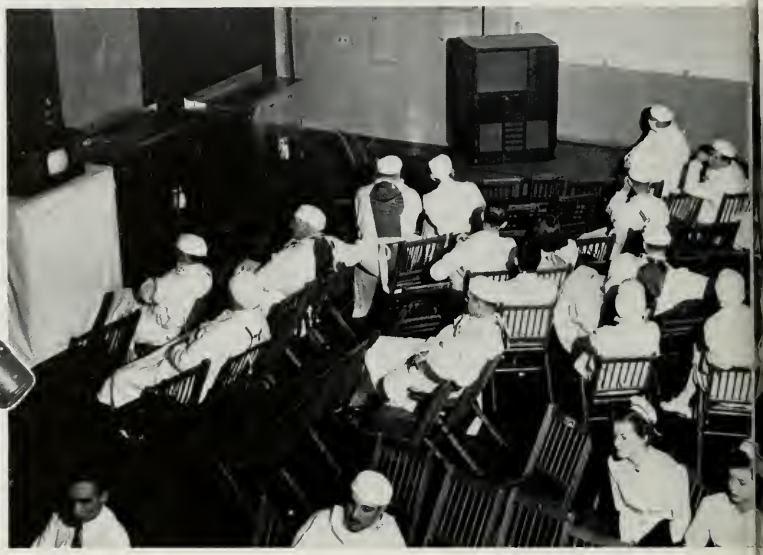
5—"BISCUITS" OF COMPOUND ARE PLACED BETWEEN THE TWO STEAM-HEATED MOLDS REPRESENTING BOTH SIDES OF THE RECORDING AND SQUEEZED UNDER HEAVY PRESSURE.

6—THE COMPLETED RECORD IS STRIPPED FROM THE MOLD, AND EXCESS COMPOUND TRIMMED FROM THE DISC.

IN THIS TEST BOOTH, EACH RECORD IS INSPECTED FOR QUALITY AND FREEDOM FROM SURFACE IMPERFECTIONS.

RBED IN MASK AND CAP, A TELEVISION GINEER FOCUSES HIS IMAGE ORTHICON CAMERA ON THE OPERATING TABLE.

SURGEONS, INTERNES AND NURSES STUDY OPERATING TECHNIQUES FROM SCREENS OF RCA VICTOR RECEIVERS INSTALLED IN A VIEWING ROOM AT JOHNS HOPKINS HOSPITAL IN BALTIMORE.



Hospital Television

More Than 300 Doctors and Surgeons Witness "Blue" Baby Operations on Television Screens During Baltimore Demonstration.

THE use of television as a means of explaining surgical techniques to large groups of doctors, surgeons and medical students was demonstrated by RCA Victor Division during actual operations at Johns Hopkins University and Hospital in Baltimore on February 27, 28 and 29. Reception of the images was restricted to receivers in rooms on the operating floor of the hospital.

The experiment was arranged by Dr. I. Ridgeway Trimble and Dr. Frederick M. Reese of the hospital staff, with the approval of Dr. Edwin L. Crosby, director of the hospital, to permit 300 members of the Johns Hopkins Medical and Surgical Association to witness the operations.

The first operation to be televised was the so-called "blue" baby operation. Other operations, including a second "blue" baby operation, were televised on succeeding days.

Two super-sensitive RCA Image Orthicon cameras were used. One was mounted above the operating table to give a detailed view of the operation. The second camera, equipped with a telephoto lens, was set up in the gallery of the amphitheatre.

Surgeon Described Operation

The camera directly over the operating table was pre-set and controlled automatically. A suspended microphone permitted the surgeon to comment as the operation progressed.

Ten RCA Victor receivers, including the new 10-inch direct view table model and two large screen projection models were installed in the viewing rooms.

Commenting on the experiment, Dr. Crosby said, "Adequate observation facilities to teach surgical techniques have long been a serious problem. The physical limitations of amphitheatres sharply restrict the visibility of the operating field. Television has brought the operative field within the critical sight of large numbers of doctors and students, and will permit them to witness many operations. The experience, although short, with this experiment, indicates that television may be extremely valuable in this type of teaching.

After the demonstrations, Dr. Trimble declared that the results were "highly gratifying and indicate a possible modification in surgical teaching." He said the new method might affect construction of operating amphitheatres and said the technique also had the advantage of reducing even further the possibility of infection. Properly aligned lights and television camera, he continued, would permit the clear reception of almost all operations.

TELEVISION FOR ST. LOUIS

Post-Dispatch Station Goes On the Air with Latest Television Equipment.

THE race for the honor of being the first newly equipped postwar television station to go on the air with regular schedules has been won by KSD-TV, St. Louis, Mo., with assistance from the Radio Corporation of America and the Interstate Supply Company, RCA Victor distributors in St. Louis. Although video transmissions were inaugurated February 8, officials of the St. Louis *Post-Dispatch*, owner of the new television station, selected Edison Centennial Week, beginning February 10, as the time to launch programs on daily schedules.

Attracted by advertisements in local newspapers, the public responded enthusiastically to the new entertainment service. Thousands flocked to the stores where television sets were on display and for sale. In some places the throngs blocked the store entrances. Within a short time after their arrival the first shipment of several hundred RCA table model television receivers had been snapped up by eager St. Louisans. Sponsors, too, were not long in making their appearance. Thirteen firms bought time on KSD-TV during Edison Week.

As the opening date approached and certain pieces of equipment had failed to arrive, KSD-TV officials flew in the essential units from the RCA Victor plant in Camden, N. J. Included in the airborne shipment were several RCA image orthicon cameras which because of their supersensitivity were widely used during the first week in picking-up street interviews, fashion shows and sporting events outside the studios.

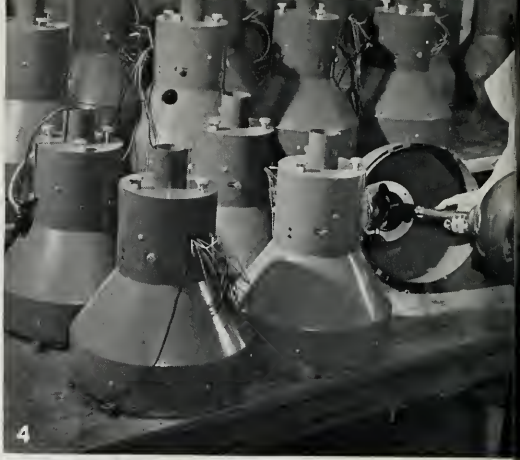
The temporary transmitter and antenna provide an effective range of about ten miles but the permanent units which are expected to be operating some time this month will include a 20 k.w. RCA transmitter with a range from 35 to 40 miles. The antenna will then be erected on a tower atop the *Post-Dispatch* building, 550 feet above the street and will deliver signals over an area of 4,300 square miles serving an estimated population of nearly one and one-half million.

Superiority of postwar equipment was immediately noted on the screens of RCA receivers. Experts rated the images the best yet achieved in actual transmission.

To give flexibility in programming, the station's facilities include an RCA radio relay link transmitter and receiver and an RCA 16 mm. projector and film camera.

ROBERT COE, CHIEF ENGINEER OF KSD-TV, AND RCA ENGINEER ED RISK EXAMINE TELEVISION CAMERA AND CONTROL.

STUDIO OF KSD-TV AS VIEWED FROM THE CONTROL ROOM. RCA EQUIPMENT IS USED THROUGHOUT.



NES FROM RCA PLANTS AND LABORATORIES

1 Curved antenna and driving motor of a shipboard radar equipment being inspected at Radiomarine Corporation of America.

2 Technician at RCA Industry Service Laboratory makes precision check on a component for a radio receiver.

3 Skilled girls draw intricate diagrams of radio circuits at the Industry Service Laboratory.

4 Twelve-inch cathode-ray tubes of Radiomarine's

5 Testing a table model radio at the Industry Service Laboratory.

6 Radiotelegraph messages to and from foreign cities pass on tapes through automatic machines at RCA Communications, Inc.

7 Panels for marine radio stations are inspected at Radiomarine's plant before shipboard installation.

8 Table-model television receivers on the RCA Victor

RCA Makes Annual Report to Stockholders

Reconversion to Peacetime Operations Has Laid Foundation for Increased Commercial Activity—Financial Results for 1946—Television Activity Increases.

RE-ESTABLISHMENT by RCA of peacetime commercial operations in the service of the nation and the public was announced by Chairman James G. Harbord and President David Sarnoff, speaking for the Board of Directors, in a joint statement issued February 27 to the Corporation's 218,000 stockholders. As a result, they said, foundations were laid for increased commercial activity throughout the entire RCA organization.

Net earnings of Radio Corporation of America in 1946 amounted to $10,985,053, equivalent to 56.4 cents per share of common stock. This compares with $11,317,068 in 1945, when earnings after payment of preferred dividends were equivalent to 58.8 cents per share.

Total gross income from all sources amounted to $236,980,770, representing a decrease of 15.2% compared with the total of $279,503,615 in 1945, when the Corporation was still engaged in filling substantial Government orders.

Personnel Increased in 1946

As of December 31, 1946, RCA personnel numbered 39,361, representing an increase of 6,376 over the total at the end of 1945. Various labor problems were solved by RCA without strikes during a year of widespread labor unrest throughout the country. RCA as a whole negotiated and maintained continuous relations with 37 separate labor unions.

In the manufacturing division of RCA the number of employees increased to a postwar high of 28,300 in December, 46% of whom were female employees. During the war, a total of 6,720 employees entered the armed forces and of this total, 3,493 have been re-employed. In addition, 4,171 veterans who were not former employees have been hired.

General wage increases were granted in the RCA Victor Division to the majority of hourly and salaried employees in an amount to provide average increases of at least 17½ cents per hour. An additional 5½-cent increase was granted to most employees in certain plants toward the end of the year. Average hourly earnings, excluding overtime, were $1.081 in December, an increase of 19.7% over December, 1945, and 60% over January, 1941. The average weekly take-home pay for hourly paid employees was $47.41 in December, an increase of 27.7% over December 1945, and 87% over January 1941.

Ten-Year Table of Operations

The Report contains a table of financial results achieved by RCA for the past ten years—year by year. This compilation shows that RCA has annual averages of: $194,475,000 gross income; $21,975,000 net profit before Federal income taxes; $12,416,000 Federal income taxes; net profit after income taxes of $9,558,000. The profit before taxes represents an annual average over the ten-year period of 11.3% of the gross income and an annual average of profit after taxes of 4.9%.

During the ten-year period, dividends paid to stockholders amounted in total to $60,086,242. Of this amount $32,376,346 was paid to preferred stockholders and $27,709,896 to common stockholders. During this same ten-year period the net worth of the corporation was increased by $39,108,225 and now is $101,876,817. The total earned surplus at December 31, 1946, amounted to $54,099,043, an increase of $5,060,916 over earned surplus at the end of 1945.

The RCA Victor Division, engaged in manufacturing and sales, exceeded the records it had established in production and merchandising during any previous peacetime year. Nevertheless, the availability of products at no time matched the demand, the Annual Report stated.

Nearly 1,500,000 units — including RCA Victor home radio, phonograph and television instruments — were produced during the year, despite the fact that manufacture was restricted by shortages of such items as wood cabinets, record changers, steel, plastics, and loudspeakers.

Television Prospects

The Report said that delivery of RCA super-sensitive television camera and field equipment during 1946 enhanced programming in general and greatly facilitated advances in the art of telecasting sports and news events. The prospect for new business in the television field was revealed to be good, with home receivers and transmitter apparatus in demand.

The year 1946, marking production of its billionth phonograph disc, was the best in the history of the RCA Victor record business. Coordinated efforts of manufacturing, engineering and purchasing departments made it possible to operate plants in Camden, Indianapolis and Hollywood to capacity during the entire year. A fourth record manufacturing plant at Canonsburg, Pa. is expected to begin operation this summer to help meet increased demand.

The RCA International Division, which has the responsibility for the foreign activities of RCA, ended the year with a back-log of orders that reached an all-time high, according to the Report. Contracts for RCA products were signed in many countries. One important transaction provided for modernization of Turkey's communication system and installation of Radiomarine equipment aboard 30 Turkish merchant ships.

The RCA Laboratories Division reported that its scientists and the research staff, having completed wartime assignments and responsibilities, directed their efforts in 1946 to research useful in develop-

ing new radio-electronic products and services. Their scientific achievements enabled engineers to put electrons to work in many new processes and applications, the Annual Report stated. At the same time, research pertaining to the national security was continued and intensified.

Recalling that color television pictures produced by all-electronic means were demonstrated publicly for the first time on October 30, 1946, at RCA Laboratories, the Report said the demonstration disclosed a revolutionary development in radio science as far-reaching as the creation of the original RCA all-electronic television system, which supplanted the mechanical discs used in the first black-and-white television operations.

"The new RCA electronic color television system is a major contribution to the television leadership of the United States," the Annual Report stated. "Like other developments of RCA Laboratories, it is available to the entire radio industry."

New Light-weight Microphone

The Report revealed development at RCA Laboratories of a new light-weight microphone for use in sound motion picture studios. The instrument was said to have twice the output of microphones previously used for such purposes. Scientists at the Laboratories also succeeded in reducing noise in sound reproduction systems, improving their fidelity as well as that of radio reception generally.

Based on extensive experience in the electronic computing field during the war, RCA Laboratories was disclosed to have established a program with the Institute for Advanced Study in Princeton to construct a universal all-electronic computing machine. It will solve almost instantly complicated problems in higher mathematics in such fields as electricity, acoustics, chemistry and other branches of engineering through use of a new type of electron tube known as the "Selectron".

RCA Communications, Inc. reported that in 1946 the volume of international radiotelegraph traffic it handled was the largest in the company's history. Commercial traffic increased more than sixteen per cent over the previous year. During the year, RCA completed the first phase of a modernization program through which its radio circuits are being converted from the old method of Morse operation to an automatic tape relay basis, providing faster and more efficient service.

New direct circuits were opened in 1946 with seven foreign centers and direct circuits were re-established with three additional countries. Use of the Tangier relay station, opened by RCA early in 1946, expedited traffic between United States and terminals in Russia and India. RCA now has direct communication with 60 countries.

The National Broadcasting Company, which celebrated its 20th Anniversary in 1946, surpassed all previous years in the scope of its services to the American public, in the size of the national audience attracted to its programs and in its volume of commercial business. The network entered 1947 with a total of 161 broadcasting stations, of which 155 are independent affiliates and six are owned by the Company —WNBC (formerly WEAF), New York; WRC, Washington; WTAM, Cleveland; WMAQ, Chicago; KOA, Denver; and KPO, San Francisco.

During the year, a staff of 65 experienced newsmen occupied reportorial posts in the principal world capitals and across the United States. NBC continued to expand its television program service, presenting new plays, national events, motion pictures and newsreels to the growing television audience in the New York metropolitan area.

Radiomarine Corporation of America, alert to the practical peacetime application of wartime radio-electronic aids to navigation, designed and added radar apparatus, as well as loran and other navigational advances to its line of equipment in 1946.

RCA Institutes, Inc., with veterans of World War II comprising three-fourths of its enrollment, had a total of 2,023 students during 1946, and at the year end its facilities were operating at full capacity. Augmenting the diversified technical courses in radio training, special courses in television technology were conducted during the year in New York and Los Angeles for the benefit of broadcast station engineers.

STUDIO LISTENERS VOTE ELECTRICALLY

A SMALL PUSH-BUTTON PERMITS EACH LISTENER TO REGISTER HIS VOTE WHEN DEBATES ARE STAGED IN NBC'S RADIO CITY STUDIOS.

INSPECTING THE CHART WHICH RECORDS THE VOTES OF THE STUDIO AUDIENCE.

NEW TUBE HAS "MEMORY"

"Selectron", Under Development at RCA Laboratories, Helps to Solve Complex Mathematical Problems With Lightning Speed.

DEVELOPMENT of a new electron tube with uncanny powers of "memory" was disclosed by Dr. Jan Rajchman, of RCA Laboratories, Princeton, N. J., in a paper presented March 4, to the 1947 National Convention of the Institute of Radio Engineers, at the Hotel Commodore, New York.

This unusual tube—known as the "Selectron"—has been designed for use in electronic calculating machines through which, according to Dr. Rajchman, it is possible to complete the multiplication of two numbers of as many as twelve digits (one thousand billions) in about a hundred-millionth of a second.

Calculations with this lightning-like speed are imperative, it was explained, in solving mathematical problems relating to supersonic air flow, atomic physics, weather predictions, and other scientific or technical equations in which ultra-rapid solution is a factor.

Dr. Rajchman emphasized that work on the Selectron is still in the laboratory stage and tubes of this type are not yet available commercially. He revealed, however, that RCA scientists contemplate using tubes of the Selectron type in an electronic computing machine being built in Princeton in cooperation with the Institute for Advanced Study.

One of the principal requirements of electronic computing machines, Dr. Rajchman reported, is that of "inner memory" such as that being achieved by the RCA Selectron tube. He said that this requirement arises from the fact that in solving equations fast registry and delivery must be made for long sequences of computations in order that the results of one operation become the data for a subsequent operation without the use of mechanical gadgets or humanly limited equipment.

Through its ability to retain data originally fed into the calculating machine and data subsequently accumulated in the process of computation, for arbitrarily long or short storing times, the Selectron makes it possible to compute the long sequences.

Each of multiple "on-off" signals, representing factors of the mathematical operation, is stored in terms of electrostatic charges on the surface of an insulator. This is called "writing". Two sets of tiny metallic wires at right angles to each other are located between the source of electrons and the insulating surface. These two sets create a checkerboard of windows which can be closed or opened to the passage of electrons at will.

The tiny metallic bars of the "windows" are internally connected in such a way that by applying "on-off" voltages to a relatively small number of sealed-in leads, the flow of electrons can be blocked from all except one selected window. This selection is part of the process accounting for the "memory" characteristics of the tube. During so-called storing periods, electrons pass through all the windows and forcefully maintain the potential of subdivided areas on the insulator.

In the experimental Selectron tubes under development at RCA Laboratories, Dr. Rajchman said, the source of electrons is an axial cathode. The Selectron has a capacity of 4,096—equal to 64 times 64—"on-off" signals. Dr. Rajchman disclosed that forty such tubes with a capacity of 163,840 "on-off" signals will be used in the electronic computing machine being constructed for the Institute for Advanced Study.

To register a signal during the bombardment of electrons, it was explained, a specific window is opened to the exclusion of all others, and a voltage pulse is applied to a metallic plate backing the insulating surface.

SMALL SIZE OF THE "SELECTRON" TUBE BELIES ITS UNUSUAL POWERS OF "MEMORY" IN HELPING TO SOLVE COMPLEX MATHEMATICAL PROBLEMS.

This pulse is negative or positive depending on the polarity of the signal and overpowers the local electronic locking mechanism. Immediately following this registration, all windows are opened again, and the previously registered potentials are locked in. For reading any signal, once more the proper window is opened at the exclusion of all others and a signal is obtained from the backing plate. The "writing" requires no previous erasing and takes only a few millionths of a second. The reading, which requires no scanning of undesired elements, follows the reading call by a few millionths of a second and can be repeated indefinitely.

Radio and Television Use Plastics

Innumerable Items Ranging from Cabinets to Small Parts Are Made from These Easily Worked Synthetic Materials.

By J. A. Milling,

General Manager, Parts Department, RCA Victor Division

TAKE half a pound of lifeless, grey powder pour it into a mold along with two bricklets of the same dull material; apply 200 tons of pressure and 340 degrees of heat, and three and a half minutes later, as surely as though a fairy godmother had waved her magic wand, out pops a beautiful, shiny black cabinet, intricate in design and rivaling the work of a master craftsman in its finished perfection. Cinderella never enjoyed a more miraculous transformation!

Almost a thousand variations of this same Cinderella act can be performed in the Plastics Section of the RCA Victor Division's Parts Department, Camden, N. J. There, plastic parts and components that find their way into practically every finished product the company makes are designed and manufactured. Little "preformed" balls of plastic powder ride into a press on a feeder tray and pop out again as finished bases for radio tubes, 49 at a time. Small preformed plastic discs vanish into a press to reappear, in almost less time than it takes to tell, as shining terminal boards for transformers.

Output of the Plastics Section ranges from tiny, bright-red pinjacks to highly polished plastic lenses for television receivers rivaling the best optical glass in refracting qualities at a fraction of the cost of glass. Typical products are control knobs, decorative and utilitarian, for every kind of equipment; cabinets for small radios and intercommunication systems; coil forms; meter cases; capacitor bases; spools; lenses, etc.

R. V. Beshgetoor was summoned from the company's Argentina plant in 1941 to organize the plastics operation in Camden. He is now merchandise manager of the Plastics Section which is a branch of the Parts Department. Earl F. Selby is production manager and J. S. Bokeeno is Engineer in Charge of the Plastics Molding Section.

The use of plastics by RCA has paralleled the expanding history of the plastics industry, for the natural characteristics of certain plastics are of special value in radio equipment. Polystyrene, for example, has a remarkably low-loss factor which makes it almost invaluable in high-frequency radio equipment. Many other plastics are excellent electrical insulators. Since the beginnings of the new "Plastic Age," in the second decade of this century, other characteristics of plastics have resulted in their gradual introduction in many radio applications, as replacements for wood, glass, and metal.

Plastics are cheaper, as well as

PLASTIC CORE-FRAME FOR A TELEVISION RECEIVER BEING REMOVED FROM HYDRAULIC PRESS.

GANGS OF HUGE PRESSES QUICKLY CONVERT PLASTIC MIXTURES INTO POLISHED PARTS FOR RADIO EQUIPMENT.

better, in many applications. Plastics are easy to mold. Complicated and expensive machining costs are eliminated. The finishing costs of plastics are relatively small, and there's no need for sanding, polishing, or painting. After the removal of a slight bit of "flash" or excess material squeezed out of the mold, the finished part is ready for the assembly line.

Plastic parts are "born beautiful," with smooth gleaming surfaces, in any color of the rainbow. The color won't wear or chip off, because it's inherent in the material. Plastics are also warm and pleasant to the touch.

Wartime Achievements

Armed with all the know-how of plastics, the Plastics Section serves as counselor to the company's technicians and design engineers on proper applications and materials. During the war, the Section found itself faced with the unusual problem of finding a rugged plastic for the nose piece of the proximity fuse, a tiny sending and receiving radio station that searched out enemy targets and detonated shells with the most lethal effect. The problem was to find or develop a plastic that would stand the shattering impact of being fired out of a cannon. The Plastics Section molded parts of all available materials, until finally a plastic tough enough to meet these requirements was demonstrated and approved by the Armed Services.

Another wartime achievement was the molding of parts of the sound-power telephone developed by RCA, which saw wide service on all types of Navy ships, operated without batteries, on power generated by the voice of the user.

Two basic types of plastic compounds are used in the manufacture of plastic products. These are "thermosetting" and "thermoplastic" materials. Among the thermosetting materials are the formaldehydes of phenol, urea, and melamine. These materials are usually cheaper than the thermoplastics, will withstand heat better, and harden permanently when molded. They are used in the manufacture of knobs, tube bases, cabinets, and terminal boards.

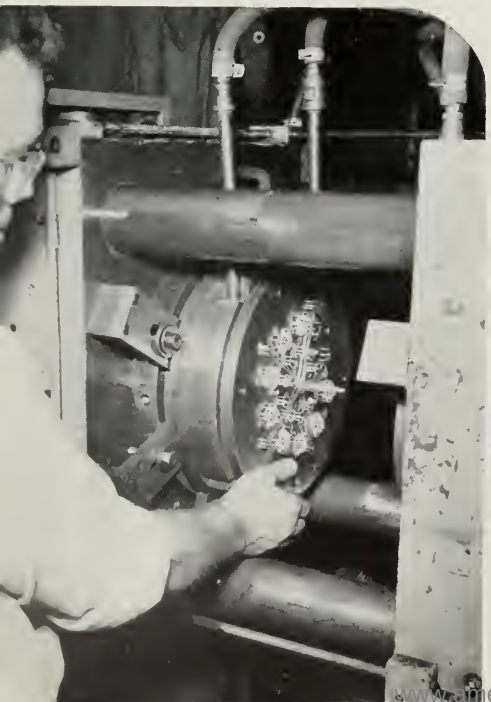
The thermoplastics, on the other hand, soften when heated and harden again upon being chilled. The Plastics Section uses such thermoplastics as Polystyrene, Plexiglas, cerex, and nylon (the same nylon that sheathes milady's limbs) in the manufacture of fine television lenses, transparent and delicately shaded knobs, and for meter cases with transparent faces.

Exerts Pressure of 1,500 Tons

Specialized machinery used in the Plastics Section ranges from a king-size "hobbing press," having the tremendous compressive force of 3,000,000 lbs. down to a "baby" 7000 lbs. molding press. (The latter exerts a force sufficient to lift two automobiles.)

A variety of molding processes are used—some almost as simple as squeezing toothpaste out of a tube or baking a cake in an oven. Molding by compression, for instance, consists merely of applying heat and pressure to a plastic powder confined in a mold of the desired shape. For molding more intricate or delicate shapes to accurate dimensions, the "transfer" method of molding is used in which the "raw material" is plasticized by heat and

FORMING THIN DISCS OF CRYSTAL-LIKE PLASTIC FOR USE AS ELECTRONIC INSULATORS.



ONE OF THE POWERFUL PRESSES AT THE RCA VICTOR PLANT TURNING OUT PLASTIC PARTS FOR RADIOS.

pressure in a transfer chamber, and then squeezed through an orifice into a closed mold, where it flows evenly around small inserts. "Injection" molding consists of heating the material and squirting it into a closed and chilled mold. In some cases, a combination of injection and compression molding is used. Some plastics are simply "cast" by pouring the liquid material into a mold and putting it in an oven to "cure" or set.

Feats in Lens Making

In a separate Optics Branch of the Plastics Section, spectacular feats in the art of lens-making have taken place. Molded lenses used to focus enlarged images in the RCA Victor large-screen television receivers, soon to be offered commercially, are among the impressive "firsts" chalked up by the Plastics Section. These lenses are rated as the most accurate parts ever molded in the plastics industry. The tolerances on the optical surfaces of these lenses are held to within ten millionths of an inch! The lenses have an index of refraction high enough to allow them to be used in place of fine optical glass yet they can be produced at a small fraction of the cost of glass lenses.

Another unusual lens, molded in the Optics Branch by a "blow" molding process in which air pressure is used to create the desired shape, is a large liquid-filled lens. Placed in front of a direct-viewing television receiver, it magnifies the image one and a half times.

The Plastics Section pioneered in the application of radio-frequency current in the preheating of plastic materials. Preheating drives out moisture and gases which might otherwise cause blisters in finished parts, and brings the temperature of the material up close to that of the mold, thus reducing the curing time as well as the molding pressure required. R-f preheating heats materials uniformly and greatly speeds up the process.

The Section has also done important development work on iron cores for coils and other radio parts. The molding of iron cores is within the scope of the Plastics Section because the material used is powdered iron compounded with a resin binder. The Section produced the first large, molded iron core used in high-voltage, yoke-deflecting transformers for all types of television receivers, reducing the cost to a sixth of that involved in making cores by the conventional use of laminations. Molding these cores takes a pressure of 60,000 pounds per square inch! Hundreds of other types of iron cores and associated coils were developed by the Plastics Section and are now in wide use throughout the radio industry.

A PLASTIC TELEVISION PROJECTION LENS IS CHECKED FOR FLAWS.

New Plastics Developed

Many more "workaday" firsts have been scored by the Plastics Section. Low-loss coil forms of polystyrene were developed by RCA engineers in the late '30s, and are now in general use throughout the industry for radio-frequency coils and transformers. The problem of dirt and moisture getting into and disturbing the delicate mechanisms of meter cases was solved by the development of a hermetically sealed meter case molded out of a transparent plastic material by the Plastics Section. In some cases, rigid requirements have actually led to the development of new materials. One such material, "Cerex," has unusual heat-resisting qualities as well as low-loss electrical properties. Cerex was developed as a result of requirements for parts used in military radio apparatus.

Ever on the alert for new applications of plastics to the products of RCA, the Plastics Section is a unique combination of production plant and engineering laboratory. The results are consistently lowered costs and improved quality as the new Plastics Age continually uncovers new and better plastic "wonder materials".

ELECTIONS

Election of Glen McDaniel as Vice President and General Counsel of RCA Communications, Inc., 66 Broad Street, was announced April 4 by Thompson H. Mitchell, Executive Vice President.

Mr. McDaniel joined RCA Communications as General Counsel in February, 1946, after serving as Chairman of the Navy Board of Contract Appeals and as Special Counsel to Secretary of the Navy James V. Forrestal when Mr. Forrestal was Under Secretary.

W. W. Watts, Vice President in Charge of the Engineering Products Department, RCA Victor Division, was elected on April 4 to the Board of Directors of Radiomarine Corporation of America, a service of RCA, it was announced by Charles J. Pannill, President.

Appointments of John G. Wilson as Vice President and General Manager of the RCA Victor Division; Fred D. Wilson as Vice President in charge of Operations and Joseph H. McConnell as Vice President in charge of Law and Finance, were announced April 8 by Frank M. Folsom, Executive Vice President of the Radio Corporation of America in charge of the RCA Victor Division.

FILAMENTS FOR MINIATURE TUBES ARE MADE BY RUNNING WIRE AS FINE AS SILK THROUGH THE DIAMOND DIES OF THIS MACHINE WHICH REDUCES THE WIRE DIAMETER TO ONE THIRD THE THICKNESS OF HUMAN HAIR.

CEMENTING INSULATORS TO THE WIRE LEADS IN THE BASE OF MINIATURE TUBES TO PREVENT ELECTRON LEAKAGE.

SLIDING A GLASS ENVELOPE WITH EXHAUST TUBE ATTACHED OVER THE ELEMENTS OF A MINIATURE TUBE.

MINIATURE RADIO TUBES

Out of RCA Research Have Come 45 of the 50 Tiny Audions Which Are Finding Favor in the Radio Industry.

MANY years ago, RCA engineers saw the tremendous possibilities — technical and commercial—which would result from a miniature-size tube. Today, as a result of well-directed research and development, RCA's miniature tube line numbers more than 45 types comprising the most extensive line offered by any manufacturer and one that is constantly growing.

The obvious advantages of these "mighty midgets" insure a major role for them in many electronic applications—make them stand out even now as the "tube of the future". Savings in space, weight and materials, combined with performance which equals, and in many instances surpasses that of the conventional metal and glass types, are major factors leading to their incorporation in new circuit designs. Added to their adaptability, also, are such features as superior operation at high frequencies, low filament power consumption, and effective heat dissipation.

New and numerous applications of these small tubes in radio, AM and FM, television and industry, and in a host of electronic developments, are presenting bright horizons for miniature tubes sales.

The story of RCA's miniature tube development and manufacture is the history of miniature tubes. Success of the Tube Department's pioneering is reflected by the fact that 45 of the 50 miniature types in use were developed by RCA. What, then, are the factors which have contributed to this success and to RCA's pioneering position in miniature tube manufacture?

Once upon a time, the entire tube industry plodded along mak-

THIS MACHINE SEALS A PIECE OF GLASS TUBING TO THE TOP OF EACH MINIATURE TUBE SO THAT AIR AND GASSES INSIDE THE ENVELOPE MAY BE EXHAUSTED.

ing tubes according to the old lamp manufacturing practice: a large glass bulb with the elements mounted inside in spacious grandeur, like fish in a bowl. But the electrodes, unsupported at the top of the bulb, often shifted in position, thereby short-circuiting and otherwise ruining the tube. Breaking with tradition, RCA tube engineers fixed a round piece of mica at the top of the electrode mount and reshaped the glass bulb so that the mica shouldered against it, anchoring the electrodes firmly.

A few years later—in 1935—along came the metal tube. Its effect also was to cut down the size of standard receiving tubes. At this point, the obstacle to further reduction in the size of tubes appeared to be the metal stem. It also offered a difficult production problem in that each of the tube leads required its separate glass insulator. These insulators had to be welded to a special alloy eyelet, and each eyelet had to be welded to the stem. This process involved the welding of as many as 17 tiny, separate parts. In 1938, RCA tube engineers found the answer. This was the button stem. The large stem was reduced to a little glass pancake surrounded by a metal ring, permitting the tube wires to run directly through it without the need for special insulators, eyelets, etc. Now the true miniature tube could be fashioned, and soon it came into existence in the development laboratories of the RCA plant at Harrison, N. J.

NBC EXECUTIVES MAKE NATIONWIDE TOUR

Following the opening session in New York, NBC representatives headed by President Niles Trammell and Executive Vice President Frank E. Mullen entrained March 13 for a nationwide tour during which they discussed problems of the broadcasting industry with station representatives in Chicago, Atlanta, Dallas and Los Angeles. Three-day meetings were held in each city.

In addition to Trammell and Mullen, the group included William S. Hedges, John F. Royal, Frank M. Russell, C. L. Menser, Ken R. Dyke, Easton C. Woolley, Hugh M. Beville, Charles P. Hammond, Sydney H. Eiges and Sheldon B. Hickox, Jr.

MACHINE SPRAYS MAGNESIUM OVER SMALL PIECES OF MICA USED FOR INSULATORS IN MINIATURE TUBES.

AGEING RACKS WHERE RCA MINIATURE TUBES ARE "SEASONED" BEFORE PACKAGING FOR SHIPMENT.

Students In NBC Competition

$1,000 Award to "University of the Air" Program Offered Teacher Trainees in UN Thesis Contest.

By Dr. James R. Angell

Public Service Counselor, National Broadcasting Company

IN July 1942, the National Broadcasting Company, acting upon the recommendations of an advisory board of leading American educators, presented the first program in the University of the Air series of broadcasts. These broadcasts under the general title of "Lands of the Free" dramatized important events in American history. Since that time, the scope of the series has been extended to include programs in the widely diversified fields of music, politics, economics and literature. Today, the University of the Air is presenting five series including "Your United Nations," on current history; "The Story of Music;" "World's Great Novels;" "Home is What You Make it," on home economics, and "Our Foreign Policy," which offers authoritative discussions of this country's foreign relations.

In the five years of its existence, University of the Air has produced more than 25 different series of broadcasts.

It was, then, with a great sense of pride that the NBC learned early this year that the University of the Air had been selected by readers of *Magazine Digest* as the winner of that publication's special prize of $1,000 for "outstanding public service during 1946."

Upon notification of the honor, NBC decided that a happy event of this kind should be utilized as the occasion for a thorough reexamination of our achievements and our philosophy as well as for the establishment of new goals still farther ahead.

At the same time it was decided to utilize the award in full accordance with the terms of the *Magazine Digest* contest which stipulated that the prize must be used "to help others". Accordingly, the University of the Air announced that the $1,000 check will be devoted to a competition to be conducted among teacher-training students in the U. S. and Canada under the supervision of the American Association for the United Nations and the United Nations Society in Canada.

Contestants will be required to write a thesis from 1000 to 2000 words in length on "The Teacher and the United Nations," showing how teachers can promote the work and ideals of the United Nations.

Winning Paper to be Broadcast

The first prize winner will receive $300; second prize $200; third prize $100 and fourth prize $50. The next 14 winning contestants will receive $25 each. Final decisions will be made before May 25, 1947 by the board of judges consisting of Clark M. Eichelberger, director of the American Association for the United Nations; Dr. Willard E. Givens, executive secretary of the National Educational Association; Murray Simmons, editor of *Magazine Digest,* and the writer.

The winning paper will be utilized as the basis of a later broadcast on the "Your United Nations" series.

The NBC University of the Air is the first endeavor in network history in the United States to provide systematic subject-matter instruction in a carefully balanced variety of subjects, correlated with existing classroom instruction in colleges and universities throughout the nation. The radio institution has planned its curriculum in close consultation with outstanding educators representing every region of the United States, as well as many other American nations, in order that the broadcasts may have the maximum of practical utility for as many instructors as possible.

Radio Aids Home Study

For the general adult audience, numbered in millions, as well as for students in schools, the NBC University of the Air offers particular advantages over random radio scheduling. It gives to those who have never gone to college and to those whose college days are behind them, the opportunity, right in their own homes, to continue with systematic and up-to-the-minute education, under the most favorable and interesting conditions. Though each program of the NBC University of the Air is a complete unit in itself, and will stand quite alone for the casual listener, each is also an integrated link in a great chain of knowledge and is designed to encourage the casual listener to become a systematic listener, first to one entire series and, finally, to the rounded whole.

For the listener who finds his interest and imagination so stirred by the programs as to lead him on from the status of listener to that of student, the institution goes beyond the broadcasts on the air to meet his needs and to provide well-rounded education. This is done through the publication of comprehensive handbooks, which give background material for reading in connection with the broadcasts and bibliographies of suggested reading related to each of the programs.

Our belief at NBC in a broad, fixed framework of public service programming must be reconciled with the equally great necessity for providing the variety that is essential to appeal to many tastes and keep pace with the changing world. This is achieved by constant re-examination of program series. We frequently try out new production techniques; we explore new areas and re-explore old ones, we seek and encourage original writings. Nothing better illustrates this diversity than the University of the Air.

Coin-Operated Radios

NEW RCA RECEIVER WAS DESIGNED FOR USE IN HOTELS, HOSPITALS, TAVERNS AND TOURIST CAMPS

A HIGH quality RCA coin-operated radio for use in hotel and hospital rooms, taverns, summer resorts, tourist camps and similar locations was shown publicly for the first time at the Coin Machine Show in Chicago on February 3. The demonstration marked the company's entrance into the coin-operated instrument field.

The new set is a two-band receiver, employing six tubes (including one rectifier tube) and a 5-inch permanent magnet speaker. It is equipped with a built-in loop antenna, and an additional 75-foot baseboard antenna is furnished for use when required.

Of streamlined design and rugged construction, the Coin-Operated Radio is engineered to provide high quality program reproduction, "eye" appeal, and maximum convenience and simplicity of operation for the patron.

The sturdy steel cabinet, finished in umber gray with brush chrome bands and speaker grille, was styled by John Vassos, noted industrial designer and design consultant to RCA, and Stewart Pike, head of the Sales Styling Section of the RCA Engineering Products Department.

Simple operating instructions are presented on the easy-to-read coin plate, and a full-vision eye-line dial permits easy location of desired stations. A small chrome frame is mounted on the top of the cabinet to hold a card showing frequencies of local stations and networks. To start the set, the patron has only to insert a coin and tune in the station he wants.

Plays Two Hours for 25 Cents

The timer unit of the instrument is wired for either continuous or intermittent playing, at the option of the coin machine operator. It permits two hours of radio reception for 25 cents, and up to four quarters may be inserted at one time, providing for a total of eight hours' playing time. If wired for intermittent performance, this time could be used up in intervals of any length. The coin box will hold up to $10 in quarters.

By means of a unique, super-sensitive slug detector assembly, including a slug rejector mechanism and coin return chute, the radio rejects all types of slugs, regardless of their metallic content. The coin mechanism may be easily cleared of slugs, bent coins, or other objects by pressing a "scavenger" button on the coin plate.

Both mechanism and coin box are protected from tampering by a heavy die-stock back plate, reenforced with a steel band riveted around the edge and secured by a strong triple-tumbler lock. A steel dial plate prevents access to the cabinet through the dial opening. For extra protection, the coin box is formed of hardened steel, welded to the cabinet, and fitted with a separate, sturdy, pickproof screw-type lock, permitting chassis service without access to the coin box.

Loss of the instrument through theft is minimized by unique styling which makes it virtually impossible to enclose the set in any standard luggage or steamer trunks.

Extra features which may be purchased and easily added to the set include an earphone jack, which automatically cuts out the speaker when in use and allows for attachment of standard headphones or a pillow-type speaker for hospitals and similar use; a two-coin unit, permitting insertion of a dime for 45 minutes' playing time, as well as a quarter for two hours; a hum-free AC-DC inverter which adapts the set for use in large city hotels where only 110-volt DC power is available; and an automatic time switch which turns off the power at a predetermined hour at night and turns it on again at a predetermined hour in the morning, making it impossible for "night-hawks" to disturb other hotel guests with radio programs during the late hours. A coin inserted during the non-operating period is automatically returned. Addition of these features requires no complicated wiring revisions and can be accomplished in a matter of minutes by any trained radio service man.

DESIGNED FOR THE SPECIAL REQUIREMENTS OF HOTELS, HOSPITALS AND SUMMER RESORTS, THE RCA COIN-OPERATED RADIO HAS FEATURES THAT APPEAL TO BOTH OPERATORS AND USERS.

THESE MINARETS, WHICH FRAME A TURKISH SQUARE, SOON WILL BE DWARFED BY THE 725-FOOT TOWERS OF RADIO ISTANBUL.

Turkey Expands Radio System

Powerful Station Being Built at Istanbul Expected to Be on the Air This Year.

THE monuments of Turkey's past, her towers and minarets, her domes and galleried walls, symbols of a long and proud history, stand today in sharp contrast to her monuments to the future—the bustling modern cities, the clean-lined architecture, the vigorous, ambitious youth of the country.

By the end of 1947 yet another monument to the future—the antenna towers of Radio Istanbul—will rise steeply above the antique spires, soaring to a height of 725 feet.

The new, 150 kw broadcasting station, recently ordered in its entirety from RCA International Division by the Turkish Government, will represent more than a mere broadcasting installation. It will represent the spirit of the new Turkey and the realization of a dream of Turkey's leader, Mustafa Kemal Ataturk.

Under Ataturk the nation abandoned the Arabic alphabet and adopted the Roman. It was a revolutionary step, involving the re-education of the entire population. But it gave the people wider access to information, education and culture than had ever been possible with the difficult Arabic script.

Now, radio supplements books and papers in carrying out the educational program.

The 150,000-watt station will be one of the most powerful transmitters in Europe, exceeding by three times the largest transmitter in the United States. It will be the last word in radio design, from microphones to antennas.

RCA International has been at work on this project since early 1946, when in co-operation with the Turkish Press and Information Service, a government agency under the direction of Nedim Veysel Ilkin, internationally known for his work on UNRRA, RCA engineers and technicians spent several weeks studying the topography of Turkey. Before a suitable site could be selected for the station, hundreds of miles of difficult mountain terrain had to be traversed by jeep, and areas impassable even to a jeep had to be surveyed by observation plane.

Paul C. Brown of the Field Organization, Engineering Products Department, who has supervised a number of important RCA installations around the world, including Radio Belge, the "Voice of Free Belgium" in Leopoldville, Belgian Congo, is supervising the Turkish project.

RCA Supplies All Equipment

The entire job of engineering and installing the station has been put in the hands of RCA International, according to the Engineering Products Department of the RCA International Division. This includes not only microphones, transmitter and antenna but musical instruments, a complete library of recordings, and theatre seats. In addition, the Division is responsible for the design and acoustics of the studios, air conditioning for the building, and, in collaboration with the National Broadcasting Company and RCA Institutes, Inc., the training of personnel in station management, programming, and radio engineering.

The station will be housed in a building chosen as the winning design in a competition for Turkish architectural students. The interior architecture will be designed and radio-engineered by RCA International.

In addition to the Turkish project, RCA International has other notable contracts around the world.

Complete RCA studio equipment will be installed in the streamlined CMQ Radiocentro, a $1,000,000 project now in prospect for Havana, Cuba. The studios themselves will be the most outstanding and modern in the Caribbean area, according to Goar Mestre, Director of the CMQ network. The Center will be known

as the "Radio City of the Caribbean."

RCA International has also recently shipped to Cuba a 5 kw transmitter for Radio Salas, in Havana. This is the first 5 kw RCA equipment ever installed in Cuba.

From the Philippines, comes an order for a 1 kw shortwave transmitter, and a 10 kw medium frequency transmitter. Installation of these equipments marks the beginning of the rehabilitation of station KZRH.

Radio Nationale Belge is at present completing the installation of a 10 kw RCA transmitter in Brussels. Later this transmitter will be supplemented by a 50 kw shortwave transmitter, similar to the one erected by RCA International in Leopoldville, during the war.

RCA International Division has shipped and is in process of installing two 7.5 kw shortwave transmitters in Lorenco Marques, Mozambique, Portuguese East Africa, for the "African Announcer" station of the Radio Club of Mozambique. This is the first RCA broadcasting equipment to go to Mozambique.

MEMBERS OF TURKISH PRESS DEPARTMENT AT SIGNING OF CONTRACT FOR RADIO ISTANBUL. PAUL BROWN, RCA INTERNATIONAL ENGINEER IS FOURTH FROM RIGHT.

DR. ZWORYKIN ELECTED VICE-PRESIDENT

DR. VLADIMIR KOSMA ZWORYKIN has been elected Vice President and Technical Consultant of the RCA Laboratories Division.

Dr. Zworykin, who has been Director of the Electronic Research Laboratory of the RCA Laboratories Division, Princeton, N. J., has received international recognition for his achievements in radio, television and electronics. He has been associated with RCA for 17 years.

Dr. Zworykin performed distinguished service in World War II as a member of the Scientific Advisory Board to the Commanding General of the United States Army Air Forces, the Ordnance Advisory Committee on Guided Missiles and three important sub-committees of the National Defense Research Committee.

In the course of his war work, Dr. Zworykin directed research resulting in the development of aircraft fire control, infrared image tubes for the famed sniperscopes and snooperscopes, television guided missiles, storage tubes and effective improvement of radar systems.

As a pioneer in the development of all-electronic television as a service to the public, Dr. Zworykin invented the iconoscope, television's electronic "eye", and developed the kinescope, electronic picture tube of the television receiver. He directed research in perfecting the first commercially practical electron microscope, acclaimed as one of the most valuable scientific tools of the 20th Century, and originated the idea of airborne television.

DR. V. K. ZWORYKIN.

His pioneering work in television has won for Dr. Zworykin many awards, the latest of which was the Howard N. Potts medal of the Franklin Institute, announced on March 3, 1947. In 1934, he received the Morris Liebmann Memorial Prize from the Institute of Radio Engineers. He received the Overseas Award of the British Institution of Electrical Engineers in 1937 for a paper on the iconoscope and in 1938 he received the honorary degree of Doctor of Science from the Brooklyn Polytechnic Institute. In 1940, he was presented the Modern Pioneers Award of the American Manufacturers' Association and in 1941 he received the Rumford award of the American Academy of Arts and Sciences.

CONGRESS OPENING TELEVISED

SCENES AT FIRST SESSION OF 1947 ARE TELECAST IN NEW YORK, WASHINGTON AND PHILADELPHIA

FOUR image orthicon cameras, two in the House Chamber and two in the interviewing anteroom, recorded the opening session of the 80th Congress on January 3, 1947, in a joint telecast by the National Broadcasting Company, the Columbia Broadcasting System and the Allen B. DuMont Laboratories. It was the first telecast made direct from the halls of Congress.

Following a 15-minute television newsreel, the program was shifted to Washington, where the joint broadcast began with an interview of Congressmen. At 12:00 noon, the two image orthicons in the House took over and recorded the formal session, highlighted by the election of Rep. Joseph W. Martin of Massachusetts as speaker of the House. The program concluded at 1:53 p.m.

Speaking in the interviews were Representatives C. A. Wolverton of New Jersey; Sam Rayburn of Texas; Charles Halleck of Indiana; and C. J. Brown of Ohio. Announcers Bill Henry and Bob Coar conducted the interviews.

Clarity of the image as seen in New York was demonstrated by the detail revealed in the numerous closeup shots. A bandage on the finger of a House clerk could be seen clearly as he punched his tally meter to record the vote for Speaker. Closeups of Representatives in their seats revealed the presence of children who had accompanied their parents to the proceedings. One closeup shot showed every detail of the historic House mace, traditional symbol of government.

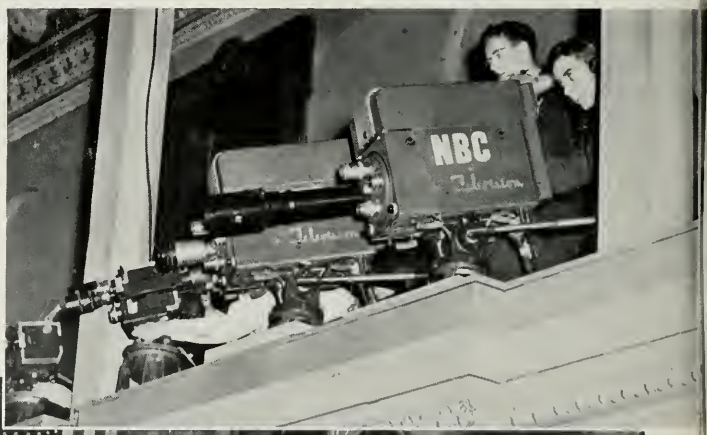
Coaxial Cable Carries Program

The telecast was seen in Washington in NBC's studios there and over DuMont Station WTTG. From the Capital it was sent via coaxial cable to New York where it was transmitted over stations WNBT, WCBS-TV and WABD. From New York the signal was sent to station WPTZ, Philadelphia via radio relay.

In commenting on this pioneering telecast, Representative Wolverton, new chairman of the House Interstate Commerce Committee called it "one of the most outstanding events that has ever happened in the field of communications."

Predicting that television pickups from the Congress eventually will be a regular part of the American system of television, John F. Royal, NBC vice president in charge of television said: "There is no better way for controversial subjects to be brought before the American people than from the floors of Congress by television. Bringing the mechanics of government into the American home is a great step forward and will most certainly have a tremendous effect on the understanding of our citizens."

RCA IMAGE ORTHICON CAMERAS INSTALLED IN GALLERY OF THE HOUSE OF REPRESENTATIVES ARE TRAINED ON THE SPEAKER'S STAND.



ONE OF THE SCENES AT THE OPENING SESSION OF CONGRESS WHICH TELEVISION TRANSMITTED TO THOUSANDS OF HOMES ALONG THE EASTERN SEABOARD.

TYPICAL "ROLLING THEATRE" INSTALLATION IN DINING CAR OF A CHESAPEAKE AND OHIO TRAIN.

Movies As You Ride

Several C. & O. Trains Are Equipped With RCA 16-Millimeter Film Projectors for Passenger Enjoyment.

PASSENGERS on some of the trains of the Chesapeake & Ohio railroad are now able to enjoy the latest Hollywood films as they ride, thanks to the successful installation of RCA 16-millimeter film projection and sound systems in dining cars. As is usual when exploring new applications, RCA engineers encountered their usual quota of problems.

Overcoming space limitations encountered on the dining cars which were doubling as "theatres-on-wheels," C. & O. set up a tiny projection booth 45 inches wide and 72 inches long. Dual projectors, standing side by side, permit uninterrupted showing of feature-length films with maximum convenience for the projectionist. The projection booth is complete with automatic changeover, monitor speaker, rewinds, film cabinets, etc. Four-inch lenses are used in the projectors. The beaded screen is approximately 60 inches wide.

The speaker system, especially engineered for the "rolling theatres," includes the standard RCA 16mm. speaker in combination with a directional horn unit to insure complete distribution of sound throughout the length of the car. Dining-car tables fold out of the way and disappear under drapes which are pulled across the windows. Seats are set up across the width of the car. Normal movement of trains has no disturbing effect on the projection equipment.

Film Projector Proved in War

RCA engineers pointed out that the RCA projector used in this installation is basically the same unit which was proven "under fire" by the Signal Corps during the war, and also recently purchased in large quantities by the Navy.

A new train, "The Chessie," to be introduced by C. & O. in the Spring, will have specially designed "theatre cars." RCA engineers are currently at work on advanced designs in 16mm. equipment for trains and other public carriers.

HOW RECORDS ARE MADE

(Continued from page 13)

for each record, one for each side. The stampers have been chrome plated to give them a hard, shiny surface. In the pressing machine, the stampers have been perfectly centered to guarantee a true and accurate pressing.

The record press resembles a huge waffle iron, with one stamper at the bottom, the other at the top. The labels which will appear on the face of the record are placed on the stampers and when the pressing is made are baked into the finished record.

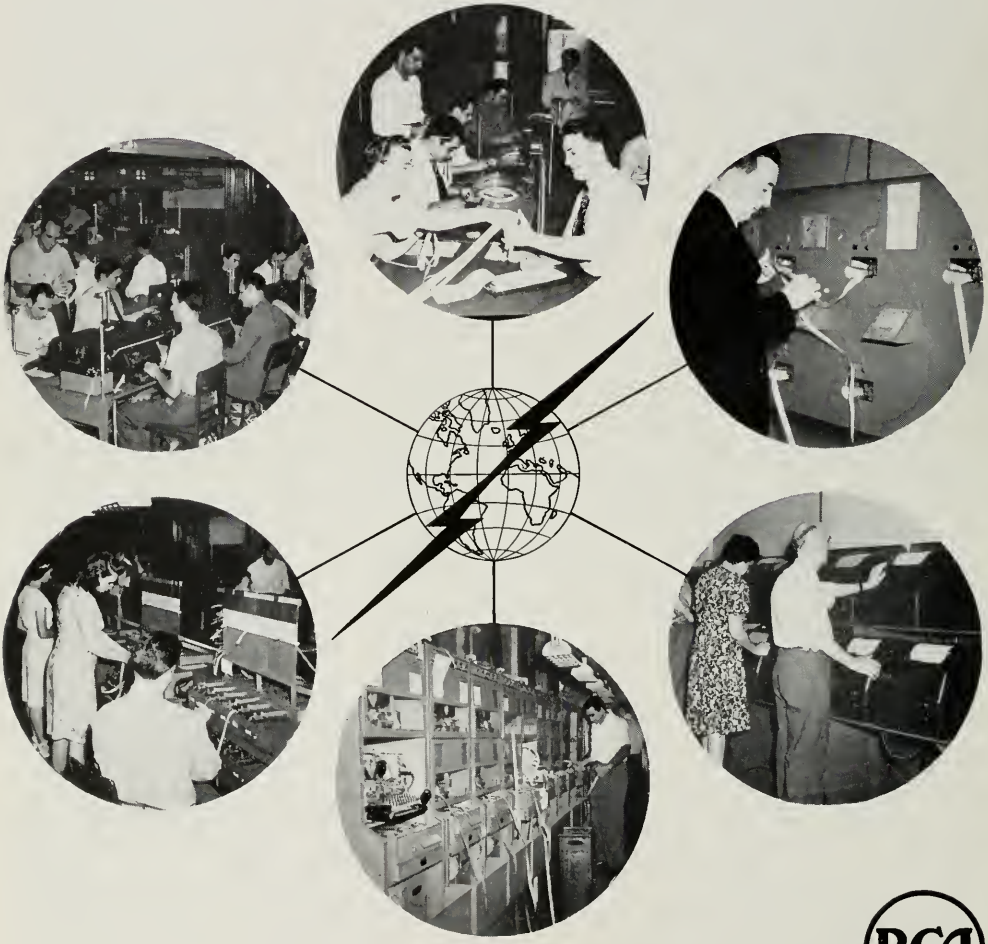
The "biscuits", which have been allowed to harden in storage banks, are reheated on a steam table adjacent to the presses. As soon as they become soft and pliable they are folded and placed in the press. The press, which has been heating meanwhile, is closed and hydraulic pressure of many tons is applied causing the plastic record material to flow over the surface of the stampers. Live steam circulates through the press, then in a few seconds the steam is turned off automatically and cold water circulates, cooling the press and hardening the record. The press is opened and the completed record is exposed.

When it leaves the press, or is lifted out as a waffle from an iron, the record has a rim of excess material known as "flash." This excess material is shorn off by nimble fingered operators and then the record goes to the finishing department where it is placed on a lathe. There the edge is ground down to perfection, first with fine emery paper, and then plain white waxed cloth which leaves it smooth and polished.

The finished records now are sent to the shipping department, where they are packed and started on their way to distributors throughout the country. These are the principal steps in the process, developed in more than 40 years experience, of making the RCA Victor Record.

PANDORA

ADDS NEW SPEED TO WORLD-WIDE RADIO TELEGRAPH MESSAGES SENT "via RCA"!



RCA

RCA COMMUNICATIONS, INC.

A SERVICE OF RADIO CORPORATION OF AMERICA

Television gives you a choice seat at the game.

Television–a Season Pass to Baseball !

Every home game–day or night–played by the New York Giants, Yankees and Brooklyn Dodgers will be seen over television this season!

Owning a television receiver in the New York area will be like having a season pass for *all three ball* clubs. And in other cities, preparations for the future telecasting of baseball are being made.

When more than one home game is on the air, baseball fans can switch from one to the other–see the most exciting moments of each through television!

Those who own RCA Victor television receivers will enjoy *brighter, clearer, steadier* pictures through the exclusive RCA Victor Eye-Witness picture synchronizer that "locks" the receiver in tune with the sending station.

To witness baseball or any other event in the ever-growing range of television programs–you'll want the receiver that bears the most famous name in television today –RCA Victor.

When you buy an RCA Victor television receiver or radio, or Victrola radio-phonograph, or an RCA Victor record or a radio tube, you know you are getting one of the finest products of its kind science has achieved. *"Victrola" T.M. Reg. U.S. Pat. Off.

Radio Corporation of America, RCA Building, Radio City, New York 20. Listen to the RCA Victor Show, Sundays, 2:00 P.M., Eastern Standard Time over the NBC Network.

Several television cameras cover the baseball diamond to bring you a close-up of the action wherever it occurs. Here is a supersensitive RCA Image Orthicon television camera used by NBC's New York station WNBT in televising home games of the New York Giants.

RCA **RADIO CORPORATION of AMERICA**

RCA Laboratories, Princeton, N. J., where televising of outdoor scenes has been greatly advanced through the development of the ultra-sensitive Image Orthicon camera tube.

Engineering...

the fountainhead of modern tube development is RCA

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TUBE DEPARTMENT

RADIO CORPORATION of AMERICA

HARRISON, N. J.

Science in Democracy

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

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

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

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

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

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

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

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

Freedom to Pioneer

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

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

Vigorous Policy Needed

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

For this purpose, every phase of