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1945

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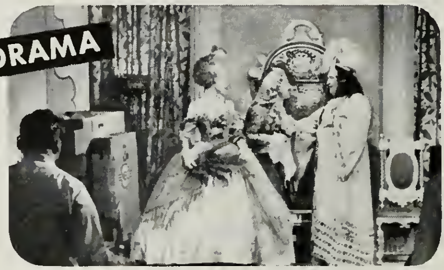

From the live-talent studio in Radio City, especially adapted for NBC television—Broadway hit shows, grand opera, variety. A regular weekly feature on WNBT.

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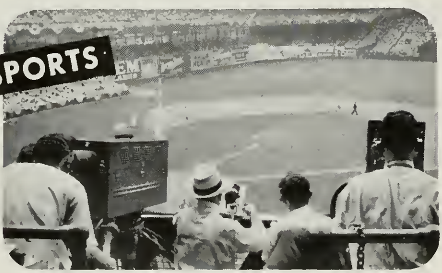

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● This is but a small sample of NBC's exciting parade of television presentations: cultural and educational topics, special events, newsreels, parades, fashion shows, motion picture features—*now being broadcast* on NBC television. Just a hint of the bigger and better television programs on their way to you from NBC.

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WNBT

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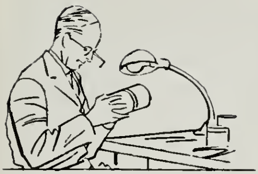

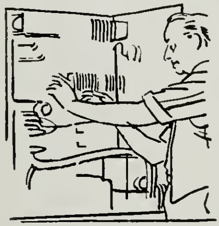

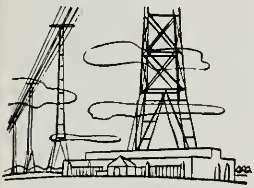

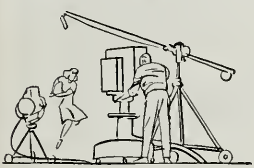

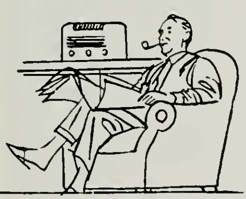

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VOLUME 5 NUMBER 1
OCTOBER 1945

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COVER—RCA Laboratories, Princeton, N. J., one of the world's foremost centers of research in radio, television and electronics.
—*Fairchild Photo*

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

FLEET ADMIRAL CHESTER W. NIMITZ, SPEAKING FROM THE NBC TELEVISION STUDIO IN RADIO CITY, WAS SEEN AND HEARD BY VETERANS IN FIVE NAVAL HOSPITALS NEAR NEW YORK.

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

"AMERICA, TO BE FIRST IN PEACE AND FIRST IN WAR, MUST BE FIRST IN SCIENCE."

technology should be explored and developed. Every scientist or embryo scientist must be encouraged, if America is to remain unsurpassed in peace and unconquerable in war.

The national security of the United States demands that military scientists and industrial scientists continue their cooperation, for peace and security rise and fall with science.

We have but to read the dramatic stories of the life and death race between the scientists of the United Nations and of Germany, to realize how narrow was the margin during the earlier periods of the conflict. It was frightening, even after the war had ended, to find how nip-and-tuck the race had been between German and American scientists in harnessing atomic power, rockets, radar, bombsights, tanks and other implements of war. It behooves America, therefore, to develop its scientific capital, to protect and to encourage science in times of peace, if the principles and traditions of this country are to survive.

Scientific Talent Must Be Cultivated

Today we survey a world that has emerged from the most terrible war in history; a war in which science, like a global flame-thrower, spread death and destruction around the earth. From now on, no nation is immune. No nation can be protected by oceans or mountains, forts, frontiers, or isolation. Victory in any future war may be determined by the skill of scientist against scientist. No physical barrier will limit the battlefields. The victor will be the one best fortified by science and development, by discovery and invention, and by use of scientific weapons in the hands of the ablest fighters.

Science that saved democratic civilization in World War II, must now be used for peace. This calls for training young Americans with an aptitude and an interest in science and invention. Therefore, Democracy must promote scientific education, not only for the development of weapons, but for the creation of employment, for the production of more abundant crops, for increasing national health, and for developing new wonders in atomic energy, electronics, chemistry and physics that will make for good living and eliminate poverty and disease throughout the world. America must cultivate its reservoir of youthful scientific talent along with development of its natural resources.

War Gave Impetus to Science

War gave tremendous impetus to scientific research. We must keep it moving in the right direction — toward progress in peace. In our land the power behind it will come from the training of future scientists—from the high schools, colleges, laboratories and workshops of America.

Just as we have succeeded in releasing atomic energy from uranium, we must release the energy from the minds of our youth. In the fertile brains of American boys and girls are the master keys to the future. We must stimulate and encourage youth, if this nation is to have health, prosperity and security. With its natural interest in science, youth is one of America's greatest national resources. The figment of an idea may be more revolutionary than the fission of an atom.

Great industrial laboratories will be built, splendidly equipped and on sites conducive to clear thinking; but they will be worthless, no matter how great the funds behind them, if trained men of research do not work within their walls. There is no substitute for brains. Men, not tools, are the lifeblood of research.

Enlisting Scientists for Peace

We stand on the threshold of revolutionary developments that call for thousands of trained scientists. We need them more and more to convert to the uses of peace, the scientific achievements of the war, which victory has made available to us.

When war came, the manpower requirements of peace were pushed aside. War drafted scientists, teachers and students with little question of future needs. Scientific and pre-scientific schools emptied their classes into the training camps of the armed forces. Industry and education responded alike to that draft of men.

Now the war is over. Peace is the order of the day. And peace, to meet our national needs, should have the priorities that were given yesterday to the demands of war. Subject only to urgent military neces-

"AMERICA, THE CRADLE OF LIBERTY, IS ALSO THE CRADLE OF INVENTION."

"NO NATION CAN BE PROTECTED BY OCEANS, MOUNTAINS, OR ISOLATION."

sity, peace should have the right to recall, for the great national service of science, the trained men and the young recruits it gave up to the war.

But no mere return of our potential scientists from the armed forces can meet the pressing needs of the hour. You cannot recruit scientists through draft boards. They must be recruited through years of training in colleges and universities. If we are to meet the needs of tomorrow, we must enroll now, in our scientific schools and laboratories, an army of students for the four to six years of college and postgraduate work that is necessary to produce trained scientists. Nothing less will give our nation the scientific preparedness we must have for the march of science in peace as well as in war.

Value of Scientific Research

At the end of the First World War, it was vividly apparent that scientific research also was a vital factor in our industrial progress. As a result, it grew ten-fold between 1920 and 1940. Within the past two decades, in television alone the radio industry spent more than twenty million dollars on research. That investment has called for faith, for initiative, and for young men with new ideas. Now we are on the threshold of a new postwar industry. Television is destined to become a utility in the American home and a revolutionary force in worldwide communications. It will bring visual entertainment to the homes of rich and poor alike; it will flash letters, documents and pictures around the world while the television eye in factories will enhance safety and speed industrial processes.

In radio, each forward step leads to something new. From radio principles and television techniques sprang another new wonder, so miraculous that it is called a sixth sense—Radar! But this, too, required research on a wide basis.

Unified research on a national scale that cost two billion dollars produced the atomic bomb. Scientists themselves were amazed at the speed of the development. They thought it possible but believed it would require 20 years or more to achieve results. Their calculations, however, did not take into account the impact of war which produces speed, direct action and concentrated effort.

Peace also can benefit from concentration on certain pressing problems. For example, what would result from even one hundred million dollars wisely spent on cancer research? If research produced a cure for cancer, it would save more lives than were lost in the war.

Science Reveals Invisible World

Research into the unknown is a great adventure. It should be encouraged if American scientists are to blaze new trails in life, as the electron microscope has done in revealing the microscopic world which surrounds us. From a study of the infinitesimal organisms and elements, from the unseen rays and waves which permeate our bodies, we may find the answer to our future in the Atomic Age. The tiny, invisible things of life are only beginning to reveal their importance. The electron is the key to the world of the infinitesimal.

We have long associated power with great size but we are now beginning to realize that tiny invisible things, such as the electron and the atom, are the nuclei around which our very existence whirls. We are beginning to see that the atomic structure is a universe in itself, like the one in which our earth revolves around the sun. We see before us a new universe of power—the power of protons, electrons, deuterons and neutrons. When the atom is smashed terrific energy is released. Scientists tell us that when a lone neutron, with only a thirtieth of a volt of energy behind it, strikes the core of a uranium atom, 200 million electron volts of energy shoot out!

Harnessing Universal Power

The release and control of atomic energy represents a new and successful attempt by man to tap nature's great source of universal power. Let us envisage nature as a huge safe on which there is a combination lock. Inside this giant structure there are many chambers, one of which contains atomic power! Man, thus far, has learned only the combination to the safe and found the key to a single chamber. He has yet to find the keys to many other chambers which will unlock the secrets of nature that may astonish and change the world.

"AMERICA MUST CULTIVATE ITS RESERVOIR OF YOUTHFUL SCIENTIFIC TALENT."

"FROM RADIO PRINCIPLES AND TELEVISION TECHNIQUES SPRANG ANOTHER NEW WONDER, A SIXTH SENSE —RADAR!"

"RESEARCH INTO THE UNKNOWN IS A GREAT ADVENTURE. IT SHOULD BE ENCOURAGED IF AMERICAN SCIENTISTS ARE TO BLAZE NEW TRAILS."

Now the scientist has stepped out from the darkness of military secrecy into a spotlight that focuses the eyes of all the world upon him. The people in whose name he achieved victory look upon him as a giant endowed with magic powers for good or evil. But it is he who creates and it is they who must decide how his handiworks are to be used—for construction or destruction?

With the perspectives now unveiled, humanity may look forward to a future of terror, or a future of security and abundance. If we desire the latter to be our destiny, then all nations must decide to live in harmony in "One World." Such decision would be helped if the social sciences moved forward at a faster pace. They should not lag so far behind the physical sciences, as they have in the past. The statesman, the politician, the scientist, the spiritual leader, the teacher, the industrialist, and the labor leader must carry their new responsibilities to society, in the light of these momentous developments. Each must do his part towards curing the causes of conflicts and preventing misuse of the new forces now at man's disposal. Only thus can we preserve the freedom and democracy for which our sons and daughters fought and gave their lives.

The Use of Science

On August 5, 1945, the earth was spinning in an orbit of destruction. Science threw a mighty switch and released the atomic bomb. The world gasped! Almost in the twinkling of an eye mankind moved out from the dark clouds of war into the promising sunshine of peace.

In the wake of war there are many new ideas and discoveries which can be applied to our everyday life. In some instances, however, science ran far ahead of man's readiness to provide practical safeguards that would confine their uses to peacetime purposes. Atomic energy is one disturbing illustration. Further development is bound to release the great potentialities of atomic energy for use in industry, heat, light, power and transportation. But the atomic units that one day may power hundreds of thousands of peaceful automobiles and airplanes, also could be used in war.

Nor can it be safely assumed that atomic bombs necessarily will come only from the skies. They might come from submarines or ships, or even from land artillery. In fact it is conceivable that "smaller and better" atomic bombs, as small as baseballs, might be planted by saboteurs at strategic places and there remain hidden until such time as an enemy decides to strike. A secret radio signal transmitted from a distance, might be used to detonate such bombs and spread havoc far and wide.

Science races Time, and man in his efforts to survive and to progress, is in the race with both. Now, as man surveys the maze of possibilities which technology created in the heat of warfare, he faces the great tasks of converting and confining them to peacetime utility.

As we sit at home and watch the Tigers play the Cubs on the screen, or watch dancers in the studio at Radio City, television—for example —looks like an emissary of peace. But like other wonders of science, television too, if man so chooses, may be applied to war. Television in peace has fascinating aspects; in war terrifying!

Television in War

Since the war ended, General H. H. Arnold, commanding the U. S. Army Air Forces, has revealed that flying rockets which can be directed to targets far beyond the horizon are a definite possibility; no longer a dream. Television gives them an eye. From a distance, radio controls them in flight. So deft, so all-seeing is this control, that from the launching site, the operator can guide the winged missile as if he were inside its shell. If he sees that it is not going to hit the target, he can turn it quickly; he can even make it loop-the-loop! The very thought of thousands of these television-eyed monsters of destruction coming up over the horizon of the sea as a storm cloud may well cause us to shudder. They might be loaded with warheads of atomic power, some to strike and wipe New York off the map while others guided westward, to turn Pittsburgh, Detroit, Chicago and other cities into death and dust. No longer is the suicide flier needed; television can do his task — and more.

We have the testimony of another great airman, Air Chief Marshal Sir Arthur Harris of Britain who recently said, "War in the future is in the hands of the scientists. . . . Just as you had the old knight in armor leveled by the first man who got hold of a gun, now you have gotten to a stage where a country could win a war despite its size. It could win, however small it was, provided it had the scientific resources and brains to obtain mastery of the new weapons. If you couple the atomic bomb with the projected missile you have something with possibilities that hardly bear contemplation. The whole world is now in the range of this weapon."

I tell you the bomber with a television eye is no myth; neither is the radio controlled rocket.

Television in Peace

It rests with man how television, atomic power, electronics, and all the other forces of science are to be used. In man's will lies the answer to the future influence of science on the world. If harnessed for useful purposes the world will go into an era of wonders never before believed possible. Man will be able to look around the world by television, with the same facility that he now listens around the world by radio. Historic events such as the Japanese surrender on board the battleship *Missouri* in Tokyo Bay will no longer encircle the earth only as sound. They will be seen and heard as sight and sound in tandem.

Nor should we think of television only as an optic nerve over which entertainment and information flow pictorially, for it has many other uses which may even dwarf its performance in the home and theatre. Wherever transport needs vision, television will help to provide it. The airplane will see by television and radar; so will ships on the Seven Seas. Similarly, wherever industry needs an eye, television will provide it. It will watch over industrial processes and machines; it will go into places the human eye cannot reach. Fireproof eyes will be put into furnaces to scan chemical reactions. Tunnels will have these radio eyes, as will conduits and mines.

Several days ago, a prominent communications official from Europe called at my office. We talked of communications and the future. I could see that the threat of competition between radio and plane bothered him. In reading the news that a plane had flown a film from Iwo Jima to Washington in thirty hours he saw an ominous cloud darken the future of electric communications. Most certainly planes would pick up speed and deliver mail even faster.

Then I told him I had no such fear for the future. Radio traveling 186,000 miles a second is faster than any aircraft or even a mail-carrying rocket. A radio signal circles the globe in one-seventh of a second. Before a mail-laden plane could get off a runway in Australia, radio could be delivering mail from Melbourne—in Washington or London. Furthermore, radio could televise an important scene or event, anywhere, so that all the world might see it instantly and simultaneously. Radio travels with the speed of light. Television is light and radio combined.

I told my friend that in the future, a person will write a letter or a message that will be put on a belt moving in front of a television eye. In a split second that letter or message, exactly as written, will appear in England, South Africa or China. There, it will be automatically reproduced by a photographic process for delivery in minutes—not hours as required by even the fastest airplane.

My friend began to smile. His conception of the future of communications was changing. He was startled when I told him that eventually we may be able to take a sealed letter or document and flash it across the hemispheres without opening the envelope. That again is a television possibility—and it's not fantastic. If X-rays can look through the human body and through steel, why should it not be possible for the television eye to look through a paper envelope? This would make possible a radio mail system.

Science and Security

Atomic energy, radar, electronics, television, jet propulsion, plastics and airplanes are the craftsmanship of scientists. They are the architects of our future. It is not war alone but also science that transformed the world within the past six years. The chief effect of the two atomic bombs was not on the two Japanese cities which they destroyed, but on the human mind. As science reconverts to peace, the evidence of all this will become clear. War was a potent force in the crucible of Destiny.

In war, we used science to defend democracy, to defeat its enemies, and to destroy their false philosophies. In peace, democracy must advance the use of science for a better life and make its benefits available to all.

While we strive to obtain these benefits, we must not neglect the problem of preserving peace by adequate preparedness. For the dangers which face all of us from the new forces released by science, must not be ignored. We should adjust our military and industrial establishments to proper peacetime proportions as quickly as possible; but we must maintain them at a level that safeguards our national security.

Our nation must not dissipate the moral and physical strength it now possesses in a world that is far from stabilized. Other nations, too, will benefit from our earnest efforts to substitute world peace for world war, if America is prepared with trained men and modern means to meet the perils of the terrifying forces science has discovered. If we fail in this, democracy will fail.

Let us, therefore, recognize the twin necessities of science in democracy and democracy in science.

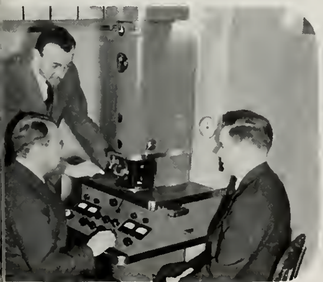
Let us see to it that in our new-won freedom, the scientist retains his liberty to think, to speak and to work unfettered. Let us teach our youth the great responsibilities of science and encourage them to travel its highways of progress. Let them be bold in thought and daring in pursuit of the vision of their dreams.

At the same time, let us not ignore the fact that the dangers mankind faces, call for vision, courage, exploration and action not only in physical sciences but also in the political and social sciences. For all the world is now one neighborhood and the best guarantee for our own security and prosperity, is the security and prosperity of our neighbors as well.

Democracy in its hour of triumph demands that America be strong and help to make science a useful servant, not the master of mankind.

"SCIENCE THREW A MIGHTY SWITCH AND RELEASED THE ATOMIC BOMB."

"TINY, INVISIBLE THINGS OF LIFE ARE ONLY BEGINNING TO REVEAL THEIR IMPORTANCE. THE ELECTRON IS THE KEY TO THE WORLD OF THE INFINITESIMAL."



"MAN WILL BE ABLE TO LOOK AROUND THE WORLD BY TELEVISION WITH THE SAME FACILITY THAT HE NOW LISTENS AROUND THE WORLD BY RADIO."

MISSILES WITH "RADIO BRAINS"

"V-T" Fuse, One of War's Best Kept Secrets was Called "Madame X" by RCA Workers Who Made Over Five Million of Them.

A MODERN miracle — conceived in the minds and machines of America—took place in the air over Britain in the summer of 1944.

For many months, the British Isles had undergone a terrifying ordeal of buzz bombs. Damage was mounting; casualties were great and increasing almost daily. Suddenly in June of that year, observers noted a sharp increase in the number of V-1s shot down by ground fire. In that month, only one out of every five bombs launched from France reached English cities and countryside. Germany's "secret weapon" had met its match. Unknown to more than a few high military officers and a handful of scientists it was the "proximity fuse," developed in American laboratories and built in American factories which had accomplished the feat. The fuse, next to the atomic bomb was the best kept secret of the war.

Thousands of RCA employees worked on the fuse in two of the Company's plants at Camden, New Jersey, and Bloomington, Indiana. Although they assembled more than 18,000 of these lethal weapons a day at the height of production, they knew only that the project was called "Madame X."

According to Navy officials, ten million of the fuses were produced nationally from October, 1942 to V-J Day. Of this amount, RCA Victor supplied the armed forces with five and a half million, or more than half the entire output, making the company the largest producer of the apparatus in the country.

Known officially to the Navy as the "VT Fuse," "Madame X" is a complete four-tube radio receiver and transmitter employing radar principles. No larger than a pint milk bottle, it is enclosed within the case of a five-inch shell. When such a projectile is fired, the fuse emits radio waves. As the radio waves bounce against the target, they are reflected back and are picked up by the receiver in the fuse. As the shell approaches closer to its objective, the returning signal grows stronger until it reaches sufficient strength to operate the detonating mechanism. Safety devices keep the shells from being discharged prematurely.

Miniature Tubes Used

Design of the miniature glass tubes was a feat in itself. Tiny as the tubes used in popular hearing aids, those designed for the proximity fuse had to be sturdy enough to withstand the terrific impact of the propelling discharge of the gun and the centrifugal force caused by the whirling of the shell at high speed as it left the gun muzzle. American tube designers attacked these formidable problems and solved them.

To supply the tubes and associated mechanisms with power, engineers developed a battery which was inert until the shell started its travel through the air. At that instant, the chemicals began to react and generate the required current.

Work Began Before Pearl Harbor

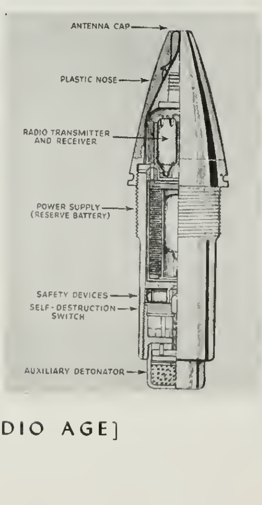
Work on "Madame X" started a month before Pearl Harbor when Radio Corporation of America scientists and RCA Victor engineers were called into conference. Ten months later, working in cooperation with representatives of the Navy's Bureau of Ordnance and the Office of Scientific Research and Development, they put the first fuse into production at Bloomington.

As an example of the ruggedness of the fuse, it had to withstand a sudden jump in velocity from zero to 2,000 miles an hour in a space of ten feet, as the projectile was fired from the gun. At the same time, it was spinning at the projectile's rate of 25,000 revolutions a minute.

The utmost care was necessary in the manufacture of the delicate device. In areas where the fuse was assembled the air was conditioned to keep out excessive moisture and foreign elements. When the fuse was fully assembled, molten wax was poured over the entire unit to keep it firm inside its housing.

"E" Flag for Achievement

So secret was the activity that the Navy Department delayed granting an "E" flag for accomplishment to the Bloomington factory. They did not want attention attracted to the plant. With the lifting of some restrictions on the proximity fuse, however, it was learned that the Navy Department was recognizing the Bloomington plant's tremendous contribution by awarding it the Navy Ordnance Flag with three stars. The Camden plant, which already has an Army-Navy E Flag with four stars for other outstanding accomplishments, is also to be awarded a Navy Ordnance Flag with one star for its fuse production record.



U. S. Navy Photo

THE "VT FUSE" (LEFT) IS SHOWN AT RIGHT AS IT APPEARS WHEN INSERTED IN NOSE OF 5-INCH SHELL.

WITH MOTORCYCLES TUNED UP, RCA MESSENGERS ARE READY TO PICK-UP OR DELIVER URGENT RADIOGRAMS. RIGHT: THIS SWISS OPERATOR, SHOWN IN AN RCA RADIOPHOTO, RELAYED THE JAP SURRENDER MESSAGE AS IT PASSED THROUGH BERNE ON ITS WAY FROM TOKYO TO WASHINGTON, D. C.

FAST, RELIABLE, COLORFUL

Mounted on Motorcycles, RCA Messengers in Washington, Are a Familiar Sight as They Weave Their Way Through Capital Streets.

FOR the pick-up and delivery of its international messages in Washington, D. C., RCA Communications, Inc., maintains a corp of efficient motorcycle messengers. Dressed in the familiar RCA uniform trimmed with red they may be seen dashing through the streets of the nation's capital at all hours of the day or night.

While these boys are well paid, particularly when the frequent overtime is considered, it does not seem to be the pay which attracts them so much as the excitement of tearing madly through traffic as though their messages concerned matters of life and death. In fact, they frequently do. Since RCA Communications, Inc., numbers among its customers practically every Embassy or Legation in Washington, as well as the Departments of the United States Government, it often happened during the war that the messages carried by these boys concerned the most vital phases of our war effort.

The messages exchanged between the Swiss Legations in Washington and Berne relating to the acceptance by the Japanese of the surrender terms were handled by RCA messengers. The final message from the Japanese, for which the world was so anxiously waiting, was held up for fully ten minutes by an encounter with an arm of the law.

Realizing the importance of this particular message, it was entrusted to two boys with instructions to get it up to the Swiss Legation as quickly as possible. One was driving while the other gave his exclusive attention to the precious message. In an effort to gain a few seconds time the driver made a U-turn where prohibited and was pounced upon by a waiting traffic officer who listened with considerable boredom to their explanation of the urgency of their errand. "A lot of horsefeathers!", he is said to have replied, writing out a traffic ticket and delivering a lecture on traffic safety which he considered appropriate. The boys completed their errand as quickly as possible and hoped it would be kept very quiet that ten precious minutes had been lost.

Unexpected Results

However, it was not to be so. All day long the gentlemen of the press had been on the look-out for this message and in some mysterious way known solely to newspaper reporters only a few minutes had elapsed before RCA phones began to ring. The story made the front pages of most of the nation's newspapers next day, with two unexpected results. First the traffic officer decided to tear up the ticket and then, the messenger, a former member of Chennault's Flying Tigers, was invited to New York to appear on the "We The People" broadcast the following Sunday night.

The rather independent spirit of these impetuous drivers does not make them too popular with the traffic officers. While the boys' instructions are to comply strictly with all traffic rules and regulations, nevertheless they have a real appreciation of the need for speed in picking up or delivering messages. A motorcycle needs little urging to cover the ground quickly and from time to time the boys are nabbed for speeding. But just as each messenger provides his own motorcycle and provides for its upkeep, he must stand on his own feet. He pays his own fine if he violates the law.

Their independent spirit also shows itself in their tendency—unless rather firmly held down—to adorn their uniforms with wide, fancy cowboy belts, to wear aviator's helmets instead of the standard caps, etc. And while a well-adjusted motorcycle can run very quietly indeed, some of them seem not exactly displeased when a defective muffler or some other maladjustment causes the machine to make a noise louder than a machine-gun.

But all in all they are a fine cross section of American youth and they perform an important function in enabling RCA Communications to serve the public. The day may come when every customer will have a teletype or facsimile machine in his office or home to provide instantaneous pick-up or delivery, but until it does, the speedy motorcycle messenger provides the fastest known contact between the ultimate user and the radio company.

The Story of Radar

THIRTEEN YEARS AGO, SCIENTISTS OF RCA LABORATORIES CONDUCTED PIONEER EXPERIMENTS ON THE USE OF RADIO WAVES TO LOCATE SHIPS AND PLANES.

By Dr. Irving Wolff
RCA Laboratories
Princeton, N. J.

THE apparatus developed for the detection of objects by means of reflected radio waves has been called radar by the U. S. Navy, and this name has won wide acceptance. Yet, if the peacetime applications had been given first consideration, a name like radio-vision might have been more appropriate.

When a scene is photographed or seen by the eye, that scene is illuminated by artificial light or sunlight and the light reflected or scattered from each object is focused on the retina of the eye or on the photographic plate. The only difference between visible light and radio waves resides in the difference in wave length, as is well known. Conceivably, therefore, a scene could be illuminated by radio waves from some intense source, and the reflected waves focused on some mosaic structure which would give an indication of the elements on which the radio wave is focused. Such a procedure has actually been proposed but has not proven practical for two reasons. In the first place, the amount of radio power taken to illuminate a large area would be impractically large, and secondly, no known mosaic similar in sensitivity to the photographic plate or the retina of the eye exists for the detection and indication of the presence of the radio signal.

If we wish to see a large area on a dark night, we do not attempt to illuminate the whole area all the time. Instead, we concentrate the light into a strong searchlight beam and examine only a small section at a time. By sweeping the searchlight beam, we can examine the whole area. In the same way, in order to concentrate radio waves into a beam, we must either have very large radiators or small wave lengths.

It is well known, as a matter of fact, that to get a specified beam width, the antenna structure is proportional in linear dimension to the wave length. Obviously, an antenna which is too large is inconvenient, if not impossible, as a scanning device. For this reason, microwaves or at least ultra-short radio waves must be used to make a sharp scanning beam. By swinging the antenna, all parts of the area can be illuminated successively by the radio beam.

Object Reflects Signal

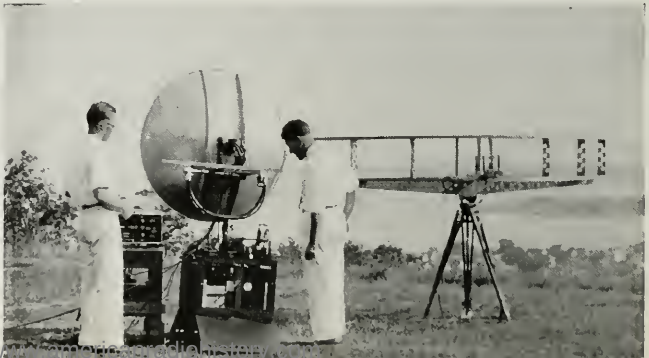
By attaching an antenna similar to the transmitting antenna to a sensitive radio receiver and swinging it so that it points in the same direction as the transmitting antenna, an indication is given in the receiver when some object in the path of the radio beam reflects signals back into the receiver. This method of scanning corresponds roughly to the old moving-spot television scanning system. In similar fashion, by synchronizing the motion of the beam in a cathode-ray tube with the motion of the antenna and modulating the grid with the intensity of the signal, a picture scanned by radio waves rather than light waves can be made visible to the eye. This is one form of radio vision.

How Picture Data is Obtained

Data used to obtain this picture are obtained entirely by directional information and the intensity of the reflection of the radio signals. Similarly, it is only this information which is available to the photographic plate or the eye. The distance information is obtained indirectly by interpretation of the sharpness of definition of the images and by binocular vision.

If radar had consisted only of apparatus for furnishing a picture as described above, it still would have been useful since the picture could have been obtained through fog and clouds which light will not penetrate.

However, radar has made one very important additional contribution which the eye or photographic plate cannot supply, even under perfect visibility conditions. By means of radio waves and radio techniques, a direct, highly accurate measurement of the distance to each of the



RCA MICROWAVE EQUIPMENT USED IN 1934 FOR REFLECTION TESTS CONDUCTED IN COOPERATION WITH THE U. S. SIGNAL CORPS. THE TRIPOD AT THE RIGHT IS A LONGER-WAVE UNIT DESIGNED BY THE SIGNAL CORPS LABORATORY.

PLANE USED BY RCA FOR ITS OBSTACLE DETECTION TESTS IN 1937-39. THE V-ANTENNA APPEARS JUST ABOVE THE CENTER OF THE WING-SPAN.

objects which are illuminated by and reflect the radio waves has been made practical. Thus, whereas vision gives accurate angular information and by interpretation, approximate distance information, radar can supply accurate information in all three dimensions irrespective of the visibility condition.

Although several methods for measuring distance by radio have been proposed, only two of these have come into practical use in present day radar equipment. These have been known as the pulse and frequency modulation (FM) systems. In the pulse system, a short burst of radio-frequency energy, usually between 1/10 and 10 microseconds long, is radiated from the transmitter. The interval between pulses lies generally between 1/100 and 1/1000 second, although longer and shorter intervals are used in special equipments. Some time after the pulse is transmitted, it reaches the reflecting object and returns again to the radio receiver. Since the speed of travel of radio waves has been accurately measured and is well known, the time occupied between transmission and reception of the reflected pulse can be used to obtain an accurate measure of the distance of the reflecting object.

Spot Moves Across Tube Face

In order to measure the time, the spot on a cathode-ray tube is caused to move rapidly across the face, usually starting at the exact instant the pulse is transmitted. The rate of travel of the spot is adjusted to correspond to the scale length and definition desired. It may be as fast as an inch or more per microsecond when great accuracy is desired, or, in the long-range sets, slower than an inch per millisecond. When the signal is received, the trace is brightened or a kink is put in it. The distance of the indication from the start of the trace is proportional to the distance of the reflecting object. With adequate calibration of the equipment, this characteristic can be used to give a very accurate measure of the distance.

Uses Continuous Wave

In the FM system, a continuous transmitted wave is used but the radio frequency is swept back and forth rapidly. In the RCA altimeter, the frequency is swept either 4- or 40-megacycles, depending on the scale used, at approximately a 100-cycle-per-second rate. Since there is a time interval between the transmission and reception of the reflected signal, the frequency of the transmitter has changed during the interval and the received signal will have a different frequency than the transmitted signal. If the rate of change of frequency is linear, the difference will be proportional to the distance of the reflecting object. The frequency difference can be easily measured by feeding the received signal and a small part of the transmitted signal into a detector. The resultant output has a frequency which is equal to the "beat" between the two or the difference in frequency.

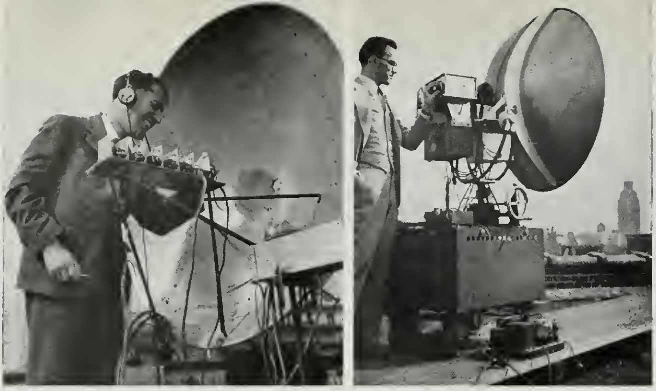
Most radar sets use the pulse method because of its ability to distinguish easily between reflection from several targets thus fixing the position of each one. The FM method is particularly applicable when accurate information is required as to the position of a single target. In the radio altimeter, where it has been used most successfully, this single target is the earth's surface.

Many methods of presenting the distance and directional information received by the radar set have been used. Although the information for forming a complete three-dimensional picture is at hand, three-dimensional indicators are not yet available. For most purposes, the information desired can be shown in two dimensions satisfactorily. In cases where horizontal, vertical, and distance information are all wanted at one time, as in night-fighter radar equipment, various tricks have been used to create the illusion on the two-dimensional indicator of the scene the three-dimensional eye would see if it were at the position of the radar transmitter.

In the most commonly used form of radar system, the scanning is limited to determining the angular position and the distance of targets without reference to their elevation. This type of limited display is useful, for instance, for ground and ship installation to get information about surface targets such as ships on the sea, and also in the search and instrument bombing airborne radar systems. It is also used in ground radars and ship radars which detect aircraft; auxiliary equipment in some cases being employed to determine altitude.

RCA Began Research in 1932

In 1932, the RCA organization started research on microwave tubes and components. This apparatus was demonstrated before IRE meetings in 1934. At that time, the possibility of reflecting sharp beams of microwaves from metal objects and ionized gas was shown.



DR. IRVING WOLFF (LEFT) AND DR. E. G. LINDER OPERATE EARLY PULSE MICROPHONE UNITS ON ROOF OF RCA LABORATORY IN CAMDEN. THESE VIEWS WERE TAKEN BETWEEN 1935-1937.

At the invitation of the Signal Corps, the equipment was brought to Sandy Hook for some tests of range as a communication set. It was also used to determine whether sufficient sensitivity was available to reflect from remote objects. Reflections were shown from gas tanks and small ships passing into New York Bay at about a half mile distance.

Ships Detected by Radar

For these tests, the microwave beam transmitter was modulated with an audible frequency such as 1,000 cycles. The directional receiver, which was placed perhaps 100 feet from the transmitter, was rotated at the same time the transmitter reflector was rotated so that both always pointed in the same direction. In the absence of a target, no signal would be noted in the receiver. When a target was in the beam, a tone was heard. These tests were described in an article in *Broadcast News* in December, 1935, but for military reasons, no mention has been possible until now of the fact that reflected signals were obtained from ships and other targets.

The equipment, in this early form, could be used to determine direction but had several defects as regards operation for location of targets in both distance and direction. These defects were: (1) in order to determine the exact position of the target, a triangulation process would be required with two transmitters and two receivers, and (2) very careful isolation between the transmitter and receiver was necessary in order to prevent interference which would blanket the weak received signal. However, these tests revealed such great possibilities in the field of reflected radio waves that our thinking on the subject was directed toward a more general application.

From then on, the goal to be reached was what has been described earlier in this article as "radio vision." This led to the adoption of the pulse technique since apparatus for determining distance as well as range was required.

Advantages of Pulse Method

The pulse method was chosen in preference to other methods of measuring distance because it was more adaptable to forming the area picture which was envisaged. In addition, it reduced greatly the interference effects which had been present in the earlier equipment, since the received signal would come in when the transmitter was inactive.

During the period from 1935 to 1937, a small group of men worked on the development of microwave tubes, receivers, pulse techinques and indicators. In 1937, they were able to demonstrate a microwave equipment which, from the roof of one of the laboratory buildings in Camden, could scan the Philadelphia skyline about 2 miles distant, and ships in the Delaware River. One coordinate on the cathode-ray screen indicator was plotted as "distance"; the "angle" was the second coordinate. This provided an area picture. The equipment operated at the same frequency employed in the 1934 tests at Sandy Hook, and used a magnetron transmitter which was pulsed, and, in the final form, a super-regenerative special magnetron detector. The pulse length was less than a microsecond, and high definition was obtained. Distances as short as five feet could be indicated. This corresponds to a time between transmission and reception of only one one-hundredth of a microsecond. However, the apparatus required considerable adjustment and attention from an operator in order to keep it running properly. Moreover, the range was short.

Altimeter Tests Began in 1937

During the winter of 1937, there were reports of a number of fatal airplane crashes in mountainous regions. Because of this, a program was initiated in the Spring of 1937 to develop airborne equipment which would give a warning of approach to obstacles such as mountains and other aircraft. Owing to the instability and research nature of microwave components at that time, it was doubted that a practical airborne system could be put in operation until microwave components had been more fully developed, hence the highest frequency which could be used with standard components, namely 500 megacycles, was chosen for the airborne equipment.

In the latter part of 1937, this equipment was installed in RCA's Ford airplane and numerous flight tests were made during the ensuing two years against the Catskill Mountains and the Alleghenies of Pennsylvania. Two antenna systems were used in the installation. In order to get a signal against objects in front, an inverted V-type antenna was installed the length of the Ford airplane. Dipole antennas were installed under the airplane in order to get an altitude signal. With the airplane in level flight at the height of the mountain tops, a signal was obtained at a distance of about 5 miles. If the airplane were 1,500 to 2,000 feet above the mountain, no signal was obtained. The pulse, which returned from the ground, representing the altitude signal, always gave good results. Other airplanes flying a half mile in front of the radar equipped plane could be detected.

Radar Placed on Secret Basis

It had been our intention to give public demonstrations of this equipment as well as a modification of it for shipboard use to guard against collisions with other ships and icebergs. However, the military representatives who saw it, thought that similarity to aircraft detection equipment and its other military possibilities made such a disclosure inadvisable, and the development was put on a secret basis.

From 1934 to 1939, the Army and Navy Service laboratories and RCA were probably the only laboratories actively pursuing radar research in the United States. Whereas the emphasis of the service laboratories was then on their chief problem, namely, aircraft detection, our emphasis had been on the possible peacetime applications of radar, in particular as applied to aircraft and marine navigation and collision prevention. But beginning in 1937, as the situation in Europe began to look more ominous, RCA engineers began to direct their work toward military ends. Contracts were undertaken in 1937 to supply some of the equipment for the first Army high-power search radar sets, and later for shipboard aircraft detection equipment for the Navy. In the early part of 1939, a 475-megacycle radar set was placed on the *U.S.S. Texas* at the same time that a lower frequency set, designed at the Naval Research Laboratory, was placed on the *U.S.S. New York.* These were the first two radar sets to be installed on Navy ships. The RCA Victor Division was given orders for the first shipboard radars, six in number, which were supplied commercially to the U. S. Navy.

From 1939 on, the development of radar equipment was devoted entirely to military requirements. The RCA Laboratories and the RCA Victor Division have participated in many of the developments of new equipment and have manufactured large quantities of sets. The altimeters that were developed as a result of the early experiments, and later the FM altimeter, have been the standard equipment for the Army and Navy and the British.

RCA Develops Tail-Warning Unit

Following the initial shipboard sets, numerous other pieces of equipment have been produced, particularly for installation on destroyers. The tail-warning set used on the Army and Navy fighter aircraft was an RCA development. Loran units for aiding in the navigation of both aircraft and surface ships have been made in an improved design and manufactured in quantity. The most accurate of the instrument bombing equipments, which was one employing radar, was initially developed and later manufactured by RCA. Details of many of these projects are still in the classified category and cannot be revealed.

As war became more imminent, first a small number and finally all industries in the electronic field were given information about radar by the services. From them came enormous quantities of equipment, and they have contributed greatly to research, development and manufacture. The Radiation Laboratory at the Massachusetts Institute of Technology, staffed with some of the best physicists in the country, has done an outstanding job.

Britain and U. S. Join Forces

The British development of radar paralleled that of the U. S. Service laboratories in the early 1930's. However, being closer to the scene of military action than the United States in the latter part of that era, they expanded their activities much more rapidly and consequently made faster progress. In 1940, when the first British radar mission visited this country, England had laboratories set up with more than a thousand engineers including many of their best scientists.

The outstanding contribution of the British was the development of the microwave tubes which made microwave pulse radar possible. They also awakened the U. S. to the enormous potentialities of radar. With this background, the Radiation Laboratory group, helped at the start by various industrial firms who had had microwave experience, were able to develop equipment in a practical form and expand its usefulness enormously.

Now that the war is over, it is to be expected that the RCA organization will again devote a major part of its effort on radar to the development of peacetime applications. The development has been so extensive during the war that most of the fundamental research is completed.

U. S. Signal Corps.

EARLY MODEL OF RADAR IN OPERATION ON AN ITALIAN HILLSIDE. THE THREE GRID-LIKE ANTENNAS GIVE AZIMUTH, ELEVATION AND RANGE OF OBJECT DETECTED.

Western Union To Use RCA Relay

AUTOMATIC MICROWAVE RADIO SYSTEM DEVELOPED BY RCA ENGINEERS WILL REPLACE HUNDREDS OF THOUSANDS OF MILES OF WIRE LINES, TELEGRAPH COMPANY ANNOUNCES.

A NEW super-high-frequency radio relay system developed by engineers of the Radio Corporation of America will be used by the Western Union Telegraph Company to improve and speed its service between the major cities of the United States.

In announcing Western Union's plans for the new relay system on October 22, A. N. Williams, President, predicted that radio relay systems ultimately will replace many of the familiar pole lines and hundreds of thousands of miles of wire in the company's 2,300,000-mile telegraph network.

Development by RCA of the new system is one of the most significant advances in the communications field in modern times, according to Dr. C. B. Jolliffe, Vice President in Charge of RCA Laboratories. It climaxes more than twenty years of radio relay research and engineering by RCA.

An experimental radio relay circuit was established between New York and Philadelphia last spring by RCA and Western Union, with the sanction of the Federal Communications Commission. It has been successful in meeting all of the tests imposed on it, according to Western Union, and has provided the experience required for the proposed nationwide radio relay system.

Employing radio microwaves transmitted by towers spaced approximately 30 miles apart, the relay system will provide a larger number of channels than are now available for the handling of telegraph traffic, it was said, and also will provide circuits for new uses and for special leased networks required by large users of the telegraph.

With this type of radio relay, Dr. Jolliffe pointed out, it is possible not only to send telegraph messages in multiple numbers over one circuit simultaneously and with the speed of light, but to transmit telephone calls, commercial high-speed facsimile, radio-photos, and FM (frequency modulation) broadcast programs. In addition, it can be used to operate automatic typewriters and business machines at widely separated terminal points.

"Tests conducted with RCA Victor apparatus in cooperation with Western Union over an experimental circuit between New York and Philadelphia," Dr. Jolliffe said, "have demonstrated that the radio relay system functions more efficiently than one using pole lines, without having the limitations or costly maintenance of wires. It is reasonable to believe that besides the wide use such systems will eventually have in communications services in this country, including those for transport vehicles and aircraft, they will be especially well adapted to rehabilitate and expand communication services in foreign lands."

Credits Three Engineers

Dr. Jolliffe credited three engineers of the RCA Victor Division, Camden, N. J., with development of the microwave system to be used by Western Union. They are Donald S. Bond, head of the project; L. E. Thompson, contributor of original ideas for the circuit, and Gerald G. Gerlach, supervisor of field installations and tests.

The system, which was manufactured by the RCA Victor Division, has these marked advantages over conventional systems: virtual elimination of distortion due to interference; simpler, more reliable and easier maintained; less equipment required at relay towers and lower cost of operation.

Radio relay stations in the system are automatic, unattended towers so perfectly designed that, despite the fact that they participate in the transmission and reception of every signal set in motion, their presence in the circuit causes no delay or interference.

In its first major move to use radio relays, the telegraph company revealed that it has applied to the Federal Communications Commission for permission to establish experimental radio relay systems between New York and Washington, New York and Pittsburgh and Washington and Pittsburgh, and a secondary system between New York and Philadelphia.

This first step, a part of Western Union's extensive post-war improvement program, is known as "The New York-Washington-Pittsburgh Triangle." Its establishment in time will permit the removal of approximately 2,500 miles of pole lines, some 54,000 miles of wires and 180 miles of aerial and underground cable.

The system planned for the "Triangle" would provide radio beams in each direction. Each beam could be equipped to provide 270 multiplex circuits, so that 1,080 operators could transmit telegrams simultaneously over a beam in one direction, but there is no present likelihood that traffic between any two cities would require such a large capacity. The radio relay facilities, however, may be used for various kinds of circuits, including multiplex, facsimile and teleprinter.

AUTOMATIC, UNATTENDED RADIO RELAY TOWERS, LIKE THE ONE ABOVE, MAY ULTIMATELY REPLACE THOUSANDS OF MILES OF TELEGRAPH AND TELEPHONE LINES IN THE UNITED STATES.

New RCA Image Orthicon Demonstrated

SUPER-SENSITIVE ELECTRONIC "EYE," SHOWN FOR FIRST TIME, PICKS UP SCENES IN CANDLELIGHT AND DARKNESS—SOLVES MANY PROBLEMS OF TELEVISION ILLUMINATION.

A NEW television camera tube of revolutionary design and sensitivity, called the RCA Image Orthicon, which has been withheld from public view for many months because of wartime secrecy, was exhibited recently in studio and remote pickups. It not only transmitted scenes illuminated by candle and match light but performed the amazing feat of picking up scenes with infra-red rays in a blacked-out room.

In the exhibition, arranged for newspaper and magazine writers in a studio of the National Broadcasting Company, Radio City, with the cooperation of NBC's engineering and production staff, members of the audience saw themselves televised under lighting conditions that convincingly proved the super-sensitivity of the new electronic "eye." The new tube solves many of the major difficulties of illumination in television programming and makes possible 'round the clock television coverage of news and special events.

Scenes from a special rodeo show arranged at Madison Square Garden for the visiting United States Navy Fleet gave the invited guests further evidence of the tube's superiority. Exciting cowboy acts were picked up by the Image Orthicon and transmitted to the studio in a comparative demonstration showing its advantage over conventional television pickup tubes in providing greater depth of perception and clearer views under shifting light conditions.

RCA-NBC engineers capped the demonstration by blacking out the studio where the writers were assembled, and providing the unprecedented spectacle of picking up television scenes in apparent darkness. Unseen infra-red (black) lights were turned on, but it was so dark that a member of the audience could not see the person next to him. Then on the screens of television receivers in the studio appeared bright images of persons in the room. The Image Orthicon tube, it was explained, achieved the feat through its sensitivity to infra-red rays.

Aladdin's Lamp of Television

"This is the Aladdin's Lamp of television," declared John F. Royal, NBC Vice-President in charge of television. "Its revolutionary effect on lighting problems means that many of our major difficulties of illumination will be eliminated.

"This new instrument which is easily portable and suitable for use in every field of television opens new vistas that challenge the imagination."

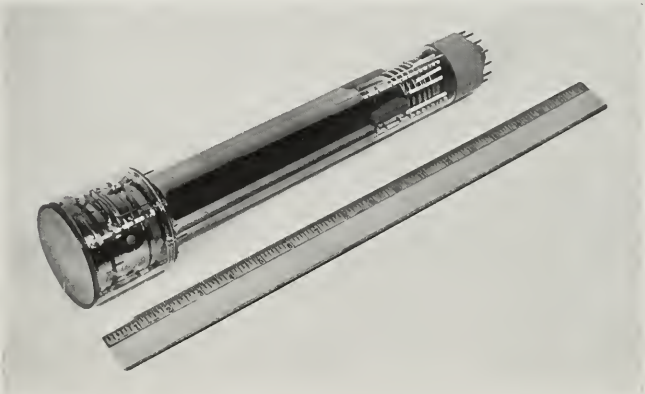
Declaring the Image Orthicon to be 100 times more sensitive than conventional pick-up tubes, E. W. Engstrom, Research Director of RCA Laboratories, Princeton, N. J., said the tube emerged in its present form much sooner than would normally have been the case, because of wartime research.

Credit for the tube's development goes to three members of the RCA research staff: Dr. Albert Rose, of Middletown, N. Y., Dr. Paul K. Weimer, of Wabash, Ind., and Dr. Harold B. Law, of Kent, Ohio. The project is a continuation of RCA Laboratories' work on the pick-up tube over the past 20 years under the direction of Dr. V. K. Zworykin, Associate Director of RCA Laboratories. During part of that period, the work was headed by B. J. Thompson, Associate Director of the Laboratories, who was killed in action overseas in July, 1944, while on a special mission for the Secretary of War.

Engineers of the tube division plants in Lancaster, Penn. and Harrison, N. J. have been engaged in development of the Image Orthicon for military applications and will be responsible for the final commercial design of the tube for television uses.

Announcing incorporation of the Image Orthicon in a new super-sensitive television camera to be manufactured by RCA Victor, Meade Brunet, General Manager of the Company's Engineering Products Division, said that deliveries

REVOLUTIONARY IN DESIGN AND SENSITIVITY, THE RCA IMAGE ORTHICON IS THE MOST COMPACT TUBE IN THE FAMILY OF TELEVISION "EYES." THE ELECTRON IMAGE UNIT, SCANNING MECHANISM AND POWERFUL ELECTRON MULTIPLIER SECTION ARE INCLUDED IN A CASE ONLY 15 INCHES LONG AND 3 INCHES IN DIAMETER.



on the camera are expected to be made to television broadcasters in about six months.

RCA engineers listed these specific advantages in performance of the Image Orthicon:

1. Ability to extend the range of operations to practically all scenes of visual interest, particularly those under low-lighting conditions.
2. Improved sensitivity, permitting greater depth of field and inclusion of background that might otherwise be blurred.
3. Improved stability which protects images from interference due to exploding photo flash bulbs and other sudden bursts of brilliant light.
4. Smaller size of tube, facilitating use of telephoto lens.
5. Type of design that lends itself to use in lightweight, portable television camera equipment.
6. Improved gain control system that provides unvarying transmission, despite wide fluctuations of light and shadow.

How the Tube Works

Resembling a large tubular flashlight in size and appearance, the advanced development model of the Image Orthicon has an overall length of about 15 inches, with the shank about two inches in diameter and the head about 3 inches in diameter and 3 inches long. It has three main parts: An electron image section, which amplifies the photoelectric current; an improved Orthicon-type scanning section, smaller and simpler than those built before the war; and an electron multiplier section, the function of which is to magnify the relatively weak video signals before transmission.

The principle which makes the new tube super-sensitive to low light levels is similar to that which enables RCA's famous multiplier phototube to measure starlight. This principle, known as secondary electronic emission, involves the use of electrons emitted from a primary source as missiles to bombard a target or a series of targets, known as stages or dynodes, from each of which two or more electrons are emitted for each electron striking it.

Light from the scene being televised is picked up by an optical lens system and focused on the photo-sensitive face of the tube, which emits electrons from each illuminated area in proportion to the intensity of light striking the area.

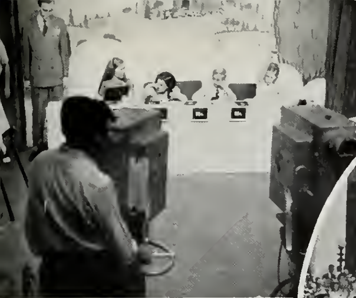
Streams of electrons, accelerated by a positive voltage applied to a grid placed directly behind the photo-sensitive face and held on parallel courses by an electromagnetic field, flow from the back of the photo-sensitive face to a target. Secondary emission of electrons from the target, caused by this bombardment, leaves on the target a pattern of varying positive charges which corresponds to the pattern of light from the scene being televised.

Electrons Stop Short of Target

The back of the target is scanned by a beam of electrons generated by an electron gun in the base of the tube, but the electrons making up this beam are slowed down so that they will stop just short of the target and return to the base of the tube except when they approach a section of the target which carries a positive charge. When this occurs, the beam will deposit on the back of the target enough electrons to neutralize the charge, after which it will again fall short of the target and turn back until it again approaches a positively charged section.

The returning beam, with picture information imposed upon it by the varying losses of electrons left behind on the target, is directed at the first of a series of dynodes near the base of the tube; secondary electrons "knocked out" of this electrode by the bombardment strike a second dynode, and this process continues, with the strength of the signal multiplying at each stage until it reaches the signal plate and is carried out of the tube through an external connection.

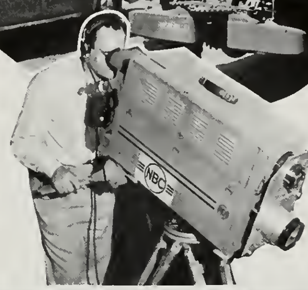
NBC ANNOUNCER BEN GRAUER AND USHERETTE BETTY BEUHLER DEMONSTRATE HIGH SENSITIVITY OF IMAGE ORTHICON USING ILLUMINATION OF ONE CANDLE. BELOW: GREATLY SUPERIOR SENSITIVITY OF CAMERA USING THE IMAGE ORTHICON (FOREGROUND) IS COMPARED WITH PERFORMANCE OF CONVENTIONAL CAMERA IN PICKING UP SCENES FROM THE RODEO AT MADISON SQUARE GARDEN.

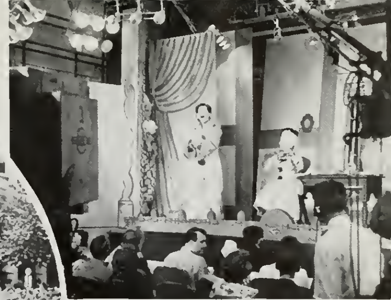


UTH CONDUCTS AN "INFORMATION PLEASE" FOR TELEVISION.

LLOWING HIS RELEASE FROM A JAP ISON, A JOURNALIST TELLS HIS STORY BEFORE THE CAMERA.

FILMS OF GEN. EISENHOWER'S WASHINGTON RECEPTION WERE TELECAST THE SAME DAY FROM NEW YORK.





AN ACTUAL NBC STUDIO AUDIENCE BECOMES PART OF THE SCENE OF AN OPERATIC EPISODE.

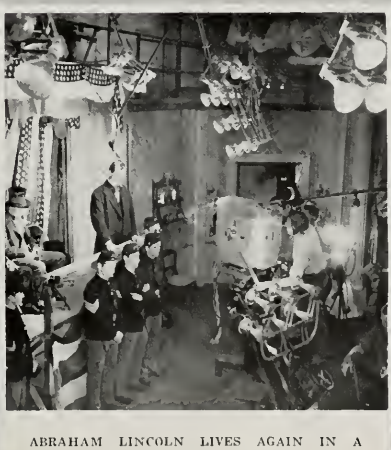
A STRIKING BACKDROP AND STAGE SETTING CREATE THE ATMOSPHERE FOR A RURAL PLAYLET.

The Play's the Thing

NBC TELEVISION STUDIOS

SNOW MACHINE IS FILLED WITH CORN AKES AND SCRAPS OF PAPER TO CREATE A WINTRY SCENE.

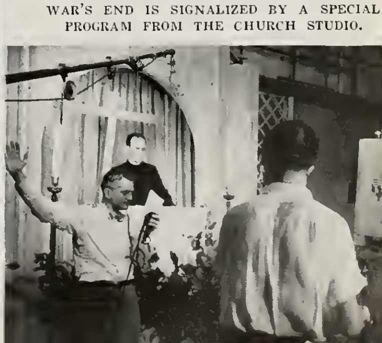
LEVISION CAMERAS FOCUS ON A TEAM OF INTERPRETIVE DANCERS.

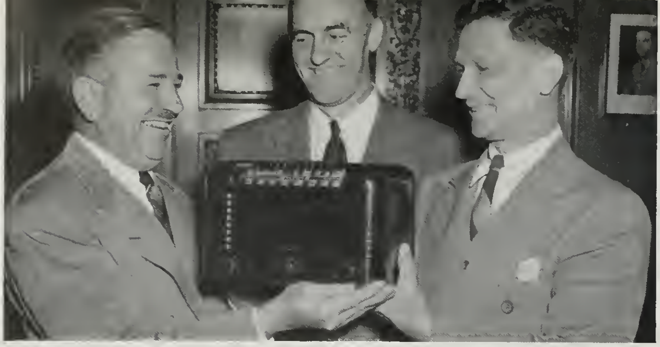


ABRAHAM LINCOLN LIVES AGAIN IN A DRAMA ADAPTED FOR TELEVISION.

A COMMENTATOR ADDS THE "SOUND TRACK" TO A NEWSREEL AS HE WATCHES IT ON THE TELEVISOR SCREEN.

WAR'S END IS SIGNALIZED BY A SPECIAL PROGRAM FROM THE CHURCH STUDIO.





RCA VICTOR OFFICIALS EXPRESS SATISFACTION AS THE FIRST 1946 MODEL RADIO RECEIVER COMES OFF THE PRODUCTION LINE AT THE BLOOMINGTON PLANT. LEFT TO RIGHT: FRANK M. FOLSOM, EXECUTIVE VICE PRESIDENT IN CHARGE OF RCA VICTOR DIVISION; J. B. ELLIOTT, GENERAL MANAGER, HOME INSTRUMENTS DIVISION, AND J. B. MILLING, MANUFACTURING DIRECTOR.

RADIO SETS IN PRODUCTION

Blueprints for Reconversion, Held in Preparation for V-J Day, Speed Up Assembly of First RCA Receivers for 1946.

By Frank M. Folsom

Executive Vice President in Charge of RCA Victor Division

THE day following the end of the war, a number of my associates and I sat in Camden reading the hundreds of telegrams and letters cancelling the production of military, radar, and electronic equipment. These cancellations wrote the final chapter to the story of RCA Victor's contribution to victory.

In six years of wartime engineering and production, RCA Victor never failed in its obligations. Our war efforts have been commended again and again by the Government and by men in the armed forces who depended upon RCA Victor equipment. When peace came, it did not find us unprepared, for practical long-range plans had been carefully made for this event.

One of the first steps taken toward reconversion was a streamlining of organization so that we are better equipped and more efficient to meet the stiff competition which is anticipated. Basically, the RCA Victor Division has been divided into four separate businesses, each virtually a complete organization in itself. These four commercial divisions are Engineering Products, Home Instruments, Records and Tubes.

Within their separate spheres, each of these businesses has the responsibility for all functions of the business, including engineering, purchasing, manufacturing, accounting and selling. All these functions are the responsibility of a General Manager, who in turn reports to the Operating Vice President of the RCA Victor Division. This modern streamlining within the organization will help to insure fast action and efficiency.

Markets were studied and their potentialities mapped. While it is estimated that goods manufactured for the armed forces will comprise about 30 per cent of our total output in 1946, overall sales are expected to be considerably above the prewar figure in all divisions — Home Instruments, Records, Tubes, and Engineering Products. Some indication of the market potentialities for records and Victrolas alone is pointed up by the estimate that only about 15 to 18 per cent of all radio-owners who have phonograph turntables.

Distribution methods, too, came in for their share of analytical study during the period of planning for peacetime production. The result is that RCA Victor is geared to a streamlined, more efficient distribution system. The new program calls for fewer distributors, many of whom cover a wider area.

Sales training courses have also been inaugurated for men who are now in the field selling peacetime products.

Peacetime manufacturing will be devoted to the radio, electronic and sound reproduction fields, in which RCA has long been a leader, and which offer unlimited possibilities for expansion. Major products assigned to each of the seven RCA Victor plants are:

CAMDEN: Broadcast transmitters, communications equipment, electron microscopes, industrial electronic equipment, motion picture recording and reproducing equipment, aviation radio equipment, sound systems, home television receivers, industrial television equipment, records, export radio and many other products.

INDIANAPOLIS: Radio console sets, Victrolas, record changers, records, auto radios, receiving tubes.

BLOOMINGTON: Small radios and Victrolas of all types.

HARRISON: Receiving and allied type tubes.

LANCASTER: Power, cathode-ray, photo and special type tubes.

SAUGERTIES: Tube mount assemblies.

HOLLYWOOD: Film and disc recording, manufacture of records.

To Enlarge Floor Space

Anticipating a substantial upswing in production and sales, RCA Victor plans to add 400,000 square feet of manufacturing floor space in the next few years, including an additional plant at Indianapolis for the production of radios and the expansion and modernization of record-making facilities at Camden, Indianapolis and Hollywood. Plans are also being made for the continued use of the 825,000 square feet of space added during the war, which will be largely used for the manufacture of radios and engineering products, such as special electronic apparatus for industrial use, testing devices, and motion picture equipment.

Speaking generally, we expect to be back on a normal peacetime schedule in about six months. Fortunately, no important reconversion problems are involved in the manufacture of electron tubes, and at Harrison, Lancaster, Indianapolis and Saugerties, work is going forward on receiving, power, cathode-ray, and special type tubes for civilian applications.

Similarly, the manufacture of RCA Victor records has no reconversion problems. Immediate expansion is being undertaken in the Record Division, which during the war has been able to supply only about half of the public demand.

Small Sets First Off Line

In the Home Instruments Division, speed of production has been considered a prime factor in reconversion. The changeover pace was stepped up to the point where deliveries on a Kick-Off Line comprised of nine outstanding models were expected to start during October. A number of table model sets were produced in our Bloomington plant under government contract for shipment to Army and Navy bases overseas for morale purposes. Other commercial sets for export were in partial assembly in Camden. Final production has been delayed and our delivery schedule set back because of our inability to get parts and components. However, we expect that small sets should be in full production by the end of the year and consoles by early 1946.

Included in the Kick-Off Line are two new models — a personal radio and a table model automatic Victrola — two console Victrolas, and five table model radios. Taken as a whole they represent an exceptional line of RCA Victor radios and phonographs engineered to give maximum performance and housed in beautiful cabinets styled to conform with anticipated postwar trends in designs.

The Kick-Off Line will be supplemented, rather than supplanted, by additional new models as they become ready for production, until the RCA Victor home instrument line covers all classes of product.

In the television field, it is not expected that receivers will be ready for delivery to distributors before from six to nine months. It is impossible to predict the time when full production will be under way until it is known what the approximate demand will be. However, it is hoped that our first television sight-and-sound receivers will reach the market during the second quarter of 1946.

Some engineering products should be ready for delivery in approximately 30 days and in full swing in about six months.

The problems of reconversion are numerous, but they are being tackled with a determination to keep work interruption at a minimum. Our factories, warehouses, and storage space have been crowded with Government material —raw materials, work which was in process for war purposes, and completed equipment ready for shipment. These must be removed to provide room for new materials.

We estimate that the expansion program as now viewed should result in an average employment of about 23,000 persons, as compared with the prewar normal of around 18,000 and the wartime peak of approximately 32,000.

AMONG THE NEW RCA VICTOR RADIO RECEIVERS ARE THE PERSONAL RADIO (LEFT), SMALL ENOUGH TO FIT INTO A TOPCOAT POCKET, AND THE DELUXE RADIO-PHONOGRAPH CONSOLE WITH ROLL-OUT RECORD CHANGER AND A "PERMANENT POINT" PICKUP.

MUSIC LIBRARY SERVICE ADDS NBC THESAURUS

Recorded music from the National Broadcasting Company's extensive Thesaurus Library, listing more than 4,000 titles, has been added to the RCA Music Library Service to augment its current catalogue of records available for industrial sound system broadcasting, according to Philip J. Jacoby, manager of RCA Victor's industrial music service.

Thesaurus offers the orchestras of Xavier Cugat, Vincent Lopez, Horace Heidt, Dick Jurgens, Lawrence Welk, Tony Pastor, and others, in the popular hit class; favorite waltzes and musical comedy successes by the orchestras of Harry Horlick and Norman Cloutier, and favorite marching airs by Dr. Edwin Franko Goldman's band of 60 pieces.

RCA Music Library Service is available to plants using industrial music systems and to music companies operating over leased phone wires and serving several plants from a central studio.

RCA Buys Brenkert Co.

Purchase of the Brenkert Light Projection Company of Detroit, and plans for expansion of its production facilities to meet increasing demands for Brenkert motion picture projectors and Brenkert arc lamps and accessories was announced recently by Frank M. Folsom, Executive Vice-President of Radio Corporation of America in charge of the RCA Victor Division.

The Brenkert Company, according to Mr. Folsom, will continue to operate as a separate company under its existing name, and Karl and Wayne Brenkert will remain active in its management.

The Brenkert firm has been engaged in the manufacture of high quality arc lamps for more than a quarter of a century, and in 1939 introduced to the trade a projector of its own design in which are incorporated many unique and advantageous features. This projector and Brenkert arc lamps and booth accessories have been marketed since 1941 through RCA theatre supply dealers.

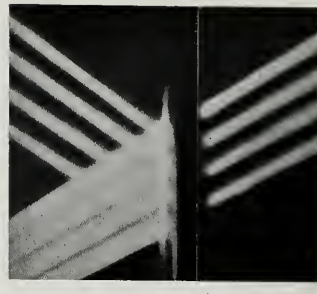
Splitting Light Beams

A PRE-WAR DEVELOPMENT IN SOUND-FILM RECORDING, IS PUT TO WORK TO INCREASE ACCURACY OF GUNFIRE.

By R. H. Heacock
Engineering Products Division
RCA Victor Division

THE optical phenomenon that causes bright blobs of color to appear when a thin film of oil floats on a puddle was put to work by RCA scientists to help our 40mm. anti-aircraft gunners draw a deadly accurate bead on Jap planes. The principle is used by RCA in processing a vital element of the new U. S. Army M-10 range finder, development of which was recently announced by the Eastman Kodak Company and the Rochester (N. Y.) Ordnance District of the Army. This element is a rectangular glass plate about the size of a calling card, but ¼-inch thick, with a submicroscopically thin chemical coating. Its function is to "split" the light striking it, transmitting a band of light with one color predominating, at the same time reflecting a band with the complementary color, both functions being carried out without absorbing any light within the reflector.

This reflector is a direct outgrowth of a pre-war development made by G. L. Dimmick of RCA's Indianapolis Engineering Department for the solution of a Hollywood sound-film recording problem. At that time Mr. Dimmick developed a color selective reflector for separating out from the modulated light-beam a band which is not very useful for photographic exposure but which is highly efficient for operating the phototube of a monitoring system. Thus in the film recording application, the reflector enables direct monitoring of the modulated light-beam without detracting measurably from its photographic exposure values. This represents a decided improvement over the type of monitor which divides the light on a purely quantitative basis and, therefore, noticeably reduces the light available for activating the emulsion on the film. This development was described by Mr. Dimmick in the January 1942 issue of the Journal of the Society of Motion Picture Engineers.



WHEN WHITE RAYS (LOWER LEFT) STRIKE A COLOR SELECTIVE REFLECTOR AND ARE SPLIT, THE TRANSMITTED RAYS (RIGHT) HAVE A YELLOW COLOR AND THE REFLECTED RAYS (UPPER LEFT) ARE BLUE.

Before discussing the principal application for similar reflectors in military range finders, it may be well to review briefly the best known methods by which light may be divided on quantitative and qualitative bases.

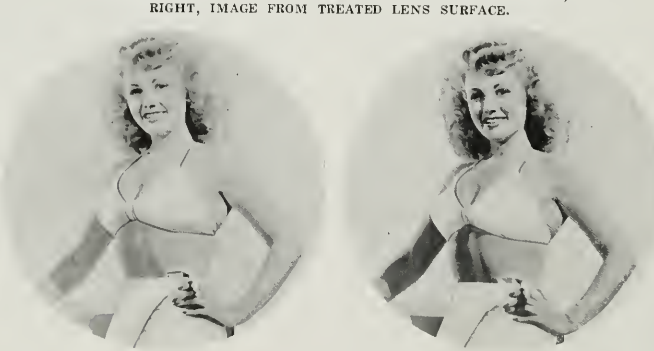
The common method for dividing light on a purely quantitative basis is to employ a partially silvered surface, that is, one with such a thin silver coating that part of the light passes through and part is reflected. These are far from 100% efficient because the silver film actually absorbs an important percent of the light it intercepts.

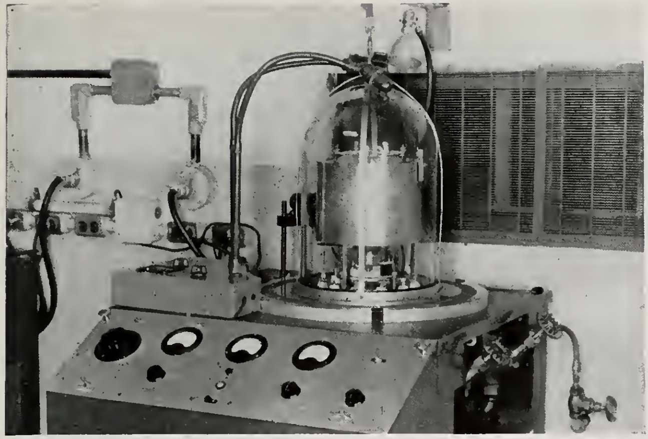
Standard Method Inefficient

A standard method for dividing light on a color selective basis is by means of colored glass or gelatine filters which are inefficient for many applications because they also absorb much of the light energy.

RCA has developed unique light dividers which employ the same optical interference phenomena which make low-reflection coatings possible. Reflectors which divide the light quantitatively and others which divide the light qualitatively (by color) are both made by the Company. They are phenomenally efficient because they have practically no absorption.

LOW REFLECTION COATINGS APPLIED TO BINOCULAR LENSES INCREASE LIGHT TRANSMISSION AND DECREASE SURFACE REFLECTIONS. LEFT, BELOW: IMAGE FROM UNCOATED LENS; RIGHT, IMAGE FROM TREATED LENS SURFACE.





LENS COATING EQUIPMENT DESIGNED AND DEVELOPED BY RCA. MATERIAL TO BE TREATED IS PLACED IN BELL-SHAPED VACUUM CHAMBER.

As used in the new range finder, the light divider serves to transmit to the eyepiece two separate images, one of one color, and the other of a complimentary color. To range the target, the gunner, by manipulating controls on the finder, superimposes the two images until a sharp natural-colored image appears. The finder is mounted on an automatic director which computes range and height factors and aims the battery of guns by applying firing data to them electrically.

The earlier counterpart of the reflector plate employed a partially metallized surface to make it semi-reflective and thus divide the light on a quantitive basis. Colored filters of the absorption type in the rest of the optical train subsequently created the dual images of different colors which the gunner superimposed by manipulation of the controls, as is done with the new sight.

Half of Light Lost

The inherent disadvantage of the metallized-surface reflector was its absorption of approximately 50% of the light striking it. This loss, coupled with absorption and reflection losses in the colored filters, made the device relatively inefficient. Furthermore, because the two images formed by the earlier device did not include all the colors of the spectrum, the "on target" coincident image could not be a natural-colored one as with the new instrument.

Because the light absorption of the new color-selective reflector is negligible, its use approximately doubles the amount of light put to useful purposes, resulting in a much brighter final image with appreciably more contrast. These properties provide easier ranging operation, as well as increased accuracy.

Coating Eliminates Reflection

In order to eliminate the possibility of reflection from the other side of the optical plate, it is customary to coat this surface with conventional, low reflection coating. Low reflection coatings very markedly decrease surface reflection and, at the same time, increase light transmission. One of the illustrations gives an artist's conception of the effect of low reflection coating applied to a pair of binoculars. Not only is more light transmitted, but a marked increase in contrast is obtained.

Any of the three types of coatings referred, namely, quantitative reflectors, color selective reflectors or low reflection coatings, may be produced on the same general type of equipment. Coatings are actually made by evaporating materials within a vacuum jar. Very careful control of thickness of the layer of each material is obtained.

All three types of coatings have played an active part in making our combat optical devices better and more useful instruments. It is believed that the same properties which made them useful in war devices will help establish them in our post-war devices of peace.

STORE TELEVISION TESTED BY GIMBEL

Television has rolled up its sleeves and gone to work to prove its power to make shopping easier and more economical for Philadelphia and, eventually, for the rest of the country's department store shoppers.

Using the practical theme, "Television Goes to Work", the most extensive demonstration of intra-store video ever held in a department store was previewed on October 23 at Gimbel Brothers-Philadelphia before an audience of department store executives, civic leaders, prominent professional and business men, educators, and radio executives. The demonstration was opened to the public October 24 for three weeks.

Under the supervision of RCA Victor engineers, a complete studio and control facilities were set up in the Gimbels store auditorium, where five hundred persons could witness the actual "shooting" of each of the television programs. In addition, 22 "telesites", or viewing centers, were located at strategic points throughout the store's seven floors.

Shanghai Circuit Open

RCA Communications, Inc., resumed radiotelegraph service to Shanghai with a substantial reduction in message rates on October 23. Under the revised tariff, the prewar rate of 74 cents a word between New York and Shanghai has been reduced to 24 cents, and the San Francisco-Shanghai rate to 20 cents.

The Shanghai circuit was opened by RCA in December, 1930, and continued in operation until December, 1941, when war interrupted commercial radiotelegraph communication with China.

AN RCA VICTOR EMPLOYEE DEMONSTRATES FLEXIBILITY OF NEW HIGH-FIDELITY RECORD.

UNBREAKABLE RECORDS

After Eleven Years of Research, RCA Victor Perfects Durable, High Fidelity Phonograph Disc of Flexible Plastic with Greatly Reduced Surface Noise.

PRODUCTION of the first non-breakable, high fidelity phonograph record for home use, announced recently by RCA Victor, adds another impressive achievement to the Division's list of "firsts." A pioneer in the record and phonograph field for 45 years, the Company has been identified with many outstanding improvements in recording and reproducing techniques, but development of the new type record has been acclaimed as the greatest advance in home phonograph records in that period.

The new non-breakable record, to be known as the Red Seal De Luxe Record, is the result of eleven years of research, covering many phases of technical exploration and development by our engineers. The final formula for the new record includes a compound composed almost entirely of vinyl resin plastic which produces a durable, long-life record.

The need for a non-breakable record has been long recognized by the industry. With a revival of the record business in the mid-thirties the need became more evident. Broken records have long been a big problem. When one considers there are approximately 10,000,000 children in this country between the ages of one and five years, many of whom have access to the family's record library, it is easy to understand the high incidence of record breakage, in addition to such breakage as might be caused by adults.

Record breakage has other annoying aspects. For example, a broken record in an album of recorded music is sometimes difficult to replace. The new De Luxe record eliminates this difficulty because, for all practical purposes, it is non-breakable.

Experiments Made in 1930

The first non-breakable record to appear on the market was made by the old Durium Company, back in 1930. It was not satisfactory and was soon withdrawn. However, this venture did serve one constructive purpose—it stimulated record engineers to examine the possibilities of a more durable disc than the standard shellac record.

Vinyl, the principal ingredient used in the new type record, is made from a series of thermoplastic resins and compounds. This material, termed by leaders in the plastic industry as one of the "most versatile plastics", scored one of its earliest successes when it was used for the making of expensive transcriptions for broadcast purposes. It was also used in the making of V-discs for the armed forces.

Weight is Reduced

Because this plastic compound does not require the mineral filler necessary in shellac records, the surface sound on the new record is substantially reduced. The new disc is the same size but its weight is somewhat less than the standard disc. Extensive tests conducted by engineers under the direction of H. I. Reiskind, Chief Engineer of the Recording Division, have determined that the new record can be played on practically all types of home phonographs, including those equipped with automatic changers.

The De Luxe record is exceptionally attractive. It has a glowing ruby-red color which lends itself to ready identification with the best in recorded music, along with the traditional Victor and RCA trade marks.

This record was first introduced at a special demonstration for music critics, record reviewers, feature writers, science editors, representatives of the metropolitan press and other selected guests in Radio City on August 30. Reaction was very favorable. Reports in the newspapers and magazines after the demonstration indicated that we had been justified in our belief that the public was ready for a non-breakable record.

The first Red Seal De Luxe album will be given general release this month. It is a brilliant performance of Richard Strauss' concert favorite, "Till Eulenspiegel's Merry Pranks," played by the Boston Symphony Orchestra under the baton of Serge Koussevitsky.

CALCULATES ANTENNA DESIGN

LONG, tedious mathematical computations which have been necessary in solving the intricate problems involving the location and arrangement of radio towers may now be replaced by a new electronic device called the Antennalyzer, Dr. George H. Brown of RCA Laboratories announced recently at a meeting of the Washington, D. C., section of the Institute of Radio Engineers.

Field tests and calculations, which formerly required weeks to perform, are now done in a matter of minutes by this electronic computing machine which adds and subtracts angles, multiplies, looks up trigonometric functions, adds numbers, squares them and finally takes the square root of the whole to produce the desired answer which the engineers must have to accurately locate a directional radio antenna.

The Antennalyzer, a new magic brain in the field of radio, consists of 52 electron tubes. The associate circuits can be adjusted to duplicate all characteristics of a projected antenna. In operation, the controls of the machine are regulated until a pattern of light on a cathode ray tube is identical with the desired pattern of transmission of the broadcast station. Final dial readings not only tell where to locate the towers, but give all electrical data needed to complete the most efficient antenna design.

Publishes New Magazine

First issue of a new Spanish langauge magazine, *Radio Mundial*, published by the RCA International Division is now being distributed throughout Latin America. The new periodical, a quarterly, is designed for Spanish speaking people interested in radio broadcasting, radio communications, television and allied activities.

PROBLEMS OF LOCATING AND ARRANGING ANTENNAS CAN BE SOLVED IN A FEW MINUTES BY THIS ELECTRONIC DEVICE.

NEW CIRCUIT LOWERS COST OF FM RADIOS

A NEW radio circuit for frequency modulation (FM) receivers which makes it possible for the first time to build a receiver that realizes the advantages of FM at a cost comparable to that of standard band receivers, was described by Stuart Wm. Seeley, manager of the Industry Service Division of RCA Laboratories, in a paper delivered to a recent meeting of the Institute of Radio Engineers in New York.

FM sets produced before the war, Mr. Seeley pointed out, required the use of one or more tubes whose functions were solely that of noise suppression. They contributed nothing to the volume of the receiver output. Furthermore, he said, to make these extra tubes fully effective, considerable amplification of the received signal was necessary. Although both of these requirements added noticeably to the cost of FM receivers, noise continued to be present when the strength of a received signal fell below a certain point called the threshold level.

According to Mr. Seeley, the new RCA circuit, called a ratio detector, is insensitive to electrical interference of all kinds, whether man-made by ignition systems, oil burners and domestic appliances, or natural, such as atmospheric static.

Mr. Seeley added that the new circuit is not only free of a critical threshold signal level, operating equally effectively on strong and weak stations, but its incorporation in a receiver eliminates the need for additional tubes and parts that formerly were considered necessary in frequency modulation receivers. It is this simplification, he said, that should reduce the manufacturing cost of FM receivers to a point comparable with that of receivers covering the standard broadcast bands.

The RCA Victor Division has announced that the development would be embodied in future models of RCA receivers.

STUART W. SEELEY CONDUCTS TEST ON A RECEIVER CHASSIS EMBODYING A NEW FM RADIO CIRCUIT WHICH REDUCES THE NUMBER OF TUBES REQUIRED.

AUDITIONS FOR SERVICEMEN

In First Year of "Welcome Home Auditions" Nearly Two Thousand Servicemen and Women of All Ranks Have Had Radio Try-outs.

ROYALTY has no option on a plush carpet welcome!

On October 9, 1944, the National Broadcasting Company unrolled its best "welcome mat," laid it on the mezzanine floor of its Radio City offices, and on it placed a desk, a file cabinet and a specially chosen reception committee, the latter in the person of Kathryn Cole.

That was the beginning of NBC's Welcome Home Auditions, the inauguration of a workable plan whereby the entire facilities of a radio network would be available to service men and women interested in radio as a career.

The plan, originated by Clarence L. Menser, NBC Vice President in Charge of Programs, provides that any person who wears, or has worn, a uniform in World War II is welcome to drop in to discuss his employment as a radio actor, musician, announcer or technical expert. Those who qualify are given an audition—either studio or committee—as soon as one can be arranged.

The procedure, organized by Mrs. Cole and carried out with the cooperation of George Maynard of the NBC production staff, has revealed interesting facts. In two months' functioning, 587 applicants were interviewed and 181 were auditioned. At the end of six months 2,102 service men and women came in for interviews with 796 auditioned. In one year's existence these figures have more than doubled: 4,602 interviewed, 1,848 auditioned.

Of those passing their auditions only 290 are dischargees and therefore available; of these, approximately 15 per cent have been employed in radio or allied positions. Of the total auditionees tested in either committee or studio hearing, approximately 22.8 per cent have passed and have been, or will be, recommended for employment when free to accept it.

Many of those seeking a radio career, the auditions revealed, have had no training and 50 per cent of the applicants have never been in a radio studio. Almost one third have had partial training or experience through regular educational channels or in military service. One fifth of those interviewed came in because of curiosity.

Nine Nations Represented

Nine countries — Great Britain, Canada, Australia, Holland, China, France, Argentina and Brazil—besides the forty-eight United States have been represented. Applicants have seen service in at least one of the war theaters, and some have seen action in all of them. Every branch of service, including the merchant marine, and every rank from private to colonel and seaman to lieutenant commander has visited Welcome Home Auditions.

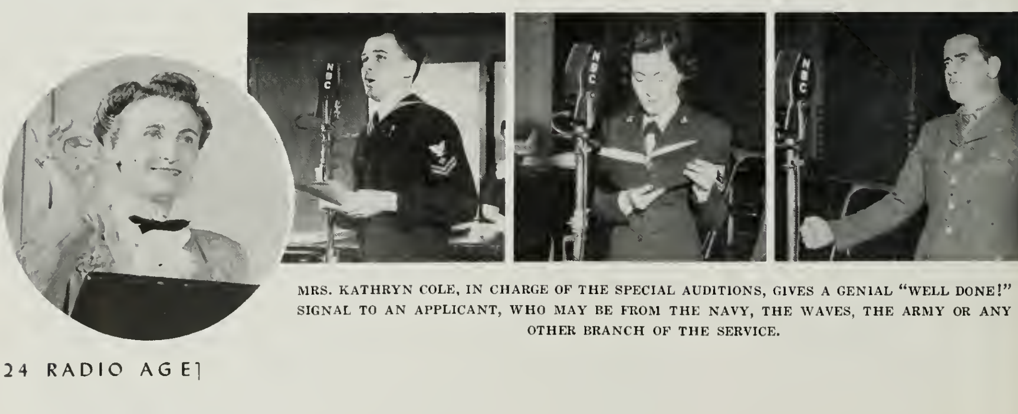
The procedure has been made flexible so that proper routing may be maintained to aid Welcome Homers. Those in the script writing or technical field are routed through the NBC personnel department. Members of the former group submit samples of their work to the script department, the latter to the engineering department. These nontalent classifications alone have accounted for 233 recommendations.

Those in the talent group—actors, singers, instrumentalists, announcers—are recommended to NBC affiliated stations once they have passed their auditions. Competing radio stations and networks have written Mrs. Cole for data on the available applicants.

Jobs Found for Forty-four

Since the beginning of the project, photographs have been taken of each successful auditionee and these pictures are attached to each recommendation sent to a radio station. As of September 25, Mrs. Cole has mailed 63,670 prints. Her recommendations have produced the following results: 15 announcers placed in commercial radio; 8 used as singers; 16 as actors; and 5 in script writing, guest relations or clerical jobs.

Welcome Home Auditions have come to the attention of men and women on foreign fronts through letters from their families or friends, or through the sound movie made by the U. S. Army Signal Corps. In consequence, inquiries by mail have reached the high figure of 3,924. These letters have come from every country on the Asiatic and European continents, as well as from countries in Africa and South America. Newly returned service



MRS. KATHRYN COLE, IN CHARGE OF THE SPECIAL AUDITIONS, GIVES A GENIAL "WELL DONE!" SIGNAL TO AN APPLICANT, WHO MAY BE FROM THE NAVY, THE WAVES, THE ARMY OR ANY OTHER BRANCH OF THE SERVICE.

RICHARD MC DONAGH, SCRIPT DEPARTMENT MANAGER, STUDIES A SHEAF OF REPORTS ON THE DAY'S AUDITIONS.

men and women have made 923 telephone calls to get WHA facts.

The seriousness of the entire project has not obliterated its human interest aspects. Victims of "mike-fright," strapping young sailors, beribboned and cited for bravery in battle zones, have slumped in limp faints at the feet of petite Mrs. Cole. A warrant officer with a dog which had been with him in army camps throughout the country came in for an audition—for the dog. The animal talked and played the piano. A young officer who might have been a double for Herbert Marshall came in one day. Plans were made for an audition, but, at the last minute, it was cancelled because he was recalled to the Pacific theater to broadcast to the Chinese people in their own language.

A former prisoner of war, whose earthly days are numbered because of the brutal treatment he had received, has had his audition, and the hopelessness in his heart has been alleviated by the knowledge that whatever the length of his life, he can do a job equally as well as someone with a greater life-span.

A blind boy has arranged for an interview through his sister, and when his health permits will come into the studio to sit at one of NBC's shiniest grand pianos.

Each passing day necessitates different handling of as many varied situations. The American Red Cross and Army and Navy hospitals have sent veterans to the Welcome Home Auditions as part of their mental therapy.

Mrs. Cole's philosophy has been based on one premise: to restore the faith of auditionees in themselves. She has consistently stressed the need of education and preparation. She has recommended that those who fail in their first attempt keep in touch with her, discuss what they are doing, and, at the end of six months or a year, make a second try.

No applicant is given the so-called "brush-off". All receive equal opportunity before impartial judges and go through their auditions without spectators. Never at any time is a Welcome Homer made to feel that he is a guinea pig for experimentation.

Welcome Home Auditions are just as they're stated—a cordial welcome, gracious hospitality and a friendly handshake to speed service personnel on the way to a successful radio career somewhere in the peaceful world they have fought to build.

MCGRADY RECEIVES MEDAL FROM PRESIDENT

Edward F. McGrady, Vice President in charge of Labor Relations and a Director of the Radio Corporation of America, has received the Medal for Merit, presented to him by President Truman in recognition of his services as consultant and advisor to the Secretary of War on labor problems for the duration of the war. Mr. McGrady was loaned by RCA for the special task at the request of the Secretary of War.

The Medal was accompanied by the following citation signed by President Truman:

"The President of the United States takes pride in presenting the Medal for Merit to Edward Francis McGrady for service as set forth in the following citation:

"For the performance of extreme services to the War Department as expert consultant to the Secretary of War and the Undersecretary of War from 2 January 1941 to 3 September 1945. To Mr. McGrady fell the task of advising the War Department on labor problems of the greatest magnitude, as well as carrying out plans to the end that a smooth over-all labor to the country's war industry would continue unabated. Mr. McGrady was throughout instrumental in strengthening the bond of cooperation between organized labor and the army; in settling and avoiding a large number of labor disputes that impeded, or threatened to impede the production of war materials; in promoting the maximum effort on the part of the labor leaders and the rank and file of American labor in support of the war effort. He performed particularly notable services in such fields as the troublesome but uniformly successful administration of Army-Navy "E" awards; and in securing labor's absolutely unqualified cooperation to the production of the atomic bomb. Through his intelligence, wise counsel, great tact and farsightedness, and through his clearheaded analyses of one of the most difficult situations facing the country, he distinguished himself by exceptionally meritorious conduct in the performance of outstanding services and materially contributed to the victory of the United Nations over their enemies."

EDWARD F. MC GRADY, RCA VICE PRESIDENT IN CHARGE OF LABOR RELATIONS.

ELECTRONS MAKE PATTERNS

New Instrument Extends Scope of Crystal Analysis—Device May Be Changed Instantly to Act as a Diffraction Camera or Electron Microscope.

By Dr. James Hillier
RCA Laboratories,
Princeton, N. J.

ALMOST twenty years ago Dr. C. J. Davisson and Dr. L. H. Germer, working in the Bell Telephone Laboratories, were bouncing relatively slow electrons on the surface of a piece of nickel in a vacuum tube. The results were not particularly spectacular. In the course of the experiments, however, they subjected the nickel to a heat treatment, probably to clean the surface, which happened to be just right to cause the normally small crystals in the nickel to rearrange themselves and form very large ones.

Then the bouncing electrons started behaving in a very unusual fashion. Being good scientists, Davisson and Germer found the new phenomenon much more interesting than their intended experiment and followed it up. They then built a tube in which the piece of nickel was a single large crystal and found that electrons bouncing off the surface tended to leave in a special direction.

They deduced correctly that they were observing the effects of electron waves which a Frenchman by the name of de Broglie had predicted should exist. Davisson and Germer's observations proved the correctness of de Broglie's theory and gave terrific stimulus to the newly developing quantum mechanics and to the development of electronic tools of analysis ultimately resulting in the development of the electron microscope and the electron diffraction camera.

A short time later Dr. G. P. Thomson, working in England, greatly simplified the Davisson-Germer experiment by using much faster electrons and by shooting them through thin metallic films in which the crystals were very small. He found that if he shot a narrow beam of electrons through the foil and put a photographic plate some distance on the other side that, in addition to the exposed spot due to the original beam, he obtained the series of concentric rings which we now call an electron diffraction pattern.

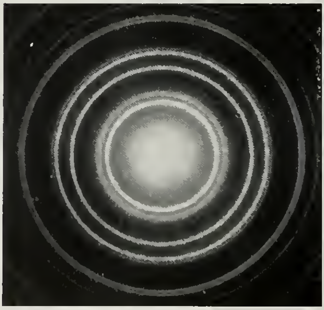
Thomson's experiments originated in a very clear-cut way the science of electron diffraction. Since it was already well known from similar work with X-rays that very few crystalline materials give the same diffraction pattern, it was obvious to Thomson and his contemporaries that the electron diffraction camera was an excellent method for analysis.

There are a number of everyday phenomena, which most of us have noticed, which make it quite easy for even the non-scientist to understand the formation of a diffraction pattern. Let us look at the factors involved. First there is a beam of electrons (or light or X-rays) which possesses a wavelength. That is just another way of saying that there is a regular vibration of some kind associated with the beam. Then there is the crystal in which the atoms are all lined up in regular rows and layers. If we have two beams in which the frequency of vibrations are the same or very nearly the same we have the possibility of interference between them.

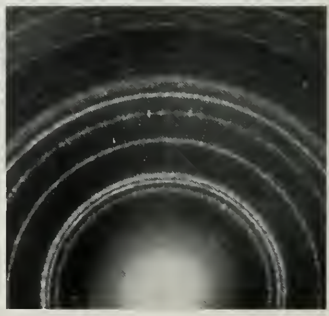
When Signals Fade

We have all heard a radio signal fade when the sky wave interferes with the ground wave. Then the two signals coming from the same station but by different paths are vibrating at the same rate but in opposite directions and cancel each other so the receiver detects no signal. (The engineer says they are out of phase) In the diffraction camera the phenomenon is almost the same. We have our signal (the beam) coming from a single station (the source of the beam) and striking the crystalline specimen before we detect it. At the crystal we find that the parts of the beam that strike the atoms of the first layer are reflected but the rest goes through to the second layer and the same thing happens and so on through the crystal. As far as our detector (the photographic plate) is concerned it is receiving a signal from one station but by a large number of paths. As you might expect, the signal is so confused that it almost invariably cancels itself

ELECTRON DIFFRACTION PATTERN OBTAINED FROM A THIN GOLD FILM.



PATTERN OF ZINC OXIDE SMOKE PARTICLES SHOWS RING CONSTRUCTION.



LEFT: CRYSTALS OF GRAPHITE AS THEY APPEAR UNDER THE DIFFRACTION CAMERA. THE SYMMETRY OF THE BEADS IS A RESULT OF THE HEXAGONAL STRUCTURE OF GRAPHITE. CENTER: COMBINATION ELECTRON MICROSCOPE AND ELECTRON DIFFRACTION PATTERN OF A SINGLE FLAKE OF GRAPHITE. THE CENTER IS A TRUE ELECTRON MICROGRAPH AT ABOUT 5,000 MAGNIFICATION. RIGHT: DIFFRACTION PATTERN OF BAUXITE CRYSTALS.

out and the detector receives nothing. However, if conditions are just right so that all the reflected signals are vibrating together when they leave the crystal then the detector receives a very strong signal. In the diffraction camera this means that no reflection is obtained from the crystal unless it is situated at just the right angle to the beam. Such a reflection leaves a spot on the photographic plate.

So far our explanation accounts for only one spot on the pattern yet the pattern shown here is a series of rings. The specimen was not a single crystal, however, but literally millions of very small ones arranged completely at random. If we examined one of the rings closely we should find that it is really made up of a large number of spots; each one due to a different crystal. Each of those crystals happened to be at just the right angle relative to the beam to reflect part of it by a definite amount. However, they do not necessarily do so in the same *direction.* In fact, since in every other regard the arrangement of the crystals is random, the result is the circle we observe.

Accounting for Rings

Accounting for the different rings in the pattern requires a little further understanding of the nature of a crystal. We have said that the crystal is made up of row upon row, and plane upon plane, of atoms regularly spaced in all directions. That means there are many different ways of picking the rows and planes which describe the crystal. It is like looking over a field of regularly planted corn. The corn was planted in regular rows both along and across the field so that the farmer could use a machine cultivator in both directions and thus cultivate all around each hill without doing hand work.

Crystals Have Many Planes

As we look over the field, however, we see that the corn is also arranged in rows other than those the farmer originally laid out but which came about as a result of the original regular arrangement. The same effect occurs in a crystal. There are many ways of finding regularly spaced planes in the crystal each of which can produce a reflection if the crystal is situated properly. In the corn field we would notice that the distance between extra rows is different than the distance between the intended ones. In the crystal this is also true and means that the angle of reflection from each one of these extra sets of possible planes is different.

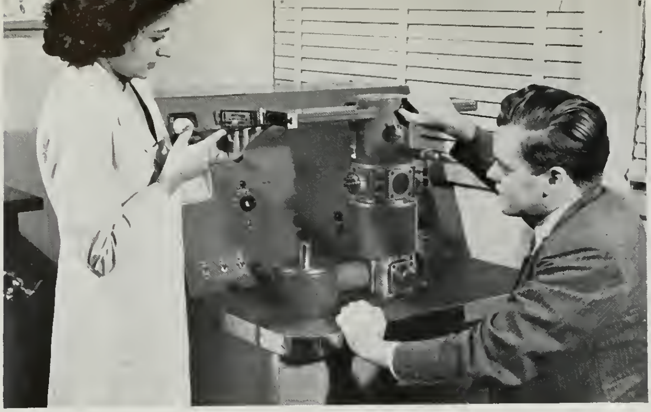
The crystallographer with a good knowledge of geometry can work out what the diameter of each ring in the pattern, due to some special crystal, ought to be. Thus, the actual diffraction pattern he obtains quickly substantiates or reputes his guesses as to the nature of the specimen.

Diffraction as a method of analysis had been well worked out, using X-rays long before Thomson's experiments. When he obtained his results it was obvious that electrons could be used as an alternate means of accomplishing the same result. Quite a lot of work was done using early cameras. Unfortunately, the X-ray technique was better known and better developed so that little was done about designing good electron diffraction cameras in spite of a number of inherent advantages which they have for precise work in a general laboratory. Electrons can be focused, X-rays cannot; an electron diffraction pattern can be made in a matter of seconds while it takes hours in the X-ray camera.

Microscope Becomes a Camera

With these and a number of other points in mind the RCA Laboratories developed an adapter for enabling an electron microscope to be used as an electron diffraction camera whenever further analysis of the microscope specimen seemed to be desirable. This was the first application of precision electron optics to the problem of electron diffraction and the results were so encouraging that even further development was initiated. The result has been the construction of an experimental model of a new type of electron diffraction camera.

The new instrument has several new features which the designers feel will make it an important scientific tool in the not too distant future. For instance, the diffraction patterns which it gives are ten to



DR. JAMES S. HILLIER AND A LABORATORY ASSISTANT AT THE CONTROLS OF THE RCA DIFFRACTION CAMERA.

one hundred times sharper than was previously possible; the instrument can be changed instantly from an electron diffraction camera to an electron microscope, or vice versa, without touching the specimen. But most important of all is its ability to produce the diffraction pattern of a small microscopic crystal at the same time that the crystal is being observed in the electron microscope.

Action of the Electron Beam

This new instrument is much like an RCA electron microscope and even incorporates many of the same parts. However, there are also a number of differences. In the first place, the vacuum tube part of the instrument, or the actual instrument, is turned upside down. The electron beam starts from under the table and travels upwards. As usual a heated tungsten wire supplies the electrons and a steady voltage of 50,000 volts speeds them up until they are traveling in a nice beam up the instrument at about 90,000 miles a second.

Then the beam passes through two electron lenses just like the lenses used to magnify objects in the electron microscope but working backwards. Instead of magnifying several thousand times they reduce things by the same amount. Still another difference — the lenses do not reduce an image of the specimen but of the electron source. This gives us what we wanted in the first place, an artificial source of electrons which we can make extremely small—less than a millionth of an inch across.

Because we have formed this artificial source by means of lenses which we can control we find we can do all sorts of things with it to make it work for us. For instance if we move this artificial source up to the top of the camera so that it strikes the photographic plate, and also place the specimen down near the lens, we have the ideal condition for a very sharp diffraction pattern.

Going back to our radio station analogy, we see that the original source is the broadcasting station, but we have focused the signal so that only one receiver on the plate can receive the signal when there is no specimen. This is something you cannot normally do with ordinary broadcast wavelengths but which you can do with very short wavelengths. When we put in the specimen then the crystal planes reflect the signal but only in the very special directions we have discussed above. Since the focusing still affects the reflected signals only the receivers in exactly the right places on the plate receive any signal. Thus we say we have a focused diffraction pattern.

This is not all we can do with our artificial source. By changing the strength of one of our lenses we can move it down near the specimen. Then it behaves quite differently. We have all observed the sharp and large shadows we get on the wall if we put an object near a candle flame, as compared, for instance, with the shadow from a frosted electric light bulb. The same thing happens when we put our artificial source of electrons very close to our specimen. We get on our photographic plate or fluorescent screen an extremely sharp and highly magnified electron shadow of the object. In fact, the shadow is so sharp that it compares favorably with a regular electron microscope image.

But that is not all that our particular electronic slave will do for us. Except for extra precision and convenience everything so far has been more or less conventional. By setting our artificial source somewhere between the specimen and the plate we find that we can pick out a single microscopic crystal on our specimen and obtain a diffraction pattern from that crystal only, at the same time we are observing it. This, in all likelihood, will turn out to be the most important part of this work.

Only Minute Samples Needed

Probably the most important way of determining the arrangement of atoms in a molecule is by the interpretation of the X-ray diffraction pattern obtained from a large single crystal of the material. Implicit in the method, however, is the necessity of having sufficient material for the crystal and the method of forming it. Very often in the analysis of a new material, only microscopic quantities are available and there are no known methods of obtaining a single crystal. In the new diffraction camera, operated in the last manner described, both of these difficulties are eliminated. The amounts of material necessary are too small to be comprehended—a millionth of a millionth of an ounce —and the problem more often is to obtain that minute amount of material in crystals that are sufficiently small.

Thus, our story must be concluded as we arrive at this point. The next step, which is already under way, is to apply the new instrument to some actual problems and to see what happens. As the English say: the proof of the pudding is in the eating.

NEW TELEVISION ANTENNA

Thin Spire Crowning WNBT's Radiators atop the Empire State Building Will Be Used for Tests of 288-Megacycle Transmitter.

PEDESTRIAN New Yorkers gazing skyward in mid-summer saw a rising scaffolding gradually enclosing the spire-like television antenna of Station WNBT atop the Empire State Building tower. When the framework was removed a few weeks later, a new antenna came into view riding the old one in pick-a-back fashion. The newcomer, looking from the street more like a thin lightning rod than a complicated assembly of rods and spheres, was then revealed as a new antenna erected for the purpose of field tests centering around the 288-megacycle, 5-kilowatt television transmitter recently developed in RCA Laboratories.

The two antennas were arranged in this manner for a definite engineering reason. In order to make direct comparison between transmissions on 288 mc. and the present #1 channel (50-56 mc.), it was desirable that both radiating systems be at approximately the same height. By mounting one directly above the other, this condition was fully met.

The antenna for the 288-mc. channel is of the Turnstile type, thus insuring the broad frequency response necessary for successful television transmission. To further aid in obtaining the desired frequency response, the radiators themselves were constructed of copper tubing two inches in diameter. In addition, metallic spheres, six inches in diameter, were mounted on the radiators in such a fashion that the radiator element itself passed through the sphere.

The antenna structure, which was completely fabricated before erection, is made completely of metal with the radiators grounded to afford lightning protection. A lightning rod is also mounted on top of the support post. The transmission lines feeding each of the radiator elements are inside the mast. Heating elements are mounted in the radiators so that formation of ice may be prevented. Two sets or layers of radiating elements are used in order to concentrate the radiating energy toward the horizon. Many more layers are desirable but the mounting of a taller structure on the existing framework would present many difficult construction problems.

RODS AND CONES, FORMING THE 288 MEGACYCLE ANTENNA, CAN BE SEEN THROUGH THE SCAFFOLDING ON WHICH RIGGERS WORKED WHILE PUTTING THE NEW STRUCTURE IN PLACE.

ELEMENTS OF THE NEW ANTENNA ARE VISIBLE ATOP THE CIRCULAR PORTION OF WNBT'S TELEVISION ANTENNA.

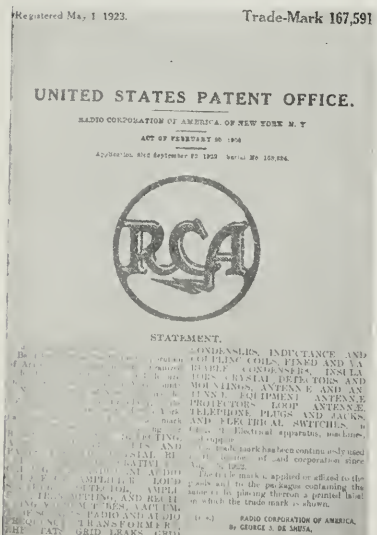
A specially-constructed transmission line of the coaxial type with insulators spaced carefully to insure a "smooth" line was installed. The total length of this line is 350 feet with 250 feet of the line hanging vertically. An air compressor and a drying chamber, to absorb moisture from the air, feed dry air to this transmission line, thus, keeping the line under pressure and preventing the entrance of moisture. This special line, which has an outer conductor consisting of a stiff copper tubing approximately one and one-half inches in diameter, leads from the transmitter room on the 85th floor of the Empire State Building to a spot a few feet below the roof of the building. From this point to the antenna a semi-flexible transmission line was used since it would have been very difficult to pass the stiffer copper-tubing line through the maze of structural members in the interior of the low-frequency antenna support tower.

HISTORY OF RCA TRADE-MARK

Symbol Was Introduced 23 Years Ago With Pledge That It Would Stand for "The Highest Expression of The Advancing Art Of Radio"

By Abraham S. Greenberg
Ass't Patent Attorney,
Radio Corporation of America

TWENTY-THREE years ago, in the earliest days of broadcasting, Radio Corporation of America pledged that the symbol "RCA" should stand thenceforth for "the highest expression of the advancing art of radio." In the years that have followed this statement, the symbol has been altered slightly in its abstract form, but its meaning and the pledge that accompanied its birth have grown in importance with the passage of time.



Registered May 1 1923. Trade-Mark 167,591

UNITED STATES PATENT OFFICE.

RADIO CORPORATION OF AMERICA, OF NEW YORK, N. Y.

ACT OF FEBRUARY 20, 1905.

STATEMENT.

RADIO CORPORATION OF AMERICA,
By GEORGE S. DE SOUSA,
Treasurer.

OFFICIAL "BIRTH CERTIFICATE" OF A FAMOUS TRADEMARK. THE SYMBOL HAS SINCE BEEN REGISTERED IN MANY FOREIGN COUNTRIES.

It would have been difficult in 1922 to foresee how much the Company would spend on Research and Advertising in the following two decades. It would have required an even keener vision to prophecy the growth of the Company from its humble birth to the outstanding position it occupies today, reaching, as it does, into almost every human activity, while reflecting the skill and determination of its personnel in producing products that touch the daily lives of millions of people.

The impact and meaning of the RCA symbol have kept pace with the Company's development. In the minds of those who see it in advertisements, on products and on counter displays all over the nation, it strikes a favorable response. Because of this wide public acceptance, there has grown up around the three letters an accumulated warmth and affection which we call "good will." It would be futile to attempt to calculate the intrinsic value of the trade-mark. By some justifiable standards of evaluation such a figure might easily scale into the millions of dollars.

As the RCA organization evolved, it absorbed other well-known companies. This expansion was accompanied by the acquisition of other famous trade-marks such as "Victor," "Victrola," "Red Seal," and Nipper, (dog listening to a phonograph), to name only a few. The accumulated goodwill presently enjoyed by the RCA organization is the commercial "reaction product" of these several trade-marks. Although inanimate, they are certainly as much a part of the selling and distributing agencies as are the salesmen themselves.

It is little wonder then, that our most famous trade-mark, "RCA", is zealously protected. Naturally, with a property so valuable it is to be expected that unscrupulous traders cast envious glances at the symbol.

The RCA trade-mark in its monogram style was registered in the U.S. Patent Office, May 1, 1923. Other registrations were granted for its use on different goods. In addition, numerous registrations of the mark exist in most foreign countries.

Old files reveal that the three letters (R.C.A.), separated by periods, were used in the earliest years of the company. The Annual Report for 1921 carried an example of this form. A short time later, the punctuation was omitted, and the resulting condensed form remained unaltered until the lightning flash, symbolizing electricity, was added to the base of the letter "A." This change is believed to have been suggested by Mr. E. J. Nally, first president of the corporation.

Two Letters in Early Symbol

Unknown, however, to most people, there was a time when the accepted monogram was a two-letter affair with the "R" and "C" superposed in a circle. Mr. R. C. Edwards, then a Company architect, is credited in the records with the design of that combination. It appeared in the company's first home radio catalog in September 1921. The next evolutionary step was taken in 1922 when the late William A. Winterbottom, for many years president of RCA Communications, Inc., wrote to David Sarnoff, at that time General Manager of the Radio Corporation of America, suggesting the addition of the third letter "A."

Obvious as this change seems today, it caused considerable discussion when proposed, objectors contending that the public could memorize two letters easier than three. However, the General Manager sided with the sponsor of the idea and the present monogram became the established mark.

The first use of the symbol, complete with three letters and the lightning flash, was in an advertisement of the Aeriola Grand—("with stand, $350."). What is even more interesting at this time is the fact

LEFT: THE RCA SYMBOL IS LAUNCHED NATIONWIDE WITH A TRIBUTE BY MARCONI. ABOVE: SUCCESSIVE STEPS IN THE DEVELOPMENT OF THE COMPANY TRADEMARK.

that the launching of both the mark and the product carried the expressed blessings of Senatore Guglielmo Marconi, "father of Radio."

From that time on, much effort, expense and ingenuity were expended toward a single goal, viz., to impress upon the public memory that the alphabetical triad, RCA, referred to the Radio Corporation of America and to that firm alone. One of the unusual methods adopted to promote the trade-mark was a traveling road show which was booked to all parts of the country to spread the message of RCA.

Approved by General Sarnoff and directed by George Clark, RCA historian, the show started out on a run that outdid even the fabulous "Abie's Irish Rose." For eight years, Clark and his troupe and exhibits ranged the land, eventually covering all but eight states.

The show played to a total audience of over twenty-four millions and the total cost of the project, including cost of exhibits, transportation, labor and salaries, was over three quarters of a million dollars. The show was given in 146 different cities and towns, sometimes returning to the same cities in successive years. Almost 500 showings were made during the existence of the traveling display.

Since purpose number one of the show was to link the company's name with its initials, Director Clark or one of his assistants concluded each lecture in each city with the statement: "When you see the letters RCA, or the RCA monogram, that means Radio Corporation of America."

Magazine Pays Tribute

Persistent hammering of the symbol through these years accomplished one of the fastest "trademark selling jobs" in the history of merchandising. Two years after the adoption of the trade-mark, the Radio Corporation of America and its trade-mark "RCA", had become so well known that *Collier's Weekly*, in an editorial on October 18, 1924, credited "much of the sound and at the same time marvelous radio progress made in this country . . . to the splendid and untiring efforts of the Radio Corporation of America."

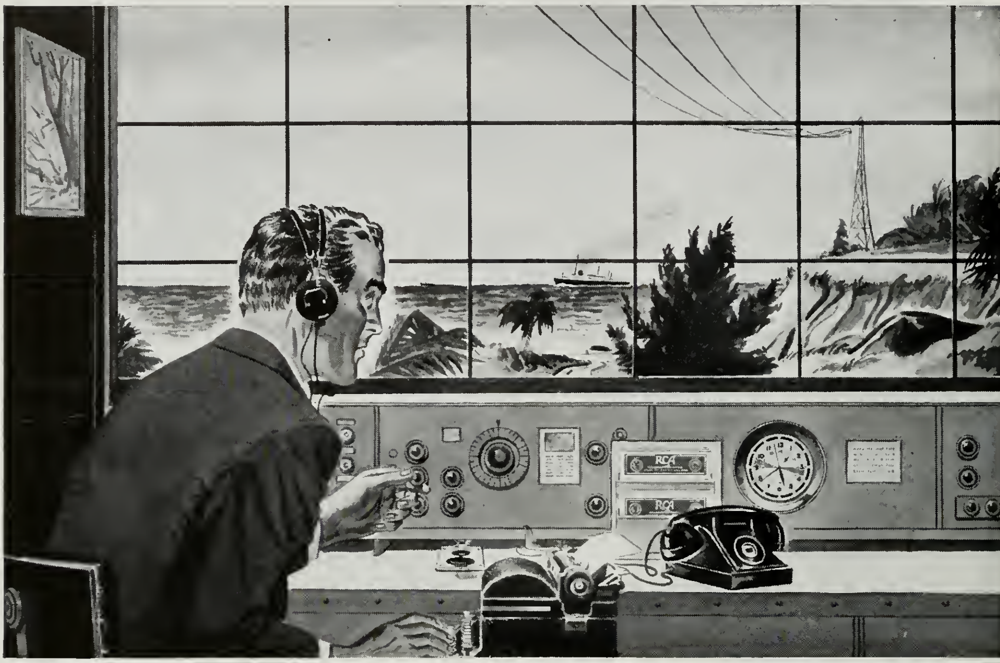
If clinching proof of the effect of this constant attention given to the importance of the company trademark is needed, it was supplied on January 24, 1944, when the Court of Customs and Patent Appeals, Washington, D. C., in handing down a decision in the case of Radio Corporation of America v. Rayon Corporation of America, ruled as follows:

> "It is our opinion that the testimony abundantly establishes that the combination of the letters 'RCA' is generally understood by the public as meaning Radio Corporation of America."

NBC ADDS WING TO HOLLYWOOD STUDIOS

Ground will be broken soon for a new wing to NBC's West Coast Radio City at Sunset Boulevard and Vine Street, Hollywood. In announcing the expansion, Niles Trammell, NBC President, said that the addition would not only provide space for two audience studios, but would make available much-needed room for the West Coast offices of NBC Radio Recording division.

INVISIBLE LINKS 'twixt SHIP and SHORE



In normal times, ships of all nations navigating the seven seas handle thousands of radio telegrams to and from all parts of the world through Radiomarine coastal stations along the Atlantic Gulf, and Pacific Coasts of the United States. Vessels traversing our inland waters are similarly served by Radiomarine radio telegraph and radio telephone shore stations on the Great Lakes and on the Mississippi.

All these stations have direct connections with national and international telegraph, telephone, and radio systems, thus assuring fast, efficient through communication service at all times.

In addition to their message service, Radiomarine shore stations maintain continuous watch for distress signals from the sea and are ever on the alert to render aid to distressed vessels when disaster strikes. These stations also broadcast weather reports for the benefit of ships' navigators and transmit daily news bulletins for those who "go down to the sea in ships."

When war restrictions on maritime communications are lifted, no vessel equipped with modern long range Radiomarine apparatus need ever be out of touch with the home office or with friends and relatives ashore. Radiomarine Corporation of America, 75 Varick St., New York 13, New York.

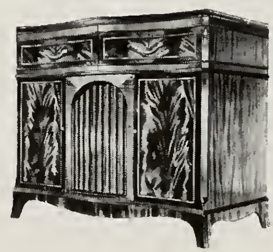
RCA

RADIOMARINE CORPORATION of AMERICA

A SERVICE OF RADIO CORPORATION OF AMERICA

Don't miss *The RCA Show* on Sunday afternoons at 4:30, E.W.T. Dial in your local NBC station and hear the world's greatest artists as guest stars.

There's something in heredity . . .



CUTE PUPPIES are "a dime a dozen." They may be born of any kind of dog parents . . . But *champion* Collies can be produced only by the most careful selection from pedigreed Collie stock. Heredity counts!

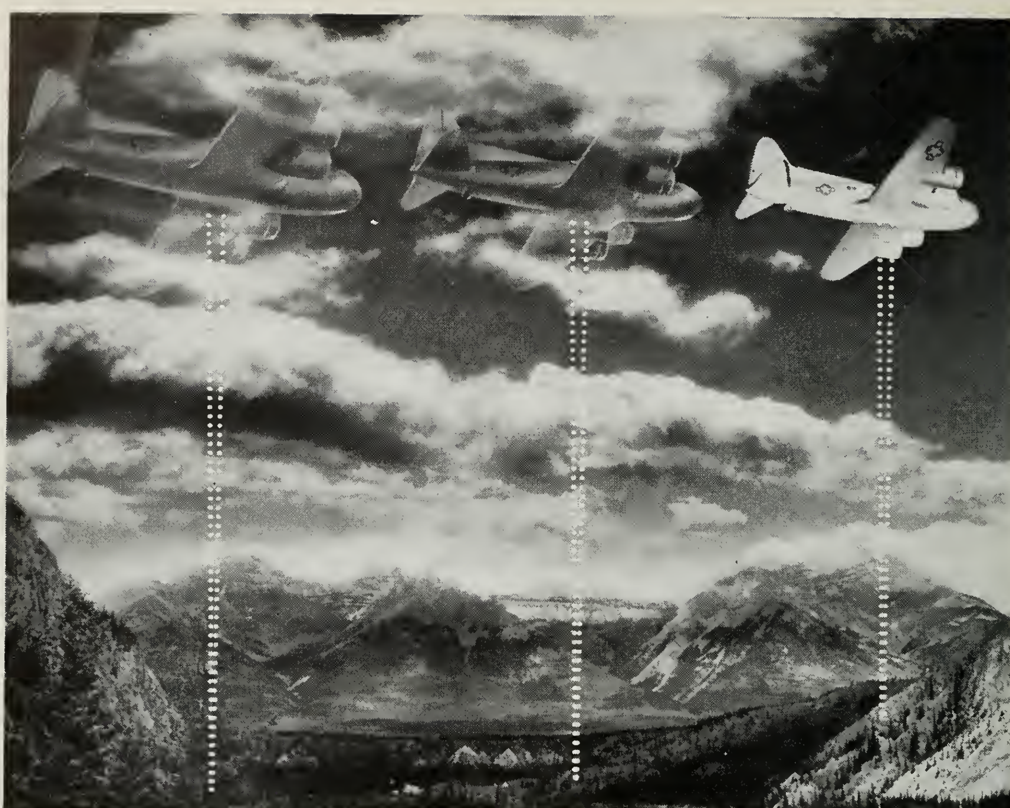
Your first postwar radio set—whatever its name—will also be the result of the background and experience of its makers. And in *engineering* where will you find a background of achievement equal to that of the Radio Corporation of America? . . . In the whole field of recorded *music* where will you find experience comparable to that of Victor?

As soon as radio sets are available, make your selection carefully . . . And at whatever price you decide to pay, you'll find added enjoyment and added pride in owning a set which bears the combined name of the acknowledged leaders in two fields—RCA Victor.

THE NEW RCA VICTOR SETS will include many great improvements—the result of extensive experience gained in building 350 different types of war equipment, *none of it ever manufactured by anyone before* . . . FM and television, of course. Radios and the famous Victrola (made only by RCA Victor) will range from excellent low-priced table models to fine automatic consoles. See your RCA Victor dealer before you buy.

RCA VICTOR

RADIO CORPORATION OF AMERICA



The RCA Radio Altimeter assures that the last mountains have been passed before letting down to the airport in the valley below.

Measuring "every bump on the landscape" –at 20,000 Feet!

A radio altimeter – that indicates the exact height above land or sea – is another RCA contribution to aviation.

Old-style altimeters gave only the approximate height above sea level – did not warn of unexpected "off-course" mountains.

To perfect a better altimeter was one of science's most baffling problems. So RCA developed an instrument so accurate it "measures every bump on the landscape" from the highest possible altitudes... so sensitive it can measure the height of a house at 500 feet!

This altimeter – actually a form of radar – directs radio waves from the airplane to earth and back again . . . tells the pilot exactly how far he is from the ground... warns of dangerously close clearance . . . "sees" through heaviest fog or snow.

All the radio altimeters used in Army, Navy and British aircraft were designed and first produced by RCA. This same pioneering research goes into *every* RCA product. So when you buy an RCA Victor radio, Victrola, television receiver, even a radio tube replacement, you enjoy a unique pride of ownership. For you know it is one of the finest instruments of its kind that science has yet achieved.

Radio Corporation of America, Radio City, New York 20. *Listen to The RCA Show, Sunday, 4:30 P. M., E. T., over NBC.*

The RCA radio altimeter will be a major contribution to the safety of post-war commercial flying. The section at the left sends the radio waves to earth and back again while the "box" at the right – timing these waves to the millionth of a second – tells the navigator the plane's exact height in feet.

RCA **RADIO CORPORATION of AMERICA**

Science in Democracy

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

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

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

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

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

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

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

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

Freedom to Pioneer

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

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

Vigorous Policy Needed

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

For this purpose, every phase of