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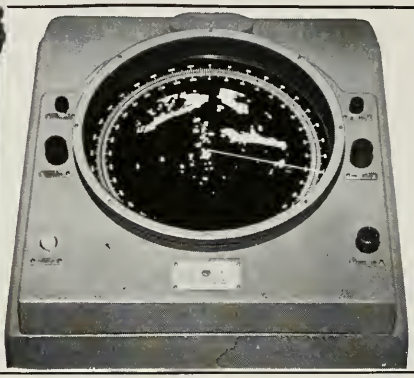

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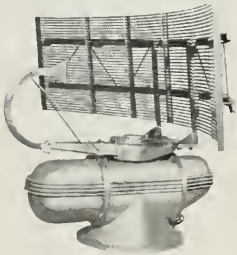

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RADIO AGE

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COVER

New RCA Victor table model television receiver which is now in production. The instrument tunes to 13 station channels and provides a bright, clear picture $6\frac{1}{2}$ x $8\frac{1}{2}$ inches.

VOLUME 6 NUMBER 1 OCTOBER 1946

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

LEWIS MACCONNACH, *Secretary* ARTHUR B. TUTTLE, *Treasurer*

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RCA IMAGE ORTHICON CAMERAS PICK UP ARMY-CORNELL GAME AT WEST POINT FOR TRANSMISSION OVER NBC'S TELEVISION STATION WNBT, NEW YORK.

40 YEARS IN RADIO

DAVID SARNOFF, PRESIDENT OF RADIO CORPORATION OF AMERICA, HONORED AT DINNER ON THE FORTIETH ANNIVERSARY OF HIS ENTRY INTO THE FIELD OF RADIO

Friends and associates of Brigadier General David Sarnoff met in New York at a dinner on the evening of September 30, to observe the 40th anniversary of his entry into the field of radio. Lieutenant General J. G. Harbord, Chairman of the RCA Board of Directors, as toastmaster, read the following messages:

From the President of the United States—

I have heard with pleasure about the dinner which is being given you tonight in honor of your forty years in the radio industry. I wish I could be with you. I should like to associate myself with your colleagues in the deserved tribute they are paying you for your part in the development of radio. Your forty year span of service with radio is almost exactly the span of the radio industry itself. Yours has been a significant part in bringing it from its infancy to its present imposing stature. The whole world of communications is your debtor. I have specially in mind at this time your fine contribution to the war effort and what you are now doing through UNESCO in the promotion of cultural relations with other countries. With your associates in the industry, I salute you warmly and send my very best wishes for your continued success and happiness.

HARRY S. TRUMAN

From the Governor of the State of New York—

Hearty congratulations to you and your associates on your fortieth anniversary in radio. It is a high tribute to all of you that radio has come through so many critical years stronger and better able than ever to serve the needs of the American people. With every good wish,

THOMAS E. DEWEY

From the Mayor of the City of New York—

Dear General Harbord:

At the time I accepted an invitation to attend the dinner in honor of my good friend, General David Sarnoff, to mark his fortieth anniversary in radio, I fully intended to be present. In fact, I looked forward to that pleasure. However, as I explained to General Sarnoff over the telephone this morning, circumstances have developed which make it impossible for me to attend. I will certainly be present at the pre-dinner reception.

I had the pleasure of meeting General Sarnoff in Rome, Italy, in 1944. Since then, particularly since the first of the year, I have had no hesitancy in calling upon him for his advice and counsel whenever I believed I needed it. He always responded like a true friend and public-spirited citizen.

General Sarnoff has become an outstanding figure in the field of communications from the time he first became associated with Marconi two score years ago, and he has established a record of patriotic and public service which has endeared him to all of us. He will always have my esteem and affection.

WILLIAM O'DWYER

From the Secretary of War—

I wish to extend my warmest felicitations on your completion of forty years of continuous service in radio. You began as a pioneer in the marvelous development of the new science of wireless communication. It is good to know that you are continuing as a pioneer in the new and apparently almost limitless field of further development of this mysterious force.

During your long service in the practical application of this science to the benefit of humanity you have retained the same youthful vigor and enthusiasm and the same lively imagination that characterized your first service as a young employee of the Marconi Wireless Telegraph Company in 1906.

I would like to join your many friends and admirers in hope that you will long continue to serve the public in the ever expanding field which you have done so much to develop.

ROBERT P. PATTERSON

From the Secretary of the Navy—

Navy joins with your friends and associates in extending best wishes on the occasion commemorating your forty years of service to radio. The story of this service is an inspiration to all. Your varied contributions to industry and the advancement of science have been of lasting benefit to the nation and the welfare of the world. My warm regards and best wishes.

JAMES FORRESTAL

From the American Ambassador to Russia—

Sincere congratulations and affectionate good wishes on your famous anniversary in radio. I still regret that you were not able to take over the job running communications in Germany but I will always be grateful for the magnificent work you did while a member of Supreme Headquarters Staff.

BEDELL SMITH

TOASTMASTER: Dr. Karl T. Compton, president of the Massachusetts Institute of Technology, needs no endorsement from us as the leading physicist of the world. In the best sense, a public citizen, a wise counselor on public affairs and in business, he has dominated a world-wide range of interests from Boston to Bikini, measured in either direction.

DR. COMPTON SPEAKS

Excerpts from address by Dr. Compton:

THE career of the man whom we honor tonight is material for one of those stories which, put together, constitute the epic of America. It is a career which illustrates what fine things can be accomplished when native ability, ambition and character find scope for free enterprise in a land of opportunity. Sometimes in the newspapers of towns or small cities we see a headline "Local Boy Makes Good" and this is always a source of satisfaction, but it is still more of an achievement when one who is not a "local boy" makes good in a new environment. David Sarnoff, like such other men as Michael Pupin and William Knudsen, carved out his career in American as an adopted home and has been a fine example of loyal, helpful, creative citizenship. Dr. Sarnoff, I honor you for what you are, as well as for what you have accomplished.

It is not too much to say that the electron is at the heart of most of the business of the Radio Corporation of America, just as Dr. Sarnoff is at the head of this business. I have no doubt that if the electron had not been discovered for another fifty years, Dr. Sarnoff would have found some other important field for successful achievement and service, but nevertheless the coincidence of Dr. Sarnoff and the electron has been a happy one. . . .

The role of electronics in scientific research and development for military purposes was played in almost every aspect of military operations and the utilization of instrumentalities and weapons of war. . . . The arts of detecting and locating airplanes and submarines, probably the two most critical specialized new features of the past war, are very largely problems in electronics. Navigation systems for aircraft and ships and some of the best devices for directing anti-aircraft fire were of electronic character.

The story of the work of the Microwave Committee [of the National Defense Research Committee], whose special staff was largely concentrated in the Radiation Laboratory of M. I. T. but which operated in the closest and most helpful coordination with the research and engineering departments of the various industrial companies, and with various other educational institutions, and with the procurement and later the operating divisions of the Army and Navy, is one of the finest stories of effective, loyal and unselfish cooperation of a great group in the entire annals of applied science. All who participated in this program deserve recognition and praise, but in view of the special circumstances of this gathering I would now pay special tribute to the personal services rendered by Dr. [Ralph R.] Beal and Loren Jones of the Radio Corporation of America, and the wholehearted cooperation of its laboratories, engineering and production departments, and the unwavering backing by the administrative officers of the organization headed by David Sarnoff.

TOASTMASTER: One of the things that I have valued most in my connection with the Radio Corporation of America has been the opportunity to know and associate with Owen D. Young, whose early interest and affection for our Company has never lessened. One of my opportunities, and, may I add, one of my pleasures as Chairman of the Board of Radio Corporation of America for the last sixteen years, has been from time to time to sound off the praises of my most brilliant junior, David Sarnoff. On this particular occasion, however, Mr. Young's long-time affection and keen personal interest in a protege unmistakably indicate him as the one who should introduce to you the president of the Radio Corporation of America for the final address of the evening.

AN INTRODUCTION BY OWEN D. YOUNG

General Harbord; my dear David, my dear electron. (Laughter) I am thankful to Dr. Compton for relieving me from the responsibility of introducing the electron, because it is a privilege—certainly a privilege pleasing to me—to introduce David.

It is not an onerous task, because so many of you know all the things that he has done—well, you don't know them all. I know some that you don't know; Mrs. Sarnoff knows some that you don't know; I know some that she doesn't. It's a delicate task, therefore, Mrs. Sarnoff, for me to draw the line on what should be said.

When I was in college, Dell Sawyer lived downtown—he was older than I—and it was in the north country, where it's very cold —and he had a way of getting a little interior heat. One day when I went downtown, he said, "Owen, you see that man across the street?"

I said, "Yes; what about him, Dell?"

He said, "I know enough about him to put him in state's prison."

I said, "Why don't you do it?"

He said, "He knows too much about me." (Laughter)

Now if there are some things left unsaid by me tonight about David, it's only because he speaks after me. (Laughter)

I want to say this at least: that in the inevitable march of the generations, one of the most impressive experiences of accumulating years—and I claim to have accumulating years—is in the spring between the generations, at the point of maximum efficiency, which is seldom more than twenty years. Naturally, there must be a long period of preparation by education and apprenticeship before one moves to maximum power. Then he enters as a junior, probably in his forties —David beat it a little bit. One is likely to be a radical, moving away from the reaction of his predecessors; and then in the sixties, having become a reactionary himself, degeneration moves in again.

It's like the old overshot waterwheel—and I have often used this figure—where the water comes in at the top and the buckets move on, and at first, after the water comes in, it hasn't quite so much power, but it moves on until it reaches its maximum leverage. Then the wheel goes on and regretfully those buckets empty. And when the last one empties you go down into oblivion which is known as history.

And so we go through this business of generations, three generations: your junior, the second generation—where you meet your contemporaries and competitors, and then the new juniors come on.

I see none of those seniors of my time around this table. Mr. Nally, I include you and General Harbord as my contemporaries. I have spent several weeks in Paris with you both, and I have reason for that statement. (Laughter)

There are around this table a few of my contemporaries and my competitors; and then there are more of you younger men, one of whom we honor tonight.

You see, David had sensitive ears, and his great introduction to radio was when he translated to the world one of the great tragedies of the sea. He didn't lose his sensitive ears altogether later either. His ears were sensitive to the scientists who were producing real things. And the mountebanks of science, those who spoke loudly and reiterated often, so paralyzed his sensitive ears that he couldn't hear them.

I think he did a little better with those ears in politics; his ears were sensitive to politics,—even though they spoke loudly. And so he came to know most of the important people not only in this country but —as he had to know—most of the important people in politics in the world.

It's a strange thing that he had this vision of the music box way back in 1915. He tried to convince the Radio Corporation about it in 1921. "Why," he said, "you'll see; one in every seven families in this country will some day have a music box, and there will be a business of $75,000,000 a year." Think of that —great vision and practical business—$75,000,000 a year!

And that has been one of his great traits, you know, because I have discovered in most of these organizations that it takes about three men with their feet on the ground to one man with his head in the clouds to go forward and save the company from bankruptcy on the one side and make progress on the other. (Laughter)

David has that rare combination, you know, of permitting his head to be in the clouds and keeping his feet on the ground. In one single package you have those several men whom I am describing.

I don't want to talk about David's contribution to radio—I don't need to here particularly. I'd like to talk about his contribution in at least one other field.

I had the good fortune to have him as an aide in Paris in 1929. Perhaps you have forgotten, so let me remind you that that was the time when David and I "saved the world." (Laughter) There were to be no more wars. Currencies were re-established. The world everywhere was starving for goods. It seemed that the opportunities to lift the living standards of peoples everywhere were the greatest in the history of our recorded civilization.

How could anyone have thought then that in a very few years vast cities would be destroyed, men by the millions would be dead and millions more, though living, would be maimed? How could David and I have dreamed in Paris—think of this!—how could David and I have dreamed in Paris in 1929, that one or more of the men with whom we were then treating would tonight lie sleepless because of his unknown sentence tomorrow?

Even though a great nation with a wounded pride, under a psychopathic leader, ruined our work, I would like now to express again— as I have many times before—my appreciation of the great service which David Sarnoff performed in that trying time.

Then came again a great and another devastating war. Then radio and the vast extensions of its art—as Dr. Compton has told you —were to play a most important part. Then one man of illuminating vision, of hard-headed practicality, a man of courage, was to be called to the service of his country, and then I could no longer call him "David." And so I salute him tonight and introduce him to you as Brigadier General David Sarnoff.

RESPONSE BY GENERAL SARNOFF

Mr. Toastmaster, Honored Guests, Friends and Fellow Workers. I am sure that you can appreciate how overwhelming all this must be to me. It is a unique experience to be alive and to hear your own obituary recited. (Laughter) Who could fail to be moved by the handsome evidence of friendship all around me tonight, by the great honor which you do me by your very presence here, and who could hope to find words that would adequately express the depth of my feeling and of my gratitude to all of you?

To you, General Harbord, let me say that I am, with pride, your junior, and I salute you as my chief not only in the military world, but also in the industrial world. I salute you as my chief and I thank you as my friend.

And to you, Dr. Compton, I am most grateful for the honor that you have done to all of us by your presence here tonight and thank you for the illuminating address which you have given on this little busybody known as the electron.

I don't know whether I would normally have claimed any relationship to the electron, but now that you have set it in such a legitimate frame of paternity, I have no fears of admitting some relationship. I would like to say that of all the relatives I have ever had, the electron was the best. (Laughter) It has supported me quite well for all these forty years, and—what is more—it has remained invisible.

And to you, my friend, Mr. Young, I shall always be "David", I hope. As my mentor and as my teacher in the gentle art of industrial statesmanship, you have marked my report card tonight very generously. But now that you have done it, perhaps I should confess that I haven't yet learned all the lessons you have taught me.

And I would like to pay tribute

JUDGE JOSEPH M. PROSKAUER, OWEN D. YOUNG, GENERAL SARNOFF AND BERNARD M. BARUCH AT A RECEPTION PRECEDING THE DINNER AT THE WALDORF-ASTORIA.

tonight to the representatives here of our Government, the Army, the Navy, the Coast Guard, the Federal Communications Commission and of the scientific agencies of our Government, all of whom have made signal contributions to the radio art and to the radio industry.

This, after all, cannot be purely a tribute to one man, because in this vast art and industry no one man can claim to have contributed very much by himself. And I am particularly happy and proud to see here tonight so many of the great leaders and pioneers of the radio and communications industry. Whether they be competitors or contemporaries, I am glad to number them among my friends, and to pay tribute to them and to their organizations for the very large share they have had in bringing radio to its present great position in world communications. They represent collectively an industry whose record in peace and in war is one of the proudest in American industrial history. (Applause)

My friends, radio is a fascinating but possessive mistress. And so during these forty years I fear I haven't had as much time as I should have liked, to give to my family, my friends and my associates, who have made it possible for me to survive these years. Perhaps tonight you will permit me to say that I recognize that my attention has not been equal to the devotion which I feel for all of them.

Forty years, if spent in a restricted environment, with limited opportunity, in an art that cannot grow, could be a very, very long time. But forty years spent in a country that has demonstrated on more than one occasion the great opportunities it offers, in an art whose possibilities are almost as limitless as space itself, in an environment rich with loyal and competent associates, could be and was, a very, very short time; in fact, so short that I can hardly believe it myself.

There is present in this room tonight one gentleman who had preceded me in this organization by some two or three years and who gave me my first job as his office boy. He is my friend and associate, a vice-president of RCA, George S. DeSousa. May I ask you to rise, George? (Mr. DeSousa rose. Applause) Now you can see by looking at him that he is not an old man.

Forty years ago, radio was so young that even a boy of fifteen soon felt that he was a veteran. As one of the youngsters within whose mind and heart the spark of wireless kindled a great enthusiasm, I must confess that even now as I look ahead I feel very little older, for radio today appears no less filled with opportunity for growth than it was in the early days when dots and dashes were music to a young man's ears. We were only on the threshold in 1906. Great progress has been achieved, but as science measures Time, we have witnessed only the beginning. We are still pioneering in the dawn of the Radio Age.

Forty years from now the instruments of radio which we marvel at today will be museum pieces, along with the coherer, the crystal detector, the headphones and the spark gaps. Long waves fascinated us in 1906; so did the sparks that crashed noisily across the gaps. Now microwaves, akin to light and generated in silence by electron tubes, are leading radio to triumphs in communication undreamed of in the beginning.

The pace of science has been swift and the challenge to the new art has been great. That pace will be swifter and the challenge still greater as the future unfolds. Because the wireless pioneers possessed faith and vision, and because the romance of wireless was so powerful within them, a vast new industry has been built, providing employment for hundreds of thousands of people, while millions enjoy the services that radio brings to them.

In America, radio has grown rapidly as a great public servant—not only because of freedom to speak and freedom to listen but because of the freedom of science to advance. Science must be free. We can permit no restrictions to be placed upon the scientists' right to question, to experiment and to think. Because America has held liberty above all else, distinguished men of science have come here to live, to work and to seek new knowledge. The world has been the benefactor and science has moved forward. In war, science dares the impossible; it must continue to dare the impossible in peace if a fuller life is to permeate society.

Radio has never ceased to stir the imagination; it has continually inspired research. That is why radio is always new. It has met the challenges of two World Wars and of the 20 years of peace that intervened.

Radio has become one of the world's great social forces; it edu-

cates, informs and entertains. Distance has been annihilated. All people have been brought within the sound of a single voice. A 9-word message has encircled the earth in 9 seconds! The face of the moon has felt the ping of a radar pulse and echoed it back in two seconds to revive predictions of interplanetary communications.

The evolution of radio is unending. It has produced television, radar and a host of other electronic devices and services. We still can foresee so many changes that those who follow us may wonder how we of this generation were satisfied to talk around the world and not to see at the same time. Our descendants will look back upon the radio services of this era and compare them, as a candle to the electric light, the horse-and-buggy to the automobile, the ocean liner to the stratoliner.

Already the electron tube responds to our sense of touch, sound and sight. We shall learn how to make it respond also to our sense of taste and smell. The tireless workers of radio science will produce a radio-mail system that will be inexpensive, secret and faster than any mail-carrying plane can travel. Portable communication instruments will be developed that will enable an individual to communicate directly and promptly with anyone, anywhere in the world. As we learn more about the secrets of space, we shall immeasurably increase the number of usable frequencies until we are able to assign a separate frequency to an individual as a separate telephone number is assigned to each instrument.

Science is continually at work to produce new discoveries and new engineering developments. But we must bear in mind that our destiny is linked not alone with advances of technology but also with the further development of society. Unfortunately, new forces are being released by science which threaten to bring an abrupt end to all progress unless they are properly controlled and usefully applied. In radio, we have met the challenge of the electron and have harnessed it. Now we must meet the challenge of the atom, which has split open a new era—the Atomic Age!

Only three weeks ago I returned from the grim and unhealed battlegrounds of Europe. There amid misery and still-smouldering ruins, one feels acutely the dread with which mankind nervously contemplates the threat of biological warfare, atomic bombs and guided missiles with war-heads pointed toward death and devastation. Within the past few months "ghost bombs" have been reported flying over Sweden. They are said to emanate from a point 500 miles away. Their course is guided and controlled from a distance. Some observers believe they are self-destroying and during their flight overland their course is automatically changed so they will fall into the sea and leave no clue as to their composition or construction. These pilotless missiles streaking across the European sky and the atomic bombs recently exploded in the South Pacific cast ominous shadows on the horizon of the future.

We have witnessed the mere beginning of push-button warfare controlled by the long-range electronic fingers of radio. Only recently two pilotless Flying Fortresses were flown from Hawaii to California through daylight and darkness, through clear weather and fog, under the radio control of a mother plane. In war, they might have carried bombs or germs. At the Bikini "Operations Crossroads," radio and television controls were much in evidence as indications of what may be expected in a future war.

Let us not be complacent in the thought that we in America are safe from destruction because we escaped invasion in the war just ended. The Atlantic and the Pacific are no more protection to our country today than is the English Channel to the British Isles. Pilotless planes and rockets flying 6,000 miles an hour in the stratosphere can carry explosives, poisons or germs half way around the globe to wipe out entire cities in a deluge of radio-activity, fire, mist, dust, debris and disease.

It is frightening to recall that not a single V-2 rocket aimed at England during World War II was shot down. But even if new techniques could be devised to explode flying bombs in space some of them surely would get through. Only a few would be necessary to ignite and to rip asunder great cities. Furthermore, there could be little protection against atom time-bombs that might be smuggled into a country by saboteurs who would plant them in strategic spots, to explode at the enemy's will by a touch of his distant finger.

What defense can man devise

GENERAL JAMES G. HARBORD, CHAIRMAN OF THE BOARD, CONGRATULATES THE PRESIDENT OF RCA FOLLOWING PRESENTATION OF A WATCH TO GENERAL SARNOFF FROM OFFICIALS OF THE CORPORATION. THE CEREMONY TOOK PLACE ON SEPTEMBER 30, THE 40TH ANNIVERSARY OF GENERAL SARNOFF'S SERVICE TO RADIO.

against an unseen enemy waging war in this way? What defense is there against a lurid streak across the sky—faster than sound, as sinister as death itself? That is the question anxious people ask in every quarter of the globe. I do not pretend to know the answer. On my travels through Europe and in discussions with noted men of science at home and abroad, I have found scant hope that any one has the answer for adequate defense against the new weapons of war that are capable of mass destruction on a world-wide scale. There is only one real defense against war and that is Peace.

Despite the fact that the handiworks of science are at stake, the scientist has little to say on how his discoveries and inventions are to be used. Inherently, he is a man of peace, but the products of his genius are often put to uses far afield from his original thoughts and motives.

If peace is the chosen course, scientists can turn their attention to the development of atomic power for industry and the conquest of disease. We would then hear less of biological warfare and more of new triumphs over diseases that have plagued man across the centuries, destroying him in greater numbers than war itself. The warlike idea that warm ocean currents could be shifted by science to turn fertile lands into deserts might be reversed in peacetime to modify or divert these currents to influence climate so that deserts would become gardens. With the aid of nuclear power plants desert areas might be transformed into habitable and productive regions.

There is even the possibility that one of man's greatest enigmas—the weather, may some day be controlled. One of our noted men of science recently told me that his studies of the problem not only suggest this possibility but that experiments are actually under way that may lead to man's dominion over the elements. For example, man may learn how to deflect air movements with consequent changes in weather and he may discover how to neutralize a storm or detour it from its course.

Automatic radio weather stations in remote places in the polar regions, in deserts, in jungles and on the seas can collect and broadcast weather data. Already radar spots a hurricane, peers into its vortex, plots its movement and photographs it from minute to minute. Radio-controlled and electronically equipped rockets will permit exploration of the upper atmosphere. Within minutes new electronic computing devices can analyze such information on a global basis.

We may yet have rain or sunshine by pressing radio buttons! When that day comes, we shall need a World Weather Bureau in which global forecasting and control will have to be vested. Here is a poser for the isolationist and a poem for the internationalist!

What is the shape of things to come in the next 40 years? The answer is difficult because the yardstick of the past is not always an accurate measure for the future. Most of the predictions of four decades ago fall short of present realities. And predictions that one might make today are likely to miss the mark of 1986. Scientific progress and prophecy both are dependent on the fertility of the imagination, and our imaginations are more limited than we like to admit. Achievement, however, is born and fostered by vision and imagination. Many great inventions have been made by young men endowed with future-mindedness. Although youth lives in the future and age in the past, yet it is not difficult for even the middle-aged of this generation to imagine world-wide television 40 years hence. International broadcasting, undreamed of 40 years ago, has taught us that in a science as universal as radio, reality surpasses prophecy. There will be many events and many discoveries to change radically anything that we foresee. An observation which today may seem trivial may become of utmost significance in the years ahead. Only a few years ago the elusive radio echo seemed a scientific fantasy, yet from it came radar, when wartime events called for it.

Necessity is credited as the mother of invention, largely because events often demand or force changes. The most difficult problems facing mankind are social and political rather than technical. Unfortunately, in the social and political spheres our imaginations cover a rather limited radius.

Many men will risk their lives to solve a scientific problem; few will risk their comfort or security to solve a social or political problem. Therefore, the most important problem of all is the selection of courageous, competent and wise leaders. That kind of leadership calls for more than mere exercise of authority; it calls for imagination, initiative, direction and guidance. People everywhere cry for such leadership. Upon it depends the future of democracy, the preservation of our freedom and the solidarity of peace.

But if opportunity is to be turned to good purpose, our country must be strong. The world has little respect for weakness. Often, weakness is associated with fear, and fear is not an attribute of peace and brotherhood. This Nation must be strong morally and physically, not alone for its security but also for the accomplishment of its task in helping to rehabilitate a world suffering from the vicious aftermath of war.

With courage and vision, we must see to it that there is unceasing exploration not only in the physical sciences, but also in the political and social sciences. Only upon these forces can world unity be built and peace be maintained.

Man must learn to control himself as well as the new forces of science which he seeks to control. He must think not only of himself but also of his neighbors. He must recognize the fact that modern science has shrunk the world into one neighborhood. Now more than ever man must be the master of his fate. The frightening weapons within his grasp may yet prove the prime influence that will move him to concentrate on the problems of peace. But to achieve the blessings of peace, man must bring to these problems also his heart and his soul.

Friends, as we look ahead through the vista of science with its tremendous possibilities for progress in peacetime, let us not feel that we are looking beyond the horizon of hope. The outlook is not discouraging, for there is no limit to man's ingenuity and no end to the opportunities for progress.

TELEVISION CAMERAS ON BIKINI ATOLL REGISTERED SCENES SIMILAR TO THIS ONE AS THE SECOND ATOM BOMB LIFTED TEN MILLION TONS OF RADIOACTIVE WATER MORE THAN A MILE HIGH.

ELECTRONICS AT BIKINI

An Eye-Witness Account of the Extensive Use of Radio and Television Equipment During the Atom Bomb Tests

By Dr. Arthur F. Van Dyck

Assistant to Executive Vice President in charge of RCA Laboratories Division

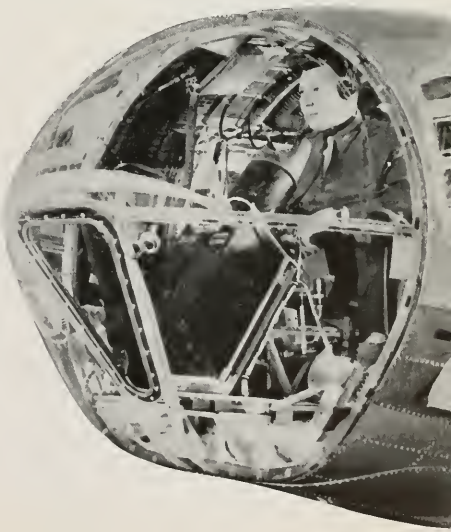
THE atomic bomb tests at Bikini brought together the greatest concentration of radio and electronic marvels ever assembled at one time and place. Although public interest was focused on the bomb explosions, this impressive array of equipment in any other situation would have been front page news.

Only those who were privileged to witness the tests and the execution of the plans under which they were conducted could have any idea of the complexity of the operation, the extent of the scientific measurement work, and the multitudinous uses to which radio and electronics were put. It can be said in truth that the facilities provided by radionics and electronics made possible this important experiment in nucleonics.

Most of the activities, the excitement, the explosions, and their awesome effects, have been adequately described in newspapers, magazines and newsreels, but the extensive provisions and precise execution of the electronics plan received little or no mention in these media.

In test A—the test in which the bomb was exploded above the ocean surface—the 73 target ships carried some 4,000 pieces of electronic equipment. It was one of the many purposes of the tests, to determine the effects of these explosions on standard electronic apparatus at all distances from zero to over one mile. For weeks before the thrilling warning cry, "Bomb Away!" was heard, 350 experts were working on this gear—testing, adjusting, inspecting, recording. These observations alone resulted in 1,000 pages of records, making a volume six inches thick.

Outstanding uses of radio were the transmission from the target ships of signals giving readings of temperature, pressure, etc.; observations of various phenomena by radar; long range control of hundreds of instruments; control of



A TELEVISION RECEIVER IN THIS "MOTHER PLANE" REPRODUCED PICTURES OF THE SCENE AS OBSERVED BY AUTOMATIC TELEVISION CAMERAS CARRIED BY PILOTLESS "DRONES" AS THEY WERE MANEUVERED IN THE BOMB BLAST AREA.

TOWERS SIMILAR TO THE ONE ABOVE SUPPORTED TELEVISION CAMERAS AND TRANSMITTERS ON BIKINI. AT RIGHT: "DRONE" PLANE CARRYING A TELEVISION CAMERA, COMES IN FOR A LANDING. OPERATOR IN FOREGROUND HAS TAKEN OVER CONTROL FROM THE "MOTHER" PLANE IN THE DISTANCE.

planes and boats at a distance, observation and recording of the explosions, and their after-effects by television and associated cameras.

Time signals were sent out by a radio transmitter and picked up by receivers correlated with the devices to be controlled. In this way, camera shutters and numerous measuring devices were activated at certain instants. For example, in order to make a study of the extremely rapid rise in air- and water-pressures during the two tests, it was necessary to run a recording film at the high rate of 800 feet per second. This demanded precise timing which was possible only through the use of radio time signals.

Another important project was the observation by radar of the cloud column which followed the blast. This was carried out by installing radar units at various distances from three miles to 200 miles from the blast. Other radar operators trained their beams on the target area in order to check on the anchored ships before, during and after the explosion. Despite the obscuring cloud that hid the majority of the vessels for many minutes, it was possible, through radar, to note the displacement of the ships and whether they were badly damaged and in a sinking condition.

As the world well knows by this time, it is not possible for humans to live safely within a critical range of intense atomic activity. But radio apparatus could be and was devised to replace human personnel in the danger areas. Scores of highly accurate automatic measuring devices were installed on the target ships, on the ocean surface and beneath the surface. A radio transmitter associated with each metering instrument transmitted the readings automatically to laboratory ships in the observation fleet, where they were received and recorded automatically. This is called telemetering.

Buoys Carried Microphones

One of the most interesting uses of telemetering was the installation of a string of sonobuoys a few hundred feet apart, extending outward in a straight line from the explosion point. Each buoy carried one microphone above water and another under water. Each sonobuoy transmitter worked on a different frequency and the various signals were picked up and recorded on an oscillograph in one of the instrument ships. There were many other applications of telemetering but those just cited illustrate the importance of this technique to the successful conclusion of the bomb tests.

To that section of the public which is not technically minded, the uses of television at Bikini undoubtedly are of major interest.

The Pacific tests involved a situation in which television was ideally suited. It was highly desirable to have a close-up view of what happened in the target area while it was happening, but no human eye could be closer than eight or ten miles with safety, and photographic cameras could reveal nothing until their films were developed. However the television camera could be close to the scene—and was.

On Bikini Island, two RCA cameras were placed on 75-foot towers spaced about a half mile apart and only three miles from the explosion point. In that position, operating unattended, they picked up and broadcast the views that human eyes would have seen had they been on the tropical atoll.

Television receivers were installed on seven ships, two were carried in airplanes and one was placed on Bikini. The viewing screen of the latter was focused on a film camera which was started up by radio control signals just before the explosion. The receivers in the planes and some of those aboard the observation ships were also combined with photographic cameras. On one ship, the camera was a special, highly complex instrument developed by the Naval

Research Laboratory. Using 35 mm film, this camera took pictures from the television screen at one-second intervals, made positive prints of the scenes and projected them on a screen automatically, all within the space of two minutes.

While the television screen view of the explosion admittedly was not as clear as an eye-view from Bikini would have been, it was better than the eye-view from nine miles away where the closest observers were stationed. It was the next best thing to being on Bikini as far as viewing was concerned, and vastly better with consideration for safety. It permitted human eyes to see things as they occurred which, without it, they could not have seen.

I shall never forget the feeling of tension and suspense as I watched the television screen during the second test and saw the water waves approach Bikini. They were first visible as they came out of the mist around the explosion area about a mile away. As they surged on toward the camera, there was some concern as to whether they would be under ten feet high when they arrived, as predicted by the planning scientists, or large enough to swamp the island and drown the cameras. The predictions were accurate. The waves broke on the beach like regular Waikiki rollers and the television cameras continued to survey the lagoon.

Another and completely separate television system was used in connection with the pilotless airplanes which flew over the explosion and through the cloud column. These planes had two television cameras. One was focussed on the plane's instrument panel and the other aimed forward from the plane's nose. "Mother" planes, too, were equipped with television receivers and could therefore see the instruments in the robot planes and the view ahead of them.

One other spectacular use of radio was in guiding crewless planes and boats. Pilotless planes controlled from "mother" planes several miles distant were directly over the lagoon at the time of the explosion. They flew through the mushrooming cloud immediately and picked up samples of the cloud and air. Then they were brought to land safely on islands many miles away and delivered their samples.

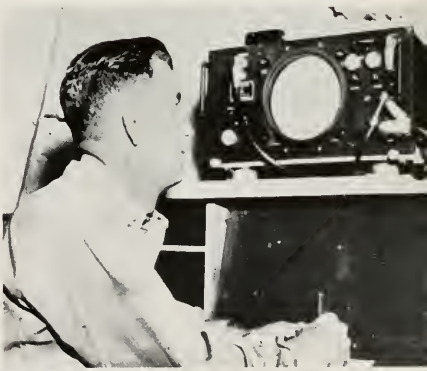
Radio Controlled Crewless Boats

Following the explosions, boats without crews were directed into the contaminated area and cruised around among the target ships picking up samples of water for analysis, after which they were guided back to a large "mother" ship.

For many years radio experimenters have controlled model planes and boats over short distances, but it was startling at Bikini to see numerous full-size bomber and fighter planes without a person aboard maneuvering in the sky along with dozens of fully manned planes. The crewless boats were more amusing than startling. They seemed impertinent as they boldly drove their yellow painted selves straight into the center area where human beings would not be able to go for days.

Perhaps the most vital electronic instrument used in the tests was the Geiger Counter, which indicates accurately the intensity of radiations in its neighborhood. The little Geiger electronic boxes had more authority than even Admiral Blandy himself! Whenever their warnings said in effect, "Keep away!", no one disobeyed.

There has been wide public discussion on the question whether the Bikini tests were necessary or desirable. Some of the atomic physicists have stated that they were not. Perhaps the tests were not valuable from an academic, nuclear viewpoint since it had been proved previously that the atomic bomb could be detonated. But from the military, engineering and practical viewpoints, the tests were vitally necessary. Quantitative data were not available and effects of many kinds were not known with anywhere near the exactness which is necessary to intelligent handling of the bomb, either offensively or defensively.



BELOW: SOME OF THE RADIO APPARATUS THROUGH WHICH SCORES OF CAMERAS INSTALLED ON BIKINI AND IN PLANES WERE ACCURATELY CONTROLLED. AT RIGHT, ABOVE: ON THIS TELEVISION SCREEN ABOARD THE USS APPALACHIAN, OBSERVERS WATCHED THE BOMB BLAST. BELOW: TECHNICIANS PREPARE RADIO CONTROLS OF TELEVISION AND STILL CAMERAS ON BIKINI.

DR. H. F. OLSON (LEFT) AND J. PRESTON EXAMINE A DUO-CONE SPEAKER WHICH REPRODUCES THE COMPLETE AUDIBLE RANGE OF SOUND.

Duo-Cone Speaker

NEW UNIT DESIGNED TO MEET DEMAND FOR WIDE-FREQUENCY, LOW-DISTORTION SOUND REPRODUCER.

By Dr. H. F. Olson and J. Preston

RCA Laboratories, Princeton, N. J.

TRUE reproduction of sounds varying in frequency from the lowest note on the standard piano keyboard to the highest tone audible to the average human ear is possible through a double-cone high-fidelity loudspeaker developed by the writer and Mr. John Preston at RCA Laboratories, Princeton, N. J. Work on the new speaker was undertaken primarily to satisfy the demand for a wide-frequency, low-distortion reproducer for use in radio and television monitoring, phonograph and sound motion picture recording, and high quality sound systems.

The new unit consists of a 15-inch low-frequency cone and a two-inch high-frequency cone combined in such a way that the larger cone is a continuation of the smaller one. The low-frequency cone functions in the frequency band from 30 to about 7,000 cycles; its smaller counterpart comes into action at about 500 cycles and continues through the audible range to approximately 15,000 cycles.

To facilitate the accentuation of low frequency sounds, when desirable, the speaker cabinet has an adjustable port or opening in the front near the base. Sound issuing from this port gives the effect of deepening the "voice" of the loudspeaker.

The directional pattern of a loudspeaker, like that of a searchlight, has a great deal to do with the efficiency of its projection. Directional characteristics of a loudspeaker vary with both the frequency of the reproduced sounds and the angle of the cone. At the low frequencies, where the dimensions of the cone are small in comparison with the wavelengths of the sound, the pattern of radiation is comparatively even over an angle of 180 degrees. When the wavelength and cone dimensions are approximately equal, however, a directional pattern appears, and as the sound increases in pitch, the directional pattern becomes progressively narrower. Since it was intended that the directional characteristics of the new RCA speaker should be practically independent of sound frequencies up to 15,000 cycles, over an angle of at least 90 degrees, it was found necessary to use relatively wide-angle cones, despite the acoustical advantages inherent in narrower cones.

A common source of speaker distortion is the vibrating surface of the cone, particularly in the range between 100 and 1,000 cycles where the maximum power in both speech and music is contained. These seemingly conflicting factors were reconciled by selecting material for the duo-cone that is more than twice as thick as that used in the conventional cone.

The undesirable qualities associated with other two-unit speakers under investigation are interesting in relation to the advantages of the improved type. The simplest design, for instance, consisted of a small cone and a large cone mounted one above the other on the face of a flat baffle. This construction resulted in a poor directional pattern in one part of the frequency band.

Comparative tests of this and other types of two-unit speakers, indicate that the adopted design is superior to the others in such important respects as uniformity of sound output, frequency fidelity, directional characteristics, freedom from distortion, and sensitivity to sharp variations in volume.

DUO-CONE SPEAKER UNIT INSTALLED IN CABINET WITH VARIABLE OPENING NEAR BASE FOR ADJUSTMENT OF LOW FREQUENCY RESPONSE.

A HAND-HELD STYLUS, MOVED ACROSS A LINE OF PRINTED TYPE, CONVERTS LETTERS AND WORDS INTO RECOGNIZABLE SOUNDS BY ELECTRONIC ACTION.

Reading by Sounds

ELECTRONIC AID FOR THE BLIND CONVERTS LETTERS AND WORDS INTO TYPICAL SOUNDS; TESTS HAVE BEEN STARTED.

AN electronic reading aid aimed toward making printed material available to the blind without recourse to Braille or "talking books," has been developed by Dr. V. K. Zworykin and L. E. Flory of RCA Laboratories, Princeton, N. J. The instrument, it is emphasized, will not be commercially available until many more tests with substantial numbers of blind people have been carried out.

Essentially, the device consists of a hand-held stylus which the user moves horizontally across a line of type, letter-by-letter, as a beam of light directed through a narrow slit in the face of the stylus scans the print vertically, 30 times per second, indicating the presence and extent of black portions of each letter by a warbling tone which becomes audible through head phones. Although the letters are scanned individually, tests have shown that a blind person, after practise, improves his reading speed by recognizing the blended sounds of a complete word. Reading speeds in excess of ten words a minute have been attained; the ultimate speed is believed to be in the neighborhood of 60 words a minute.

While the layman would probably find it difficult to understand the composite of tubes, circuits, light sensitive tube and lucite conductors which comprise the reading aid, the means by which letters and words are converted into recognizable sounds can be easily understood.

Scanning Beam Detects Letters

If the stylus slit is placed on a clear space such as exists between letters, the circuit elements are so arranged that no tone is heard in the headphones. But if the scanning beam strikes part of a letter, as for example, the top connecting line between the two legs of the letter n, the user would hear a click of rather high pitch which would be repeated each time the beam crossed the black line. As the stylus is moved to the right it would encounter the vertical portion of the n and the presence of this substantial black area would create a tonal variation ranging from nearly the highest extreme to the lowest. Thus, any letter scanned in this fashion is soon recognized by the user of the reading aid as a definite combination of tones.

At the beginning of his instruction period, the blind subject requires some form of mechanical guide in order that the stylus should follow a line of type with some degree of exactness, but it is believed that a proficient reader will be able to dispense with the guide, since any deviation would be detected instantly by a change in the pitch of the tone.

Work on the reading aid was carried out for the Committee on Sensory Devices of the National Academy of Sciences under the chairmanship of Dr. George W. Corner. Cooperating with Dr. Zworykin and Mr. Flory in the development were the Haskins Laboratories, New York; the Medical Research Institute of the National Naval Medical Center, Bethesda, Md.; and Solomon Lasof, C. J. Young and K. Magnusson of the Laboratories staff.

TELEVISION SERVICE AT U.N. ASSEMBLY

Television service has been provided for the convenience of newspapermen covering sessions of the United Nations General Assembly at Flushing Meadows, according to a joint announcement by officials of Radio Corporation of America and the National Broadcasting Company.

The RCA Victor Division supplied pickup equipment, including the new supersensitive RCA Image Orthicon camera, for transmissions directly from the floor of the Assembly to quarters in the building reserved for the press and overflow audience. RCA television receivers are installed there to accommodate viewers. NBC television cameramen operate the pickup equipment.

TRAFFIC IS HEAVY AT THE TICKET OFFICE OF A DRIVE-IN THEATER ALREADY CROWDED WITH CAR-BORNE PATRONS.

DRIVE-IN MOVIES

New Sound System and In-Car Speakers Increase Popularity of Outdoor Theaters in More Than 200 American Cities.

"LET'S go to the movies tonight!" is a common rallying call in this country where millions of families depend on Hollywood for much of their manufactured entertainment. But in numerous cities and towns the evening's objective is not necessarily the gaudy-fronted cinema palace, with its upholstered seats and uniformed ushers. In more than 200 communities the phrase is likely to refer to movies exhibited outdoors and viewed from the free-and-easy comfort of the patrons' own cars. These al fresco attractions are the Drive-in Theaters, a trend in motion picture exhibition which is believed to have started thirteen years ago in an open lot on the outskirts of Camden, N. J.

News of the success of that pioneer theater brought immediate action in the film industry. By 1941, more than 150 similar ventures were in operation and at least 50 others were in the blueprint stage when war halted all non-military construction. Today the movement is under way again and new projects are being reported regularly in the film-trade papers.

A Drive-in Theater consists essentially of an open lot with its surface broken up by a series of semi-circular ramps facing a large screen supported on an elevated tower. The front end of each ramp is slanted upwards slightly to provide an unobstructed view of the pictures from each car wherever it may be parked. The screen is larger than normal theater screens in order that the images may be seen without eyestrain from the most distant ramp which may be 200 feet or more away. Some of the larger outdoor theaters use screens more than 50 feet wide.

When the industry was new, and before manufacturers had given it much attention, it was necessary for outdoor theater operators to utilize whatever equipment was available. As a result, some of the installations were undependable, either through inadequate design of apparatus or through the effect of weather on units constantly exposed to heat, cold and dampness. The speaker problem in particular required an early solution.

The first Drive-in Theaters amplified the sound track of the film and distributed it to the parking lot over powerful loudspeakers similar to those used in indoor theaters. The speakers were not designed for such work and constant repairs and replacements were essential. Moreover, it was necessary to operate the speakers at their full capacity in order to deliver sufficient sound to all cars. Not only did the speakers fail under this

IN-CAR SPEAKERS MANUFACTURED BY RCA ARE ONE OF THE ADVERTISED FEATURES AT THIS OUTDOOR THEATER IN UNION CITY, N. J.

heavy loading but when they did work properly, nearby residents objected to the escaping sounds. At this point, RCA engineers started an intensive study of the problems presented by the new industry. After trying out substitutes for the large open-air speakers, including a system of underground speakers placed beneath each car, RCA in 1940 designed the first in-car speaker and power supply system, an innovation which was the forerunner of the tried-and-proved postwar layouts now going into use.

Loud Speakers Hung in Cars

Under that earlier RCA arrangement, a patron driving through the theater entrance gate received a portable speaker unit with extension cord which he plugged into a receptable beside his parking place. The speaker was hung at any convenient place within the car. In this way, the film program could be enjoyed even when the weather made it desirable to close the car windows. Moreover, there was no "leakage" of sounds to annoy the neighborhood.

However, it soon became evident that the constant handling of the speakers by careless customers, necessitated frequent repairs to the units. After a thorough study of this problem, RCA Victor contrived the new weatherproof, foolproof speaker which was announced a short time ago. This speaker is installed permanently on a pedestal beside each car space and is equipped with a coiled cord which allows the speaker to be drawn through a car window and suspended in the most convenient place. The patron adjusts the volume by means of a control on the speaker case.

The combined terminal box and speaker receptacle unit has been so designed that a short circuit in the speaker unit or cord can affect no more than the two speakers connected to any one terminal box. This permits all other speakers to continue normal operation. Formerly, a short circuit in even one speaker could put an entire line of speakers out of operation until the trouble could be located and corrected.

Built to take a lot of hard handling, the new RCA speaker has been tested under extremely adverse conditions and found able to withstand greater variations in temperature and humidity than would ever be encountered in actual operation.

Speaker Units Are Weatherproof

The new type neoprene-covered extension cord is sixteen inches long when retracted and can be stretched to about four and one-half feet with only a slight pull on the speaker unit. If necessary, the cord can be stretched to a maximum of approximately seven times its retracted length, or about nine feet. Since the cord covering is treated with a "sun proofing" wax, it can be exposed to the hot sun over long periods without deterioration.

The new in-car speaker and receptacle are part of a complete new line of drive-in theater equipment offered by the RCA Victor Division. One of the outstanding features of the new sound system is an automatic arrangement for keeping the sound level constant regardless of the number of speakers in use, once the line volume has been adjusted.

Drive-in Theaters Using RCA Sound Systems and In-Car Speakers

Name and Location	Parking Capacity (Cars)
Montgomery Drive-In, Montgomery, Ala.	500
Outdoor, Drive-In, Chicago, Ill.	1040
Drive-In Theatre, Lima, Ohio	600
Skyline Park-In, Dayton, Ohio	750
Miami Drive-In, Dayton, Ohio	790
Toledo Drive-In, Toledo, Ohio	790
Cuyahoga Drive-In, Parma, Ohio	790
Dort Drive-In, Flint, Mich	1020
Park-In Theatre, Lorain, Ohio	310
New Drive-In, San Antonio, Texas	950
Drive-In Theatre, Houston, Texas	1000
Circular Drive-In, Waco, Texas	550
Waco Drive-In, Waco, Texas	500
Chalk Hill Drive-In, Dallas, Texas	500
Bowie Drive-In, Fort Worth, Texas	400
"81" Drive-In, Wichita, Kansas	600
Drive-In Theatre, Colton, Calif	800
Mohawk Drive-In, Colonie, N. Y	950
Drive-In Theatre, Union City, N. J	1200
Kallet Drive-In, Oneida, N. Y	850
Tri-City Drive-In, Endwell, N. Y	600
Open Air Theatre, Beckley, W. Va	650
Pittsburgh Drive-in, Pittsburgh, Pa	720
Motor-In, Fresno, Calif.	950
San Jose Drive-In, San Jose, Calif	650

LOUD SPEAKERS WHICH CAN BE DRAWN THROUGH CAR WINDOWS ARE SHOWN BELOW ON THEIR PARKING-LOT PEDESTALS. AT RIGHT: AN IN-CAR SPEAKER HAS BEEN LIFTED OFF ITS PEDESTAL AND HOOKED ONTO THE INSIDE OF A CAR WINDOW

MEMBERS OF THE FEDERAL COMMUNICATIONS COMMISSION WATCH RCA VICTOR TABLE MODEL TELEVISION SETS ROLL OFF A PRODUCTION LINE AT CAMDEN, N. J., AS J. B. ELLIOTT (CENTER) VICE PRESIDENT IN CHARGE OF RCA VICTOR DIVISION'S HOME INSTRUMENT DEPARTMENT, DISPLAYS A 10" PICTURE TUBE. LEFT TO RIGHT: COMMISSIONER PAUL A. WALKER; ACTING CHAIRMAN CHARLES R. DENNY; W. W. WATTS, VICE PRESIDENT IN CHARGE OF THE RCA VICTOR DIVISION ENGINEERING PRODUCTS DEPARTMENT; MR. ELLIOTT, AND COMMISSIONERS E. K. JETT, RAY C. WAKEFIELD AND ROSEL H. HYDE.

NEW TELEVISION RECEIVERS

Four Post-War Models Shown to Distributors at Meeting in New York - - Deliveries Begin in November

FOUR models of post-war television home receivers, designed by RCA Victor engineers, were disclosed for the first time before the company's television set distributors at a meeting held in mid-September at the Hotel Pennsylvania, New York. It was announced at the time that limited quantities of two table models embodying television sight - and - sound channels are expected to be ready for delivery to the public early in November. Console models will be available early in 1947.

The larger of the two table models, shown on the front cover of this issue of RADIO AGE, gives a bright, clear picture $6\frac{1}{2}$ by $8\frac{1}{2}$ inches. It is equipped with the newly developed "Eye Witness Picture Synchronizer" which simplifies picture tuning and minimizes interference from exterior sources. The second table model gives a $4\frac{1}{4}$ by $5\frac{1}{2}$ inch picture.

Also shown to the distributors were two console models, one of them a large-screen projection type receiver which provides a picture almost the size of a standard newspaper page. Facilities for the reception of FM (frequency modulation) and standard broadcast programs are included. The other console has a 10-inch direct-view image, and in addition incorporates a Victrola radio-phonograph with automatic record changer, standard broadcast and FM radio reception with push-button tuning and generous storage space for record albums.

In outlining RCA's television set sales plans to the distributors, Joseph B. Elliott, vice president in charge of home instruments, said that a program of antenna installations, conducted by the company's service engineers to assure satisfactory demonstrations in dealer stores, is under way. A similar program, he added, has been planned for the public to provide the most efficient operating performance of each RCA Victor receiver sold. Under this arrangement, factory service engineers will install the receiver and provide antenna, antenna installation and instruction in the operation of the set, followed by a year's service and complete maintenance of the instrument for a reasonable charge.

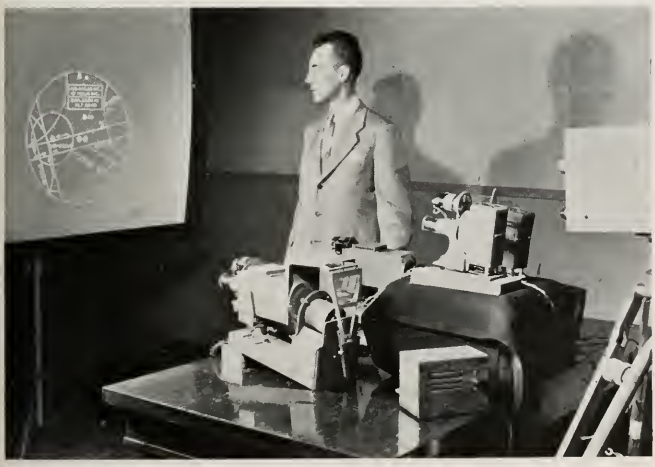
RCA VICTOR TELEVISION RECEIVER EQUIPPED WITH 7" PICTURE TUBE.

TELERAN COMBINES TELEVISION AND RADAR AS AIR TRAFFIC AID

Teleran — a combination of television and radar — developed by scientists and engineers of Radio Corporation of America in cooperation with the U. S. Army Air Forces, to meet most of the major requirements for safety in the airways, was displayed for the first time on October 10 at the demonstration of radio aids to air navigation in Indianapolis.

LOREN F. JONES, DEVELOPER OF TELERAN, POINTS OUT PRINCIPLES OF THE RCA SYSTEM OF AIR TRAFFIC CONTROL ON A SCALE MODEL WHICH ILLUSTRATES APPROACHES, DEPARTURES AND LANDING OF PLANES

THIS SCALE MODEL OF A TYPICAL AIRPORT AND SURROUNDING TERRAIN SHOWS AIR LANES AND LANDING PATHS USED IN TELERAN. BELOW: DR. D. H. EWING OF RCA VICTOR DIVISION, DEMONSTRATES HOW ESSENTIAL INFORMATION IS PICKED UP BY A TELEVISION CAMERA AND TRANSMITTED TO THE PLANE BY THE TELERAN SYSTEM.



As a comprehensive system of air navigation, traffic control, collision prevention and instrument approach, Teleran has many advantages over existing methods.

Teleran furnishes the pilot and ground controller with accurate and timely information concerning the locations of all aircraft of interest. By its use, the pilot may participate in the traffic problem, and the handling of traffic may be accomplished at a greatly increased rate. Complete monitoring of all operations is provided, and emergency conditions can be readily accommodated.

Teleran permits flexibility in the choice of paths, and allows new airways and temporary courses to be established without the installation of new ground equipment.

Teleran provides a maximum of safety against collision both with terrain obstacles and other aircraft. It likewise provides a flight instrument of great flexibility in convenient form. All heavy and complex equipment is on the ground; the plane carries only a light-weight television receiver.

OPERATORS AT THE DU PAGE PLANT, LOMBARD, ILL., JOIN VINYLITE STRIPS BY ELECTRONIC HEAT-SEALING TO FORM AN AIRTIGHT, WATERTIGHT BALLOON.

Radio Heat Seals Plastics

ELECTRONIC POWER GENERATORS SPEED UP FABRIC SEAMING, PRODUCING BETTER ADHESION.

By Wiley D. Wenger

Electronic Apparatus Section, RCA Victor Division

THE use of high-frequency radio waves to generate heat within thermoplastic materials and join them quickly in strong, airtight seams, is greatly improving manufacturing processes for many consumer products, bringing the benefits of electronic industrial techniques into the average home. Commonly-used products now being fabricated in this way include dress shields, raincoats, bathing caps, shower curtains, baby pants, pelts, tobacco pouches, and other commodities.

Before the age of electronics, heat sealing of thin thermoplastic materials was accomplished in various ways, but electronics revolutionized existing sealing methods by furnishing a source of energy that does not exist as heat until it passes into the plastic material.

The effect of heat on the surface of a thermoplastic is similar to that of a solvent or cement. It prepares the surface to be sealed, so that if pressure is then applied, an intermingling of surface films occurs and a chemical bond is formed. Essentially, the same fundamentals apply to any method for bonding thermoplastic materials. There are disadvantages in using solvents, however, such as the time required for chemical action, the need for extra operations, and the continued effects of solvent penetration.

Successful edge or butt welding of various types of plastics has been accomplished in the past by using a "hot blade" applicator. Immediately after heating the two surfaces, the knife-blade is removed and pressure is applied to the two pieces. If the blade temperature is too high, the plasticizer of the materials is vaporized or burned and no bond results. Conversely, if the blade is too cool, no seal will be made. The speed of the hot-blade operation is restricted by this temperature limit, in addition to the fact that the joint must be cooled uniformly after its formation.

Since the application of heat directly to the interface of a seam, in thin films or sheet stock, is difficult, critical of control, and of limited scope, this system of "hot blade" sealing is impractical for most purposes. The usual method of heat sealing plastic or plastic-coated materials has been the application of heat from the outside by means of hot dies, bars, or rollers. This is satisfactory under certain conditions, but extrusion of the outer surfaces of plastic film results, and the process is slowed down by both the time required for heat conduction into the material and the cooling period.

Radio Heat is Uniform

The need for a sealing device which would not be dependent on heat conduction was quite apparent. Turning to electronics, RCA engineers applied alternating electrical energy of a high frequency to the plastic material to be sealed. This radio energy, it was found, could generate heat uniformly throughout the material and quickly raise the temperature of the plastic to the softening point. Best of all, the electrodes, used to apply the energy, remain cool and conduct heat away from the outer surfaces of the seam. The cold metal electrodes were used to raise the temperature of the plastic to the bonding point, apply the necessary pressure, and cool the outside surfaces. Demonstrations of laboratory devices of this type

created a considerable amount of interest among fabricators of thermoplastics, and RCA electronic power generators, designed for this application, were put into production.

Briefly stated, the general advantages of high-frequency heating stem from the fact that heat is generated within the material being treated, instead of being applied from the outside. This internal heat is "born" within the plastic material when it is placed in the path of high-frequency currents flowing between two electrons.

Current Agitates Molecules

Power supplied by the high-frequency generators, with a frequency somewhere in the range of 20- to 30-million cycles per second, sets up a rapidly alternating field between the electrodes, causing agitation of the molecules of the thermoplastic, thus producing intense heat.

The temperature of the interface of the two overlapped edges of the plastic material increases more rapidly than that of the outer surfaces, due to conduction by the cool electrodes.

This so-called "inside-out" heating characteristic of electronic power, as applied to thermoplastics, makes it possible to bond edges of the material into a firm, hermetic seal without causing gumming or other damage to outer surfaces, which would be likely to occur if heat were applied from an outside source.

No matter what the application, all the high-frequency heat sealing machines work on the same basic principle. The electrodes are either flat bars or rollers which apply both the high-frequency potential and the necessary pressure to produce a welded seam in the work material. An experimental model of a 48-inch bar-sealer, which has been developed by the Engineering Products Department of RCA Victor, drew a great deal of interest at the recent plastics show in New York City. Demonstrations of this sealing unit showed that it could produce a uniform 48-inch seam in 4-mil material in a single operation requiring only four seconds. Timing is automatic and the unit is operated simply by pressure of a foot pedal. This device extends the field of application for electronic sealing beyond that served by any former units, since it makes possible the sealing of large areas of thick materials such as belt buckles, shoe straps, and similar articles. The seam may be in either a straight line or any desired configuration. Such consumer items as raincoats and shower curtains are being produced in a minimum of time. The four-foot bar-sealer can also be used to produce a series of short seams in several smaller objects, such as dress shields and tobacco pouches, in one operation.

Resembles Sewing Machine

Heat sealing principles developed by RCA have been incorporated into machines of several different designs. One such device developed by the Singer Manufacturing Company, resembles a conventional sewing machine in appearance and operation. It seals by means of a small bar which moves up and down rapidly. While the bar electrode is up, an intermittent drive wheel pulls the plastic material forward. Each stroke of the bar overlaps the previous one to form a continuous seam.

Another type of applicator, developed by the Union Special Machine Company, employs roller electrodes which apply high-frequency power and pressure and feed the material through at the same time. It has been so designed that if the material varies in thickness as much as from two 4-mil sheets to ten 4-mil sheets, the temperature of the seam will remain constant and the seam will be uniform.

During the war, electronic heat sealing helped in the fabrication of important military requirements such as the solar still, a device which enables sea-wrecked fighters to obtain safe drinking water from the ocean.

Used in War Industries

It should be borne in mind, that electronic seals can be made only in materials that can be heat-sealed.

In fact, electronic sealing is heat sealing, but because the heat is confined and controlled, more uniform seals can be made. The strength of the seal is not weakened by extrusion of hot material around the bars, no solvents are added to the materials to be absorbed by it, and there are no glues present to cause deterioration.

PLASTIC TOYS SUCH AS THIS HUGE BUBBLE ARE MORE DURABLE BECAUSE OF THE STRONGER SEAMS PRODUCED BY RADIO HEAT.

OPERATING PERSONNEL BECOME ACQUAINTED WITH THE MOST ADVANCED COMMUNICATIONS EQUIPMENT IN THIS SCHOOL AT RCA COMMUNICATIONS.

Training for "Pandora"

PERSONNEL ASSIGNED TO OPERATE NEW INTERNATIONAL COMMUNICATIONS PLAN ATTEND SCHOOL TO STUDY SYSTEM

By J. F. Rigby,
Personnel Director,
RCA Communications, Inc.

IN PUTTING into effect the Pandora Plan of fast, low-rate international communications, instituted by RCA Communications, Inc., perhaps the most critical of many requirements has been the need for trained personnel. While the new, advanced equipment now being installed in RCA stations and in the stations of RCA correspondents all over the world, represents the peak in technical design, such apparatus would fall far short of its potential efficiency without the intelligent and sincere interest of operators thoroughly trained for the purpose.

Recognition of this vital requirement led to the expansion of the Company's operating school several months in advance of the first Pandora installations at the Central Radio Office, 66 Broad Street, New York.

Under the direction of the author, a comprehensive curriculum was established, including courses not only in the operation of the tape relay system, but also detailed instructions in the modified administrative and clerical functions which would result from the new method of operation.

A teaching staff of seasoned personnel was assembled from the operating group and from the various clerical departments. Texts were prepared under the supervision of department heads, published and distributed to all personnel. A regular schedule of classes was established, and lectures, based on the texts, were augmented by actual demonstration and operation of the new equipment, several units of which were installed in the school. Fifty-eight students comprise the average class.

A system of records enables the teaching staff to note the progress of each student in all phases of his instruction. Periodic examinations and tests are given. Assistant instructors work with the students during the operating portions of their instruction.

Separate handbooks, written and published at intervals during the early stages of the school's expansion, have been combined and correlated in one omnibus training manual which, in ten chapters, presents a comprehensive and detailed course in the departmental functions of RCA Communications.

Included in the subject matter is a brief history of the company; a resumé of International Regulations; a description of the various types of services and the manner in which they are handled; instructions for the operation of automatic and semi-automatic equipments, and a description of the functions of the Central Radio Office in relation to branch office procedures.

It was found, from the beginning, that instruction was the most effective means of indoctrinating the operating and supervisor personnel with the Company's mission and with the means for its accomplishment.

ACTUAL OPERATION OF EQUIPMENT DESIGNED FOR THE "PANDORA" PLAN IS AN ESSENTIAL PART OF THE INSTRUCTION GIVEN EMPLOYEES AT RCA COMMUNICATIONS, 66 BROAD STREET, NEW YORK.

VIEWS OF NBC STUDIO 3A SHOWING UNEVEN WALL SURFACES WHICH CAN BE ADJUSTED TO CONTROL ECHOES.

Echoes Made to Order

NEW STUDIO DESIGN PERMITS RECORDING ENGINEERS TO CONTROL REVERBERATIONS ACCURATELY

AN echo-control studio recently completed in Radio City, New York, as a joint project of RCA Victor Division and NBC provides recording engineers with flexible facilities to enhance the quality and tonal effects of transcriptions and home-type records. By means of scientifically shaped ceilings and walls, combined with hinged panels and sound absorbing draperies, the echo characteristics of the room may be varied at will. The studio is 50 feet wide, 80 feet long and 18 feet high.

In cutting records, it is desirable to vary the resonance of a studio according to the nature of the subject matter being recorded. This variable is known as the reverberation time period. Expressed in layman's terms, it is the length of time required for sounds of moderate intensity to drop below audibility.

In recording large orchestras for home-type disks, RCA Victor engineers frequently use echo periods as long as 1.8 seconds while NBC technicians specify reverberation time periods as short as .9 seconds. Shifting the wall surfaces and readjusting the draperies, makes it possible for a recording engineer to select any echo period between these two limits with an accuracy of one tenth of a second.

NBC's Engineering Department designed and built the studio under the supervision of O. B. Hanson, NBC vice president and chief engineer, and William A. Clarke, architectural and construction manager. Acoustical analysis and specifications were prepared by John Volkmann of RCA Victor and George M. Nixon of NBC.

LORAN UNIT INSTALLED ABOARD S.S. AMERICA

Installation of a modern marine loran receiver aboard the *S.S. America* was completed at the Newport News Ship Building & Dry Dock Co., Newport News, Va., during the first week of this month. The *America* will be the largest American passenger liner equipped with loran—modern electronic method of long-range navigation.

Radiomarine recently reconditioned for peacetime operation the *America's* radio installation consisting of eight transmitters, nine receivers, a radio direction finder, an automatic distress alarm, and a network of thirteen antennas. When she returns shortly to trans-Atlantic service, the *America* will carry the most powerful and complete American flagship radio station.

Installed aboard the *America* are high frequency, medium frequency and low frequency radiotelegraph transmitters with power outputs of 1000 watts. To withstand the high power generated by these transmitters, Radiomarine has installed a new type of antenna insulator that is found on no other ship afloat. The insulator, built to withstand 12,500 pounds pressure, is 30 inches long and has a 12-inch corona ring.

Another exclusive feature of the insulators is the fact they are equipped with copper rain shields which serve to reduce losses of power at the lead-in. In addition to six of these large new-type insulators, 54 egg insulators are used. The thirteen antennas utilize 1042 feet of wire.

The *America* is being reconditioned for peacetime service by the United States Maritime Commission and will be turned over to the United States Lines as soon as the work is completed.

PYLON ANTENNA FOR FM

NEW SELF-SUPPORTING RADIATOR, ROLLED FROM METAL SHEET, SURPASSES OTHER TYPES IN POWER OUTPUT GAIN

A NEW cylindrical FM antenna, revolutionary in the simplicity of its design and principle, providing higher gain, height-for-height, than all previous types of antennas, has been developed and placed in production by the RCA Engineering Products Department, W. W. Watts, Vice President in charge of the Department, has announced.

Known as the "Pylon" antenna, the new FM radiator is a single-element mechanically-rigid, self-supporting structure. Unlike all previous types of FM antennas, it was pointed out, the new antenna requires no additional means of support or mounting. Arms, loops or circular elements with their attendant mounting and connection problems, are not required. Because of this, Mr. Watts stated, erection of the Pylon is extremely simple. The bottom flanges of the cylinder are bolted to the building, tower, or other supporting structure which provides the necessary elevation and the job is complete.

Where high gain is needed for an FM station, additional sections of the antenna can be stacked on top of each other simply by bolting together the end flanges of adjoining sections. Since radiation of the signal is compressed in the vertical plane, there is a subsequent power increase in that characteristic. Stacking four sections of the Pylon results in a power gain of six. The same type of antenna is good for any power which FM stations are likely to use. It can be used to cover the whole frequency band with no tuning or adjustments required either on the ground or in the air.

Structurally, mechanically, and electrically, the new RCA antenna has been reduced to functional elements. The Pylon is a cylinder each sections of which is approximately 13 feet high and 19 inches in diameter, with a narrow slot cut from top to bottom. There are no dipoles, no loops, no appendages of any kind.

The cylindrical structure itself is the radiator. The feed line is a single transmission line running up the inside of the cylinder, along the slot.

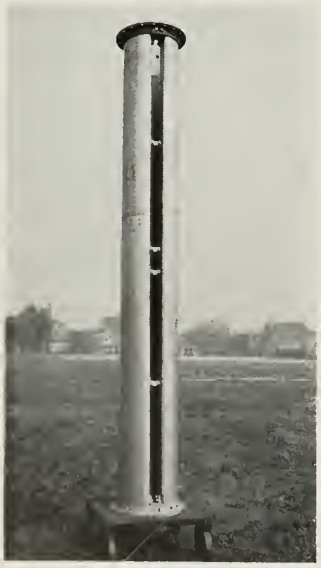
Rolled from Metal Sheet

The cylinder is rolled from a single sheet of metal and weighs approximately 350 pounds. It is capped on each end with a cast base (flange) which gives it great mechanical strength and provides a means of connection to the supporting tower or to additional stacked sections.

One radio frequency feed point per section is all that is required with the Pylon antenna. When two sections are used, they may be joined on the ground, the interconnecting feed line mounted in place and the whole assembly raised as a single unit. When this is done, only one transmission line connection must be made in the air. For a four section radiator, only two connections are required, contrasted to other types of antennas which require as many as ten to fifty connections.

Maintenance is Simplified

Maintenance problems of the Pylon are practically negligible because of the extreme simplicity of the power feed-line arrangement, the small number of end seals and the fact that the feed-lines are enclosed. Provision is made for mounting a standard code airplane beacon on the plate which covers the top section of the antenna. A cable to operate this light may be run either inside or outside the cylinder. Steps provide a means for replacing the light or servicing the lines which can be reached easily through the open slot.



THE NEW PYLON ANTENNA, A ROLLED-STEEL CYLINDER WITH A LONGITUDINAL SLOT, DELIVERS A HIGHER POWER GAIN THAN ANY OTHER TYPE OF FM ANTENNA.

RADIOPHONE SAVES CREW AFTER CRASH

Only four days after radiotelephone equipment had been installed aboard the *B. F. Macomber*, one of the Consolidated Fisheries fleet, the ship's captain, John B. Lowery, used the apparatus to summon aid when his vessel was badly damaged in collision off the Delaware Cape. The *Macomber* was en route from Sea Girt, N. J., to the Fisheries headquarters at Lewes, Del., on the night of July 19 when the merchant ship *Henry B. Brown* collided with her and smashed in her bow.

Captain Lowry, who had witnessed the installation of the telephone set by the Radiomarine Corporation of America on July 15, ordered use of the equipment to notify the U. S. Coast Guard and other craft in the vicinity of the accident. Despite heavy damage to the *Macomber*, the telephone worked perfectly and at 1.20 a.m., the fishing vessel *William Blundon* approached and removed the crew before the doomed ship sank.

FILMS FOR TELEVISION

Once Used Mainly as Stop-gaps in Visual Programming, Motion Pictures Now Have Essential Role in Television Entertainment

By Paul Alley

Television Film Editor, National Broadcasting Co.

MOTION picture films should not be looked upon as a substitute or a stop-gap when building programs for television. Quite the opposite! They are destined to become an important and increasingly valuable segment in the overall show. Current operations support this statement. Approximately 60% of NBC television programs today are on either 16- or 35-millimeter celluloid. Furthermore, there is no indication that this figure will decrease when television moves ahead out of its present preparatory stage into its full stature as a nationwide source of entertainment.

Basically, there should be no argument between "live shows" versus films. Each has its place. It is generally conceded that television's most dramatic role will be in bringing to the screen important events as they happen. But even when television cameras become increasingly mobile and flexible in operation, there will be many events, both spot news stories and news features, to which television cameras cannot go. These events will, of necessity, be covered by motion picture cameras.

This sharing of responsibility is standard practice today. Cameramen working out of the NBC Film Office at 630 Ninth Avenue, New York, are assigned to cover newsworthy events in the metropolitan area. The film thus exposed is rushed back to the laboratory, developed, printed and frequently put on the air the same day. Regularly on Monday and Thursday evenings, these films comprise a substantial portion of the NBC Television Newsreel as presented on WNBT by "Your Esso Reporter."

Whenever time is an important factor in rushing an outstanding story to the television screens, a negative print instead of the usual positive print is run through the film projector. By making certain changes in the transmitting equipment, the negative pictures are made to appear on the receiver screen in their natural, positive form.

Perhaps one of the best instances of this rapid-fire handling of a news events film was the recent spectacular Staten Island pier fire. The New York Fire Department sounded its fifth alarm shortly after 2 o'clock one afternoon. By 3, NBC cameraman Irving Browning was at the scene in a police boat. By 3:30 Harry Tugander and Jack Hartley of NBC Television, in a chartered tug, were filming scenes from another vantage point. It was 6 o'clock before the first reels reached the laboratory. There they were developed and assembled just as photographed. At 9:20, NBC put the films on the air, giving viewers a chance to see the blaze almost as it happened.

Under normal conditions, the processing of films takes much longer. First the editor screens the negatives, tells the film cutter how long he wants the story to run and in what sequence of scenes for best dramatic effect. The cutter lists the scenes and measures the footage. With this information the editor then writes a running commentary to fit the respective scenes. Appropriate background music is selected from a library of recordings and synchronized with the pictures. Finally, when picture, script, music engineers and commentator are ready, the film is projected in rehearsal. At that time, the commentator, sitting in front of a television screen runs through the script as he watches the picture develop, while listening to the music through earphones. This procedure is the same as though the soundtrack were being recorded on the film itself.

Since beginning its regular twice-weekly 10-minute newsreel, NBC has made an enviable record. Staff cameramen in 12 weeks have covered 101 different stories in and around New York City. In addition to these local reels, stories from

PERCHED ATOP A STATION-WAGON, AN NBC TELEVISION FILM CAMERAMAN RECORDS ACTIVITIES AT A MADISON, N. J., DOG SHOW, FOR USE IN A LATER TELECAST ON WNBT.

correspondent news cameramen here and abroad, contributed to NBC's television world film coverage. As an example, films of the Paris Peace Conference, made by cameramen engaged especially for NBC, were shown here for the first time on television within 48 hours of the actual opening of the conference. Pictures of the atom bomb blasts at Bikini were seen by NBC's television audience a full ten days before the story was released to theaters throughout the nation.

Films Provide Atmosphere

Today, the use of motion pictures in augmenting the "live" studio show is also an important phase of the work of the film unit. In addition to having his titles on film, a producer may call for an opening sequence which would quickly establish the locale of the play or live broadcast. At the request of the producer, cameramen are called on to film the exterior of an apartment building, a city street or a neighborhood. At another time the film editor may be asked for "stock" shots of waving wheat, a winter scene, a ship at sea. Even a lion-tamer in the cage with his "cats" was adroitly used by NBC Producer Ernest Colling in bringing realism to a studio show. Scenes of the actual circus were cut back and forth to fit in with action in the studio thus creating the effect of being actually under the "big top."

Prepares Short Subjects

In addition to its production of newsreels, NBC's film unit edits, writes and presents short subjects specially prepared for television. However, the greater proportion of films now used including those of feature length, are booked in the same manner as theatre releases. Although many outstanding Hollywood features have been presented on NBC, the major film companies have not as yet released their product for television. But working through independent producers, NBC is able to present an amazingly high standard of motion picture features and short subjects.

In the foregoing paragraphs, references to procedure have been limited to those of WNBT, a station owned and operated by a broadcast network. However, the small independent television station must depend to a similar degree on films and will need a basic film department. It would appear from the results of our experience that such a station, even when drawing on eventual networks for the major part of its video programs, will need at least one 16 mm. sound projector, a cameraman, film editor-cutter and a writer. This investment will not be required for local programs only. When networks come into being, good film footage taken locally but embodying events of national interest will be fed into the network just as broadcast programs today are likely to originate at any network affiliate.

In these days of experimentation, opinions differ as regards television programming. This is to be expected. There are many schools of thought and all of them, undoubtedly, possess some merit. But one fact is fundamental and cannot be refuted. In television, there is no substitute for a good picture, whether that picture originates in a studio, on film or through a skilful combination of both mediums.

AN NBC FILM CAMERAMAN PICKS UP SCENES FROM THE FAIR GROUNDS AT GOSHEN, N. Y., SITE OF THE FAMOUS HAMBLETONIAN RACE.

RCA VICTOR PRESSES BILLIONTH RECORD

The billionth phonograph record to be produced by RCA Victor was pressed in October at the company's Camden plant. It was a double-sided recording of "Stars and Stripes Forever" and "Semper Fidelis," performed by the Boston Symphony Orchestra conducted by Serge Koussevitzky. This achievement in record production, unapproached by any other firm, symbolizes 45 years of leadership in the record and phonograph field.

A billion records, like a billion dollars, is not a quantity that can be easily visualized. For instance, if this output of records were to be stacked, the pile would be 4,000 miles high. Working 24 hours a day, it would require 48,000 years for one person to play the entire collection.

The demand for recorded music has been increasing constantly over the years. In 1901, the Victor Talking Machine Company produced only 250,000 records. By 1921, the annual output had risen to 55 million units. In 1942, RCA Victor was able to report a new all-time high production of 59 million records.

At present, record manufacture is distributed among plants at Camden, Indianapolis and Hollywood while recording is carried out in modern equipped studios at New York, Chicago and Hollywood. In addition, the company operates mobile equipment which makes it possible to record great orchestras at their home headquarters.

Radio Communication and its Import in International Relations

Address by Brig. General David Sarnoff at Princeton University Conference on "Engineering and Human Affairs," October 3, 1946.

IT IS indeed a great pleasure to participate in this conference as part of the observance of Princeton University's Bicentennial. It is most appropriate that the subject to be discussed at this meeting is "Modern Communications and Its Import" and that it should be discussed at this place. For it was on this campus that Professor Joseph Henry, more than a century ago, erected important milestones in electromagnetism and telegraphy that helped to open the way for radio. The notebooks which he kept show that he "communicated orally" by means of "induction at a distance".

One of his students at Princeton noted that "each spark sent from the electrical machine in the College Hall affects the surrounding electricity through the whole village". The spirit of research exhibited by Professor Henry continues to characterize the work and scholarship of noted scientists and teachers at Princeton University. Indeed, that spirit extends beyond the walls of the University, for here in Princeton are located the RCA Laboratories where research in radio, communications, electronics and related fields are carried on by a staff of renowned scientists and engineers, on a world-wide scale. Today, man is able to "communicate orally" around the earth.

War revealed, in a spectacular way, the vital significance of communications. In a world that is struggling for rehabilitation from the ravages of war, there is no doubt that communications represent an important factor in human affairs and in any formula for peace. All forms of electric communication — telegraph, telephone and radio—now are woven through the pattern of international relations. Of these, radio is the most powerful because of its speed and its ability to reach all nations regardless of barriers, whether oceans, mountains, deserts, frontiers or censorship. It can speak any tongue; it can speak as the voice of freedom or as the voice of dictatorship.

Radio's effectiveness depends not only upon kilowatts and wavelengths but upon the use which man makes of it. The power of radio for good or for evil does not rest within the electron tube but within the minds of men. They determine to what use we put this modern means of communications which encircles the globe and travels with the speed of light. Radio can move even across 240,000 miles of outer space to bring a radar signal back from the moon in less than three seconds! We have crossed the threshold of television domestically and are approaching international television. Thus we see how radio has helped to shrivel the size of the universe; we behold its great power and the challenge which science hurls at mankind.

During the war, radio did a tremendously effective job in linking the Allied armies, fleets and air armadas. The impact of war and its demands upon science revolutionized communications. Today we have at our disposal new electronic devices which make radio an even more powerful force throughout the world. By giving a fair and balanced picture of world relationships and by honest dissemination of facts and news, radio can be used constructively to help achieve a lasting peace.

For long years the portals of the British Broadcasting Company carried the inscription, "Nations Shall

GRADUATE COLLEGE OF PRINCETON UNIVERSITY, MEETING PLACE OF THE UNIVERSITY'S FIRST BI-CENTENNIAL CONFERENCE ON "ENGINEERING AND HUMAN AFFAIRS."

"'THE VOICE OF U.N.' . . . SHOULD HAVE A WORLD-WIDE RAN 'E AND BE USED FOR BROADCASTING THE PUBLIC PROCEEDINGS OF THE UNITED NATIONS, FOR DISSEMINATING ITS INFORMATION TO LISTENERS EVERYWHERE AND FOR SPREADING KNOWLEDGE AND UNDERSTANDING AMONG THE PEOPLES OF THE WORLD."

Speak Peace Unto Nations". But there came a day when those words over the doorway in London were illuminated by fire while exploding bombs and rockets shattered the surrounding area. Some of the missiles were even guided to the London target by radio. So we see how important it is for man in his efforts to re-establish peace throughout the world, to harness radio as a constructive aid in human affairs. Man's highest motives and hopes, including the slogan, "Nations Shall Speak Peace Unto Nations", will go for naught unless all nations use communications for peace with the same determination that they used it for war.

Today, every country realizes the need for a powerful globe-encircling voice in the post-war world. It is vital for friendship, for trade and for commerce. As part of its contribution, the United States must develop an adequate plan for international broadcasting.

When World War II began, Great Britain was at the forefront in international broadcasting through the use of its Empore system of short wave stations.

Russia, too, had erected within her borders, powerful broadcasting stations. Their programs reach all of Europe and are beamed to the East, to South America, and to other parts of the world.

Germany, before and during the war, operated a most extensive system of world-wide broadcasting. Its programs of propaganda, developed to a point of psychological warfare, were a vital part of its aggressions upon humanity.

By comparison, the international short-wave broadcasting operations of America, before the war, were insignificant. During the war, a number of additional stations were erected and the service substantially expanded. The U. S. Government financed this expansion and controlled all our international broadcasting activities during the emergency.

In the brief period of one year that has elapsed since the war ended, the American position in international broadcasting has already declined sharply. Today, Great Britain continues with her International Broadcasting services reduced little, if any. Russia is actually increasing her services over those of wartime. The United States, in striking contrast, has reduced its international broadcasting services by more than one-half.

The curtailed American services are under the auspices of the State Department and are financed by a temporary grant from Congress.

The questions now facing us are these: How shall the United States continue and expand its vital service of international broadcasting so that the "Voice of America" can be heard throughout the world? Who shall control it? How can it be supported in peacetime? These questions pose new problems for our country and their solution calls for a new approach.

Advertising, from which domestic broadcasting derives its revenue, does not, for various reasons, supply the practical answer for international broadcasting. Such meager revenue as might be derived from this source would be totally inadequate to provide the large sums needed for a public service of world magnitude. Moreover, many questions of foreign policy arise in any plan to finance international broadcasting entirely on the basis of commercial advertising.

Because of the special circumstances surrounding this unusual service and its national and international implications, I believe that private enterprise, as well as Government, would be well advised to recognize that international broadcasting does not belong *exclusively* within either domain.

The cost of doing this job effectively is quite likely to be $20,000,000 a year. This figure is less than the amount spent yearly and individually by the British and the Russians. Indeed, as time goes on, the United States may find it necessary to raise this figure substantially, if we are to match their world coverage.

A Plan for the U. S.

In an effort to stimulate discussion of the problem and to help solve it, I presented on January 9, 1943, to the Secretary of State, a tentative plan, the principal features of which are as follows:

1. That the United States Government and the American broadcasting industry cooperate on a public service basis. Only the Government can make known to the world the Nation's foreign policy, or provide the financial means commensurate with the task. On the other hand, private industry is needed to lend its initiative, ingenuity and experience to make this exposition effective.

2. That a public corporation be organized for this purpose and that it be charged with the responsibility for doing the job. The corporation might be owned jointly by Government and industry.

3. Such a public corporation should derive its legal authority from Congress through enactment of a bill that would define specifically the purposes and scope of the organization, representing, as it would to the rest of the world, "The Voice of America". The organization should be removed as far as possible from political influence and domination. Its Board of Directors should be composed of representatives of the public, of industry, of labor, and of governmental departments most directly concerned with our foreign policy and with other phases of our foreign relations. Such a Board would assure freedom for the presentation of non-partisan views of American life.

4. The Board of Directors shall select the managerial and operating staffs of the organization and be charged with the responsibility for its programs and activities.

5. The corporation would be the agency to establish direct relationships with the other international broadcasting organizations of the world, and would thus provide facilities for inter-change of programs, to be relayed and broadcast through local station tie-ins.

Let me make it clear that my proposals relate solely to international broadcasting. They do not deal at all with the subject of domestic broadcasting, where the same problems do not exist. There is no need and I know of no intention to depart from the American system of domestic broadcasting which, as a private enterprise, has found the way to support itself and to render a finer and freer broadcasting service to the American public than can be found in any other part of the world.

A Plan for the U.N.

In considering the subject of international broadcasting, I wish to stress the fact that if it is to be effective, the principle of Freedom to Listen must be established for all peoples of the world. This is as important as Freedom of Speech and Freedom of the Press. People everywhere must be able to listen without restriction or fear. In the light of present-day world developments, it would seem highly important that the U.N. should be able to reach directly all people of the world so that they in turn may impress their thoughts and desires upon their leaders. In this way, the danger of the people being kept uninformed by their leaders would be overcome.

One effective way to achieve this is for the U.N. to provide an effective world-wide system of broadcasting that can reach all people of the world freely and simultaneously. That system would supplement the plan I have outlined for international broadcasting by the United States.

To further this idea, I submitted to the officers of the United Nations, on April 4, 1946, a two-point plan, as follows:

1. Establish the principle of "Freedom to Listen" for all peoples of the world.

2. Establish an independent international broadcasting system to be known as "The Voice of U.N." This system should be owned and operated by the U.N. It should have a world-wide range and be used for broadcasting the public proceedings of the United Nations, for disseminating its information to listeners everywhere and for spreading knowledge and understanding among the peoples of the World. "The Voice of U.N." should broadcast in the principal languages employed throughout the World. The U.N. should continue to afford to other broadcasters and to the press the privilege of broadcasting and publishing its proceedings and information.

I realize that many practical problems are involved in adopting and executing such a plan, technically, politically and financially and that it will take time to achieve it. The technical problems can be solved by technical experts. The political problems can be solved by the membership of the United Nations. Financially, the problem is certainly not a serious one for the total number of nations comprising the U.N. The cost of erecting such a supplemental broadcasting system would be no greater than the cost of building one modern battleship. The potentialities of such a service for helping to preserve the peace of the world would seem greater than that of any single ship.

These two plans for international broadcasting — one by the United States and one by the United Nations—are based upon the American tradition of freedom. I submit them as a joint "Voice of Peace" that can speak around this planet and be heard by all the people everywhere no matter what their race or creed or political philosophies.

"Man of Science"

General Sarnoff was selected to receive the first "Man of Science" award established by Science Illustrated magazine in recognition of his contributions in building the radio industry and for his vision and imagination in developing research as a keystone of the Radio Corporation of America.

The gold medal and scroll comprising the award were presented to General Sarnoff by Dr. Gerald Wendt, editorial director of the magazine.

HORACE SCHWERIN, ORIGINATOR OF THE SURVEY PLAN, POINTS TO A CURVE SHOWING THE VARYING REACTIONS OF LISTENER-CRITICS THROUGHOUT THE PROGRESS OF A 15-MINUTE PROGRAM.

Critics by Request

GROUPS OF WEAF LISTENERS MEET IN RADIO CITY STUDIO TO SERVE AS JURIES IN NBC PROGRAM RESEARCH PLAN

By Hugh M. Beville, Jr.,
Research Director,
National Broadcasting Co.

PANELS of 300 radio listeners who have accepted invitations to become "critics for a night" are meeting twice weekly in an NBC studio in Radio City to express their opinions on network and WEAF programs. These gatherings provide basic data for the operation of a system devised by Horace Schwerin, well known research expert, to serve as a practical program-building tool for radio producers.

Numerous methods of sampling radio audience reaction have been advanced at various times, but the Schwerin System is being used on an experimental basis by the network because of its flexibility and the speed with which results can be obtained. Not only is this form of testing useful in auditioning whole programs or individual performers. It functions equally well in testing experimental changes in programs, in discovering the need for changes in content and structure, and in revealing faults of timing which should be corrected for maximum audience appreciation. Reports prepared by Schwerin Research Corporation after each test given NBC Program Department complete information on audience attitudes, so that producers may combine this knowledge with their own showmaking experience in effecting needed changes and improvements.

Listeners Invited by Radio

Participants in the tests are recruited by announcements over WEAF inviting the station's listeners to come to Radio City and "tell NBC what you think of its programs." Each listener who responds receives a multiple folded mailing card to fill out and return to NBC. The card bears information which permits NBC and SRC research experts to select a balanced cross section of listeners for each panel. This insures a group containing the desired proportion of men and women from different age, occupation and educational groups.

The test begins with the playing of a transcription of the program to be analyzed. At certain preselected points in the show, numbers are flashed on the screen, and each audience member then checks on his reaction sheet his opinion of the program part to which he has been listening. There are three choices of reaction, the words on the sheet varying, depending on the type of program being tested. In this way, qualitative reactions to the various units that comprise the program, such as the music, the commercials, the vocalists, etc., are obtained. In a half hour show the audience may be asked to check as many as 50 to 60 points.

At the conclusion of each program transcription, the meeting is thrown open for a general discussion. The guests are urged to state their likes and dislikes without restraint. Comments useful to the survey are then put to the audience in the form of specific questions, and all audience members vote on these propositions on another check sheet.

Charts Show Audience Response

When each group has concluded the evening's tests, sheets are collected and the information they contain is transferred to cards for analysis. From these data is compiled a profile chart, the ups and downs of which depict the shifting in audience reaction from beginning to end of the program. This profile is then presented as part of the report to program producers, to be used by them as an aid in better programming. By relating the reactions obtained on the check sheets with each respondent's personal data (secured from a detailed questionnaire filled out at the start of each session), it is possible to study the relative appeal of any program to men and women of different age groups and living standards. A large number of other breakdowns is possible.

CROWDS AT THE IOWA STATE FAIR WATCH ONE OF THE TELEVISION SHOWS STAGED BY RCA VICTOR AND STATION KRNT, DES MOINES.

TELEVISION GOES TO THE FAIR

Thousands of Visitors to Annual Exposition at Des Moines, Iowa, Watch Daily Video Programs on Twelve RCA Receivers

THOSE sure-fire, time-tested main attractions of country fairs—the Midway, the races and the live-stock show—met the stiffest competition of their history last August when RCA sent twelve television receivers to the Iowa State Fair at Des Moines to show mid-westerners what they may expect to see in their own homes in a few years.

For nine days, RCA personnel under the direction of Richard Hooper, Shows and Exhibition Manager, working in cooperation with Paul Mowrey and Harvey Marlowe of the American Broadcasting Company, and Chuck Miller, program director of Des Moines station KRNT, an ABC affiliate, put on a total of 35 hours of programming, an average of 18 television periods a day. Typical country fair features predominated in the entertainment but many of KRNT's regular programs were televised at the Fair studio and fed to the receivers. All television programming was directed by Joseph A. Jenkins of the RCA Victor exhibition staff.

The television stage, control rooms and viewing positions were set up in a huge tent accommodating more than 800 persons, 300 of whom were seated in front of the stage. Two of the receivers were located in a lounge at the rear of the tent and eight others were placed in shaded booths on both sides of the tent entrance. Fair officials estimated that at least 50% of the record breaking attendance of nearly half a million guests visited the telvision demonstration, the first to be given in Iowa. So great was the interest shown that a much larger tent would have been needed to accommodate the crowds seeking entrance.

Receivers Connected by Cable

The major remote pickup was in the grand-stand area where programs of harness racing, automobile races and stage acts were televised. A 500-foot coaxial cable connected the cameras with the group of receivers.

As expected, programs with a rural appeal drew hearty applause from visitors to the Fair. Each afternoon the International Harvester Company sponsored a special program which became one of the day's highlights. One of these features was a demonstration of animal disease control by spraying, with a loudly protesting pig as the subject. Another was an exhibition of pure bred calves, staged by youngsters from a nearby 4-H Club. And farmers and city folks alike watched the television screens with amusement as a cow was led onto the stage to take the leading role in an actual demonstration of a modern milking machine.

The sound portions of a majority of the television programs were broadcast simultaneously over KNRT, which not only helped to promote television through references made by the actors and speakers, but attracted additional visitors to the television tent on the fair grounds.

AN RCA TELEVISION CAMERA FOCUSES ON THE THRILLING FINISH OF A SULKY RACE AT THE IOWA STATE FAIR.

ANNIVERSARY IN SOUND

RCA Joins with Warner Brothers in Celebrating 20 Years of Development in Recording Sound for Films

By M. C. Batsel,

Chief Engineer, Engineering Products Dept., Radio Corporation of America.

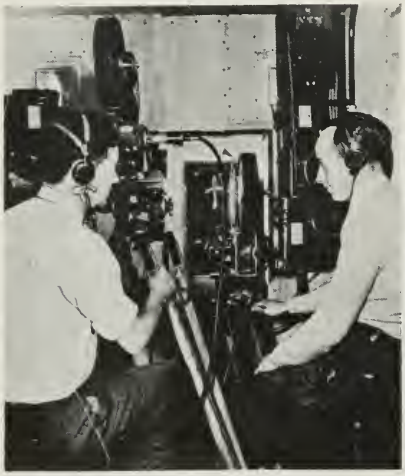
WHEN Warner Brothers, in 1926, were looking around the country for a manufacturer equipped to produce sound-on-disk recordings for the first talking pictures, their search brought them to Camden, N. J., plant of the Victor Talking Machine Company, predecessor of the RCA Victor Division. There they found engineers, acoustics experts and manufacturing facilities ready to go to work on the numerous problems that accompanied the revolutionary change in motion picture production.

In the 20 years that followed, RCA assumed the lead in the development of equipment and techniques, and contributed to the art a number of advances which have been honored in special awards by the Academy of Motion Picture Arts and Sciences.

Any history of a new industry should include mention of its birthplace. In the case of sound motion pictures, the industry's "log cabin" was an abandoned church in Camden. There, where the congregation of Trinity Baptist once worshipped, the first experiments in combining sound and film were carried out. Because of its location in a neighborhood that was rapidly losing its residential character to encroaching industrial plants, the property was sold to Victor for use as a warehouse. A little later, Victor engineers discovered by accident that the building had acoustical properties which made it an ideal recording studio. Soon all recording activities were concentrated in the "church." There, up to the advent of sound pictures, came a constant procession of the world's greatest personalities in the concert and operatic world to have their art etched on phonograph disks. Enrico Caruso, Jean de Reszke, Ignace Jan Paderewski, Emma Ames, Galli-Curci, Ernestine Schumann-Heink and many others visited the studio to record their vocal and instrumental talents for the ages.

Camden is Production Center

As the making of sound disks for talking pictures grew in importance, phonograph recording activities were transferred to New York and the Camden studio became the principal production center for the new industry. It did not take long for Victor engineers to discover that the demands of film producers presented problems that they had never faced in making recordings for the home. Not only was there a lack of suitable equipment but the necessity for what are known today as "sound effects" tested the ingenuity of the recording pioneers. Carbon Klieg lights that sputtered with strange noises that found their way into the disks; "masked" and hidden microphones that muffled voices, and microphone booms that had a fiendish way of collapsing noisily during the final minutes of a scene were only a few



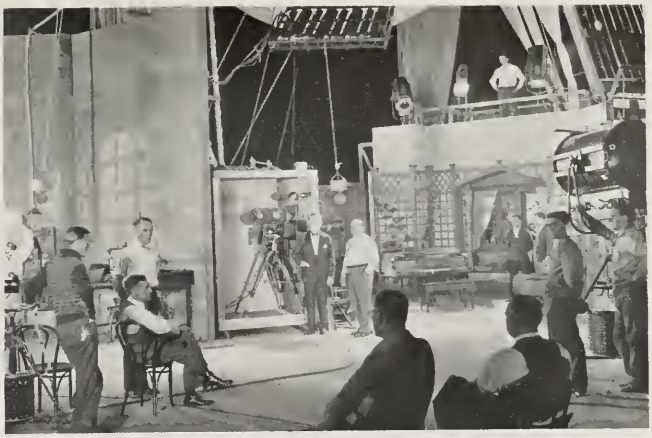
IN THE EARLY DAYS OF "TALKIES", CAMERAS WERE SO NOISY THAT THEY WERE ENCLOSED IN SOUND-PROOFED CABINETS, SHOWN BELOW AT RIGHT, IN A 1927 VITAPHONE STUDIO. THE CRAMPED QUARTERS OF A CAMERA BOOTH OF THAT ERA ARE PICTURED AT THE LEFT.

of the difficulties that made the job complex and oftentimes discouraging.

For the most part, the church studio was used for matching sound to the films which had been shipped in from the West Coast but during its existence, more than 24 films-with-sound were "shot" there. At such times the place resembled a combination of a railway terminal at rush-time and a machinery plant under full production.

Grass Grown to Order

Frequently, the proceedings taxed to the extreme the ability of the RCA Victor staff. Once while shooting scenes for an Hawaiian picture, it was necessary to have real grass in the foreground of the set. How the staff solved that one will be the envy of many suburbanites! Workmen merely spread good Jersey soil over a 20-foot square space in the studio, sowed grass seed and sprinkled it with water. They turned hot Klieg lights on the acreage and left them burning. In no time at all — the records say 24 hours — enough grass had sprouted for the picture-making to proceed. It was winter and the green plot within was in strange contrast to the snowdrifts on the studio door-step.



TYPICAL MOTION PICTURE STAGE OF THE MIDDLE TWENTIES SHOWING CAMERA CABINET AND AN EARLY TYPE CONDENSER MICROPHONE SUSPENDED ON A CORD OVER THE SCENE TO BE FILMED.

RCA Achievements in Sound which have been honored by awards of the Academy of Motion Picture Arts and Sciences.

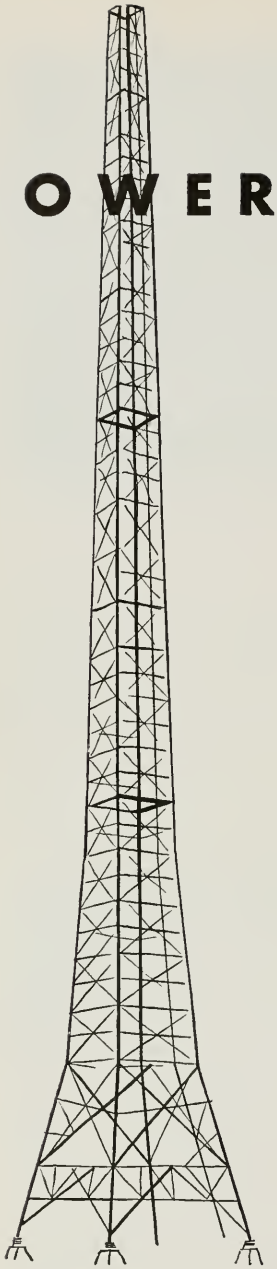
1931—Velocity microphone.
1931—Noise reduction recording equipment.
1932—High-fidelity recording and reproducing system.
1936—Ultra-violet light recording system.
1936—Non-slip printer.
1936—Rotary stabilizer sound-head.
1937—High frequency method of determining optimum photographic processing conditions for variable width sound tracks.
1941—Uni-directional microphone.
1941—Recording of sound in Disney film "Fantasia."
1945—Sound recording in "Bells of St. Mary's."

Hiding "Mikes" a Problem

Recording engineers who are still working for RCA Victor recall other difficulties encountered in the early days of recording for sound pictures. One of the principal problems was effective "masking" or hiding of microphones when pictures were being produced. The mikes used in those days were big, heavy, and unwieldy. They were taped on the backs of pillars used as stage props, suspended by pulleys from the ceiling, hidden in the bases of potted plants, and generally scattered over the scenes. Because of their unfavorable locations, the objects used to "mask" the mike would often block the voice pick-up. For example, when a mike was taped behind a pillar or back of a chair in a scene, that "prop" would often act as a barrier to good voice pick-up. The result would be a recording that was muffled and hard to understand.

The boom microphone, suspended overhead and built on a dolly that could be wheeled into the most advantageous position, solved most of this "mike" trouble. But the evolution of the boom mike was not without incident. The first models were suspended on one end of an elevated cross-bar and counterbalanced on the other end by a series of weights, much like those used on old-time grocery scales, but much heavier. Occasionally, in the excitement of picture making, "grips" would move the mikes too quickly and the weights would fall clattering to the floor, ruining the recording.

In view of this long association with the motion picture industry, it was only natural that RCA Victor Division should have joined with Warner Brothers on August 6 in marking the 20th anniversary of the production of the first film with synchronized sound, for RCA, perhaps to a greater extent than any other company with the exception of the film makers themselves, is responsible for the development of the sound motion picture film industry from the years of its earliest struggles to the notable achievements in equipment and techniques which produce today's high-fidelity sound recordings.



TOWER OF LEARNING

NBC's many cultural and informative programs, and its University of the Air, are significant factors in adult education.

From the radio towers of the NBC Network, systematic liberal education is being broadcast to American listeners through programs which make up the great majority of NBC's hours-on-the-air. They are programs of news, public affairs, discussion, drama, music, religion and specialized services which contribute to man's knowledge and understanding, his discrimination and faith.

Many of NBC's educational activities are centered in The *University of the Air*, supervised by Dr. James Rowland Angell, NBC's Public Service Counselor and President Emeritus of Yale. Implemented by dozens of national and international organizations and hundreds of world leaders, NBC's *University of the Air* is a major factor of the Special Service which prompted 300 editors in *Billboard's* annual poll to name NBC "Top Network in Public Service."

> Since its inauguration in June, 1942, the *University of the Air* has presented 18 important courses of college caliber . . . in dramatic form or round-table format . . . on such significant subjects as classical music, homemaking, the world's great novels, and foreign policy. All *University of the Air* courses are now devoted to the fostering of United Nations understanding, in anticipation of NBC's United Nations Week—September 1 through 7.

Important as it is, The *University of the Air* is only a part of NBC's yearly total of 3043 non-commercial hours of broadcasting—hours made possible by the success of NBC's commercial programs but sponsored and produced by NBC in the special interest of its audience.

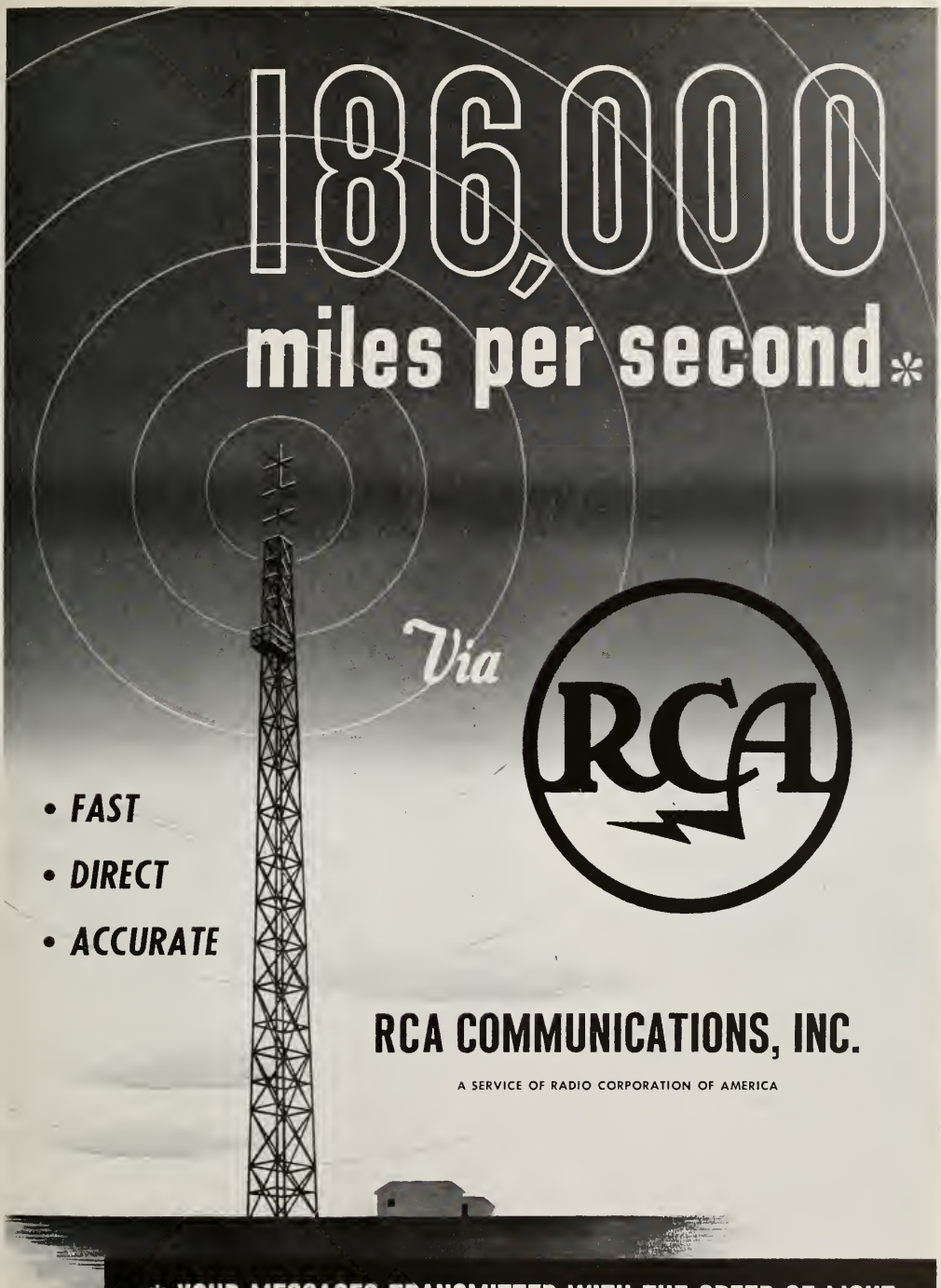
America's No. 1 Network

NBC

A service of Radio Corporation of America

...the National Broadcasting Company

Printed in U.S.A.



Teleran pictures—air traffic control by radar plus television.

Teleran—"radio eyes" for blind flying!

It's a television "information please" between airplane and airport—with the pilot's questions given split-second answers on a television screen mounted in the cockpit.

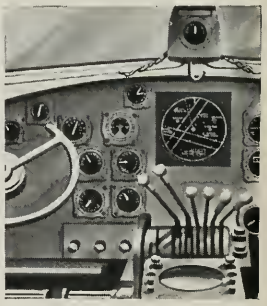
Teleran (a contraction of *TELE*vision—*R*adar Air *N*avigation) collects all of the necessary information on the ground by radar, and then instantly transmits a television picture of the assembled data to the pilot aloft in the airplane.

On his receiver the pilot sees a picture showing the position of his airplane and the position of all other aircraft near his altitude, superimposed upon a terrain map complete with route markings, weather conditions and unmistakable visual instructions. The complex problem of air traffic control is well handled by Teleran.

Teleran—another achievement of RCA—is being developed with Army Air Forces co-operation by RCA Laboratories and RCA Victor, endless sources of history-making developments in radio and electronics. They are also your assurance that *any* product bearing the RCA or RCA Victor monogram, is one of the finest instruments of its kind science has yet achieved.

• • •

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



Instrument Panel of the Future. The Teleran indicator, mounted in a cockpit, simplifies the pilot's job by showing his position relative to the airport and to other planes in the vicinity. It promises to become one of the most useful developments in the history of aviation.

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