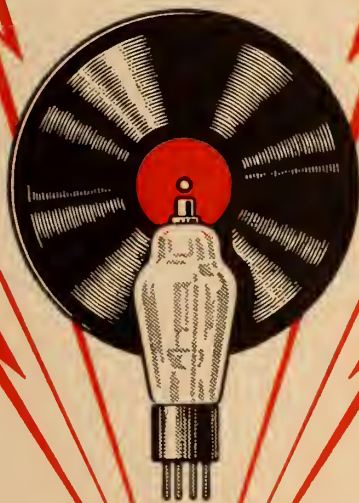
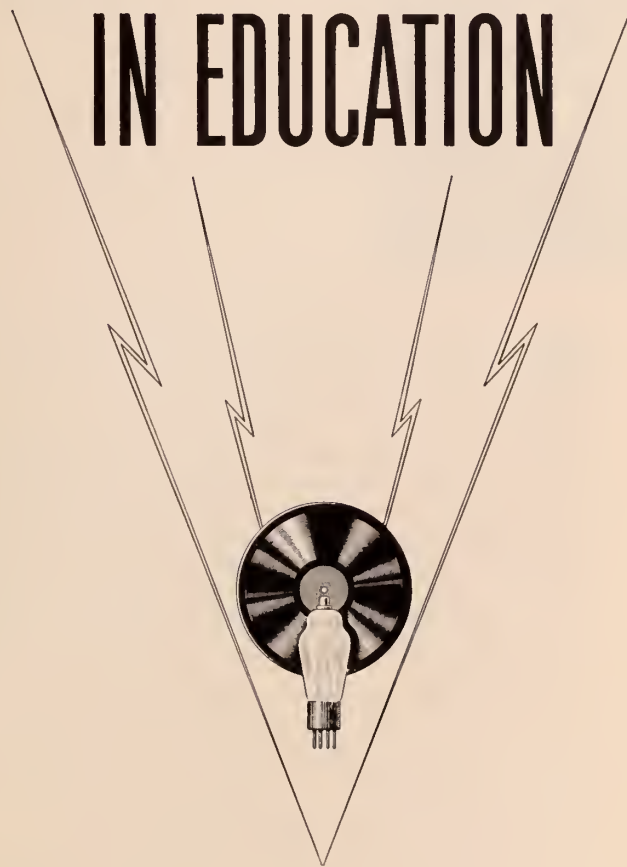


RADIO-ELECTRONICS IN EDUCATION



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FOREWORD

THIS booklet presents briefly the various types of aid which radio, both as a science and as a system of communication, renders to the cause of education.

Education is as old as civilization itself; radio is one of civilization's newest products. It is therefore too early to appraise the ultimate extent or influence of their relationship. Enough has already been accomplished, however, both in the field of broadcasting and in the use of new educational techniques made possible by radio research, to prove that the importance of radio in the educational field is profound and far-reaching.

New developments in radio and electronics, such as television and the electron microscope, are of the utmost significance to the future of education.

It may be argued that the future of education is of slight interest when civilization is locked in a life-and-death struggle with forces which seek to destroy it. On the contrary, I believe it is a subject of major importance at this time.

For the civilization of free men and women will triumph in this war, and the vital need for wise, courageous leadership will be more insistent in the post-war generation than ever before in history. The education of both adults and children — and of the many, not the few — will strongly influence the choice of policies and of leaders capable of establishing and maintaining a better world for all humanity.

David Sarnoff

President, Radio Corporation of America

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To Frances Elliott Clark
Doctor of Music

Teacher and Friend of American Youth whose life-long career as a pioneer in Music Education has been an inspiration to musicians and educators everywhere, this booklet is dedicated with deep respect and affection by her associates in RCA.

BROADCASTING AN AID TO MODERN EDUCATION

Radio's Cultural and Instructive Services Seek to Supplement Rather Than Replace the Standard Methods of Teaching

By DR. JAMES ROWLAND ANGELL

Public Service Counselor, National Broadcasting Company

UNLIKE the practice of other countries, broadcasting in the United States has always been a product of private enterprise and has never been a direct agency of the Government. Naturally, it has been necessary, in order to avoid hopeless confusion, to have the technical operation of radio conducted under general Government regulations.

Again, unlike the practice in European countries, American broadcasting has been supported by the sale of time to advertisers and not by direct taxation upon the owners of receiving sets.

These two circumstances have presented a problem to the intelligence and the public spirit of the American broadcaster, which has not in the same manner been faced by his colleagues in England and on the Continent of Europe. The dependence of broadcasting in this country upon the advertiser has carried in its train the inevitable disposition to produce programs designed to attract the largest possible listening audience. This circumstance, in its turn, has resulted in the tendency to exploit entertainment programs primarily, and especially those of the lighter varieties.

On the other hand, no American broadcasting com-

pany ever succeeded in selling to sponsors all of the time at its disposition. Each company has, therefore, been under obligation to produce at its own expense a very considerable amount of programs the nature of which it has been able to control completely.

To meet both the opportunity and the obligation which this situation creates, our broadcasters have undertaken an extraordinary range of "sustaining" programs designed to cover a great variety of interests and tastes. Some of these programs have been frankly in the lower ranges of entertainment quality, resembling certain of the sponsored programs which have achieved wide acceptance. Others have been cast on lines infrequently, if ever, found in the sponsored group. The American broadcaster, in the development of these sustaining programs, has included such major interests as religion, education in all its aspects, music and drama in their most significant and important phases. Of late, and especially since the outbreak of the war, an enormous amount of time has been devoted to the dissemination of news and to the explanatory discussions of commentators.

As these developments have slowly come to pass there has been an increasing consciousness, on the

Careful study and planning go into the program structures of the national broadcasting networks. This is the NBC Program Board in session at Radio City in New York.





The "wise men" of "Information, Please," strike a happy medium of culture and entertainment.

America's Town Meeting of the Air is one of the best examples of the serious informative-type of programs on the air today.

part of responsible owners of broadcasting stations, of their obligation to occupy an appreciable part of the time at their disposition with programs which offer an unequivocal public service. The National Broadcasting Company and the Blue Network have been leaders in their response to this obligation.

There is always a problem to be faced in discriminating between the loud clamor of a few and the gentler voices of certain large and important groups. There is neither chart nor compass whereby with certainty a course may be set amid these shoals. Only actual experience can give the answer, and even that is not always easy to interpret. Meanwhile, there are certain large areas within which broadcasters can obviously render a service that is less likely to appeal to commercial sponsors. Moreover, commercial concerns cannot enter certain of these areas without encountering suspicion of their motives.

All Great Faiths Are Served

As in certain other fields to be mentioned later, notably education, the contribution of radio to religion is one supplementary to the normal and usual agencies which serve religion's needs. Radio thus makes it possible for the invalid, the shut-in, the person remote from a church, to participate in a service of worship.

Many a church has a microphone in its pulpit by means of which, through local transmitters, members of the community for miles around may hear the prayers, the hymns, the sermon; while on the network may be heard the words of the most commanding preachers of the day and the noblest religious music produced in the churches and temples of the land. All the great faiths are thus served.

The practical difficulty which a network confronts

is that of giving opportunity for all the groups which feel they should have representation. As there are said to be more than 300 different religious sects in the country, it is easy to see that this problem is real.

Over the years, no networks have been more generous of their time in the service of religion than the two great networks of the National Broadcasting Company and the Blue Network Company. Theirs has been a strikingly useful service. This statement is substantiated by innumerable pronouncements of important religious bodies and by various of the recognized leaders of the religious life of our time.

In undertaking to render a service in the religious field, we have sought the cooperation of the men and organizations that have worked with us in avoiding criticism of any faith by the representatives of another. We have attempted to confine the spoken word to the presentation of basic spiritual principles without sanctioning the teaching of purely doctrinal tenets. The propriety of these guiding policies has been generally recognized as being in the common interest by the members of all faiths.

Some of the outstanding programs in this field are the *Catholic Hour*; *The Message of Israel*, conducted by Rabbi Jonah B. Wise; *Religion in the News*, conducted by Dr. Walter Van Kirk, and the regular Sunday services conducted by Dr. Ralph Sockman and by Dr. Harry Emerson Fosdick. More recently, there has been a program on Sunday afternoons presenting the music of the great faiths. Letters from all parts of the country testify to the deep appreciation of an immense audience for these services.

A good many programs, some sponsored, some sustaining, have presented the stories and teachings of the Bible. The sum total of these religious programs is impressive.

Formal group education is another important area in which broadcasting has been active. The field covered by the term "education" is necessarily very broad. It includes all branches of formal instruction, from the pre-kindergarten up through the college, the graduate school and the professional school. It embraces in its scope not only these generally recognized areas of teaching, but it also includes adult education in all its phases. Broadcasting nowhere pretends to replace other methods of instruction. It is supplementary to the other agencies which have been developed to carry out the educational work of a nation, and as such, wherever possible, it must be conducted in cooperation with the teaching staff.

Problem In Time Differential

In the United States, it is not practicable to put educational material on the air which shall be acceptable to all these various communities and at hours which are feasible for schools and colleges to employ. This is partly because radio with us is a privately conducted enterprise rather than a governmental activity, but much more because of the vast extent of the country and the existence of forty-eight different States, each with its own educational organization and curricula. With the time differential between New York and San Francisco three hours, the grave character of this time difficulty becomes apparent.

There are two partial solutions. The first is a delayed broadcast which a station may put on, if it will, at a time acceptable to the local and regional schools. Under the conditions of American broadcasting, while this is mechanically a perfectly simple proposition, it is administratively and financially often difficult to achieve. The station may have an opportunity to sell part or all of the time in question, in which event it is rather unlikely to sacrifice the available

income. There are plenty of instances, however, in which this has been done.

The second solution is found in the electrical transcription, or recording, which has some advantages over the broadcast procedure itself. Its success depends upon certain favorable combinations of circumstances. If a teacher, planning to use the recordings of a given series of broadcast programs, can receive the records well in advance of the time of their use, she can study them herself and be much better prepared to exploit their values for her own class than if she has to deal with a broadcast which she has not previously heard. This is true even though she may have received a syllabus and a handbook presenting the plans for the broadcast series. Moreover, a record can be stopped at any point for question and discussion, it can be played a second time, and it can be held for repetition on other occasions.

The use of receiving sets and playbacks is rapidly increasing and the latter, with the well-made recording, certainly represents far greater flexibility in the use of material than does the broadcast, which has to be heard at a specific hour with the consequent possible disturbance of schedules.

Of all the programs devised by American broadcasters for use in the schools, the *Damrosch Music Appreciation Hour*, was, over the years, undoubtedly the most successful. Not only is music itself a radio "natural" but, thanks to the adroit skill of Dr. Damrosch, these programs were so organized as to fit very effectively into the musical courses in a large proportion of our elementary and secondary schools. This fact, coupled with the opportunity which was afforded to hear a great orchestra, and with the informing expository comment of the director, gave the series a tremendous appeal. Literally millions of children listened to it. Like all other effective radio edu-

Use of electrical transcriptions in school rooms, as shown here, has found favor among broadcasters and educators alike.

The networks maintain a constant flow of up-to-the-minute news and comment to the vast radio audience.





"The Army Hour" features service news and facts. In this scene, North African campaign equipment is being described.

Studio sound effects add realism to "March of Time" broadcasts.

educational programs, it was accompanied by a cleverly devised manual, part of it directed to teachers and part to the listening children.

Although the National Broadcasting Company has from time to time offered educational programs to be used in the classroom, they have been relatively few in number and definitely limited in the periods during which they were offered. Another important network early developed an in-school hearing series which rendered it somewhat superfluous to attempt a duplication. Meanwhile, a number of educational stations and some commercial stations developed considerable bodies of programs for use in the classroom. In view of the existence of this large body of programs for classroom listening put on by other broadcasting agencies, the NBC has chosen to direct the larger part of its effort in this area to the field of adult education and to out-of-school listening.

Among the more successful programs of this kind are:

Great Plays, showing the development of drama from the ancient classical world to modern times.

Farm and Home Hour, supplying valuable and interesting information to the farmer and his family.

University of Chicago Round Table, presenting scholarly authorities in discussion of current issues.

America's Town Meeting of the Air, offering lively debate by conspicuous leaders of various causes, followed by questions from the audience.

Doctors at Work, dealing with a wide range of health problems as they relate to both individual and community.

Story Behind the Headlines, giving authoritative analysis of current world conditions in terms of their historical origins.

Unlimited Horizons, presenting interesting information as to important scientific discoveries.

Some commercially sponsored programs may be classified as contributing to the adult education field, and among them are:

Information Please and *Quiz Kids*, both appealing to the culturally inclined through the wide range of wit and knowledge displayed by the more permanent performers on the programs.

March of Time, dramatizing the news of the day.

Cavalcade of America, presenting dramatizations of great historical events of the past.

Increase In News Programs

A special chapter in this volume is devoted to the latest of the strictly educational ventures of the company, i.e., the *Inter-American University of the Air*. This is in some ways the most ambitious undertaking upon which the company has entered in the educational field. It has great promise, and there is no reason why it should not go on to take a place of widely recognized prestige in the cultural world of the Americas. A separate chapter also is devoted to programs developed for women and children and the definite interests of the home.

Particularly since the outbreak of the war, there has been a tremendous flux of news and commentator programs, some of them sponsored, many of them put on by the company itself. These render an unquestioned public service, although as programs they have not been under the jurisdiction of the Public Service Division.

So far as concerns the public, the only question raised about news, as such, has related to its authen-

ticity and to the particular periods at which it was made available. In both these respects, the company has made every effort to meet the highest standards of public service. The problem presented by commentators is quite different and much more complex. There is a wide variation in the public mind as to what the commentator should offer — whether, for example, it should be merely an intelligent analysis of the news, or whether it should also contain the editorial opinion of the speaker. In theory, most commentators assume to be purely objective analysts and reporters, but in fact — whether by phrasing, by intonation of voice, or by outright verbal expression — some of them seem to be very definitely partisan and propagandist. So far as this company is concerned, it has sought to have all the programs in this field for which it is responsible as objective and as accurate as possible, avoiding anything that could be regarded as an unfair or distorted presentation.

In this connection attention must be directed to the large amount of program material which the company has offered since the outbreak of the war, directed specifically to assisting in every aspect of the national war effort. The list of programs in this field is long. It covers not only service to the Army, the Navy, and the Coast Guard, but also to all governmental and civil organizations and activities, including the Red Cross, which are making significant contributions to the nation. No other broadcasting company has done so much, measured either in quality or quantity.

One great division of the company's activities, definitely of a public service nature, is centered in its contributions to fine music. No finer orchestra, no

more brilliant conductor, no more musically perfect performances have at any time or anywhere been produced than are represented in the NBC Symphony Orchestra concerts under the direction of Arturo Toscanini. Similarly, the Metropolitan Opera has been made available to millions of people. And over the years, the finest music of our civilization has been heard through the contributions made by the National Broadcasting Company. Add to this the great body of lighter music and you have a contribution which, on the one hand, ranks as entertainment and, on the other hand, stands as one of the finest elements of culture in the modern world.

Better Understanding Developed

During the last year, we have appointed Mrs. William H. Corwith to present the activities and policies of the National Broadcasting Company to schools, colleges and civic organizations of various kinds. This she has done with distinguished success, addressing nearly 40,000 persons in communities scattered throughout the Central and Northeastern States. This is a service which may well be extended. It supplements a procedure which we had earlier developed in setting up advisory contact committees of the several large groups that make regular use of radio. We have had the helpful cooperation of more than 3,000 persons in this venture, representing all parts of the country. We have looked to them for advice, criticism and suggestions upon our Public Service program structure with beneficial results. A better and more sympathetic understanding on our part and on theirs of our common problem in seeking to make radio a more effective public servant has developed.



Dr. Walter Van Kirk conducts "Religion in the News," an outstanding public service program.



Everett Mitchell highlights the weekly farm news on "The National Farm and Home Hour."

RECORDINGS FIND WIDE USE IN TEACHING FIELD

Many Series of Records and Albums Developed for Use With Classes in History, Literature, Drama, Music, and Speech

By PAUL THORNTON

Educational Department, RCA Victor Division

THERE are many interesting and unique stories about the history and development of large industrial organizations. Many articles have been published concerning nationally known companies and their founders, and the history of RCA Victor is no exception. This is especially true as it alludes to the establishment of the Educational Department, which dates back to April 1, 1911.

It takes little imagination to comprehend the situation which faced the early pioneers in the phonograph record industry. Here was a new idea which had received some attention, but the product was crude in many ways, and the public considered it a toy at best. Further improvements in the product were necessary but, most of all, greater acceptance by the public was the issue.

In 1909, Walter Geissler, then vice president of the Victor Talking Machine Company, developed the premise that recordings would be valuable only when a plan for their serious use could be established. His thoughts were directed toward the schools, for in this area was a definite need for recorded music to be used in music classes.

Frances Elliott Clark was a most successful music supervisor in the public schools of Milwaukee. In her own words, she relates:

"It was a lovely spring day in 1909 when I stepped into a store in search of some Victor Records of hymns. These were intended as a Christmas present for my mother who had been a singer of hymns. As I waited to be served, I heard the recorded voice of Evan Williams singing the song, *All Through the Night*. Every fourth grade in the city is now singing that song, thought I, and what a pleasure it would be if the children could hear such beautiful singing. I walked out of the store half dazed by the vision of what could happen if the children in my schools could have the rapture and inspiration which had just been mine.

"At a meeting with two school principals, we discussed the possibilities of this new contribution to music, and arranged for demonstrations in their schools. The children were awed and delighted, sang with the instrument and listened with keenest pleasure to some recordings far beyond their repertoire.

The trial was a complete success.

"The teachers and principals in the Milwaukee schools were much impressed by the reports of the first demonstration and, accordingly, arranged for a series of concerts to acquaint parents with the possibilities of the innovation. Within a month, more than forty phonographs were placed in schools.

"In school music circles, the news of our successful experiments had travelled widely. Miss Katherine Stone of Los Angeles came to visit me in March. She was completely converted to the adaptability of the idea, and wrote me an analytical review of her observations."

Subsequent developments in the Victor Talking Machine Company included the appointment of Mrs. Clark as director of the newly-formed Educational Department, and she began her work on April 1, 1911.

Records Seen As Necessity

The first recordings specifically for schools were made in September, 1911. The types of these early recordings included Mother Goose songs, folk dances, art songs for children, and military marches.

Plans to introduce recordings to schools were extensive and several members were added to the staff of the Educational Department. All of the new members were school music specialists with a wide background as teachers. The philosophy of the department was "Ours not to sell, but to show that the service of recorded music is not a fad, not entertainment nor luxury, but an actual necessity in 20th century teaching."

As the schools became acquainted with techniques for using recordings, new materials were provided to meet the needs of the expanding school program. The Victor Record Catalogue has grown to meet most of these needs.

The elementary grades have received much consideration in the preparation of recordings, and literally hundreds of selections are available for use on this level. Textbook publishers have been especially eager to record the songs included in their many music books. With this wealth of material it is comparatively easy for children to learn, by imitation, the great vocal heritage which is theirs.

An appreciation of instrumental music is an important study in the elementary grades, and much attention has been given to this field. One of the many problems faced is the recognition of the sounds of the various instruments of the orchestra. For that purpose there has been prepared a series of twenty large wall charts, picturing the instruments in their true color, as well as the player of the instruments. A handbook is also available which gives much detailed information to the teacher about the various instruments. In addition, there are two Victor Records which include a short recording of each of the instruments in the orchestra. With these materials, you have the powerful learning combination of *Sight, Sound and Story*.

Music from an appreciative basis has been developed by several outstanding authorities in the field, one of whom was the late Louis Mohler. He prepared a set of twenty records known as the Louis Mohler Series, which has been used widely among schools. This series of records approaches the teaching of music with the following objectives: creative listening, rhythmic development, appreciation of music form, correlation of music with other subjects, and creative development. Additional records have been used which extend this approach to the upper levels of the elementary school.

Many of the well-known classics which have been written primarily for children have been recorded. Other musical compositions, while not written especially for children, are equally acceptable. *The March of the Little Lead Soldiers*, *The Petit Suite*, and *The Toy Symphony*, are only a few of the many interesting compositions which have been recorded for children.

Recorded music for junior and senior high schools,

normally less specialized than that in elementary schools, is even more abundant. Music recorded for general use can be easily adapted for use on these levels, so the teacher has a wide choice in her selection of materials. Practically all of the standard classics have been recorded, and in many instances there are several different recordings of the same composition. The current catalogue includes many classifications, only a few of which follows: art songs, ballet music, folk songs, liturgical music, madrigals, rondos, sonatas, suites, symphonies, themes with variations. Under each heading is found the world's greatest music, performed by the world's greatest artists.

Reference Books Supplied

As Victor records became more widely used in schools, there were many requests from teachers for assistance in presenting the recordings effectively. In addition to the many pamphlets and booklets issued from time to time, several full-sized text and reference books have been supplied.

One of these is *Music Appreciation for Children*, which is an excellent program of music appreciation intended for grades one to six. Another is *Music and Romance*, an interesting story and history of music published for use by students in the junior high school. *What We Hear in Music* is a veritable encyclopedia of music for students in high schools and junior colleges. The *Victor Book of the Opera* and the *Victor Book of the Symphony* are outstanding contributions to the study of the major operas and orchestral compositions. These books cover the wide range of musical interest in the elementary, junior, and senior high schools, the colleges and universities. This is another of the many services provided to schools by the RCA Victor Educational Department.

Nearly thirty years ago, these children in the Ramsey School at St. Paul, Minn., held Decoration Day Exercises with the aid of a Victor phonograph and records.





All trained in small groups by phonograph records, this chorus of school children performed with distinction at the Music Educators National Conference in New Orleans.

The greatest use of phonograph records among schools has been in the field of music. This has been due to the fact that other types of material were not as adaptable to recordings as were melody, harmony and rhythm. In addition, many materials were not available until the wide application of radio broadcasting to various fields of learning. Many techniques were developed to bring the great dramas and stories to the radio audience and, with this experience, new types of materials were made available for recordings.

Illustrations Increase Interest

The recent developments in the new recorded programs have created new and essential teaching aids for classes other than music. Subject matter in history, literature and related fields can be illustrated, thus increasing the pupils' interest. The establishment of social institutions, the growth of democratic principles, and the vital comprehension of social problems can be developed through use of recordings with a minimum of effort and with greater results than through the usual media.

In the subject of American history, numerous recordings are available. One which is used widely is *Abe Lincoln in Illinois*, as recorded by Raymond Massey. This masterpiece brings to the school room many of the essential elements of the life of Lincoln in the period of the War Between the States. Here are portrayed the trials and tribulations of a man beset by problems as great as any President had encountered during his term of office. The personality of Lincoln, his sympathy and tolerance, his sincerity and concepts are pictured to a greater degree than is possible from the mere reading of books. With

the use of this teaching aid it is possible to learn more about the many social and political problems with which this nation was faced in that period.

The study of Colonial America is often confined to the chronological events of the landings of the Pilgrims, the many engagements with the Indians, the American Revolution, and a description of early American heroes. The average man, his everyday life, his manner of conduct are often forgotten unless mentioned in lauding his heroism on the battlefield. To learn the culture of any period in history, it is necessary to know something about the songs which were sung during that time; the early American period is no exception. The portion of that period which might have been neglected by historians has been brought to our attention by the thousands of folk and composed songs which were sung during early times. Many of these songs are not well known to all of our people because of widespread migration, and other factors. The songs have remained in their areas of origin, however, and many are available on recordings. The albums are accompanied by small booklets which give some of the history and background of each of the songs. Such materials are invaluable to the teacher of American history who is attempting to develop among pupils a greater appreciation of the sacrifices and trials of their forebears.

The study of literature in schools may be greatly enhanced by the use of appropriate recordings. The dramas of Shakespeare, the literature of Keats, Browning, Milton and Wordsworth have been recorded by the best talent available. Cornelia Otis Skinner has done an *Anthology of English Lyric Verse*, in which the works of the great writers are

interpreted. The late Otis Skinner and his daughter, Cornelia, have recorded *Scenes from Shakespeare's Plays*, which include highlights from his immortal dramas — *Macbeth*, *Julius Caesar*, *Romeo and Juliet*, and *The Taming of the Shrew*. *Edna St. Vincent Millay in Readings from Her Poems* is the title of another album which has been received with enthusiasm among schools.

Useful In Many Subjects

One of the most recent developments in recorded works is the treatment given to the Recordrama, *Macbeth*. Maurice Evans and Judith Anderson have collaborated with a large cast and orchestra to make this an outstanding contribution to the study of this well-known classic. The recorded material itself includes the most important scenes in the five acts of *Macbeth*. The album also includes pictures of the actors, the various scenes used, a complete script of the recordings, the interjoining text, and other pertinent information.

The use of a recording is not limited to its primary subject. Recorded material that is valuable in teaching history may also be used by teachers of speech to develop a more critical consideration of speech among pupils. Teachers of drama will be interested in using the recordings as good examples of proper inflection and emphasis. Teachers of music may use the material to indicate the relation of music to drama. Thus, with the many possible uses of recordings in different fields of learning, school administrators are finding that well directed

expenditures for such aids make a wise investment.

The study of foreign languages in schools is traditionally based upon the use of textbooks and other printed materials. Experimental evidence indicates, however, that the comprehension of foreign language is as much audible as it is visual; that the best way to learn a foreign language is to live among those who speak that language. This means of learning is impractical in most cases, so accurate reproduction of the spoken language on recordings serves as an excellent substitute. Several complete sets of recordings are available for teaching the various foreign languages.

The present efforts among many governmental agencies to develop a greater interest in Latin American culture has created an unusual demand for the learning of Spanish. Many schools are now using recordings to accelerate the study of this popular language. One well-known Spanish language set is called Hispanophone. This album includes fifteen recordings on which Spanish words are spoken, with the words arranged in simple sentences. The correct pronunciation and diction, as well as the melodic flow of the inflection, can be grasped much more easily and quickly with the aid of such recordings. A small textbook accompanies the Hispanophone, in which the spoken words are printed and the sentences arranged chronologically for study of their structure. This is an invaluable teaching aid for the classroom or for individual instruction. In addition, it is an excellent aid to those who may wish to refresh their earlier knowledge of Spanish.

An effective teaching aid is the Recordrama, "Macbeth" which features the voices of Maurice Evans and Judith Anderson (right).



Many unusual types of recordings have been prepared for specific purposes. Possibly one of the most unique is the series for measuring musical talent. Dr. Carl Seashore, who, for thirty years has been developing many types of tests, has published the *Seashore Measures of Musical Talents*. These tests are based on a scientific analysis of musical hearing, appreciation and performance. They include the basic elements which function in all music and are essential for hearing and learning music. They are designed for group measurement, but can be administered either individually or in large groups of adults or children, from Grade Five upward. Specific elements in music which are measured by the tests include pitch, loudness, time, timbre, rhythm, and tonal memory.

The pre-school and elementary school levels have also received much attention from producers of recordings. The amount of material available for use in these areas is abundant. Most kindergarten and elementary teachers are expert story-tellers. It is doubtful, however, if many could do as well as Paul Wing, who tells the story of *Little Black Sambo* and many other delightful stories for children. Most of the fairy tales, which are a part of pre-school experience, are available on records, produced with sound effects which stir the imagination without over-stimulating the tender nervous system of the young child.

The story of *Peter and the Wolf*, which has been

recorded by the Boston Symphony Orchestra, is another example of the many experiences available to children through the use of recordings. It is impossible to do justice to this story without the assistance of a large instrumental group, yet, with the use of recordings, it is a simple matter. In addition to telling a story, *Peter and the Wolf* can be used effectively to introduce and develop recognition of the various instruments of the orchestra.

Dickens' *A Christmas Carol* is an ever popular story which is enjoyed by children and adults alike at Christmas time. Ernest Chappell and a cast of excellent dramatists have recorded the classic with all the verve and human interest which Dickens created in this interesting story. For use in the schoolroom at any time, but more especially during late November and early December, this recording creates the necessary background for the genuine Christmas spirit in the hearts of students and teachers alike.

These are but a few of the thousands of recordings which are available to schools for use in various fields of learning. Their use is recommended by recognized school authorities, many of whom were consulted before the recordings were made. Teachers generally have found recordings to be simple to use and operate. They have become a regular part of teaching procedures, and their value as a classroom aid is immeasurable.



Teachers of history, literature, the drama, music, speech, and languages find a wide variety of recordings extremely useful in classroom work. Many new types of material are available.



The NBC Symphony Orchestra, under notable leadership, is a recognized contribution to the musical culture of America.



Maestro Arturo Toscanini, whose genius radio made familiar to millions of listeners.



Leopold Stokowski, whose fame as a conductor is widely known to the radio audience.

RADIO WIDENS MUSICAL CULTURE OF AMERICA

Constant Broadcasting of Good Music Through the Years
Has Given Public General Awareness of its Worth

By **SAMUEL CHOTZINOFF**

Director, Music Division, National Broadcasting Company

It is hardly possible to exaggerate what radio has done for the musical culture of America, indeed of the world. While it is true that all forms of art have benefited greatly through radio, it is music that has enjoyed the greatest expansion. The reason for this is inherent in music itself. Of all the arts it is, so to speak, the easiest to "take;" of all the arts it is the only one whose progress depends on familiarity and repetition.

Radio is an ideal medium for familiarity and repetition. This is equally true of popular music and so-called serious music. A hit tune may require less repetition to become familiar than a symphony of Brahms, but "plugging" does the trick for both. And the plugging of good music on the radio in the last fifteen years has resulted in a general awareness of that spiritual commodity quite beyond the dreams of musical educators.

A good way to measure this advance in our country's musical culture through the instrumentality of radio is to contrast the number of music lovers who

attend symphony concerts and recitals with the number who tune in on musical broadcasts over the air. Let us take New York City for example. While the Philharmonic gives around 12 concerts during the season and the visiting Philadelphia and Boston orchestras 10 each, it must be remembered that all these concerts are played to small subscription audiences, and that the actual number of listeners is not more than around 18,000. Add to this the 18,000 or so guests of the NBC Symphony Orchestra broadcasts in Studio 8-H at Radio City and we get a grand total of 36,000 persons who are present at all the symphony concerts given in New York each season.

That is a very small number compared with the audience these orchestras get for their broadcasts. Audience ratings for broadcasts cannot obviously be as accurate as the box-office reports of Carnegie Hall. Still these ratings are accepted as fairly comprehensive by the commercial sponsors of radio programs. According to these ratings, then, the New



The Boston Symphony Orchestra, under the leadership of Serge Koussevitzky, is heard over the Blue Network throughout its long season of concerts, including the "Pops" series.

York Philharmonic concerts should reach an audience of around nine million persons in the United States, and the NBC Symphony Orchestra and Toscanini around eight million. A single Metropolitan Opera House broadcast is heard by about eleven million, whereas an actual performance of opera at the Metropolitan is heard by only 3,000 persons.

The difference is awe-inspiring, and shows what radio has done for musical culture in a comparatively short span of years. Where a few thousand people listened to symphonic concerts fifteen or twenty years ago, many millions are listening today.

The enormous progress in our country's musical culture has been duly noted and appraised by the sponsors of commercial products. This should set the final seal on the power of radio as a cultural force, for the American system of broadcasting is made possible by advertising, and when our national advertisers are willing to sponsor serious music it can only mean that serious music has become a staple of the American public. For many years the Ford Motor Company sponsored a symphonic broadcast with the Detroit orchestra and celebrated conductors and soloists. The Texas Company is now in its second year sponsoring the Metropolitan Opera House broadcasts. The Bell Telephone System offers millions of listeners each Monday night a half-hour of the playing and singing of the country's top-notch musical artists.

These commercial sponsors were at first timid in appraising just how much good music the buying public could "take." The telephone hour is an instance of the progress in program-making that is taking place. Starting out at first with the most popular classics, the small bits of good music that are known and loved everywhere, the Bell Telephone

System has now boldly advanced to scheduling movements of symphonies and concerts. Jascha Heifetz, the eminent violinist, recently featured the slow movement of the Brahms Violin Concerto on the Bell Telephone Hour, and the response from listeners has been gratifying.

New Technique In Opera

The symphony broadcasts of the Philharmonic, the Boston Symphony, the Philadelphia Orchestra and the NBC Symphony Orchestra make no compromise at all with the alleged popular fondness for musical tid-bits. Their radio programs in no way differ from those they play to their regular subscribers in concert halls. They not only exploit the classics but they keep their radio audience abreast of the times with performances of modern scores.

In one field, opera, radio has devised a new technique and composers have been encouraged to take advantage of this technique. The radio opera is an altogether new musical-dramatic medium. It does away with the necessity for acts. With the aid of a commentator it transports the listener in imagination from one scene to another. There are no stage sets to impede the progress of the story.

In one hour, the radio opera traverses a dozen or more different scenes. In a way this kind of opera is akin to the novel, and its advantages are so obvious that composers are eager to try their hand at so flexible an art form. Of course, with the development of television, the radio opera will enjoy another transformation, and it is not improbable that the opera of the future will be altogether different from the prevailing 3, 4 and 5 act operas of the present. An interesting speculation is what an innovator like Wagner

would do if he were alive in this radio age.

While radio in the guise of entertainment reaches into several million homes and plants there the seeds of musical appreciation, it has also penetrated schools and universities with scholastic results that are impressive. For thirteen years, the National Broadcasting Company's Musical Appreciation Hour under the direction of Dr. Walter Damrosch brought to millions of school children in America a course in the form and construction of the world's musical masterpieces. This radio course in musical appreciation was supplemented with explanatory booklets sent out to those teachers and educators whose students formed Dr. Damrosch's vast air conservatory. The results are to be measured by the great increase in the listening air audience of the country's symphonic broadcasts.

Looking Toward the Future

Radio has brought Chamber Music into homes that never suspected the existence of a string quartet. This form of music, formerly appreciated only by the musical "elite," is now heard in homes in small towns and in farm houses. The instrumental concert and song recital are heard over all the networks with increasing regularity. The general picture is that of an extension of the musical fare of a metropolis like New York to every part of the United States. Where formerly one had to journey to a large city for music, now the large city journeys, as it were, to one.

Considering the past marvels of radio and its contribution to the music culture of America, there is every reason to believe that the future will witness an equally impressive contribution to general musical appreciation. It is within the bounds of possibility that the schools and colleges of the country will depend more and more for their musical studies on our radio networks. Musical courses of the future will be taken via the radio, either in schools during the school period or at home as homework, with full credit given. Students will have the benefit of the most noted musical pedagogues and artists that radio networks can obtain. Then, too, these very select pedagogues will have at their disposal great orchestras and fine musical ensembles, as well as noted soloists, with which to illustrate their lectures. When television comes into its own after the war, the student listeners will see as well as hear. It is indeed an alluring prospect for the music student of tomorrow. For wherever situated, his or her musical education will be entrusted to the most qualified experts in the field.

Lucile Manners, soprano, and Dr. Frank Black, conductor, are prominent radio artists.



NBC program executives examine microfilm of Shostakovich's Seventh Symphony, flown from Russia.



Kenneth Gordon, violin prodigy, and Michel Piastro, concert master, both veterans of the air.



SCHOOL SOUND SYSTEMS HEIGHTEN EFFICIENCY

Specially Developed Equipment Has Become Necessary in the Training of Students and in the Administration of Schools

By **GEORGE R. EWALD**

Manager, Sound and Picture Department, RCA Victor Division

IN ROMAN TIMES, there was a close correlation between individual prominence and power of voice. In our own times, the commencement speakers, lecturers or athletic announcers in greatest demand were, until recently, those who were able to stir the rafters with their stentorian qualities. Even so, it was often difficult for those near the back of the audience to hear clearly. Furthermore, the quality of delivery of the speech — when finished — was lost to posterity except for the remarks of critics in the press.

The invention and development of sound recording at the beginning of this century made it possible to preserve the utterances of those who came to the recording studio for that purpose. The most important speeches of Theodore Roosevelt, Taft, Wilson and other prominent persons were recorded, as were the performances of the world's greatest interpreters of music and drama. There remained, however, the problem of sufficient amplification and distribution of sound to reach all those who should hear. The solution has been provided in the past two decades, through the purposeful application of the principles of radio-electronics.

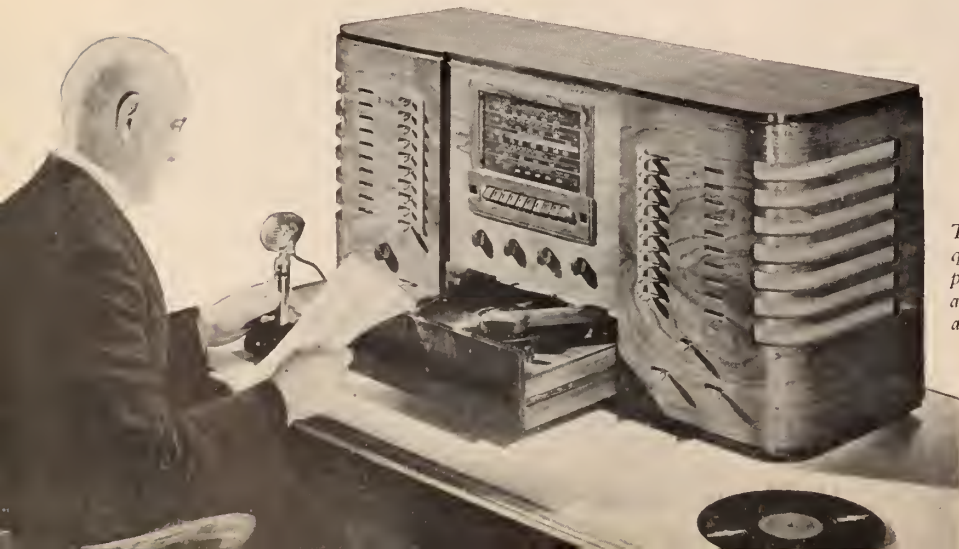
Early in this development, it was the belief of RCA that the need for sound recording, reproduction, re-enforcement, and distribution was great among schools. This problem was attacked at the source — by determining the requirements of schools. There were visits to schools of all types. Conferences were held with educators and school architects. On many occasions, research engineers

attended school functions and educational conventions. These research activities, important at the outset, have increased from year to year for the same initial purpose — to determine the current and probable future requirements of schools.

From that beginning there has developed a technique of use, design and manufacture of sound equipment for schools. This development has grown to such proportions that amplified sound has become a real necessity, not only in the training of students but also in the efficient administration of the business management of schools, and in the manifold recreational activities which are a part of the general school program.

The fundamentals upon which all later development has been based were, of course, the microphone, the amplifier, and the classroom loudspeaker. This initial working unit has now been expanded so the principal or any other member of the faculty may be provided with a beautifully designed control cabinet which serves many purposes. Seated at the microphone with switches conveniently located for immediate control, the principal may talk to all of the students in the school simultaneously without the necessity of assembling them in a central auditorium, or may speak to any individual classroom or to any selected group of rooms. Over the same control system, important speeches or radio programs may be transmitted to the entire student body.

The rapidly growing importance of radio in education increases the potential values of an adequate school radio-sound system. NBC and the other



This central control unit permits quick, easy distribution of radio programs, phonograph recordings, and on-the-scene vocals to any or all rooms of a school building.



Scientifically placed loudspeaker (above teacher) bring music or speech directly into the classroom.

national networks provide numerous special programs of interest to a majority or all of the pupils in a school or school system. Local commercial stations and those owned by state and city school systems provide the programs needed to fill the specific requirements of local situations. The extreme flexibility of the radio-sound system permits the use of these various programs in selected classrooms as desired.

Invaluable In Emergencies

Instructions may be issued for routine procedure, or to control and advise the entire school under emergency conditions. Under present conditions the use of the sound system for air raid alarms is, of course, a recognized necessity. There have been actual instances of the control and direction of the pupils over the sound system in cases where fires have broken out and it was necessary to evacuate the buildings quickly. In cases of accidents, explosions, cyclones, or any other conditions which might create incipient panics or endanger lives, the use of the central control system would be invaluable.

It is also easy for the night watchman or janitor to throw open the switch controlling the speakers in all rooms and listen for unusual noises as a periodical check, or as an emergency precaution.

The efficient administration of the school can be tremendously expedited. It is possible to effect a great saving in time and personnel by the elimination of written notices and announcements. It is easy to understand how invaluable a control system of this type can become in schools which have large enrollments and numerous classrooms, with much actual physical distance to cover.

A central control sound system is most convenient to locate individual members of the faculty, who may be required to perform some specific task or come to the office for consultation. Through well-placed speakers, the proper amplification of speeches and other programs in the auditorium and gymnasium is easily accomplished. Recorded music may also be distributed over the entire system or to individual classrooms. This is an additional service of great value, particularly in music training.

The use of amplified sound in connection with recreational activities is also important to the well-organized and efficiently-conducted school. Whether it be in the gym or on the athletic field, the use of amplified sound has been found most advantageous. When large numbers of people gather for some of the major athletic contests, it is hard to imagine a proper handling of these games and other activities without the use of sound amplification.

For the use of the individual pupil in the classroom, there have been many important developments of equipment. It is difficult to condense into a few words the many different items of equipment which have been designed and manufactured for this purpose, and the various uses to which they are put. Many text books have been written on audio-visual education, and it is, perhaps, one of the most important developments in the field of education in recent years. Obviously, audio-visual education is supported by the use of sound equipment so effectively that it is almost a "must," if this type of educational program is to be used to the best advantage.

The development of the disc recorder has been one of the most interesting features of this use of sound equipment. The opportunity that is afforded through the use of a recorder to reproduce imme-



Microphone and recording aid this girl student in training her voice, for either speech or song.

diately any type of effort by individuals or by groups is of great value. Not only can the individual effort of the student be recorded and reproduced, but also it is easy to file these discs as a permanent record of the progress of the student in speech, dramatics, or music. In no other way can the pupil so clearly realize his own deficiencies.

The pupil also can take pleasure in the progress he is making as revealed by a series of recordings over a period of time. In the same way, the instructor can determine the best manner in which to aid and speed the progress of the work that is being done. In choral work and in band music, the same general type of record of progress can be made. Through the use of the turntable and the playing of standard classical and dramatic records, comparisons can be studied and the work of the individual pupil or the groups thus made more interesting.

In the science laboratories, a splendid opportunity is afforded the student to study the technique of amplified sound, and to become familiar with the fundamental principles involved. Various types of sound distributing equipment and test equipment are available for this purpose. The study of electrical circuits and the many components, which are necessary for the manufacture of amplifiers and other similar equipment, may well become a standard part of the school curriculum. The future possibilities in this type of instruction are most interesting because of the tremendous development and use of all types of sound equipment in connection with our war effort. The radio-electronic field, as revealed by the great strides made in the past few years, has tremendous and almost unlimited possibilities. We are now on the threshold of a new era in the use of radio-electronic equipment of all kinds, and the study of amplified sound, as fundamental training, will develop the interest of the student in exploring further this most interesting science.

The large industrial organizations all over this country have been adopting sound equipment rapidly, and adapting it to their own purposes. Again, this seems to bear a most significant relationship to the educator and his study of the possibilities of the future. A real necessity for educational work is unfolded in this industrial activity. The ground work laid by the RCA Victor Division in its many uses of sound equipment in the industrial field indicates a much greater development to follow.

New Ideas Being Developed

Many industrial institutions are conducting various types of educational programs. It is beyond the scope of this article to forecast the relationship between the industrial educational activity and the school activity, but certainly we cannot be insensible of the possibilities and the important part that sound equipment will bear in developing this cooperative idea. It is also true that much of the research work that has been done in the industrial field will bring about corresponding improvements in sound equipment for use in the educational field. Already many new ideas are being developed in the laboratory which will later be available to schools. Both the administrative and training activities will be afforded an opportunity to use this equipment in many new and practical ways.

The very important part that good service plays in the functioning of any type of equipment must not be overlooked. As the various types of sound equipment find new and greater fields of use, the demands for service are multiplied and expanded. Properly to develop competent personnel for this field becomes a major educational problem. Again, we find sound equipment playing a most important part in the development of new fields for those who have been trained adequately. The great impetus that has been given to the use of sound equipment in the present war will bring about a much greater use of this equipment in peace-time pursuits. It will provide a real need for thousands of people who will find a place in this most important work. The numerous possible future applications of sound products and other developments of the radio-electronic arts have no determinable limit.



A microphone in principal's office conveys round-table discussion to all classrooms simultaneously.



Performers on "The Quiz Kids" have won fame for their erudite expressions on all manner of subjects.

A dramatic scene from "Against the Storm," which won 1942 Peabody Award for best radio drama.



WOMEN AND CHILDREN HEAR SPECIAL PROGRAMS

Wide Variety of Broadcasts Features Information on Homemaking, Community Education, Newscasts, Music Appreciation, Many Other Items

By **MARGARET CUTHBERT**, Women's Program Supervisor, NBC, and **GRACE M. JOHNSEN**, Director of Women's Activities, Blue Network

RADIO, to function effectively in all phases of American life, must keep a balance of interest and entertainment that is both satisfying and constructive. Since the earliest days, NBC and the Blue Network have sought to attract the attention of women listeners. It has watched the process of intelligent broadcasting gradually liberate the imagination of the homemaker from the four walls of her home and as her interests and horizon expand, NBC and the Blue increase their service and broaden their span of activity.

In peace-time, the necessary control of consumption has always been the responsibility of the homemaker. In war-time, the responsibility falls with unusual force on the shoulders of our women, requiring adjustments, sacrifices and demands.

To present a rounded pattern of programs, which answer the needs of women and children so that they may be better informed and function more effectively in the home and community, is radio's continuing responsibility. To this end, NBC and the Blue Network build many Public Service Programs. Some of these are planned in cooperation with Government agencies; others are co-sponsored by national organizations, and many others are com-

mercially sponsored. These programs cover information for consumers on homemaking and community education, dealing with such subjects as price control and buying, food, nutrition and health, child care and management, clothing, rent, war work for women, and reports on how the women of our fighting allies are meeting the challenge of total war, as well as newscasts, music appreciation, drama and programs for children.

These programs are classified roughly into four divisions: (1) Information programs; (2) Daytime serials; (3) Personality programs; (4) Children's programs.

A quick backward glance over recent years brings into high relief certain women's and children's programs that were important because of their timeliness and significance.

A weekly program of great importance to parents over a period of years has been the series presented in joint cooperation with the Children's Bureau of the United States Department of Labor, Washington, D. C., under the leadership of Dr. Katherine Lenroot. It has been heard under the title of *Raising a President* and, more recently, as



Chester Stratten portrays a young Army pilot in the daily serial "Hop Harrigan."

Nancy Craig's "The Woman of Tomorrow" features homemaking hints.

Children in War-Time. This program, through dramatizations and the voices of authorities on child care and training, has helped thousands of parents in raising their families. *The Adventures of a Modern Mother*, in lighter vein, achieved the same goal.

The *What Can I Do?* weekly program was the first network series to give authoritative information to women on how they could help in the all out war effort.

An outstanding one-time broadcast, presented by NBC in 1942 on behalf of women, was a world-wide rally of representative women leaders of our United Allies, speaking on *What Women of the Democracies Must Do in 1942 for Victory*.

Many Programs for Women

Both NBC and the Blue Network carry many informative programs for women. Among those that have won a large and loyal following are:

The *Consumer Time* weekly program, which endeavors to make the listener a more conscientious and effective consumer. It is presented by the Consumers' Counsel of the U. S. Department of Agriculture and other U. S. Government agencies working for consumer interests.

Definite and authentic information on war work for women — old and young, voluntary jobs, paid jobs, part- or full-time work — is given on the *Commando Mary* program each week.

Reasons behind new Government regulations are channeled to the home front in an entertaining, informal way through the weekly program *Neighborhood Call*, written and produced by the Radio Section, Office of Emergency Management.

The *Morning Market Basket*, with Isabel Manning Hewson, suggests a daily menu for dinner, based on the best food values offered in the day's market.

First-hand information on housekeeping, sewing, and conservation as well as the participation of women in national and international affairs are given by Alma Kitchell five days a week on the *Meet Your Neighbor* program.

The outstanding features of *The Mystery Chef's* daily program are (1) recipes that are easy to make; (2) that are wholesome and nutritious; (3) economical, and (4) require no rationing points.

Child training, child care and health are problems that confront every mother, particularly during wartime with the scarcity of doctors. The Blue Network presents each week-day outstanding pediatricians, child psychiatrists and pre-school educators with the purpose of providing competent medical and disciplinary advice to mothers and expectant mothers.

NBC, in conjunction with the Office of War Information, inaugurated a series of special dramas in October, 1942. In this five-day week series — *Victory Volunteers* — characters from the regular daytime serials, in addition to their scheduled appearances, were cast in stories telling how the war affected them and what methods they followed to carry out the various directives issued by the Government. The series had the cooperating support of advertising agencies, sponsors, writers, producers, directors, and actors who donated their services. Each daily episode of the first series concluded with an official Government plea by Clifton Fadiman relating to the topic dramatized.

Government agencies in Washington have given full approval to the purpose of *Front Page Farrell*, a sponsored program which has started a new trend in five-a-week serials on NBC. Reflecting actual events of the day, with up-to-the-minute information from the Office of War Information and the Manpower Commission, *Front Page Farrell* presents

Isabel M. Hewson, in "Morning Market Basket," gives a daily menu.

Heana Worth, child actress heard on "The Game Parade" broadcasts.



a moving drama with real wartime meaning for our people.

Every art form finds its most effective technique. The serial has developed a dramatic technique of telling a story through a series of continuing episodes, with an underlying philosophic concept that there is hope for all if one does the right thing.

As far as timeliness in subject matter is concerned, the radio serial drama is probably more sensitive to change than any of the arts. No one who listened to a serial had to buy a newspaper or listen to news broadcasts to learn in December, 1941, that America was a nation at war. These day-to-day dramatic broadcasts are a natural medium for portraying the effects of war on the lives of average folk, for most of them are built around the normal everyday perplexities and problems of the American home as well as the comedy, humor and warmth of family life.

Almost all radio serials have contributed some noteworthy scripts in this respect since the war started. *Against the Storm*, written by Sandra Michael, has had consistently inspiring scripts, of such calibre that it won the Peabody Award in April, 1942, for the best radio drama.

The invasion of radio by the creative minds of today is, by sheer force of impact, automatically and inevitably leaving a definite imprint on the majority of programs.

Among the personality programs is *Mary Margaret McBride* who dispenses wholesome thoughts and recipes five days a week. She interviews celebrated and interesting people, and wins a large and loyal following of friends among housewives for NBC's Station WEAJ.

Nancy Craig's friendly "glad to see you" program, *The Woman of Tomorrow*, heard five times a week on the Blue Network, runs the scale through



Alma Kitchell, who conducts the popular "Meet Your Neighbor" series.



Ernesta Barlow, who is featured in the "Commando Mary" programs.

homemaking, fashions, how to stuff a turkey, when and where to buy an apron, how to entertain and keep your friends and family happy.

Besides the kitchen front, Nancy Craig reports on the entertainment field, including such items as new war movie or play, jobs in war industries for women from 17 to 70, and first hand pictures of what is happening in army camps and naval stations.

Children accept radio as naturally as their parents accepted the automobile. Each child selects programs that supply satisfying substitutes for personal experience and meet individual needs for emotional development.

Children Like Adventure

There is a place for adventure serials on the air, and rightly so, for children have need of hero worship. Whether the characters in adventure serials are real or of heroic proportions, the child identifies himself with the hero, wondering if under the same circumstances he would do the right thing or be as brave.

Children like programs that illustrate loyalties. Children like fun. They appreciate humor that is within their experience. That is why *Charlie McCarthy* and *The Aldrich Family* are two of their favorite programs.

It has been found that between the ages of 10 and 14, depending on the development of the individual child, children outgrow juvenile programs and make little distinction between adult and children's programs.

Keeping a balance of interest and entertainment that is both satisfying and constructive for the youngsters, the *Children's Hour*, a weekly feature of variety entertainment, offers juvenile talent an opportunity on the air. The patriotic motif is

Janice Gilbert has many stimulating adventures in "The Sea Hound."

Madge Tucker's "Little Blue Playhouse" attracts older children.



woven through the continuity to encourage the young listeners' cooperative attitude toward war regulations.

For three years *The Quiz Kids*, on their weekly sponsored program on The Blue Network, have won fame for erudite expressions on all manner of subjects, from turtles to trigonometry. These children, whose age is from 8 to 14, are not little monsters of learning but youngsters whose families took particular pains with their children's early education—with the result that the children can match wits with the best of adult scholars.

Many of the talented young actors and actresses heard and seen in the motion pictures, on the stage and on the radio, graduated from Madge Tucker's Junior Training School. For years, Madge Tucker has been the author and producer of *Coast-to-Coast on a Bus*, a weekly program for juveniles.

The *Little Blue Playhouse*, a weekly feature for older children, dramatizes young defenders of our country in the past and present, thereby inspiring youngsters of today to make their contribution to America and its ideals.

Games, Contests Welcomed

Not having reached the draft age, *Jack Armstrong, the All-American Boy*, whose search for the power possibilities of Uranium 235 has taken him to the four corners of the world, does his bit for the war effort in the daily serial on The Blue Network. He asks each of his listeners (and they are legion) to organize a Write-a-Fighter Command. Each listener is asked to organize a unit of five members who are not listeners. Each of these units is under command to write one letter each month to a man in the service. The leader of each unit writes the names of his five members and his own on a post card and sends it to his sponsor. By return mail, he receives a complete W.A.F.C. kit and instruction booklet.

In line with our Good Neighbor Policy and for the purpose of stimulating the imagination of children of the United States in the geography, industries, products and ways of living of the people of our Latin American neighbors, the office of the Coordinator of Inter-American Affairs, in cooperation with the Blue Network, presents *The Sea Hound*. Five times a week, the *Sea Hound* carries Captain Silver and his crew from port to port and adventure to adventure around South America.

Since games and contests are forever welcomed by youngsters and oldsters, the *Game Parade*, weekly quiz program, includes among its many diversions of word and song games, a victory bond con-

test, and an interview with "the youth of the week" selected for some outstanding patriotic service.

Bombers, pilots and aviation news intrigue the imagination of youth. Like radio, aviation is a medium of their time. Boys and girls are encouraged to join the Junior Air Reserve of the National Aeronautic Association, on the Blue Network's weekly program *Scramble*, presented in cooperation with the Aeronautical Chamber of Commerce and the Army Air Force.

Among the thriller-dillers that satisfy a youngster's thirst for adventure is *The Lone Ranger*, long a leading sponsored thrice-weekly serial of justice maintained in the West by the fearless Masked Rider. The Lone Ranger has evolved into a patriotic campaign to enlist all youngsters in his Victory Corps. Membership identification cards, official insignia and instructions are given to each joiner, who is obliged to collect salvage, garden, conserve food and power, distribute Government literature and purchase War Savings Stamps.

Hop Harrigan, a young Army pilot, and his devoted fighting mechanic manage to inject themselves into the thick of the war on many fronts: England, France, Russia, the islands of the Pacific. Full of action, danger, and hairbreadth escapes, yet without false excitement, this daily adventure serial presented by the Blue Network is relieved by a goodly sprinkling of highly satisfying humor.

Presenting an over-all picture of the nation at war, *The Victory Hour*, weekly Blue Network program, is heard in schools from coast to coast. Special recognition is given high schools making outstanding contributions to the war effort. This is the official program of the newly formed High School Victory Corps, arranged in cooperation with the War and Navy Departments, the United States Office of Education and other Government agencies.

Feeling that music, now more than ever before, is a national need and should be a living force in the life of every child, Leopold Stokowski and the NBC



"The Lone Ranger" ranks high among radio's offerings of thriller-dillers.

Symphony presented a special holiday children's program recently. This informal concert included selections written by children as well as standard classics. Other music appreciation programs are being planned for the future.

Since self-education never ends, the universal appeal of radio is readily understandable. Providing a mighty channel of education and interpretation of the war as well as entertainment, the major networks have become a popular university of the air. The only enrollment fee is the desire to learn, plus the patience to chart one's own course by scanning the radio listings in the newspapers.

Throughout any day, the accent in radio is upon what is going on now. Often the broadcast comes from the very scene of the event, giving the listener an experience that no other medium has ever before provided for man.

What influence radio in these years and the years to come will have upon our children only time can show. Will the coming generations have a greater knowledge of the world outside their nation? Will they take a keener interest in local politics and in the Government of their own country in the days to come? Will they be better able to detect the false and unworthy because of the X-ray quality of radio? Will they realize that it is not bigger and better armies but new ideas and great ideals that can change our ways of life and make a better world in which all nations may live together in peace?

As most other children's programs today, "Jack Armstrong, the All-American Boy" features a patriotic theme.



The characters in "Front Page Farrell" present a moving drama with real wartime meaning for radio listeners, old and young alike.

Here, Henry and Mary carry on one of their famous and funny "Aldrich Family" spats. Mary Rolfe and Norman Tokar, redbeards, play the parts.



SOUND MOTION PICTURES AID GROUP INSTRUCTION

Advances in the Development of Studio and Theater Equipment
Put Into Sound-film Units Specially Designed for Schools

By ELLSWORTH C. DENT

Manager, Educational Department, RCA Victor Division

FORMAL group education started very early in history — probably as soon as there were more people wanting to be educated than there were tutors to do the job. Or, it may have started when one learned teacher became so popular that he could no longer give individual attention to the many students who came to sit at his feet. Regardless of when and where it all began, the extension of group instruction to the majority of civilized peoples has been accompanied by a constant search for those devices which will increase the effectiveness of teaching.

It is possible the first such device was a specimen from some distant land, or a picture drawn with a stick on the sand or with charcoal on the wall of a cave. Maps were made; small at first but later of larger size so they might be studied by several persons simultaneously. The symbols of language and printing were illustrated with crude drawings, later photographs.

Photography led to the development of enlargement by projection — a truly great advance in the interests of group instruction. The “magic lantern” could be used to instruct or entertain dozens or hundreds, and all could see essentially the same thing at the same time. The projected pictures were motionless, but interesting and effective when used properly in classrooms.

Films Best for Groups

Two new developments made their appearance at about the same time: just before the turn of the century. One recorded motion on a strip of film — the other recorded sound on a disc. Several years passed before either was used to any great extent in formal education, although both made rapid strides in theater and home entertainment. The phonograph record was more readily adaptable to home use and the motion picture film served best before large groups in public halls.

Thomas A. Edison, to whom credit is given for the early development of the motion picture, also played an important part in the development of the phonograph. It was his belief that the motion picture would become a powerful aid to instruction, by permitting

the teacher to bring into the classroom those life situations which were not readily accessible to pupils. It is reported that, in his early thinking, he considered the motion picture and the phonograph record to be complementary, although the practical application of the combination did not occur until some twenty-five years later. When it did, the first simultaneous reproduction of sound and picture was achieved with silent film and a synchronized disc recording.

Engineers Develop New Methods

RCA, always a leader in the fields of radio, electronics and sound, can be credited with a major responsibility in the development of the sound motion picture as we know it today. It was a logical step to branch out into the fields of sound film recording and reproducing. Its engineers — already equipped with extensive experience in the phonograph, radio, communication and other acoustic and electronic arts — set about developing a method of recording and reproducing sound-on-film, which they believed far superior to the original synchronized sound-on-disc method. The correctness of their belief is amply demonstrated by the fact that sound-on-film quickly became the universal standard for synchronized sound recording and reproduction.

Films with synchronized musical and sound effects enjoyed but a brief period of popularity and, in general, were merely an expedient while the transition to talking pictures was being effected. Most of these early pictures were made according to silent picture techniques and then embellished by a musical score and sound effects.

In the early days of talking pictures, the leading equipment manufacturers were faced with an overwhelming demand for apparatus. Talking pictures literally took the country by storm, and theater owners all over the country quickly became impatient to “get on the bandwagon.” The most important consideration for a theater owner was to get equipment — any equipment which would do the job reasonably well. Efficiency, simplicity and reliability were not then nearly as important as availability.

The first sound reproducing equipment was operated from motor generators or batteries, which were regularly a source of trouble. In spite of constant attention, the number of delays and shut-downs due to sound system failures was alarming. Then, when a solution to this problem seemed almost beyond hope, RCA Photophone introduced the first completely A-C operated equipment, eliminating the necessity of motor generator and battery, and insuring smoother, more reliable operation.

But all efforts were not centered on reproducing problems. The improved reproducers made recorded "wows" and background noises more evident and objectionable than before. Recording engineers, therefore, intensified their work of dissecting apparatus and sifting ideas to further perfect sound-on-film recordings. A major problem was to develop a recording machine capable of maintaining absolutely constant speed of the film during recording, thus eliminating the objectionable rasp, as drawn-out speed variations are more intimately known. After many months of intensive research, RCA's scientific minds created such a machine. It was called the "magnetic drive recorder."

The continuous attempts to obtain the best possible results brought about improvements in recording which had to be matched by similar improvements in reproduction. It was a spiral, shifting from side to side but climbing constantly toward perfection. Steadier reproduction from film recordings was achieved by the new RCA "Rotary Stabilizer," which gave the film motion a constant speed. Then came more accurate sound tracks, aided by the use of ultra-violet light for recording and printing. Unwanted noise was reduced, the volume range increased. A more accurate sound track printer was needed to extend film recordings into the higher frequency ranges, and such a printer was developed.

Functional Design Applied

Similar painstaking research and development has been applied to all phases of motion picture sound engineering. If an audience is to have the best in sound, a theater must have loudspeakers with fine tonal performance and special propagation qualities. Exploration of these factors required special studies of theater acoustics, sound distribution and the direction of sound, and led to the development of the directional baffle bass loudspeaker and its complementary unit, the multi-cellular high frequency loudspeaker, which sprays the treble tones uniformly over the audience area.

Functional design was studied and applied, so the

equipment might be attractive in both appearance and performance, and be convenient and simple to operate. And even the picture screen has come in for its share of attention, since it must reflect a brilliant picture without noticeably distorting the sound which must go through it. Studies of screen composition and surfaces led to the development of screens of outstanding merit with respect to both picture and sound qualities.

RCA is the only organization that is actively engaged in every phase of motion picture sound, from the studio to the theater. It has been responsible for a complete series of outstanding developments which have raised the standards of sound motion picture recordings and reproduction to new heights of entertainment value. These technical advances begin in the recording studio and extend in an unbroken chain through the laboratory processing of the sound track and the equipment in the theater.

Through reproducer equipment sales and through its sound service contracts with thousands of theaters, RCA's nation-wide organization of service engineers is making an important contribution toward raising the standard of sound-film presentations. These RCA service engineers, who render service on no less than nineteen different and competitive makes of equipment, are constantly educating theater exhibitors to make the most of the Hollywood sound product through modern equipment, careful maintenance and better operating practice.

This story of RCA's activities in motion picture sound for theaters shows that the very fine reproduction of sound films in schools today has resulted from years of painstaking research and development. The developments in motion picture sound for the-

As a means of increasing the effectiveness of teaching, sound motion pictures rank high. In this classroom scene, children watch an educational film with rapt attention.



aters have been most helpful in the production and projection of 16-mm. sound motion pictures in classrooms. RCA was one of the first to offer 16-mm. sound-on-film to education and to industry. It is working constantly to improve the quality of all 16-mm. sound recording and reproduction.

The important use of sound films for training among the various branches of our armed forces now requires all production of RCA 16-mm. Sound Projectors, which are being built by the thousands. At the same time, research and development continue in a never-ending attempt to achieve the finest combination of simplicity in operation and sound performance. Furthermore, when the war is won, the service engineers who now keep the sound motion picture equipment of the armed forces and theaters in finest operating condition will be ready to give the same painstaking attention to projection equipment in schools.

There is every good reason to believe that the winning of the war will mark the beginning of an almost complete revolution in the use of motion pictures and other audio-visual aids among schools. Those in charge of training recruits for their respective specialized jobs are using films extensively, and for one important reason — they have found that good films, used properly, facilitate learning sufficiently to permit a reduction of as much as 40 percent in training time. Such a saving has been and is highly important to the military forces. It should be even more important to those responsible for the education of youth in peaceful pursuits.

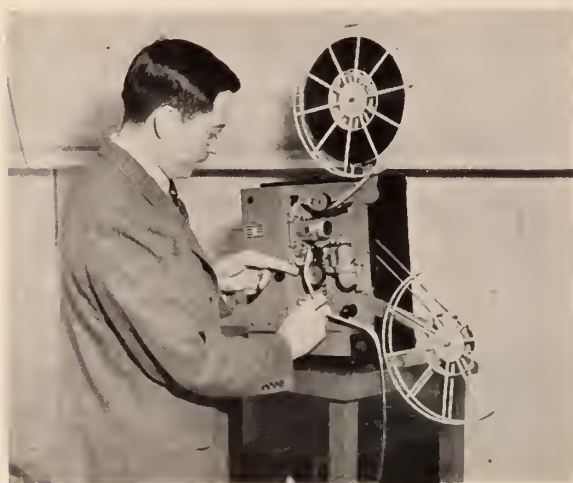
Practically every phase of the program of training for war is being aided effectively by the use of films, including both motion pictures and slidefilms, sound

and silent. The armed forces use films to train men to handle weapons of war; to guard health and care for the wounded; to know the immediate problems at hand; to record the results of combat activities; and to understand what we are fighting for. Auxiliary organizations use films to sell war bonds, explain the defense activities and train workers, and to show farmers how they may produce more food to supply the world's critical needs. Industries use films to analyze and improve specific production operations and to train men and women for almost every conceivable type of job. Thousands of projectors and hundreds of thousands of reels of motion pictures and rolls of slidefilms are in use and more are being produced each month. Many who would like to obtain equipment are unable to do so, because all production is needed for war training and associated activities.

Possibilities Are Challenging

When the war is won, however, it is expected there will be a marked reduction in our armed forces and in the production for war. We shall then be faced with the problems of training more millions to follow the pursuits of peaceful living. Many of the films which will have been used for war training will be entirely suitable and available for general training. Production of thousands of projectors for war training purposes should result in new designs of equipment for classroom use — more portable, easier to operate and perhaps lower in price. School executives, who now think in terms of a motion picture or film-slide projector for a building or group of buildings, can then think of a projector for each classroom — where it belongs. Classroom film producers, who now think in terms of a few thousand projectors in schools, can then think in terms of tens of thousands of potential customers with projectors. The possibilities challenge the imagination.

RCA, with its background of accomplishment, and its organization for future technical achievements through RCA Laboratories, is now devoting its energies to the grim job of winning the war. It is serving the armed forces and the motion picture industry; it will be prepared to serve all producers and users of sound films in the future. As a pioneer in radio-electronics, it will continue to develop and make available those devices which are so important to the training of youth.



Ease of operation features this 16 mm. sound motion picture projector, especially designed for school use.

TELEVISION IS NEW EDUCATIONAL MEDIUM

Experts See Radio Sight as the Most Powerful Means Ever
Developed for Mass Instruction in Home or School

By **NORAN E. KERSTA**

Manager, Television Department, National Broadcasting Company

TELEVISION is one of the most powerful means ever devised for mass education, both in the home and in the school.

Its potentialities as a medium for broadcasting intelligence, as well as entertainment, are virtually unlimited. Psychologists agree that man acquires by far the greater portion of his knowledge through his ability to hear and see. Television, combining the transmission over long distances of sound and sight, extends these human senses far beyond their normal range. Great masses of people are transported into realms of experience heretofore limited to a fortunate few.

Technically, television is far advanced. It is capable of picking up and transmitting images of still or moving objects and scenes and broadcasting them, in conjunction with sound, over a wide area, in which they may be reproduced by countless receiving sets. This operation is not limited in its origin to the studio; mobile and portable equipment permit television operators to journey out of doors, to meetings and conferences, to great spectacles, to the lecture room, museums, the opera, and the concert stage. Anywhere there is something worthwhile to see, the television camera can go. And it is so sensitive that it requires no special lighting arrangements, except possibly for artistic effect.

Furthermore, the means for linking cities in great television networks similar to those now serving sound broadcasting have been developed. This means,

among other things, that if there should be a great teacher in Chicago he could be seen, as well as heard, in New York.

Since the beginning of the development of television by RCA Laboratories, and its later practical utilization by the National Broadcasting Company, much thought has been directed within these organizations toward the use of radio vision as a medium of mass education. Until the war brought a severe curtailment of regular television program schedules in New York, the results of study and planning in this field were being carried out on an increasing scale. It was clear that television could perform an education service in at least three different ways.

The first of these lies in the field of adult education, through public sight and sound broadcasting to the home. In the last few years of television programming by NBC, there have been many interesting and informative programs about people and travel. Film and other material concerning more than twenty-five countries of the world have been used. On the subject of "How to Make" and "How to Do," a great cross-section of man's interests has been touched, from hobbies in the home to techniques used in heavy industries.

In the field of current topics and events, through the use of the mobile television equipment, the audience has been taken to such history-making activities as President Roosevelt's opening address at the New York World's Fair, a Memorial Day Parade, the

Television is a natural medium for group entertainment or instruction.





Television cameras pick up simulated bombing scenes in New York to instruct Air Raid Wardens.



A television actor, portraying an Air Raid Warden, shows how duties should be performed.



The cameras move in on this scene from Pagliacci in one of NBC's television broadcasts of opera.



visit of the King and Queen of England, parade of United States mechanized cavalry, activities of United States Army Air Corps at Mitchell Field, Edison's "City of Light," entire proceedings of the last Republican National Convention in Philadelphia, Republican and Democratic rallies in Madison Square Garden, New York.

Other fields of a direct informative nature covered were literature, social topics, history, general culture, health, economics, scientific and natural science, household hints, general women's interests, and the fields of mechanics, politics, management, etc.

As the war started, there was the task of training tens of thousands of air raid wardens in New York City. As various methods of doing this were analyzed, it was concluded that no other medium could possibly tackle the job and be as effective as television. Through the use of the NBC television facilities, more than 200,000 air raid wardens were trained in their primary duties and responsibilities. A television receiver was installed in every police station classroom in the city. The course was compulsory. The entire operation was never before equalled as an example of local radio public service.

It was through the experiences of sound broadcasting in presenting program material covering various topics that the value of offering it visually through television was indicated. The introduction of such informative-type material to the home is one of the greatest services sound radio and television can perform.

As a feature of wide interest among women, fashion shows are good television fare.

Television in the "Church of the Air" enables audience to see the minister.



The Paulist Choristers appear before the television camera in Radio City.

The second sphere of television in the broad field of education is the use of public informative-type broadcasts in school classrooms.

On May 23, 1938, NBC, with the cooperation of New York University, applied this technique. Two hundred students were placed before fourteen television receivers. A member of the University staff performed a number of experiments in the television studio. With each receiver having approximately fourteen students before it, every student had a front row seat. Through the camera technique used and the close-up views of the specific parts of the apparatus under attention at the moment, the students saw more than they actually would have seen had they been present at the experiment. A number of times after this experiment, during public television broadcasts, student groups were assembled before receivers within range of the NBC transmitter in New York City. Such publicly broadcast informative-type programs may readily be used directly in classrooms to assist the students in their various courses of study.

Television In Classrooms

The third application of television to education involves the installation of television receivers of the large-screen projection type in classrooms, fed by either a radio or a wireline path from a centralized studio. Such a confined network of classrooms would afford an opportunity of having the most qualified authorities from the various fields of study, using the most elaborate assembly of teaching equipment and apparatus obtainable, present the material to thousands of students at the same time. There is always an expert lecturer on any subject, and considerable efficiency could be had by using one set of demonstrating apparatus. Uniformity, authority, and effi-

ciency could be better served in this manner than through any other method.

Through proper production methods during such lectures and demonstrations, unusual emphasis can be obtained to get across salient facts. Vital steps of experiments can be magnified to sizes many times those which would be observed by the eye if the students were actually present at the lecture. Further, any type of film material and slides can be easily incorporated. In addition to the academic presentation of subjects, actual television trips into industrial laboratories, plants, museums, and galleries can be made. Thus, the educational process is greatly enhanced.

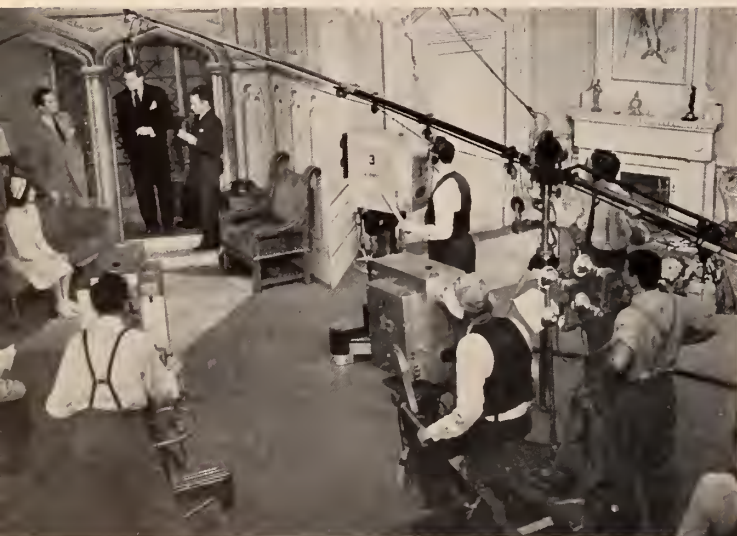
It is impossible to find a better method of teaching principles of democracy, for instance, than that piece of television which came to New York from the Republican National Convention in Philadelphia in June, 1940. Through the disposition of television cameras around Convention Hall, people seated many miles away saw more of what was going on at the convention than did the people in the galleries of the hall and even the delegates themselves in the arena below. With the push of a button, 50,000 persons in the New York area alone were taken in a flash from the scenes picked up outside Convention Hall before the sounding of the gavel to a panoramic view of the activity of the delegates and the speakers assembled on the platform inside. In another flash, a full-face view of the speaker at the rostrum was had by the voters seated in their homes. For further analysis and highlighting of activities of the convention, another camera in Philadelphia gave the people interviews with personalities of the convention and intimate discussions with leading newspapermen and radio commentators who got their stories from behind the scene of action.



NBC's mobile television unit moves into Times Square, New York, to cover a news event.



The rhythmic dances of the ballet have proved ideal material for television programs.



The television "eye" scans the printed word as the commentator interprets.



Nothing but television can do this type of presentation. It is really more than the ordinary idea of training and the presenting of ordinary informative material. Television captures the elements of life itself and stirs into the learning process all of the suspense and spontaneity that may be associated with any type of activity where and when it happens.

In the near future, it can be expected that a 10- or 12-year-old child will have seen more of the world about him than his grandfather would in his entire lifetime. We have but to make that comparison today with what sound radio has accomplished. It seems that even though adults and children listen alike, the children absorb more information than their parents. Through their curiosity and their feeling that they must learn, they naturally turn to all sources of information, especially those which are particularly pleasant, interesting, and easy to listen to as in the case of sound radio. As sight is added to sound service, this radio learning process will be much faster, more vivid, and more efficient. This will be accomplished whether material is presented as a public broadcast to the home, as a combination home and classroom service, or as an out-and-out direct educational network to the classroom.

The National Broadcasting Company is very conscious of its obligations of the proper stewardship of this forceful new medium. Likewise, it is fully cognizant of the fact that the material which it will present must be in the public interest, necessity, and safety, and must be the ultimate in general wholesomeness.

Dramatic offerings have won a high rating with the television audience in New York.

RCA ELECTRON MICROSCOPE EXPLORES UNSEEN WORLDS

Instrument Capable of Magnifying Tiny
Particles 100,000 Times Opens Many
Subjects to Scientific Exploration

By M. C. BANCA

Engineering Products, RCA Victor Division



The RCA Electron Microscope has opened up vast new fields in scientific exploration.



The power of the electron microscope is shown by these micrographs of mercurochrome (left) and zinc smoke particles.

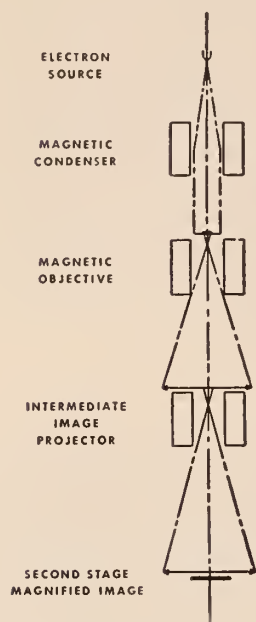
DIRECT observation of minute particles has been of great value to both science and industry for many years. Three and a half centuries have passed since Janssen, a Hollander, put lenses in a six-foot tube and thereby made up the first compound microscope. Since then, this device has been constantly improved to the modern light microscope which is capable of rendering visible a particle which is as fine as .00002 centimeters. The naked eye is able to see a particle between .01 and .02 centimeters. Therefore, the maximum useful magnifications of our best light instrument are of the order of 1,000 to 2,000 diameters. These limits are not due to imperfections in the design or construction of the instrument, but due primarily to the illumination used.

It was proved in the latter half of the last century,

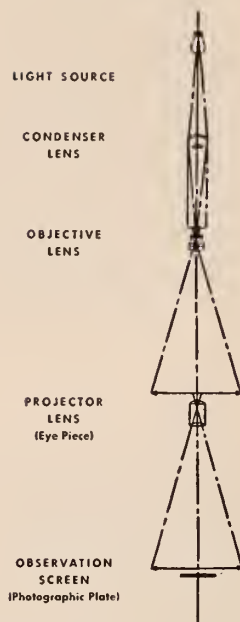
that the illumination fundamentally placed the limitation on the minimum particle that could be observed with the microscope. Consequently, every effort was made to improve this limiting factor.

About twenty years ago, it was shown that particles, such as electrons, had a periodic motion similar to light waves. These light waves and electrons (controlled by the voltage) had a given wave length much as a radio wave or as the waves set up in a pond by dropping a stone at its center. Similarly, about 1925, it was proved experimentally and mathematically that electrons could be focused by electrical lenses very much like light rays were focused by glass lenses. It was then considered only a short time until a microscope would be built which would be a direct counterpart of the light microscope except that it would use electrons for

ELECTRON MICROSCOPE



LIGHT MICROSCOPE



This diagram shows the close relationship in operation between the light microscope and the electron microscope.

illumination instead of visible light and use electrical lenses instead of glass lenses.

Since electrons will not travel in air, the first limitation imposed by the electron microscope was that the instrument must be completely evacuated to operate. Secondly, electrons are invisible. Consequently, the energy in the beam had to be transferred into light energy so as to permit viewing the pattern of the specimen. A fluorescent screen accomplishes this purpose.

Let us review the improvement that may be obtained in using the electron microscope instead of the light microscope. It is known, for instance, that the wave length of the electrons used for illumination at 60,000 volts is approximately $1/100,000$ that of light. Due to certain physical limitations in the electron lenses, which the present state of the art has not completely solved, the instrument is actually able to see particles only 50 to 100 times smaller than that of the very best light microscope. However, the electron microscope permits us to obtain magnifications to 100,000 diameters.

Another inherent advantage of electrical lenses is the great depth of focus; that is, the ability to maintain focus throughout the height of a particle to allow accurate calibration of magnification as well as linear magnification of wide ranges.

As a result of these factors, few developments of scientific nature have made a place for themselves so readily as the electron microscope in the fields of industry and science. To date, 49 of these instruments have been sold to industrial research laboratories, hospitals, universities, Government departments, and to friendly foreign countries.

These instruments are being applied to all branches of science from pathology and medicine to production control. The major portion of the work obviously at this time deals directly with the present war effort.

The art of electron microscopy is completely new. Consequently, it has required a completely new technique in application of this instrument to many fields of work. To further the application of this instrument in the field of biology, an RCA fellowship for electron microscopy research was established under the auspices of the National Research Council. Dr. Thomas F. Anderson was given the Fellowship. Collaborating with a large number of scientists, Dr. Anderson investigated numerous biological problems. Many of the disease-producing microorganisms have revealed a wealth of internal structure which heretofore could only be surmised.

Studies Yield New Information

The success of the instrument in the field of viruses has been great since these disease-causing agents are beyond the range of the ordinary microscope. Such viruses as bacteriophage, influenza and plant viruses have never before been seen and the effect of immunizing agents on them is now being carefully studied and is yielding valuable information. Other investigations are being carried on in the finer sections of tissue, insect life, etc., such as the breathing tube of the honey bee larvae. Many structures like the scales of butterfly wings are now visible and open to interesting and important study.

The field of powders, colloids, insecticides, ceramics, and many other preparations, where the individual particles are too small to be identified with the light microscope, are now open to study with this instrument. Its inherent high resolving power and great depth of focus permit us not only to count and classify according to size and number but also to determine shape and distribution.

It even can be applied to solid materials which the electron beam is unable to penetrate since the transparency as applied to light does not hold for the electron illumination. Consequently, the metallurgist is able to study the polished surface of his

material by the "replica method," whereby a very thin replica of the surface is made up and studied in the instrument as shown in the figure of pearlite eutectoid steel.

Oftentimes, it is desirable to study a particle or a shape in depth. This instrument has been worked out to take two pictures of the specimen in succession, the specimen being tilted in a special holder at a small angle with respect to the instrument axis, first in one direction and then the opposite. When the two resulting micrographs are viewed with a stereoscope, a very beautiful third dimension of depth results.

Even with the tremendous resolving power of the electron microscope, we have been unable to work into the actual atomic structure of matter. Consequently, the electron diffraction adaptor unit has been developed so that the range of the instrument has been increased a hundred-fold. This unit does not permit us to see the atoms but gives us a pattern of where they are. It is a set of concentric circles, some diffused, others sharp. From the diagram of the circles and the intensities, the elements of the atoms in the material are determined so that the crystal structure can be identified and analyzed.

It is correct to assume that the experience obtained by the RCA Laboratories in the last two years of electron microscopy would certainly obtain

foresight in the future applications and qualifications of these instruments. Consequently, the Laboratories have developed a new model, stream-lined microscope which gives the scientist virtually all he requires in flexibility of operation, application, and in quality of work.

At the same time, attention was turned to developing a model of the electron microscope with limited application. This consists of an instrument whose actual resolving power, or ability to see subjects, is the same as that of a deluxe instrument. It is considerably smaller, less expensive and naturally not as flexible in operation and application. Similarly, an instrument of portable nature is being considered for operation either in remote places or easily transferable from place to place.

New Tool of Science

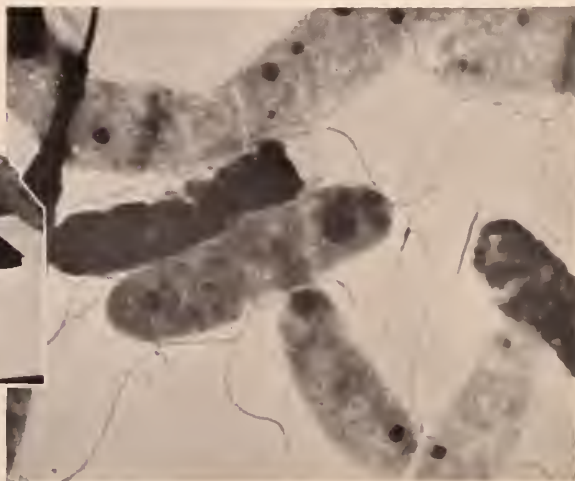
The electron microscope is being set up in many of our educational institutions almost as a branch of its own, closely cooperating with the chemical, biological, physical and metallurgical branches to obtain maximum flexibility and coordination between operation, application and results. The findings of this remarkable instrument may be defined in one simple sentence: "One never knows what one will see next."

Thus, the electron microscope has been able to open new unseen worlds far into the sub-microscopic realm. In doing so, it has become not only a powerful new tool of science and industry in general, but also an instrument of great value to education.



This small, but powerful, RCA Electron Microscope, after the war will be available to schools and colleges.

Bacteria Vibrio, magnified 23,000 times, revealed heretofore unseen details.



THE INTER-AMERICAN UNIVERSITY OF THE AIR

Experiment in the Field of Higher Education for Millions
Expected to Have Far-reaching Influence on Popular Education

By **STERLING FISHER**

Assistant Public Service Counselor, National Broadcasting Company

THE National Broadcasting Company inaugurated, in the Summer of 1942, an experiment in the field of higher education for the millions, which, it is hoped, may have far-reaching and permanent influence upon both the structure of popular education and the development and maintenance of international understanding, friendship and cooperation.

In launching this project, the company was acting upon a conviction that the vast potentialities, and equally great obligations, of radio as a social and educational medium could not be attained merely through sporadic broadcasting or relatively unrelated public service features, even when the quality and merit of such individual features, in themselves, is high. NBC had come to believe that radio education was represented, in some respects, by the ancient fable of the father who showed his sons how one sword blade, when struck across the knee, proved relatively weak and easy to break, whereas, when several swords were placed together, they were virtually unbreakable.

So, NBC reasoned, educational radio programs gained new strength and value when they were brought together systematically under a unifying and strengthening institution, like the Inter-American University of the Air.

Important practical advantages have been envisaged in the creation of this permanent institution.

The Inter-American University of the Air is the first endeavor in network history in the United States to provide systematic subject-matter instruction in a

carefully balanced variety of subjects, correlated with existing classroom instruction in universities throughout the nation. The new radio institution has planned its curriculum in close consultation with leading educators representing every region of the United States, as well as many other American nations, in order that the broadcasts may have the maximum of practical utility for as many instructors as possible. The Inter-American University is already offering a dramatic course in the history of the development of liberty in the Western Hemisphere, titled *Lands of the Free*, and a series tracing narratively and musically the history of music in the Americas, titled *Music of the New World*. It is preparing to launch, in a short time, a course in a form combining narration and drama, presenting outstanding features of literature of the American nations. Thus, students will have the opportunity to enlarge their cultural horizons simultaneously in the fields of history, literature and music, through courses planned to supplement each other.

For the general adult audience, numbered in millions, as well as for students in schools, the Inter-American University offers particular advantages over random radio scheduling. It gives to those who have never gone to college, and to those whose college days are behind them, the opportunity, right in their own homes, to continue with systematic and up-to-the-minute education, under the most favorable and interesting conditions. Though each program of the Inter-American University is a complete unit in itself, and will stand quite alone for the casual

Dr. Guy E. Snively, Director, Association of American Colleges; Dean Virginia Gildersleeve, Barnard College, and Edwin Hughes, President, National Music Council, discuss the "Inter-American University of the Air."



listener, each is also an integrated link in a great chain of knowledge and is designed to encourage the casual listener to become a systematic listener, first to one entire series, and, finally, to the rounded whole. The opportunity to capitalize in this broad way on one's listening time may be compared to the situation of the man who rents a house with an option to buy, and whose periodical rental payments, if he buys, are not spent upon mere transitory satisfactions but become a part of an investment that is a lasting possession and benefit.

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

A coordinated radio institution, such as Inter-American University, provides the necessary mechanism for experimentation with leading universities looking toward the future development of new types of college instruction utilizing radio broadcasts as an ingredient. This is a field hitherto completely unexplored, on a national scale. Already, the Inter-American University of the Air and Columbia University have completed one small cooperative experiment pointing in this direction, in the holding of a joint institute of Inter-American Affairs.

The schedule of this institute combined lectures by outstanding inter-American authorities with examples of radio instructional techniques in the form of dramatic and musical broadcasts. Reactions to this endeavor were typified by that of the Hon. Leighton McCarthy, Canadian Minister to the United States, who said:

"It marks a valuable and successful experiment in cooperation between a university and a private cor-

poration in an important field. This is itself an encouragement in more ways than one to those who are working towards cooperation in the bright political field of inter-American relations."

A second experimental, institutional step is now being taken in cooperation with the Music Educators' National Conference, a department of the National Education Association. This group, under the leadership of its president, Prof. Lilla Belle Pitts of Teachers' College, Columbia University, has organized a national committee to evaluate the music broadcasts of the Inter-American University of the Air in relation to their suitability to classroom needs. These evaluations will be carried on regionally, and promise to make a significant contribution to the effort to find the field of maximum utility of the programs.

A third, and more elaborate, institutional development of utilization of the broadcasts is under discussion among certain universities and the Inter-American University of the Air. This scheme tentatively calls for the installation in a great university, on a strictly experimental basis, of several correlated units of instruction of a new type. One of the more significant features of the plan is the interrelationship of studies in writing and production techniques and in appropriate related cultural subjects. Each unit of instruction would call for three sessions weekly, and would provide three university degree credits per semester. All would revolve around the suitable broadcast series of the Inter-American University of the Air, which would serve as the integrating elements of the whole.

One of the three weekly sessions of each class in techniques would be held in the radio studio, jointly with one of the weekly sessions of a class in a cultural subject (history, literature, music or news). Before and after the broadcasts the classes, sitting jointly, would carry on discussions together on the basis of the program to which they had listened. This joint meeting would be for the purpose of cor-



Aims of the "Inter-American University of the Air" are outlined by Dr. James Rowland Angell, Public Service Counselor, NBC; Dr. Leo S. Rowe, Director General, Pan-American Union, and Dr. Pedro de Alba, Assistant Director, Pan-American Union.

relating materials and techniques. The test of script and production requirements would tend to give a sense of practicality and creative application to the studies of cultural subjects, while the presence of teachers and students of these subjects should give depth and a realistic sense of academic requirements to the students of techniques.

Students of production and writing would have as their instructors the NBC technicians who are responsible for the broadcasts of the Inter-American University. These classes would receive research materials from the work, based upon the forthcoming broadcast subjects, done by the classes in cultural subjects. They would use these materials to prepare their own practice scripts, and would be able to carry on constant comparison of their own scripts with the actual broadcasts, as prepared by their instructors. The students of cultural subjects would, therefore, receive the additional stimulus of knowing that their materials were to be put in practical use, and would, in many instances, be forthcoming in network broadcasts.

Another important field in which the new NBC institution is already taking a place as a factor in systematic education is thus described by Dr. Jacob Greenberg, Associate Superintendent of New York City Schools, in charge of teacher training:

"An innovation that may prove to be the basis of far-reaching developments in the use of radio in teacher training was inaugurated at the NBC studios in Radio City on Sunday afternoon, February 28. There, a group of New York City teachers enrolled for a fifteen-week "in-service" course involving the study of "Lands of the Free"—an historical series of NBC's Inter-American University of the Air. Thursday evening, March 4, another group of teachers assembled for a second "in-service" course concerned with the study of "Music of the New World," also a series of the Inter-American University of the Air.

"Both these courses represent a joint experiment on the part of the New York City Board of Education and the NBC Inter-American University of the Air to provide New York City teachers with listen-

ing and study material from which they may derive "in-service" credit. If successful, the number of "in-service" radio courses will be extended to other areas of the metropolitan district. Radio will thus become an integral part of the professional "in-service" program, sponsored by the Board of Superintendents of the Public Schools of the City of New York."

The utility of the Inter-American University of the Air as an agency for rapid promotion of understanding and friendship among nations is already beginning to be evidenced. As a result of requests from Latin America, *Lands of the Free* is being translated into Spanish and Portuguese by the Office of the Coordinator of Inter-American Affairs and is being put on microfilm for distribution to broadcasters in all the other American Republics. In addition, the new Peruvian National School of the Air is planning to adopt the series as a regular feature of its own broadcasts for that country's college students and general listeners. Canada is not only hearing the programs through stations of the Canadian Broadcasting Corporation, but also is making the first international contribution to the series by having the scripts dealing with Canadian history written and produced in that country for the NBC network and by providing for the music series a broadcast by the Toronto Symphony Orchestra.

Music of the New World has been selected by the Office of War Information as one of the American network programs best suited to display to the rest of the world the nature and results of inter-American cultural cooperation. As such, it is recording the programs and sending them, with continuities in the various languages, to the non-American members of the United or neutral nations.

The developments described are regarded not as ultimate measures of the potentialities of the Inter-American University of the Air, but rather as the significant trends of its early infancy. These trends encourage the National Broadcasting Company to believe that as the institution is guided on toward maturity, it may exercise a great, and ever-increasing, influence for true enlightenment and appreciation among the peoples of our nation, and between them and their neighbors in the twenty-one other sister lands of our hemisphere.



The history of music in the Americas is told narratively and musically in the Inter-American University of the Air's series "Music of the New World."

RADIOS AND PHONOGRAPHS FOR SCHOOLS

Research Leads to Specially Designed Instruments That
Render Excellent Service in Classroom or Auditorium

By **THOMAS F. JOYCE**

Manager, Radio, Phonograph and Television Department, RCA Victor Division

THE fine recordings and radio programs which schools use so extensively would be of no value if there were not suitable phonographs or radio receivers. This problem was recognized early by the Victor Talking Machine Company (now a part of RCA Victor). Special school instruments were made available in 1911 — less than a year after the effectiveness of Victor Records in schools had been demonstrated.

Progress in record reproducing instruments was rapid. The early mechanical phonographs with small horns were followed by more accurate reproducers with large "morning glory" horns. These larger horns and more sensitive diaphragms provided sufficient volume for classroom or playground groups. Further development brought the large console instrument, with the "horn" inside and facing the doors of the cabinet. A table model of similar construction was introduced and, on each, the doors were opened or closed to regulate the volume.

Research Brings Improvements

The later models of these mechanical phonographs were refined to provide quite satisfactory performance in classroom or auditorium. They were not favorably comparable, however, to the clearness and tonal values of electrical recordings and reproduction which followed as a result of RCA research. The differences were apparent to all and soon changed all processes of recording and reproduction. The large "horn" was replaced by a "loudspeaker" and it was no longer necessary to have such a large cabinet for the instrument. Real portability became a possibility and more and more phonographs entered the classrooms — where they belonged.

The phonograph preceded the radio receiver by some twenty years, but the later developments in radio provided the means with which to increase the fidelity of the phonograph. Some were concerned for fear the radio would replace the phonograph, whereas the story of the years has made the two complementary. Now, with many fine radio programs on the air, and with thousands of good recordings available, the use of each among schools has increased to

the point where the majority of all schools have one or more phonographs and radio receivers, or combined instruments. "The music you want when you want it" has become as important a slogan among schools as in homes.

These instruments, which are now so well suited to classroom use, didn't just happen. They are the results of years and years of painstaking research, involving everything from laboratory experiments with rare metals to conferences with school teachers and administrators to determine requirements. Quality of reproduction — in either phonograph or radio receiver — has been and is paramount. Then, it has been necessary to determine the output or volume necessary for all to hear well in the average classroom; quite a different problem from reproduction in the home.

The need for adequate volume has been opposed by the need for portability. Furthermore, an instrument for school use must be of substantial construction, so that it will provide satisfactory operation for several years. The best compromise is the most satisfactory instrument for general school use. It is the result of close co-ordination of objective data and cooperation among those confronted with the problems of effective training.

Cooperate With Educators

There are numerous ways in which the phonograph and radio receiver requirements of schools might be determined. One method is commonly known as "trial and error." Another would involve exhaustive research into the characteristics of the situations in which the equipment is to be used. A third involves close cooperation with leading educational and research organizations, as well as with educational leaders. RCA Victor uses a combination of the second and third — special research and careful consideration of recommendations made by those who use the equipment. In addition, appropriate attention is given to such new services as television, facsimile and other developments of the radio-electronic arts.

RCA Victor manufacturing facilities which were

formerly used to produce RCA phonographs and radio receivers are now employed 100 percent in the production of instruments for war. More satisfactory instruments for use in schools are the very real possibilities of peace because of RCA radio-electronic research. Consideration will be given to all such developments when planning for the future. In the meantime, however, it is highly important that equipment now in use be given the best possible care.

It is planned that still greater attention will be given to the phonograph and radio requirements of schools

in the future. Research will be conducted to determine the usefulness of new developments which will be made available as soon as their practicability has been established. At the same time, standardization of school models of both phonographs and radio receivers will be achieved wherever possible. This will permit long range planning and will reduce the problems of repair and replacement. The extent to which such a program can be placed in operation will depend largely upon the active cooperation of both classroom teachers and administrators.



Various models of mechanical phonographs built by the RCA Victor Division are designed to provide excellent performance in classrooms or auditoriums.

R.C.A. INSTITUTES OFFERS TECHNICAL RADIO COURSES

Radio Operators and Technicians
are Trained; General Course
Covers Electrical Communications

By **JOHN H. COSE**

Assistant Superintendent, R. C. A. Institutes

THE R.C.A. Institutes is one of the oldest services of the Radio Corporation of America. It was organized in 1909 for the purpose of providing the training necessary to equip Morse telegraph operators to become "wireless operators" aboard ships. During its early years the school was known as Marconi Institute and functioned as a department of the Marconi Wireless Telegraph Company of America. With the formation of the Radio Corporation of America in 1919, the school was continued as a department of that company and its name changed to Radio Institute of America. In 1929 the school was incorporated as a subsidiary corporation — R.C.A. Institutes, Inc.

In the early nineteen-twenties, as radio broadcasting became an important part of American life, R.C.A. Institutes added a course for the training of radio servicemen. With the advent of commercial television broadcasting in 1939, R.C.A. Institutes broadened the scope of its Radio Service Course to include the installation and maintenance of television receivers.

In 1935 it became evident that there was a need for a higher type of training than that required for radio operators and servicemen. Colleges and universities had not inaugurated courses in radio engineering; only a few of them offered extensive electives for those electrical engineering students desiring to specialize in electronic communications. In view of this situation, R.C.A. Institutes developed its General Course in Electrical Communications.

The Commercial Radio Operating Course, as it is now known, trains students to obtain Federal Communications Commission licenses as commercial radio telephone and telegraph operators. The course requires full-day attendance for a period of six months. Instruction is divided into three major sections: sending and receiving the International Morse code; basic theory of radio circuits and apparatus; and laboratory instruction in the manipulation of commercial radio equipment. Parts of the course



These young men are learning to be radiotelegraph operators by actual practice in R.C.A. Institutes.

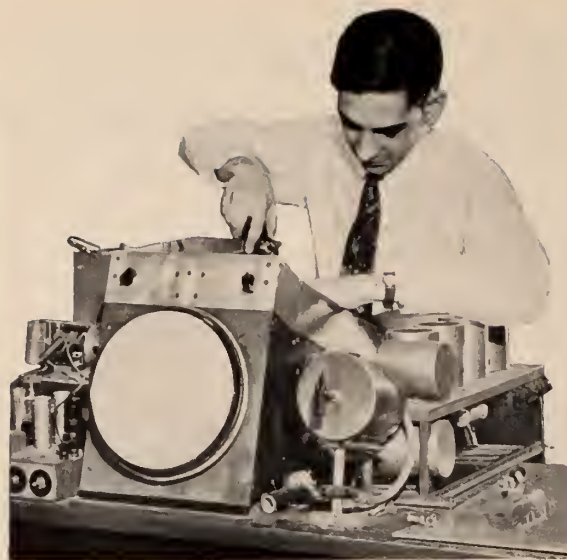
are devoted to a study of relevant Federal and international laws and regulations; radio direction-finders; and conventional operating procedures. Graduates of this course have served with distinction in the military services, in the Merchant Marine, and in broadcast stations. The Commercial Radio Operating Course may be taken in evening school, a period of fifteen months being required for its completion.

The Radio Service Course embraces instruction in radio and electrical fundamentals; circuits of a wide variety of receivers; and the use of modern test instruments in adjusting and repairing all types of receiving apparatus. Although the student is taught the intricacies of current receivers, emphasis is placed upon a thorough knowledge of unchanging fundamental principles so that the graduate may, with relative ease, master new and improved apparatus as it appears. The Radio Service Course requires six months for completion, and an additional three months' instruction in servicing television receivers is available as an option. The same course may be had in evening school, where twice the number of months is necessary for completion.

The General Course requires two years of full-day attendance for completion; if taken in the evening school, its duration is approximately five



An instructor explains the intricacies of radio to a group of students at R.C.A. Institutes



Students in R.C.A. Institutes get practical training by working with radio and television equipment.

years. The first year of the General Course is devoted largely to such basic subjects as physics, mathematics, and the theory of vacuum tubes and their associated circuits. The second half of the course covers radio transmitters, receivers, television equipment, antenna systems, acoustics, and recording. The treatment of these subjects is at collegiate engineering level. By holding classes for fifty weeks each year, R.C.A. Institutes' two-year course embraces approximately the number of weeks in three conventional school years. In general, high school graduation is a prerequisite to admission to the General Course. Graduates of this course have been employed as engineers by many of the larger communications companies and manufacturers of electronic equipment.

To meet the requirements of the commercial airlines, an Aviation Communications Course has recently been added. The principal differences between this course and the Commercial Radio Operating Course are that it requires one year for completion and that its graduates are taught to operate at the much higher code speeds used by the airlines. Considerable instruction is given in remotely-controlled devices and other apparatus especially developed for work in this field.

The Signal Corps, United States Army, has granted recognition to R.C.A. Institutes' courses. Students of the General Course who have completed half of their scheduled studies are permitted to enroll in the Enlisted Reserve, Electronics Training Group, and to complete their studies as inactive

reservists. Upon graduation, if found qualified, these students are commissioned as Second Lieutenants. Students of all other courses who are scheduled to graduate within eight months are permitted to enroll in the Enlisted Reserve Section, Signal Corps. These students then remain on inactive status until the date of their scheduled graduation, when they are ordered to active duty as privates in the Signal Corps. Approximately 300 R.C.A. Institutes students are now enlisted under these plans.

Curricular policies of R.C.A. Institutes are under the control of its Board of Technical Advisers, which is composed of prominent RCA engineering executives. New classes in all courses are started four times each year, approximately the first of March, June, September, and December. The present registration in its school at 75 Varick Street, New York, is 1250.

In addition to its activities at the Varick Street school, R.C.A. Institutes conducts a separate school for the U. S. Navy, where enlisted personnel are trained as radio operators. This school has an enrollment of approximately 900 enlisted men of the U. S. Navy and Marine Corps. Only one standard four-month course is given, and new students are accepted at the rate of 240 each month. This school was placed in operation on April 6, 1942, only ten days after definite orders to proceed had been issued by the Navy Department. It is felt that R.C.A. Institutes' Navy School is the best-equipped and staffed school of its kind. Graduates are already in service with the fleets and in shore posts.

TRAINING DEVICES DEVELOPED FOR SCHOOLS

Radio-electronic Instruments Greatly Simplify Teaching of Radio Fundamentals, Making of Measurements

By L. A. GOODWIN, Jr.

Engineering Products, RCA Victor Division

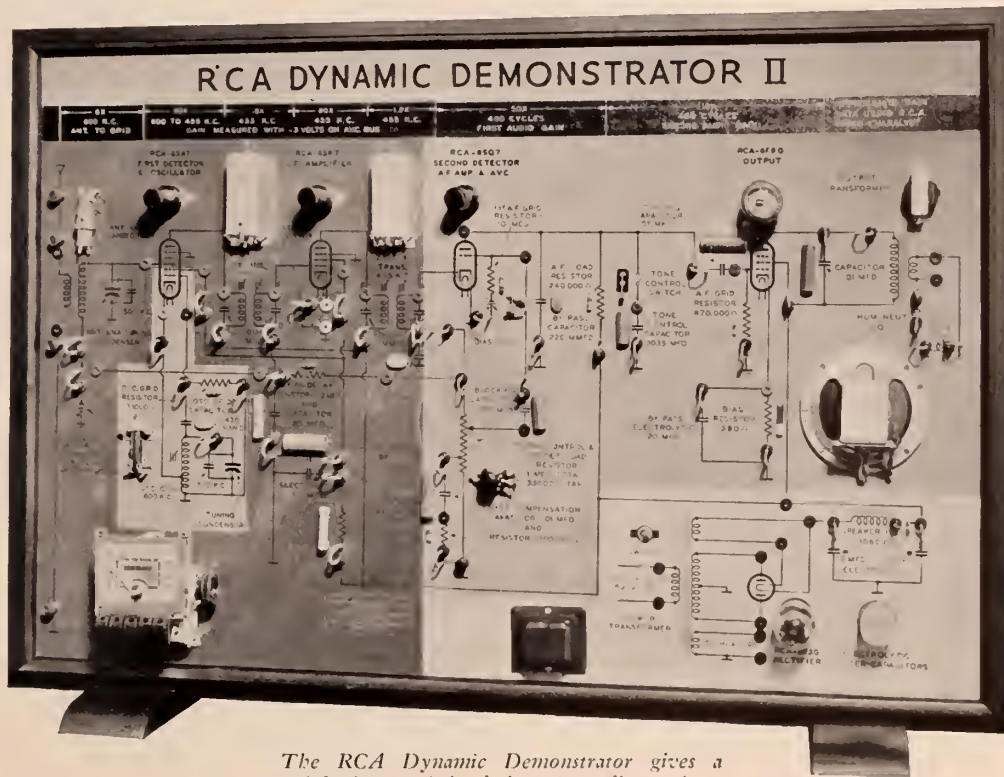
AS THE field of radio-electronics rapidly expands under the impetus of war, there is a corresponding increase in the need for trained personnel. This situation has called for the development of special training devices. In order to provide the most effective tools, RCA Victor Division has designed a series of measuring instruments, headed by the Dynamic Demonstrator and associated equipment, which form an important part in the training of technicians.

Detecting the causes of radio performance variations and indicating the necessary corrections are the essential functions of the instruments. The Dynamic Demonstrator is in reality a five-tube radio set spread out on a board suitable for classroom viewing. The surface of the board is printed with a typical sche-

matic diagram of the five-tube set.

Next to each symbol, the exact part has been physically mounted on the board. The parts in turn are inter-connected behind the board, thus enabling the whole radio set to operate. Important voltage measuring points, as indicated by the schematic diagram, are available through pin jacks for electrical testing. The board is divided into several major color blocks which indicate the principal sub-divisions of the radio receiver.

By using this Dynamic Demonstrator, a student can, within a very short period of time, form a mental picture of the logic behind radio receiver construction. It will serve as a basis for the study of far more complicated receivers and radio principles. Many assorted pieces of test equipment can be employed in



The RCA Dynamic Demonstrator gives a quick picture of the design of a radio receiver.

conjunction with the Dynamic Demonstrator to further analyze how each circuit functions.

RCA Cathode Ray Oscillographs can be used for school laboratory and classroom demonstration work to great advantage in actually showing audio and radio frequency wave functions. Heretofore, drawing and diagrams were necessary along with complicated mathematical procedure, in order to make certain electrical images, such as basic sine waves, clear to the students. With the cathode ray oscillograph, it is very easy to reproduce a sine wave while the student is listening to its characteristic tone, thus affording visual as well as oral indications.

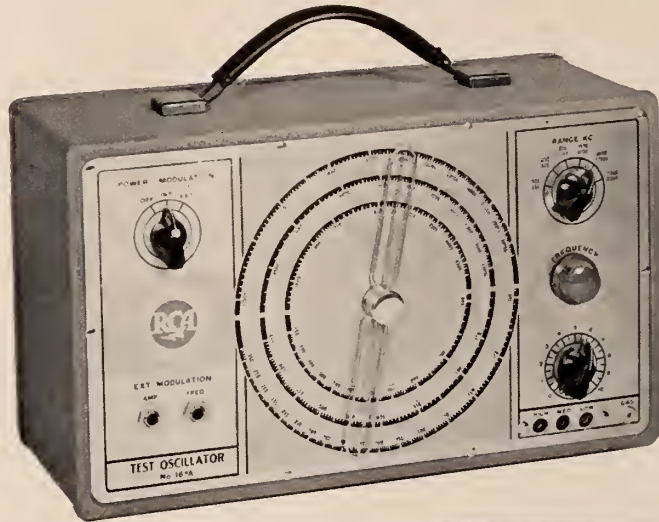
The RCA Junior VoltOhmyst is designed primarily to make it possible to measure voltages in radio receivers and electrical equipment without seriously

loading such circuits. A student can make measurements and listen to a signal simultaneously involved in the same circuit.

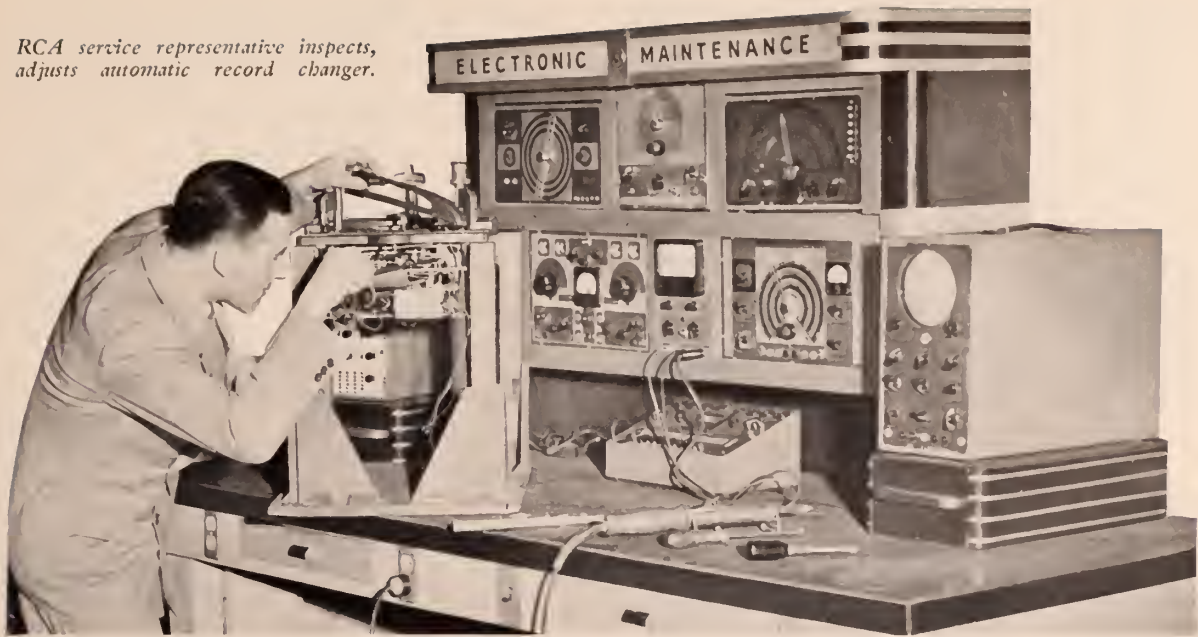
The Junior VoltOhmyst also has an unusual protective feature which prevents most common errors, in applying voltage, from ruining the delicate meter mechanism.

The RCA Rider Chanalyst features teaching possibilities based on modern radio service practice. By using this instrument, a student can learn quickly where the signal progresses through the radio receiver and thus become acquainted with its most important functions first. The Chanalyst also can be used for basic radio servicing studies such as trouble shooting, voltage measurements and gain comparisons.

RCA has developed many aids to the teaching of the technical aspects of radio. Shown here are the Test Oscillator (right), the VoltOhmyst (bottom left), and the Cathode Ray Oscillograph. They greatly simplify testing and measuring problems.



*RCA service representative inspects,
adjusts automatic record changer.*



SERVICE ORGANIZATION MAINTAINED IN FIELD

Trained RCA Engineers Install Equipment, Keep It Operating
at Peak Efficiency; Also Act as Technical Consultants

By **W. L. JONES**

Vice-President, RCA Service Company

THE RCA maintains a nation-wide service organization devoted exclusively to the proper installation and maintenance of all RCA products. Adequate supplies of replacement parts are maintained at the factory in Camden, N. J., and at stock depots throughout the nation. District service offices, under the direction of a Service Manager, are located in all principal cities. Factory-trained field engineers are strategically headquartered throughout the Nation, and they are within easy reach of even the most remotely located rural community.

RCA field engineers during normal times travel 3,500,000 miles and deliver tens of thousands of service calls a year, installing and maintaining RCA products. This technical field force has the backing of the largest development and research group in the radio-electronic field. It is completely equipped with the latest and most modern test equipment and tools. Current technical information, installation and service data are constantly being prepared and supplied to keep field engineers informed with latest practices.

Periodically each engineer is brought back to the factory to receive refresher courses on new technical developments and on new products.

During normal times the duties of this field force are varied and numerous. Technical specialists are maintained and each engineer in his own specialty performs the duty of technical consultant on the proper application of radio and sound products as well as the final installation and maintenance of such RCA products as:

Sound motion picture systems in thousands of theatres, schools, colleges, and public institutions.

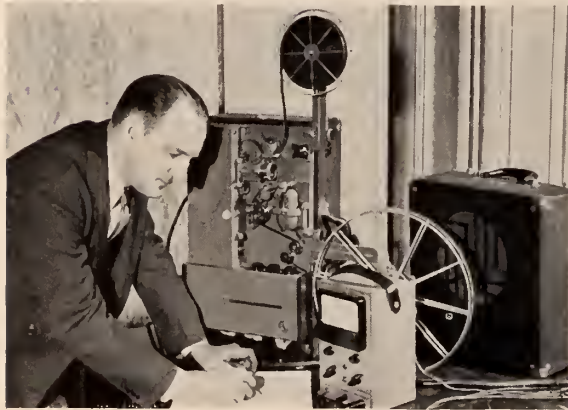
Police radio in municipal and state institutions.

Special electronic products such as film and disc recorders, master control radio and sound systems, and 16mm. sound systems in schools and colleges.

Radio broadcast transmitters and receivers in the broadcast field.



RCA engineer replaces parts of an auditorium public address system to maintain peak efficiency.



A portable motion picture projector is checked with charts to assure RCA standards of operation.



Transmitter tube measurements being made by an RCA engineer in high-power broadcasting station.

Since Pearl Harbor, the duties of this vast field force have multiplied and are exclusively devoted to the war effort. Special schools are being conducted for the purpose of training our armed forces in the proper use and care of the special electronic products being supplied to them. Both products and technical services are being delivered only to direct war or essential civilian activities. Until peace returns, the energies of this field force will be devoted to the installation and maintenance of essential electronic apparatus such as:

Special electronic equipment on land, sea, and in the air, and as directed by our armed forces.

The electron microscope in colleges and research laboratories.

Air raid, fire alarm, and communication systems in war plants.

Special radio-frequency heating systems in war plants for the processing and heat treatment of vital war materials.

Talking motion picture and sound reinforcing systems in Army and Navy training camps, USO centers and essential motion picture theatres.

The unusually heavy service requirements during wartime will develop new techniques and a larger staff of trained personnel, all of which will be available later to provide the best possible service to schools and other users of radio and electronic equipment.

A monitoring unit is being used by this RCA engineer to check a police radio transmitter.



TUBE INFORMATION SERVICE IS AVAILABLE

New Tube Announcements, Manuals and Bulletins, Handbooks,
and Application Notes Are Included in Technical Series

By C. D. MITCHELL

Commercial Engineering Department, RCA Victor Division

WITH communication facilities in our armed forces dependent today more than ever before on the vacuum tube, Uncle Sam realizes the vital importance of having trained personnel to install, operate, and repair those facilities. He can train some of his nephews and nieces for this work in his own schools, but he looks to our nation's schools for a vast reserve of men and women trained and ready for action at his call.

Schools all over the country are exerting every effort to provide on a tuition-free basis, or at a reasonable fee, courses in electric communication. There are courses in all phases of this art from fundamental principles to the most advanced concepts of UHF (ultra-high frequency) technique. Underlying all of these courses is the performance of the electron—that tiny bit of electrically charged matter discovered back in 1897 by Sir Joseph John Thompson.

Emphasis On Vacuum Tubes

Important in the utilization of the electron in the radio communications field is the radio tube. Without it, effective and instant liaison in modern warfare would be impossible. Since such liaison is vital to the successful prosecution of the war, the RCA Victor Division is doing its best to produce radio tubes at an unprecedented rate for our Armed Forces, and to provide technical information as to their characteristics and operating requirements for use in training required personnel.

Ever since its inception, the RCA Victor Division has realized its responsibility in the matter of furnishing educational institutions with technical service on its products with particular emphasis on vacuum tubes.

Toward meeting this responsibility, the Commercial Engineering Section of our Tube Division has several major technical services, i.e., new tube announcements, tube manuals and bulletins, handbooks, application notes, and classroom exhibits of component parts of tubes. Of these various services, the latter two have been discontinued for the duration of the war.

The new tube announcements are of primary interest to physics and electrical engineering professors who desire to keep abreast of the latest tube developments.

The tube manuals and bulletins are of general interest to everyone concerned with radio-electron tubes. Prominent among the manuals are the Receiving-Tube Manual (RC-14) and the Air-Cooled Transmitting-Tube Manual (TT-3). These publications explain tube theory and performance in a simple, straightforward way for the layman and student and yet maintain technical accuracy for the radio engineer and equipment designer. As a consequence, these publications are being used as supplementary texts in numerous schools, and are ordered year after year.

Abridged data covering the salient characteristics of all RCA tube types have been catalogued in chart form for quick reference in bulletins 1275-B and TT-100. The former covers receiving and allied special-purpose tubes, while the latter includes transmitting tubes, voltage regulators, cathode-ray and television tubes, phototubes, gas triodes and tetrodes, acorn and midget tubes, and special amplifier tubes. These chart bulletins enable any student to get an overall picture very quickly of the various tube types by class groups.

Charts for Student Use

For the student engaged in transmitting-tube operation and circuit construction, the RCA Guide for Transmitting Tubes is an invaluable aid. In addition to giving pertinent data, basic circuits, and socket connections for popular power tubes, it not only contains helpful information on the design, adjustment, and operation of transmitters but also has pictures illustrating these factors in the design of several rigs.

Similarly, for the student interested in light-operated relays, light measurements, and sound reproduction, the Phototube Bulletin (PT-20R1) with its theoretical and practical circuit information will be especially useful.

In the bulletin classification are several charts of

value in helping beginners to gain an understanding of just what a tube is, what it consists of, and how it is put together. Intended for student use, these charts show, respectively, the different parts before their assembly into the final tube structure, a listing of all the different materials used in the manufacture of radio tubes, and cut-away views to give specific information on the interior arrangement of typical tubes.

The handbooks are in a class by themselves and are of particular interest to engineers, advanced students, and teachers. At the present time, there are two handbooks designated, respectively, as the Radiotron Designer's Handbook and as the All-Types Tube Handbook HB-3.

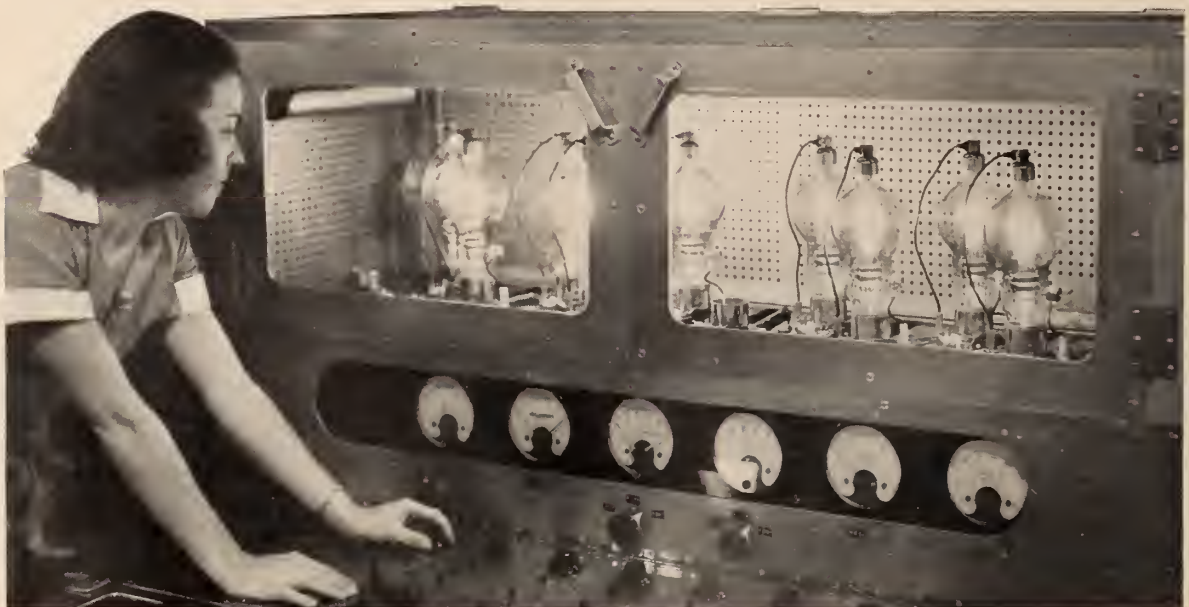
The Radiotron Designer's Handbook is a valuable asset for anyone concerned with practical circuit design and the use of tubes in circuits. It includes discussions on audio-frequency circuits, radio-frequency circuits, rectification, testing, general theory, and numerous tables, charts and sundry data.

The HB-3 Handbook in two deluxe, loose-leaf volumes provides concise, fundamental data on all RCA tube types. The data for each type include its intended uses, maximum ratings, characteristics, physical dimensions, terminal connections, typical

operating conditions, and the most commonly used curves plotted to easily readable scales and large enough for the solving of design problems. Because of its comprehensive nature and the fact that it is kept up to date by new and revised data at intervals, the HB-3 Handbook provides a technical service of distinct importance to research workers and professors whose activities are in the electronic field.

In addition to the above-described major technical services which are available year in and year out, there are also available to schools numerous minor technical services on a limited basis. Typical of such services in normal times are: supplying of special data on tubes, furnishing curves of tube types for student use, and answering questions from students concerning subject matter and references for these on different phases of vacuum-type technique.

In providing technical information service for educational institutions, RCA Victor Division supplies much information without charge. However, on items for which the preparation expense is high, or in cases where sizeable quantities of an item are desired, a charge for the material is made to cover partly the printing cost involved. Quotations for all technical service items in quantities are given on request.



Tubes manufactured in a plant of the RCA Victor Division undergoing one of many routine tests.

BOOKS AND PAMPHLETS

Many of the subjects dealt with in "Radio-Electronics in Education" are developed in greater detail in books and pamphlets published by the various services of RCA.

Following is a representative list of these publications:

RADIO AND ELECTRONICS

INTO UNSEEN WORLDS (the story of the RCA Electron Microscope)
RCA, WHAT IT IS. WHAT IT DOES.

RADIO AGE (a quarterly describing current activities of RCA)

*Available on request from Department of Information,
Radio Corporation of America, 30 Rockefeller Plaza, New York, N. Y.*

MUSIC AND ROMANCE (\$2.25 List Price)

WHAT WE HEAR IN MUSIC (\$2.25 List Price)

MUSIC APPRECIATION FOR CHILDREN (\$1.25 List Price)

VICTOR BOOK OF THE OPERA (\$2.00 List Price)

VICTOR BOOK OF THE SYMPHONY (\$3.50 List Price)

Available from the Educational Department, RCA Victor Division, Camden, N. J.

CHARTS: Materials Used in RCA Radio Tubes; Parts Entering Into Structure of a Glass-type Tube; Structure of Electron-Ray Tube (Magic Eye) RCA-6E5 (cutaway view); Structure of Single-Ended Metal Tube (cutaway view); Structure of Transmitting Beam Tube RCA-813 (cutaway view); Structural Design of Beam Power Tube RCA-6L6 Illustrating How Electrons Are Confined to Beams, Structural Design of RCA Cathode-Ray Tubes (with cutaway view of electron gun).*

PHOTOTUBES BULLETIN*

RADIOTRON DESIGNER'S HANDBOOK (\$1.00)

RECEIVING TUBE MANUAL (25 cents)

RECEIVING TUBES AND ALLIED SPECIAL-PURPOSE TYPES BULLETIN 1275-B*

TRANSMITTING AND SPECIAL-PURPOSE TUBES BULLETIN TT-100*

TRANSMITTING TUBE GUIDE (35 cents)

TRANSMITTING TUBE MANUAL TT-3: AIR-COOLED TYPES (25 cents)

TUBE HANDBOOK — ALL TYPES HB-3**

Write Commercial Engineering Section, RCA Victor Division, Harrison, N. J.

*Single copy free on request. **Subscription.

HOW SCHOOLS USE RADIO

Handbooks of the NBC Inter-American University of the Air series "LANDS OF THE FREE," Vols. I to III, and "MUSIC OF THE NEW WORLD," Vols. I and II. (25 cents each).

*Write the Department of Information,
National Broadcasting Company, 30 Rockefeller Plaza, New York, N. Y.*

SOUND MOTION PICTURES: AIRWAVES (radio broadcasting) 1 reel; TELEVISION, 1 reel; UNSEEN WORLDS (electron microscope) 1 reel; ELECTRONS ON PARADE (vacuum tubes), 2 reels.

*Available through William J. Ganz Company, 40 East Forty-ninth Street, New York, N. Y.
No cost, except for transportation.*



RADIO CORPORATION OF AMERICA

The Services of RCA:

RCA Laboratories, RCA Victor Division

National Broadcasting Company, Inc., Blue Network Company, Inc.

R.C.A. Communications, Inc., Radiomarine Corporation of America

R. C. A. Institutes, Inc., RCA Service Company, Inc.