PRODUCTION AND DIRECTION OF RADIO PROGRAMS

John S. Carlile

Production and Direction of
RADIO PROGRAMS

by

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With Drawings by
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TO THE MEMORY OF
MY FATHER

Allan Douglas Carlile

Preface

THE PURPOSE of this book is to provide a useful volume on radio production for those who are busy performing tasks within the industry and for those who hope to enter radio's gates to create or direct, entertain or inform, or to assist in any capacity.

Radio has grown so fast that many persons employed in it have only a vague conception of the functions involved in producing and directing programs. As in the theatre, each one who does a special task should understand the work of the others who surround him. It is especially necessary in radio that the program builder's work be clear to those who are in administration, engineering, sales, and publicity.

The entire industry exists for the sake of the production functions which this book describes. Radio broadcasting as at present organized will proudly survive only in so far as knowledge, skill, and the showman's flair are increasingly evident in radio performances. Competent craftsmanship is more worthy of honor than clever salesmanship. The proficient showman is of more value to a radio organization than the clever manipulator.

It is as important for the student of radio broadcasting to understand these values as it is for those employed in the industry. Radio has come to a point at which it has the same glamorous appeal as motion pictures. Thousands every year are drawn to it, seeking fame and fortune. Those who think of program produc-

tion as an exciting job in a spectacular world requiring little capacity or training will find this book hopelessly pedestrian if not positively discouraging. Unfortunately, however, that impression is abroad. As broadcasts become better, their execution seems easier. In fact the success of a broadcast may be said to be in inverse ratio to the amount of strain it reveals. It is not always clear to the listener that this is an accomplishment, that the excellence of a smooth-running performance is the result of the mastery of technique.

Many people want to understand the ways of radio. Some seek to become qualified for radio production as they would for any profession. For these, this book will have some exact and fruitful value.

Grateful acknowledgment is made to the Mutual Broadcasting System and the National Broadcasting Company for their assistance in getting accurate details for descriptive and explanatory material; the Columbia Broadcasting System for permission to use portions of manuscripts and photographs as illustrations; the WKBN Broadcasting Corporation of Youngstown, Ohio, for permission to describe its old and its new studios as examples of early and modern construction; radio broadcasting station WLW and the Crosley Radio Corporation of Cincinnati for details concerning the camera range-finder method of measuring distances for microphone placement; the publishers of *Variety* for permission to reprint such of my diagrams and descriptive matter as were contained in the 1938 edition of the *Radio Directory,* and also the "Glossary of Production Terms" and the "Studio Sign Language," which I assembled for the 1937 *Radio Directory;* Mrs. Henry P. Davison and the Nassau County Chapter of the American Red Cross for permission to use portions of the manuscript written by Hans Adamson for the 1938 anniversary program; Mr. Walter R. Pierson, director of the Sound Effects Department of the Columbia Broadcasting System, for his description of the production and construction of the basic sound effects which appears in the Appendix; Mr. C. R. Jacobs, Manager of Construction Operations of

the Columbia Broadcasting System for his contribution to the Appendix on building a radio studio; Mr. Robert S. Emerson, Lecturer on Radio Production in the Division of General Education of New York University for suggesting a number of the "Questions and Projects" suitable to college classes; W. Cabell Greet, Ph.D., Professor of English at Barnard College, Columbia University, Mr. Edgar A. Grunwald, editor of the *Variety Radio Directory,* and Mr. Leslie Urbach, a director in the American theatre, all of whom patiently read the manuscript and made helpful suggestions on form.

J. S. C.

Foreword

JOHN S. CARLILE has provided, above all, a practical book. It has the feeling of authority, the solid common sense of experience, and the steady focus of reality. Here is no back-seat driver. Professionalism is implicit in the approach to the various phases of radio craftsmanship but, better than that, the related techniques are tied together so that no one activity assumes more than its due share of importance in the totality of the subject. The book has perspective and interpretation to unite the solid factual material. It is an applied text in the best sense in contrast to many previous contributions to an already extensive but largely unsatisfactory literature on the subject of radio programs.

Radio programs are, in final essence, entertainment. The catch-as-catch-can era is long since past. The miracle of transmission and reception has entirely ceased to provoke awe even in the most remote jungles. Radio is settled down to the impending dawn of maturity. Even in the realm of daytime serials, commonly admitted to be radio entertainment in its crudest, most hokum-laden form, there is today a pronounced advance in finesse of writing, directing, and acting compared to the hodge-podges of a few years ago. Everywhere the evidence is clear: emphasis is upon skilled craftsmanship.

Quite apart from the commercial side of broadcasting we find today that every organized pressure group has its radio director.

A hospital drive for funds of necessity turns to radio. The station will donate time for "the good cause," but who will listen if the program isn't entertainingly projected? Not many. The success of politicians over the radio is in direct relation to their showmanship. Radio advisers have been assigned to coach candidates for office and other prominent speakers in recent campaigns.

Colleges and universities are themselves using the radio to facilitate educational campaigns. Most of the patriotic organizations have radio directors. Parent-teacher associations, churches, the Red Cross, community chests—all have discovered, or are rapidly discovering, that getting on the radio is only half the job; making intelligent use of the time is the big problem, a problem of craftsmanship, of knowing how. We may anticipate that the future will open many opportunities to trained persons. The whole sweep of public relations, of which radio is the greatest single development of our times, confirms this view.

John Carlile's book is a bright floodlight on the subject of *how* to do it. It helps arm the future soldiers of broadcasting in the battle that promises to become increasingly one of careful strategy. The enemy is boredom. Technique is calculated to avoid this disaster and to lead to the victory of engrossed, persuaded, attentive listening.

ROBERT J. LANDRY
Radio Editor, Variety

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Part I

THE PROGRAM AND THOSE WHO PRODUCE IT

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The Program Idea Takes Form

RADIO HAS BEEN CALLED everything from a cultural influence to an annoying noise. It is clown, singer, actor, thinker, musician, lecturer, politician, scientist, teacher, salesman, commentator —the list is as endless as the ideas capable of expression by man. Radio is as varied as the occupations, the living and working conditions, and the interests of the people who make up listening audiences of ten or more millions. Whatever I may say it is, the world is used to it now. Whether the listener calls his receiving apparatus his "radio" or his "wireless," it is fast becoming as commonplace as a doormat. But the men who are responsible for the programs you hear do *not* take the medium for granted; they know without any reminder from the government that their interests are identical with public interest, convenience, and necessity. They are governed by what they can discover to be the tastes and opinions of the most representative cross-section of the listening public.

Whether participating in actual programs or not, the audience is in control. Every effort is made to discover the will of the people. Mail is scrutinized. Phone calls are made. Communities are surveyed. Whole areas are canvassed. Every expression of general and group opinion is studied. Reports of independent social and psychological surveys and experiments are consulted.

This close collaboration between those within and without the industry has hastened the progress of radio and increased its general usefulness. It has corrected faults both in technique and in taste. It has created a willing and effective self-imposed censorship. It has made program schedules touch the lives and interests of a great number of people.

Earlier fears of what might be done for ill as well as for good have been allayed. The leaders in the industry are sensitive to the public will, even when it has no organized expression. They consider their office a public trust. Thus, radio is far more subject to immediate public control than the stage or the screen. It is another sort of project. The very fact that it is bound up with the commercial as well as the social and civic life of the people makes it more susceptible to public opinion. Commercial broadcasters conform to public desires. The heads of broadcasting companies anticipate any concerted public demand by executing new program policies or restrictions. What we do with radio today and in the future will be determined by the kind of nation we are, and how well-trained and efficient as technicians and showmen.

More and more, people are striving to make better use of the medium. Even the listener feels the need to acquire better listening habits—habits that will make him benefit from educational, cultural, and informational programs. Doctors, teachers, lawyers, farmers, manufacturers, and businessmen want training to fit them for effective air appearances. These men are often called upon to represent their calling before a large local or nation-wide audience. Others want to equip themselves for employment in the industry. Everyone wants to know more about radio.

Many colleges and universities today are giving comprehensive instruction and laboratory experience in the essentials of broadcasting. Some universities have added special schools of radio. Others have provided both practical and theoretical training in connection with stations and studios located on the campus. These are in some cases related to the school's general educational theatre courses.

Types of Programs

Since I am most concerned with the men who are responsible for the creation of programs, let us consider their simple point of view. While they know that radio has long since outgrown that stage in its development when the mere broadcasting of sound was enough of a miracle to hold the listening public's attention, they are not unmindful of the fact that radio is sound and not sight. They know that the listener "sees" only with his mind and his ear.

It is said that there are only four things that can be done by radio: one can sing, talk, whistle, or play an instrument. If "whistle" is understood to include all sounds, not vocal, that are produced without mechanical aid, and if "play an instrument" means to operate any sound-making machine, the statement is correct. Combinations of any two or more of these types of sound are possible. Through expert use of them, many illusions are created. Part-time stations are filling eight or more hours a day, full-time stations eighteen to nineteen hours, and a few stations twenty-four hours a day, with all possible combinations of those sounds.

"Spots," varying in duration from ten seconds to five minutes, are either commercial announcements, news broadcasts, or weather reports. Sometimes "spots" are talks introduced by instrumental or mechanical sounds—attention-getters. Occasionally they are short dramatizations supported by music or sound effects as an aid in creating illusions. Longer performances are dignified by the name *programs,* of which there are, without too much subdivision, at least fifteen different kinds:

Speech (predominating sound):

1. Serials and drama.
2. Talks.
3. Instruction.
4. News commentators.
5. Audience participation.
6. Sports.
7. Popular religion.

Music and Song:

8. Popular music.
9. Classical music.
10. Familiar music.
11. Hymns.
12. Brass, or wind bands.

Combinations of All Four Sounds:

13. Novelty.
14. Song-patter teams.
15. Variety.

With reference to the person or persons who pay the cost of broadcasting, all programs can be divided into two classes: sustaining and commercial. Sustaining programs fill periods of time unsold (or withheld from sale) and in consequence are naturally produced without the aid of an agency or a client. Though the exact figure varies, there is always a large percentage of unsold time to be filled. But sustaining programs are not only time-fillers; they are frequently top-ranking programs. The networks or local stations are repaid for this public service in two ways: by the reputation they build for themselves, and by the creation and retention of a sustaining audience for themselves and their prospective clients.

Organization

Each period, from five minutes to an hour long, must receive special attention. And here the departmental functions come into play. The network program personnel is divided into groups of specialists. Each division of work and each department plays an essential role before even the simplest program goes on the air.

While the basic functions remain the same in all radio broadcasting organizations, the size of the station or stations determines simplicity or complexity of personnel.

The Local Station

The low-powered local station presenting many recorded programs may have a staff of only three or four executives. An

owner, who is also the *general manager,* may combine the functions of financial controller, director of public relations, manager of sales, and originator of policies. A *station manager,* next in command, will probably direct all the daily operations of the station. He may in addition be salesman, chief announcer, and program director.

The third person in this small staff may be a combination *program director* or production manager, musical director, writer, and announcer, who has immediate responsibility for the form, content, and presentation of non-recorded programs.

The fourth is the *chief engineer,* who is responsible for the operation and maintenance of the station transmitter and all studio technical equipment.

The Large Station

Some of the large high-powered stations have a hundred or more employees. Their organization is more highly departmentalized.

The *owners* may or may not appear in the active organization. If they do, their function is administration.

The *general manager* is the executive head of the working organization. He may be called *station director* or *station manager.* The heads of all departments report to him.

The *program director* heads the division of personnel which originates and prepares programs to be produced under him.

The *director of music,* or the *head of the music department* supervises musical programs, selection of musicians, singers, and so on. He attends to all musical copyright matters and maintains a music library.

The *director of the scripts department* or the *manager of writers* supervises the preparation of all written material which goes into the program. He employs writers and literary research men; attends to all matters of literary copyright involved in the use or adaptation of the material of outside authors; prepares advertising copy to accompany program script only when commis-

sioned especially to do so by the sponsor or his advertising agency.

The editing of news may or may not be within the province of the writing director. Frequently, in larger organizations, there is a special *news editor.*

The program director and all those in his department are responsible for the originating or assembling of *program ideas.*

The *production director* or *manager* heads the division of the personnel that brings the planned and written program to life in the studio and "on the air." In this department are found specialists in studio techniques, those who can bring about the best arrangement of instrumentalists, vocalists, speakers, actors, sound-effect technicians, and so on, in the studios for the purpose of broadcasting.

A *chief announcer* is found at some stations. At others the announcers are rightly in the *production department* for frequently, to a large extent, the success or failure of a program depends on them.

The *chief engineer* or *technical director* heads a department composed of radio engineers. These are operating engineers who control equipment in the studios and at the station transmitter. There are also construction engineers who build equipment. In the very large organizations are research men working in engineering laboratories to develop better transmitting equipment.

The *director of sales* or the *commercial manager* is the head of those who maintain contact between the station and the advertiser or the advertiser's agency. He and his assistants offer periods of time in a regular program schedule for the advertiser's use. They offer a service of studio, staff, and technical facilities in accordance with advertising demands. Usually the advertising agency provides the program, producing and directing it for the sponsor. Frequently, however, a program prepared by the station staff is sold to the sponsor by the station's sales manager. Then its production and direction may also be in the hands of the production staff of the broadcasting station.

The *advertising manager* functions in the same manner as such

an executive would in any commercial organization. Through carefully prepared advertising copy in magazines, in newspapers, and on billboards, the particular merits of the station and its facilities and staff are presented to the potential purchaser of such services.

The *publicity director,* by means of stories and photographs sent to magazines and newspapers, promotes the interest of readers in the programs and personalities which the station presents in its weekly schedule.

The Network of Stations

A network organization is merely an enlargement of that found in a well-operated station.

The heads of large divisions of personnel may become vice-presidents. The departments may be subdivided and specialists put at work under junior executives. The only additional functions are those made necessary by the linking of a number of stations into a chain by telephone lines and the control of programs originating at any point or at many points on that network.

The *production department* then extends its responsibility to the control of program operations by special instructions, by word and other sound cues, and by the establishment of common rules of procedure.

A *traffic department* supervises the routing and flow of program signals over the network; provides proper connecting lines by rental from the telephone company; and provides means of rapid communication between all points.

It is obvious that the obligations and concerns of the many different people in a network are dissimilar and special, but for the moment we must see radio as a whole. In simplest terms, the worst possible fate for any radio program is to be turned off, and the best, to be received enthusiastically by its listening audience. The commercial and the sustaining programs may have different objectives, but the desire to please the listener makes the problem of producing a program basically similar. It may be

true that the difference in purpose will cause the commercial and the sustaining programs to differ in selection of the program idea, but there are a number of times when both programs select the same idea. The Ford Motor Company gives the listener an hour of music by the Ford Symphony Orchestra; the Columbia Broadcasting Company gives him weekly broadcasts of the Philharmonic-Symphony Orchestra. No matter what the objective, the listener must be made to listen.

If we assume that the decision has been made to devote a period of radio time to the station's program or to the client's, we are ready to take the first step toward the production and direction of a radio program, which is the special province of this book. Discounting the instances when broadcasting amounts to little more than the purposeless transmission of noise, the idea to be expressed in the program is both the first and the basic consideration of the production man. Actually the director of programs of a network, agency, or local station comes into focus at this stage. He may have a special group of assistants appointed for the sole purpose of gathering program ideas, or he may consult a council composed of department heads for suggestions and approval until finally the program idea takes form.

The Writer's Department

At this early stage of the process, the head of the writer's department, or the actual writer himself, goes to work. No program lacks a script. This is true whether the writing is a short introductory or concluding announcement, a compilation of news reports, straight advertising copy, a lecture, or a radio drama. Even audience-participation programs have scripts. These scripts may be in evidence at the rehearsal periods and subsequently missing at the public broadcast, but they make their contribution to the production nevertheless.

The Program Department

The policy of the head of the program department bears a

certain resemblance to that of a publishing house. He may wait for finished scripts that come from the pens of his own writers or from outside free-lance writers, or he may feel the pulse of the public's wants constantly and answer that demand by suggesting ideas to the head of the writer's department. But radio cannot be divided or capsulated so easily. It is only partially like a publishing house, a theatrical producer, or a concert bureau. It is similar to all of these and still quite different—thus, the head of the program department finds himself listening to the idea of a man who believes that radio can use man's desire to excel, to laugh at the mistakes of others, to compete, and to learn more about contemporary life. The resulting program may be eventually a "Professor Quiz," or an "Ask-It-Basket," and so on. A program may mature with neither the program department head nor the writer having conceived the idea. The alert program head of a network, local station, or agency has the ability to see the potential program in an idea—his own, a writer's, or anyone else's. An informal description of the factors at work in the generating or selecting of an idea for a radio program will give you a general understanding of how a few of our thousands of radio programs have come into existence.

Some Program Ideas

Let us take an actual early morning program, the "Musical Clock." Someone—it doesn't matter who—probably approached this program with his mind working like this:

Mornings, when people get up, bathe and dress, and gulp their breakfast before hurrying off to work, there is much asking of the time throughout the land. The blood has not yet started to circulate properly and energy is not at a high point. Many little details must be attended to before leaving the house. The time factor is a very important one. Usually there is a plan for this hour, and just so many minutes are given to each of the several acts needed to get the body and mind ready for the day's tasks.

Obviously, while taking care of these very personal matters, one

cannot give close attention to what flows from the loud speaker into the home. But a man or a woman at this time needs a little light cheering up. Music of the happy sort is good. And everyone wants to know what the weather will be. Is there anything important in the news since the night edition of the previous day's paper? A man doesn't feel like laughing but, if he can be coaxed into a smile by some subtle effort, it will probably help his humor.

Therefore, what the program department of the station in his neighborhood puts on is a half-hour or hour of music in a gay mood. It is interrupted every few minutes by brief announcements of the exact time, latest reports from the weather bureau, market reports, bits of last-minute news, and events of interest to occur that day.

The "Musical Clock" has become a standard accepted type of program for an early morning broadcast. Whether the approach to the idea was right or not, the program has proved that the listener reacts much as it was hoped he would. But one of the most interesting factors in this business of approaching an idea is the fact that ideas which seem to become standard are frequently debunked.

By reversing the whole approach, an announcer inadvertently discovered an amusing variation. The personality of this particular chap, who was often most amusing when most frank, was a definite factor in the twist he gave the program. Never before had he been asked to get up early and work the dawn-patrol.* He arrived at the studio a little before seven and experienced the same difficulties anyone else might have in rising early and getting off to his job. Instead of forcing himself to deliver his announcements and ad-lib† his continuity with the accustomed cheer that characterizes these morning periods, he blithely informed his audience that he wasn't happy about his assignment at all, and didn't see why he should make people believe he was; that he didn't see how anybody could be in a cheerful mood before ten o'clock, es-

* See Glossary, page 360, in the Appendix.

† See Glossary.

pecially if he had been out late the night before; that this was the bluest hour of the day so far as he was concerned. And that he thought it was equally blue for his listeners. His voice and manner of delivery indicated that life was at its lowest ebb. His reversal of the basic idea of the program made an enormous hit. This simple case does not disprove the fact that any good program must be built around an idea, for this announcer gave the program an idea by going exactly counter to a prepared idea.

A program might be built around a single character conception: for instance, an old violin maker. The idea that the man who makes the finest of musical instruments plays a part in the world of music has distinct program possibilities. The central character, the old violin maker, would have to be created. Both his love of his craft and his pleasure in the music that great artists create with his violins could be used. Writer, musician, program head, and show director could combine their ability to define a point of view, to furnish a continuity or script, and to select the right musical compositions for the violin.

An actual program, "Dear Columbia," reveals the program idea behind it, for this program was built on the assumption that people have favorite songs, that they like to have music played especially for them. All the music played on this particular program is in response to requests written by members of the listening audience; hence the program's title was selected to catch that idea of letter writing—*"Dear Columbia,* please play" such and such a number. To personalize the idea further, many different voices are used to give the illusion of many different correspondents being at the microphone. With this particular program the basic idea of letter writing is never changed, but new variations are constantly introduced; that is, the actor who reads the letter may be given additional dialogue with the announcer. He may ask questions about the life of the composer whose music is requested, or the dialogue may be given a humorous twist, and so on.

In the planning of "Understanding Opera," a story like the fol-

lowing probably created a desire to make opera understandable.

Some years ago a gentleman came to New York from a Midwestern town and went to his first performance at the Metropolitan. He didn't understand a word and it was too much trouble to follow the translation in the libretto. He liked light, simple music. This opera was tremendous. His eyes got tired of watching the appearance of soloists, quartets, and choruses on the stage. He liked the scenery, but the action was too hard to follow. Many of the scenes that were supposed to be tragic seemed funny to him. He wished they would stop singing a while and speak a few lines. He enjoyed the ballet interlude, although he had seen prettier girls and enjoyed much livelier dancing in a revue the night before.

In this case, the whole thing was in the realm of the highbrow and hardly worth the strain, but hundreds of thousands of people are shy of operatic music. They are unaccustomed to attend operas and do not understand them. Three hours of performance suddenly thrust at any of them would result in similar discouragement. Yet in every large motion picture theatre and on records in many homes, excerpts from operas are heard and enjoyed—overtures, pieces of ballet music, intermezzos, and the better-known arias.

These facts were used in the actual development of the program idea. At first, better-known pieces of music were used. One period dealt with the overtures, another with the ballets, another with the tenor arias. Some were familiar, others new. The master of ceremonies at no time appeared as an instructor. The purpose behind the program was *not* to conduct a school, but to introduce the audience to beautiful music. The conductor explained the meaning of each piece and described what he felt its intrinsic musical quality to be. Again, a popular program resulted from the development of a basic idea. Needless to say, no part of this program was set in action until every detail of its script, its music, and its purpose was approved for production by the head of the program department.

The general idea that an audience likes to participate in a program has given rise to many successful program ideas.

For "The Man in the Street," an interviewer, with an engineer, special transmitting equipment, and a prepared list of questions, was sent out to interview the passers-by on current events. This idea originated in the CBS's Special News Department, and since that time stations throughout this country and other countries have continued it. Cross-sections of public opinion have been gathered by using interviewers in every major city in the country. For example, a statement from a man on Broadway, in New York, was immediately followed by that of a Chicagoan from a corner on Michigan Avenue. This view, in turn, was followed by that of a citizen on Olive Street, in St. Louis, or on Hollywood Boulevard in Los Angeles. Variations of this program frequently make their appearance on local stations under different titles: "The Sidewalk Reporter," "The Curbstone Studio," "Inquiring Reporter," "The Talk of the Town," "The Public Speaks," and so on.

But the rough and ready sidewalk form of program may not last, because properly planned curbstone broadcasts devoted to subjects on which the passer-by is likely to have a well-formed opinion can only occasionally be of real value. The general appeal of an audience-participation program has been realized in the studio and has proved to be more entertaining. As previously mentioned in this chapter, question and answer contests, spelling bees, pronunciation trials, and instances in which members of the audience relate their own experiences or hobbies are effective. Participants can be carefully selected with a view to better entertainment or information value. Representatives of special groups of people find large audiences of interested listeners. Programs like "The Farmer Takes the Mike" and "The People's Platform" are typical.

Many program ideas have stemmed from the general idea that people want information concerning every-day necessities. A few titles such as "Recipes," "Household Hints," "Suggestions for

Farmers," "Gardeners," "Housekeepers," and "Apartment Owners," quickly illustrate the possibilities. Very often the head of the program department is called upon to approve or reject the treatment of any one of these proven ideas.

To this man and his associates, answers to questions like the following are a constant subject for consideration:

"What time of the day will the program be heard?"
"What are people doing at that time?"
"Which class of society will it appeal to?"
"What need will it satisfy?"
"Is its appeal emotional or intellectual?"
"Will an audience participate?"
"How attentive is an audience likely to be?"
"What sort of entertainment do they want?"
"What do people want to hear when they're eating, resting, working, talking?"
"What music appeals to people attending a party?"
"Does the listener want to hear music in long, uninterrupted periods?"
"When do people want formal entertainment?"

No matter what the answer, the program period must have a point to it. It can be complete only if it has a theme and an interest, and these must be attained without being forced. These same problems will occur again in another form when the actual process of rehearsal and production is reached, but the head of the program department has the responsibility of seeing that the idea is developed in such form that it is capable of being produced. In this department as in others, good taste, good showmanship, and special skill are needed in assembling such material in such form as to make the program idea a distinct entity plainly logical from beginning to end.

Many presentations fall short, not only in radio but in the concert field and on the stage, either because there was no definite idea in the planning of the presentation or because the idea was a

mere label which the subsequent production could carry out only halfheartedly. Many of the theatre's best directors will freely admit that their chance of creating a successful production with a script whose basic idea is weak or confused is rare. In the theatre and in radio, the invariable result of confusion in planning is an equally confused audience reaction. There are no hours when the purposeless transmission of sound, no matter how pleasant, is commendable.

I cannot repeat too often that the program idea is for *any* and *all* broadcast periods the first important step in preparing for the actual production of a program.

2

The Program Goes Commercial

LITTLE will be said about the sales department of a network or agency, because it seems to me that this function is familiar enough to the average person to need no further analysis here. Except for the fact that the sales department does not educate its prospective client on how to approach radio, I would have no reason for discussing the function of that department in this book.

Often when a client wishes to buy time from a local station, he deals directly with the personnel of that station; but when time is to be bought from a network, contact almost always is made through an agency. The sales department of a local station, network, or agency has the task of selling the client on the advisability of using radio as a merchandising medium.

Perhaps the client is the president or advertising head of a large grocery business. Suppose the agency for the Wellgood Grocery Company has been using newspapers, billboards, and other media for an active advertising campaign. The objective is to get more customers and sell more groceries. Occasionally, a special article, such as a particular brand of butter, has been singled out for sales promotion. At other times the campaign has been to focus attention on the name of Wellgood whenever the customer buys food. Now, in approaching the radio campaign, what does our client want to do, sell butter or sell Wellgood? This makes a great deal of difference. He may increase his butter sales by the use of

one-minute or five-minute spots. But such a limited period may not be enough to preserve the dignity of the Wellgood name. The time element is all-important in deciding the character of the broadcast.

Say that our client wants to advance the sale of butter on Monday, a brand of canned goods on Tuesday, cakes and pies on Wednesday, and so on through the week. When he stresses butter on Monday, he may want to mention, in passing, the cakes and pies. On Tuesday, when he stresses canned goods, he will probably want to let his audience know that he also has butter. If this is the kind of campaign he intends to launch, a series of fifteen-minute periods at the same time over the same stations each day in the week may be best.

But if it is Wellgood's reputation that he wants to uphold, and the fact that the firm's name on the labels of any article is the best guarantee of quality, we should probably recommend a half-hour or an hour once a week in which to identify the name and character of his organization in the grocery field with entertainment of the same high quality and importance. The commercial objective is the prime concern of the client.

Under ordinarily favorable circumstances, the Wellgood Grocery Company would most probably then take a background position and wait until such time as either agency or network provided a program idea for its approval. But in any case, after the program idea or audition has been approved, the client usually gives radio's production staffs complete freedom to work out details. With clients who buy radio time regularly, the approval of a program idea may precede the signing of any contracts, and it is a definite part of all discussions relating to appropriations; thus, the program department of a network or agency gives the sales department something more specific to sell.

Since such a sane procedure is not always followed, radio sales departments may be grateful to me if, in devoting space to a reverse situation, I succeed in showing to at least one prospective client that, regardless of his commercial objective, a basic clearly

defined program idea is necessary for the realization of any good program.

No customer thinks of going to a baker to rent the use of the baker's ovens in order to make a pie. But clients who buy radio-time, and then plunge themselves, their friends, their relatives, and their business associates into a position where they presume to make *all* the decisions, are no less insane. Not content to approve a basic idea for a program, these clients do the baker's customer one better—they neglect to decide what sort of a pie they've started out to bake. They want a pie in the form of increased sales, and they mistake their desire to sell merchandise with a program idea. They believe that the only requirement is to have short commercial announcements at the beginning and end of the period, and to fill in whatever time is left over "with music and jokes." Conjecture alone leads me to suspect that this peculiar form of muddling may also be due to their long suppressed desire to play circus. Usurping the baker's oven is a relatively sound idea by comparison.

Although these instances have become increasingly rare, radio men still have need of the slang expression they use to describe this evil. They call it a "clambake." To them that word means a program for which preparations are filled with uncertainties, rehearsals with errors and constant changes, usually destined for bad performance and consequent failure.

I know of one instance in which a contract was made between agency, network, and client for one period a week for thirteen weeks. Several people in the agency had their ideas for his program, but their differences were ironed out before a single idea was presented to the client for his approval. As is usually the case, outside program-producing associations hounded the agency for a chance to present programs which they had already prepared. Free-lance actors, singers, orchestra leaders, and radio writers, hearing of the opportunity, applied at the agency for work. The client himself, represented by many of the officers of his company in addition to the vice-president in charge of ad-

vertising, quickly provided many more ideas. To the beleaguered agency which had sold the client the radio time it seemed that everyone in the world was being pushed into the opening by the client. In spite of the confusion resulting from the interference of so many people at this particular point in the process, the agency might have succeeded in developing an idea, if it could have persuaded the client that one basic idea must be approved before production began. This client, underrating the soundness of the agency's advice and brushing aside all caution, insisted on immediate production. The first step in the preparation of a clambake! Even after the first broadcast, indecision was the rule. Changes were frequent. Authoritative but unschooled demands were made. Friends and relatives of the sponsor listening to the program at home were not pleased. Their telephone calls and letters were both for and against. Both the broadcasting company and the agency had hoped, of course, that this contract would be extended to twenty-six or fifty-two weeks, but before the conclusion of the thirteen-week period it became obvious that nothing could be done to supply a program idea that was never there, and with this particular client there was little possibility of ever securing his approval of one. Thirteen radically different programs with no basic idea! Needless to say the sponsor was equally sure that nobody connected with the entire campaign knew anything about radio broadcasting or entertainment or selling his merchandise. There is an extremely wise old saw about "too many cooks."

While clambakes are still in evidence, it is encouraging to note that this sort of hodge-podge has become less and less frequent. The above case history is, fortunately, an extreme example. Clients are beginning to feel that their interference in the entertainment business is no more advisable than would be that of the showman in operating their plants and stores. As a result of the mutual respect between radio showmen and businessmen, we are listening to better commercial programs. Good radio is based upon clear thinking, painstaking execution, and showmanship.

3

The Director Is a Showman

Once the program idea has been reduced to paper and its general type agreed upon—whether musical, dramatic, audience-participation, and so on—we are ready to begin actual production. With the full resources of all departments and facilities at his disposal, the director takes over full responsibility for the production, up to and including the actual broadcast.

In a small station the man who conceives the program idea often does the necessary literary research, writes the dramatization, and directs the production. Similarly, the orchestra conductor, with one of his musicians to help him, may take over the whole task of musical research, arranging, copying, and directing.

With larger stations or network broadcasting systems, the personnel of the organization includes several directors, some of them departmental executives: chief of the technical division, head of the music department, head of the research department, and head of the program department. The last-named executive, besides having the functions previously described in Chapter 1, is in charge of all broadcasts but does not handle actual production. He delegates this work to another whose title is similar to his—the program director. In practice this man is seldom called "the director," but I will use that title in order to avoid confusing him with the network's head of the program department.

To familiarize oneself with the director's tasks and how he performs them is to learn radio production. Now that radio has grown up, its newspaper critics point to the program "that had a good idea but failed because of bad direction." Directors are called in on the earliest conferences concerning the program, and they follow it through every possible phase of preparation and production. Their duties range from the purely disciplinary organization of minute details to that of creation. Two different directors given the same program idea will always finish with distinctly different productions. Their decisions as to what they consider important and unimportant alone is enough to make their finished work different.

Showmanship

Many a manuscript or musical composition has gained strength and point from the collaboration of the director with writer and composer. This is the man who frequently goads the technical department to better and better development of the means of transmission. With him last year's "best" is never good enough. To a technical expert, the director often seems a perpetual malcontent. By nature the good director is a perfectionist. This man is a showman!

Volumes have been written about showmanship, but for our purposes it will be sufficient to define it by illustrating what constitutes good radio. Showmanship is more important to the successful program than salesmanship, science, or technical skill, because it understands these things and puts them all to use. We find it in stage productions, in movies, and in good radio shows. Some of the best showmen are in the circus, or selling colored water at a dollar a bottle from the back of a van. On many occasions, both in the theatre and in the radio studio, nothing would be more welcome to the director than to have a circus showman at his side, who would point with uncanny insight to those parts in a show which would entertain and those likely to be ineffective.

He could spot the ineffectual actor at once and say, "He'll never be able to deliver those lines if he lives to be a hundred. He'll 'lay an egg' every time."

Showmanship is necessary in all work, for its purpose is to impress the public. A good newspaper man is a good showman. So is a good advertiser. The make-up of an advertising page, a billboard, or the label on a can of sardines requires it. There is showmanship in the copywriter's use of words, in the making of books, the writing of stories, the forming of a slogan or sentence to capture the attention and excite the imagination of readers and hearers.

The director who is a good showman takes his place with the originator of the program idea, the writer, the star, and the composer. He may not always be an artist in the highest sense of the word, but he must at the very least be a craftsman. Whether radio is an art or an industry is immaterial; both are based upon good craftsmanship. Like railroading, radio has developed its rules and regulations, and a clear conception of its service to the public. It is constantly streamlining. The idea that people in the theatre or in radio must be crack-brained inspirationalists is as old-fashioned and as erroneous as that a painter must have long hair and wear a black velvet smoking jacket. Radio makes an imprint on the lives of its listeners, and radio's creators are in turn sensitive to the public. A good director is completely alive to the life all around him. He must have a desire to say something, the craftsmanship to say it, and the art (or showmanship) to produce a program that people will listen to.

The *exact* manner in which the director approaches the various types of programs will be dealt with in detail after the inherent problems in each have been brought to the reader's attention. In each program, whether it is commercial or sustaining, no matter what its type—musical, dramatic or simple speech-making—the one man whose decisions affect every detail, from the selection of the proper studio and correct placement of microphones to the conducting of rehearsals, is the director. He has an understand-

ing of what his agency or network believes the result of proper production will be. He knows their reasoning, but knowing it is only the first step. His function is to leave the conference room with script or score in his hand and to assemble every probable type of talent, whether actor, writer, musician, hog-caller, announcer, or lecturer, with all the physical means of production. He then starts the actual process of producing the show. From this point on until the listener dials the program, this man argues, defines, explains, coaxes, bullies, or compliments his people until he has molded every detail of the show, until every inference of the original idea is captured. It is no accident that the director—no matter what type the program—invariably calls it a "show" and thinks of it as such.

The director has been trained in one or more of the departments from which he draws his assistants. In addition, his personal history includes a working experience with the theatre, motion pictures, or the concert field.

Because there are so many types of programs, each using different materials, the top-notch director is a specialist. It is amazing, however, how many abilities he must have to get his daily work done. There are programs composed, except for the announcements, entirely of music. For these, a musical specialist is required. Though usually able to direct entertainment of a different character, this director is always at his best on musical programs. Such specialization may be further divided, because a man may have a particular flair for one kind of music and not another.

There are also programs devoted entirely to speech. Addresses with opening and closing announcements. Some dramas come in this class. Other dramatic periods combine speech with sound effects. And there are programs in which music, speech, drama, and sound effects are all used.

If a director is a pronounced specialist it is best (when enough programs of his type are broadcast) to let him work in his particular field.

The Director of Musical Programs

This man must know his music. Usually, when such a man is found, it happens that he has played an instrument or conducted an orchestra. If he has not had this background, then the music library from which the program is drawn must be familiar to him. He must know the instruments and the kinds of sound they produce, and know what is expected of them in combination with other instruments by both the composer and the conductor. He, the musical director, and the performers speak the same language. No man can bluff his way through.

The director of a musical program is showman enough to understand what writing or speech is best suited to it. As a technician he understands his studio, and the range and capacity of the transmitting equipment.

The first set-up, or arrangement of orchestra in relation to microphones, is provided him by his assistant director and the engineer. This gives him a chance to discover much about the particular room. If the studio produces decided effects, he must be able to take advantage of them or avoid them.

As for the equipment, he is aware that there is a limit to the high volume of sound which can be transmitted without seriously affecting the transmitting tubes. He knows that there is a limit to the low volume level which can be carried through the equipment, over the lines and through the receiving set, and still remain audible. He can anticipate marked crescendos and diminuendos, thereby aiding the engineer in setting the controls as these changes in expression are approached, and losing none of their value for the listener.

In a few broadcasting stations an additional facility is provided —the echo chamber. Into it sound is transmitted from the studio, from which it is again picked up by a microphone after additional reverberations have been added. The construction of this echo chamber and the distance the sound has to travel from the loud speaker will control the amount of added reverberation or

echo. Often orchestra or organ music is made more impressive by adding this cathedral effect.*

The Director of Dramatic Programs

The haphazard days of radio are over. The mere fact of having a great star or a fine play title is no longer sufficient. The function of the director is being recognized. Broadcasters now realize this. Newspaper critics who until recently devoted their space largely to a gossip column of radio personalities, have in their turn responded to radio's coming of age. They deal with the direction of plays with the same helpful criticism given to performances of stage and screen. That attention is being paid to these reviews of radio productions is becoming evident in dramatic programs. The reviews are influencing advertising agencies with strong radio departments to underscore the functions of the director of an important broadcast.

Into the hands of the dramatic director comes the script of the show. Sometimes he himself has taken part in its preparation. Reading it, he quickly grasps the entire play, sees its action and the accompanying sound—those sounds that are close or distant, those that are counterparts of action, those that will be in the foreground or background when broadcast. Some of these sound patterns may be simple, and others complex. He translates all of the action and scenic background into sounds and inflections that call forth exact images in the mind of the listener.

He must cast the program. For this he must perceive the subtle nuances required by the characterization. In casting he makes use of his wide acquaintance with performers, or through holding auditions discovers talent previously unknown to him.

The next step is to clarify the scene cues and know what studio techniques and control-room methods will prove most useful. The director must be experienced in quickly separating the scenes and situations and visualizing changes in time and space which

*Described more fully in Chapter 14.

the author is asking the audience to imagine. There are the major and minor plots and their climaxes. All these must be fully understood, even sympathetically understood, to make the most of the entire performance.

It is preferable for the director to have had previous experience with some of the people in his cast, so that his manner of directing awakens quick response. The director and the actors must be *en rapport* by the time the program takes the air.

The same unity must exist between the director and his studio staff. Familiarity with even the most detailed pieces of equipment required to produce certain sound effects will help, because he can gauge the personal attention these pieces of equipment need in order to be properly operated. Also, he will be better able to specify his requirements in detail. The dramatic director has a working knowledge of the extent, capacity, and flexibility of all transmitting equipment. If sound-frequency filters are available, he knows what can be done with them. He is aware of what can be achieved by the placing of the microphone, and the best way to distribute his performers in order to get the effect desired. Needless to say, he fully understands the functions of the assistant director, the announcer, the engineer, and the sound-effects technician. The expert radio showman, instead of exercising stagecraft, exercises studiocraft, for the studio is the stage of the air.

Both men and women are charged with the responsibilities of direction by the networks and by local stations. Most schooled directors are connected with advertising agencies and independent production organizations. The reason for this is twofold. The commercial program is likely to be a more elaborate show. A larger budget is provided than can be secured for most sustaining shows. In commercial programs, musical shows are therefore produced with more musicians, and with a conductor of reputation. The other artists who appear on the program are first rank. In the semi-classical and popular musical shows, money is available to employ arrangers who give the musical renditions

originality and distinction. There is nothing to bar hiring an announcer or master of ceremonies from among the very best. The director's compensation can be, and is, much higher. Few of those participating in the production of a sustaining show receive as much for their services as those rendering the same services in connection with a commercial.

The incompetent director occasionally succeeds in selling himself to an employer who does not fully realize how important this position is to the successful program. Too often, an existing friendship between directors and their employers keeps them in incompetent charge; or, the employer feels that the program seems to be running along as well as many others, so the client decides to let well enough alone.

Where can radio find more directors? It looks to universities for young men and women of outstanding merit who are ready to begin the task of learning radio, but it looks in other places for its directors. A man experienced in the theatre as a director, assistant director, or stage manager is likely to have something to offer to the production of a radio play. Of course, he must learn to work under entirely new conditions; to eradicate all visual impressions except those which can be suggested to the imagination of the hearer. That means thinking entirely in terms of sound.

For the dramatic directors in radio, nothing can take the place of theatre experience. Only after years of work in the studio will the man without this background become successful.

In some quarters a kind of jealousy is apparent towards those who have come from the stage. Too many times I have noted a determined unwillingness to admit the value of this experience. Much of this feeling is due to the very understandable desire of those who have jobs to hold their positions in spite of a possible inadequacy. I cannot blame them for this. Nor can I be blamed when I rejoice that those who rode the tide of radio are being replaced by men and women more highly qualified for their important tasks.

As in most other efforts, it is also true in radio that the direc-

tors who are at the top in their profession are accessible, open to suggestion, and tolerant. This comes of knowing their job and knowing that they know. This type of man is constantly searching for ways and means to increase effectiveness and stature. Where one may "butt in" to everyone else's job and tell him exactly what to do, another may find that for him the best way to work is to test the ability of his associates, to delegate powers, and give them their freedom. In every industry, an executive has to decide whether to leave his office door open for everyone in the company to enter, or to keep it closed and make all his decisions behind that closed door; and although both attitudes have worked for success in radio, I am inclined to favor the man who leaves his door open and freely listens to the advice and complaints of his many associates. To my way of thinking any effort so definitely the product of coöperation stands to gain from the latter policy.

Lest I run the danger of making the director of the program seem a veritable Hercules of energy, or a man capable of being everywhere at the same time, it is well to set about introducing you to those who assist him.

4

The Production Man, or Assistant Director

IN WELL-ORGANIZED broadcasting systems the assistant director is a member of the production department and is frequently called the production man. Perhaps a better name would be the studio manager, since his position is very like that which the stage manager holds in playhouses. With the studio and its properties—microphones, stands, rugs, sound effects, equipment, tables and chairs—he sets the stage for the theatre of the air. The director himself is aware of all the slight *but significant* details, but he cannot be responsible for the execution of everything. For this reason he must depend upon his studio manager. How this assistant operates during rehearsals and air shows in turn depends upon the director.

The assistant director is responsible for all production details and therefore finds a definite routine helpful to his job. The first thing he does is to study the program carefully with the director. If it is a musical program, for example, he learns the instrumentation of the orchestra, the number and types of voices to be used, and the musical effects that are desired. He absorbs the character of the program.

Besides a technical knowledge, it is well if the production man has an insight into human nature. By a deeper understanding of the various personalities of conductor and artist, he can give them as much as possible the environment in which they perform best. Subtleties that would completely escape a theatre audience reveal

themselves in radio production. The assistant director must always bear in mind that the sound-effects man, announcer and others not only take their orders from him but unconsciously reflect his attitude. All of this lends color to the general atmosphere. One of the most outstanding examples is the complete dignity and devotion surrounding a broadcast by a great artist.

Let us return to the more tangible duties of the routine. After the production assistant has studied the program, he acquaints himself with the studio from which the program is to take air. If he is not familiar with the characteristics of the studio and its available properties, he immediately sets out to get this information. Before the first rehearsal the studio must be converted into the most desirable location possible. Stands, chairs, and microphones must be placed. As there are several types of microphones, he must understand the special qualities of the one used and see that the engineer makes a placement that will best carry the program. If he has not already conferred with the conductor of the orchestra, he does so now, and sees the special arranger of the music if there is one. This he does to find out exactly how the instruments are to be used: whether muted or sub-toned passages will occur, or full and open solos. This knowledge determines the position of the musicians and their instruments. The conductor and his men can be instructed on these points prior to the rehearsal.

Some mutes and many open solo tones can be properly picked up with the musician remaining in his normal place in the orchestral choir. But occasionally these men must stand to bring their instruments within the beam of the microphone so that a solo passage has the proper emphasis when heard. The sub-tone which can be produced on any wind instrument is as low in volume as that brought forth when the softest mutes are used. A position very close to the microphone, therefore, is necessary for sub-tones. Frequently a separate microphone has to be placed to pick up this kind of performance.

The studio staff consisting of the announcer, porters, and pages is directly under the production man for purposes of studio management and discipline. The announcer and engineer take their instructions from him regarding all production details.

It is his responsibility to see that all the music selected for the performance is clear so far as the copyrights are concerned; also, that none of the pieces conflicts with any other network policy or restriction. He must be familiar with the regulations of the musicians' union and its rules governing the use of substitutes.

If the orchestra is in the employ of his own broadcasting company, he must know the times arranged for the call and dismissal of the orchestra and vocalists. Naturally, this applies to both rehearsals and broadcasting performances.

The matter of *timing* is also in the province of the production man. Timing begins as soon as that part of the rehearsal starts in which the numbers are played in their entirety. Previous to this, it is possible that part of the period will be used for a "reading rehearsal." This is done when musicians and artists are unfamiliar with the music. As short passages in sections of the score are gone over several times during these practice periods, an accurate timing record is not possible. Unless the program consists of numbers played before under the same conductor, we usually find, after the first run through, that it is either a little too long or a little too short for the allotted time. This makes it necessary to abbreviate or add to the material, as the case may be, effecting a change either in the announcer's continuity or in the music. There are times when entire numbers have to be eliminated and shorter ones substituted. Great care is taken by the director, and by the assistant director as well as the conductor, that the new piece is in keeping with the tone of the rest of the program.

From the very first rehearsal, the production man keeps a log (Appendix pages 356, 357). This remains as a permanent record of all that has transpired, together with a list of the names and

Figure 1. A dramatic program in progress. Note the production man, with hand raised.

functions of all performers and members of the broadcasting staff who participated in the show.

In the production of dramatic programs the studio manager or assistant director can be just as useful as the stage manager of a theatre. If the director prefers that all rehearsals be in the studio itself, he will probably want his assistant in the control room. Then he can refer to him all questions regarding positions of the cast, voice levels, and the placement of the microphones and various perspectives which he desires to produce. Some directors follow this procedure until the dress rehearsal, when they reverse positions with their assistant.

On the other hand, the director may prefer hearing everything himself as it sounds on the transmitting equipment. In that case he relies on his assistant to stay in the studio and regulate the positions of actors and effect apparatus, especially the locations of microphones. He often expects him to prompt the actors in their cues. In any case, the general placement of microphones, the adjustment of variable acoustic elements (such as curtains or screening or the erection of booths in which a part of the performance may originate), the placement of sound-effect apparatus and

pieces of studio furniture, are part of the assistant director's function, though he may have a chief who refers to his own stopwatch. The experienced assistant director is capable of relieving the director of all detail work except controlling the actual performance of the show. It helps if he is familiar with the director's manner of rehearsing and knows the kind of vocal and other sound production his chief is likely to require. He can then anticipate many of the moves within the studio before they are demanded. Having carefully studied his copy of the script, annotating in the margin the places where he can be useful, he watches the production details.

The studio manager must come to the scene armed with complete knowledge of the particular show. Nothing is so aggravating to the director as to take time set for rehearsals to inform his assistant of what it is all about and what will be required of him.

All other things being equal, the next step up in the organization may be to the position of director. This work the director can never undertake unless he has learned the assistant's duties.

Many ambitious men, in addition to giving careful attention to their assigned work, spend their free hours attending other broadcasts. They carefully study the different directors' methods and learn the requirements of a great variety of programs. At other times they go to the theatre and the movies to look for suggestions or ways in which to get effects. Holidays for the aspiring assistant director are like the busman's, for most assistant directors are ambitious. But even if his position satisfies him and the compensation is sufficient, he cannot stand still and hope to remain among those preferred by directors able to make their choice.

In connection with the production of variety shows, the assistant is sometimes entirely responsible for setting the studio stage and for the relationship of the performers to all microphones or parts of transmitting equipment.

Frequently, important commercial broadcasts are repeated a few hours after the first program is transmitted to enable distant

listeners throughout the country to hear the performers at a convenient time. If the rehearsal and the first performance have run smoothly and no important changes are required, the assistant may be left in full charge of the second show. Not, however, unless he has previously demonstrated to the director and the client, or network executive in charge of all broadcasts, to whom they are both responsible, that he can fulfill this trust. This may prove the assistant's great occasion.

The qualifications of the assistant director are necessarily very high. He need not be a skilled musician (though that is very desirable) but he must have a listening knowledge of all kinds of music. It is essential that he never be a stranger to any part of the program being produced. Before becoming an assistant director he will have gone over these duties many times, probably as a student working in some station as an apprentice. As in the case of the director himself, these men also find themselves specially equipped to do one type of program better than another.

In emergencies, it is up to the production man to see that the program continues to function quietly, efficiently, and without marring disturbances or nervousness. Such emergencies may be the sudden failure of some of the technical equipment, though usually the engineer will be provided with alternate microphones and amplifiers. A performer may suddenly become ill. Or again, it may be nothing more than one of the cast forgetting to which microphone he has been assigned.

Despite the best planning during rehearsal, the musical tempos or the speed with which announcers read becomes very different on the broadcast. Since the actual time to be filled is so many minutes and so many seconds, smooth network operations must fit it exactly. Only long familiarity with broadcasting will give the director and his assistant the experience necessary to meet situations. If the staff producing the show is wise, some kind of "cushion" will have been provided. This "cushion" may be music in the form of a program theme which can be extended or abbreviated. Announcements may have been written also, with

optional cuts to be used in a program that is running over and additional material if it is running short.

Special instructions covering details of the studio manager's or the assistant director's work have been assembled. These are the outgrowth of long experiences in network and station broadcasting, both in studios and at remote originating points. Most of the procedures are mandatory but since they deal with other personnel in addition to the production man, they will be covered fully in a later chapter.

5

The Studio Engineer

THE PROGRAM IDEA is approved and the subsequent production matured under the guidance of the program director, but as yet the public does not hear anything. Until the production is transmitted by radio, there is no radio program. It is ready to be heard, but many switches and dials must be touched before it will be broadcast.

The studio engineer's place is at the control console in the monitoring booth. When he touches these switches, the program "takes the air." The life-size voices and other sounds of ample dimensions in the studio all press upon the sensitive gate of the microphone and enter. Here they are converted into electrical impulses. These pass along the channels which lead to the controlling equipment in the monitoring room, and on through the master control room to the station transmitter.

The force of the electric streams is maintained and increased in amplifiers, as is the strength of the sounds, which now ride in an electric rather than an air medium. Borne over wires out into the impalpable airy substance that lies around us, into the ground beneath our feet, these sound impulses travel as variations in a stream of radio vibrations. They match the speed of light. By the listener's receiver—a selecting, amplifying, and converting instrument—they are released through a loud speaker; the air in the

room becomes kin to the air in the studio. The program is present in the home.

In order to reach the transmitters in a single network of a hundred and fifteen stations, the program is carried long distances over wires. If these wire circuits are of high quality, our sounds are diminished in volume over long distances but changed only a very little in character. Amplifiers along the way revive the strength of the vibrations. They may become so weak that no mechanically unaided living thing could detect their presence. Yet their original magnitude can be restored by an electric booster made and operated by a radio engineer. He would say that the extent of the restoration might be from one [over ten to the fiftieth power] to one. We in production say nothing. We only look our admiration and respect.

Our studio engineer does not know how to define these vibrations but he does know how to make them behave. He is of a noble ancestry, part professional and part amateur. He has made radio programs possible. He himself follows the traditions of the practical scientist. Every year finds the transmission and reception of programs more nearly perfect.

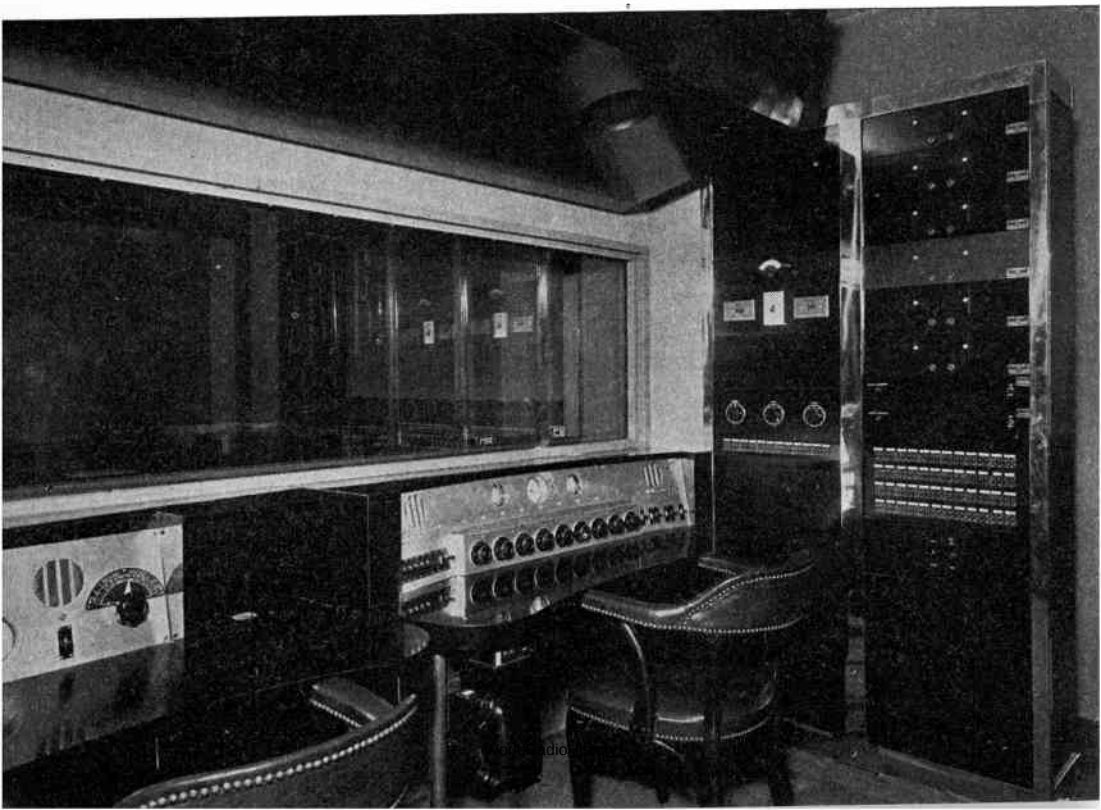
Come into the studio for the rehearsal of a radio play, a musical concert, or a variety show. You will find the engineer taking his place at the control console in the monitoring booth. He is the one who places the microphones in the positions where the production director wants them for the particular program. He is responsible for these and the control equipment. The control desk in the monitoring booth supports a console. On the console panels, from two to eight or more control knobs and switches are mounted. The knobs are connected with the potentiometers and pads which are used in varying the volume. One on the right is a "master gain control." The others are in the microphone circuits. The switch keys control the opening and closing of the microphone circuits. Here the mixing of the sounds which are imposed upon the several microphones is done by the manipula-

tion of the graduated knobs. The volume of the entire blend of sound which is passed into the studio control room and out to the station transmitter or on to the long lines is regulated by the master gain control.

This is the studio engineer's podium. A technician, he handles technical operations. He is often very busy with all the instruments on this control console and another lot of switches, patch cords, and controls on the rack or bay at his side, in which his lines terminate and his amplifiers are contained. With his left hand he flips switches, cutting microphones in and out. With his right hand he adjusts the master gain control and operates the necessary buttons, cords, and switches on the rack. With both hands he handles the variable controls, increasing or diminishing the volume produced in the microphonic channels. He often wishes he had four eyes and a half-dozen hands. One wonders why a few foot controls were not added.

A good studio engineer is quite sensitive to art as well as science

Figure 2. Studio control room.



in broadcasting. Only in rare instances is he a smart showman as well as a skilled engineer. The more he appreciates the many arts finding expression in radio, the greater is his value as an operator in the studio. Some broadcasting stations are fortunate in having a few engineers who are at the same time musicians or students of the drama. Occasionally they leave the controls for more creative work. Naturally, such dual talent is rare. Emphasis on engineering training does not make for showmanship. Nor does stress on the things of the show world equip one to handle the control board. The industry will gain much as engineers and directors acquire knowledge in each other's departments. Both art and skill are necessary in each. The closest cooperation is required for a good show. What the production staff lack in technical knowledge and skill, the studio engineers should supply. The engineer's weakness in showmanship and artistic talent must be compensated for by program directors and assistants. These men can assist but they cannot supplant each other, because the gifts that make for excellence in one branch do not even qualify for the other.

A living drama or an effective musical performance may be very ungrammatical. Words need not always follow laws of correct sentence formation. Nor must notes come together according to an accepted rule of harmony. By the very breaking of every rule, an effect may be gained which is exactly what the showman desires to impress his audience. This is particularly true in dramatic and variety shows and in some unconventional musical productions. In radio, as a means of communication, engineering embraces the "grammar." The very factual exactness of his training makes the engineer a very literal grammarian as far as a show is concerned.

Admittedly, there are engineers capable of complete responsibility where conventional musical programs are concerned. Excellent technical ability and musicianship are often combined in the same man.

But in a well-produced dramatic and variety show we cannot do

without the director and his staff. Too many eyes, hands, arms, and feet are required to manipulate the performing units and the transmitting parts at the same time. Neither the equipment nor the show personnel can be permitted to run itself for a minute.

The director is the interpreter of rules and regulations. The presence of "grammar" is essential to him. He needs it for his effect. Even by its misuse it serves to give a true characterization, or a gangling, strident mood. It is a special field where an artist often strikes the right note by hitting the wrong one.

So each one to his own work. . . . One is cause; the other, effect.

* * * * * *

In radio as well as in the theatre, the whole is of course greater than all of its parts. It is true that while each function is important unto itself, the whole thing surpasses the division-of-labor idea. Again and again, the reader will discover that the best men in radio not only know their individual tasks, but also understand that each new production situation involves the modification of those functions in order to better the whole presentation.

The following chapters, though more detailed in nature, will give the reader an idea of how the production man achieves results greater than his own single contribution.

Part II

THE PRODUCTION OF MUSICAL PROGRAMS

6

Musical Sound in the Studio

THIS AND THE NEXT two chapters will be devoted to a closer study of the problems inherent in the production of any musical program.

Our chief problems in the presentation of music are not to add character and value to a thing of such intrinsic worth. Rather are they found in connection with the preservation of true values in the broadcasting of music. In other words, the success of the idea largely depends on the extent to which we are successful in reproducing musical sound.

Music stimulates the hearer through sound alone. But in radio, sound can reach the emotions or intellect of the hearer only as effectively as the transmitting equipment, the studio conditions, and the skill of the broadcasting staff permit. Men have long known and understood most of the many influences that affect the production of a musical sound; but with the emergence of radio much that was still unknown had to be discovered.

Musical Qualities

Every musical instrument produces sounds which are the result of certain musical characteristics inherent in its construction, and these are brought out by the skill of the performers who play them. The distinguishing tones of each instrument are con-

trolled (1) by its construction and (2) by the method of sound production used.

For instance, in the construction of a stringed wood instrument the gut or wire is one control; the shape and size of the resonating body are other controls. Violins have small bodies. Guitars, cellos, and base viols are larger; pianos are still larger. One group is bowed, another plucked, and still another enlivened by hammers that beat upon the strings.

Woodwind instruments also vary in size and shape and in the material and construction of their vibrating reeds.

Brass instruments, with their bent tubular resonators and their mouthpieces which require actuating lip and breath movements, vary in size. Each adds its typical tone, determined by its construction and the way it is played. This is also true of drums, xylophones, vibraphones, and harps, all of which produce tones determined by their shape and size and by the metal, wood, and string materials used in their construction.

Besides the inherent characteristics of the instruments, as a conditioning factor, each composer's work has its own nature derived from his distinctive use of melody, harmony, rhythm, tempo, form, suggested color, and expression.

Each orchestra has its own peculiar qualities which result from its size and instrumentation, the technique of the musicians, and the conductor's interpretation of the composition.

It is not too much to say that both the inventors and the manufacturers of instruments are factors in the presentation of music.

The Quality of Transmission

Radio introduces still more conditioning factors. Microphones and amplifiers—indeed every transmission line and transmitting station—have measurable musical traits. These, today, may be of such high quality that great symphonies are broadcast without severe loss of sound. Every receiving set has distinctive musical attributes in direct relation to the quality of its material and elec-

trical parts. Fortunately, many of these have reached a point of scientific construction matching the perfection of transmission.

Variations in the quality of transmission lines are a commercial matter. The telephone companies are prepared and do provide lines of high fidelity as fast as they are called for by the radio industry. Many network hook-ups use the highest class of line at great annual expense. And with the great commercial laboratories constantly experimenting for better and better equipment, the purchasing power of a station at the moment when new equipment is released also bears on the quality of musical sound it can produce.

Acoustics

Over all these factors, containing and conditioning them, is the studio or auditorium. This, too, has its own musical characteristics and is another "instrument" in the performance. In so terming it, I may be challenged. Yet think of the influence the studio actually has in the broadcast of musical programs. This room, with its wall, floor, and ceiling treatments, with its live and dead surfaces, is like a master instrument in that it controls the quality of tones produced within it. Like other instruments, it modifies the tones produced within it by its construction and by its peculiar method of sound production. The size, shape, and treatment of the room and the placement of instruments, performers, and microphones within it are all controlling factors of sound. Expert knowledge on these controlling factors is provided by thoroughly trained and experienced broadcasters and acoustical engineers. And behind these men are laboratories specializing in the science of sound as applied to radio and recording.

Let us look into these authoritative sources in the science of sound.

It was a shock to most of us, ten years ago, when we realized that the studios we worked in daily were built in ignorance of the

physical laws that operated within them. Despite all the departments of physics in world-renowned universities and colleges, there was no body of knowledge to which we could turn for exact construction plans and specifications. Newton's *Philosophy of Mathematical Principles* had been written nearly three hundred years before. It is odd that in the interval it had not inspired continued experimental study of sound, for from this very old study stemmed information we needed. For years the prevailing ignorance of acoustics led to many strange and futile practices. For instance, thousands of strands of piano wire were strung to various tensions below the ceiling of a poorly constructed auditorium to correct the distortion of sound. In addition to their failure to make the auditorium more useful for music or speech, these piano wires marred the appearance of the place.

Many auditoriums were and are almost useless. Yet we are grateful that one of the worst of these was built on the campus at Harvard; the large lecture hall in the Fogg Art Museum was so inadequate acoustically that a demand was made upon the physics department for help. The work of Professor W. C. Sabine for this auditorium resulted in the first scientific study of architectural acoustics ever undertaken. It provided the only advance in the understanding of the hearing of sound since the close of the seventeenth century. Professor Sabine's reports on these experiments were not published until 1922. Unfortunately for us, his findings were more applicable to current concert halls and theatres than to radio studios.

In the Case School of Applied Science in Cleveland, Ohio, Professor Dayton C. Miller was directing experiments in the measurement of sound. Far away at the University of Calcutta the department of physics was compiling a collection of data on acoustic experiments. Pioneer work, all of it! But tardy in its appearance and incomplete for our purposes.

Radio went to architects and engineers who, having acquired some of this new knowledge, were dampening the echoes in public buildings, churches, court houses, and schools to kill the

annoying "slap-backs" of speakers and singers. These same architects placed sound-absorbing material on ceilings and walls and carpeted the floors of banks and large offices to abate the noise of typewriters and the confusion created by people at work.

The sounds requiring absorption at such places were at the upper end of the sound-frequency scale. Having controlled them, the remaining sounds in the lower register were left to take care of themselves. These low frequencies were not disturbing to stenographers, but they were a serious problem to radio. Wall and ceiling treatment which could give a comparatively even absorption of the full range of sound as produced by human voices, or an orchestra, was unknown. In using monk's cloth, drapes, or the prevailing commercial absorption materials, our broadcasting lost most of the high, brilliant partials that give character to musical sounds. Also, we found the lower frequencies so overemphasized as to be almost out of control.

Fine, air-conditioned studios were built and decorated in keeping with the architectural design that symbolized a new art and industry. These rooms were far different from any before constructed. The first reaction would invariably be, "Isn't this all wonderful? I suppose these studios are simply the last word." They were simply the last word, and just as simply almost the first word. They were correct—for the broadcasting of an octave in the middle register. For no other sound frequencies above or below that octave were they anywhere near correct. We used them for music but, alas, they were built for typewriters.

In an effort to improve the radio transmission of music, the string basses, cellos, and tympani were played everywhere in those studios, wherever they could be placed. Could a musician have performed while hooked to a wall or suspended from the ceiling, that would have been tried, too. But it would not have helped. The harmonics of violins and oboes were simply smothered by immediate absorption. For within those walls there existed the acoustic peace in which we could have said, "Miss Jones, take a letter," gratefully aware that none of the metallic sound pulsations

from her machine would jar our nerves. But what we needed was a room in which we could say, "Gentlemen, take a symphony," in the happy knowledge that the impulses from the instruments combined in our full orchestra would blend in an evenly balanced tone picture, the perfect fulfillment of the intention of the composer and the artists.

Acoustic conditions had been definitely improved in auditoriums. What was it that made this studio problem so difficult? One reason was the size of the room. Not alone because of the expense of building space was the studio small. The intention of broadcasting is that the listener be in his own home, not present in the studio, and there seemed to be no valid purpose in making the room much larger than the size of the orchestra to be accommodated. Therefore, the studio was an originating place only, rather than an auditorium.

Of course, before radio's advent, there were confined spaces especially built for origination of sound; for example, specially designed platforms and stages in auditoriums and reflecting shells constructed like canopies over and around the bandstands in public parks. But none of these spaces was wholly enclosed.

Our studios had to have four walls. Since they could not be isolated from each other by large separating distances, they had to be separated by thick building materials, leaving sound unable to escape except by way of the transmitting equipment.

At first this isolation appeared to be the only consideration. No one considered an analysis of just what would happen within those walls when sound was produced by the human voice and other instruments. I often wonder today how much thought is given by the producer to the actual air disturbances within the confined space of a studio, which we call music.

Mechanics of Sound

What does happen in a studio when sound is made?

The organ or instrument that actuates the sound is excited; and

(as everyone who has read the fundamental laws of physics knows) waves in the air within the studio are created in much the same way as waves are produced when a pebble is dropped upon the surface of a quiet pool. In ever widening circles this wave motion is projected. The effect is in all directions; but owing to the construction of the instrument, these waves are somewhat directional, especially close to the actuating or generating elements of the instrument.

The singer's voice is produced in his throat by vibrating vocal chords. His breath itself carries the sound up into the modifying air cavities of his head which give quality and character to that sound. As the sound waves pour forth they disturb the air in the entire studio, but primarily, for a short space in front of his mouth, in the direction in which he faces. A sensitive instrument picks up the vocal sounds in the room regardless of the position of instrument or singer; but proper transmission of the true character of that sound depends upon the correct relationship between singer and instrument, and the correct condition on the walls, floor, and ceiling of the room itself. This last is as true as the fact that modifying air cavities in the singer's throat and head affect the character and quality of the sound, owing to the shape and size and character of the resonating surfaces. In like manner, the modifying air cavities of the studio itself mar or preserve this character or quality. On leaving the singer, the sound waves bound out across the length and breadth of the room and up and down between the ceiling and floor. They are absorbed or reflected upon reaching these partitions, depending upon the type of surface that covers the walls, ceiling, and floor.

To return to our pebble and the pool, the little waves which started circling from the center when the pebble fell shoot out to the edges of the pool. When they reach the pool's boundary, they are reflected and seem to bounce back. This rebound is especially strong if the pool is bordered with concrete. If the edge is soft mud punctuated with indentations, the waves partly penetrate and

lose some of their force. If one edge of the pool is perforated for an overflow, the waves pass on through the grating and are lost from sight.

Back in the studio our sound waves are sharply reflected if they encounter hard surfaces. They tend to be lost when they touch soft absorbent surfaces.

The condition of a studio with highly reflecting walls is called "live." The condition of a studio in which the walls are highly absorbent is called "dead," and the reason for this is clear.

Let us take a violin, for example. Across the tightly drawn gut strings the player, with skilled hand, draws his hair-strung bow. On this bow he has rubbed resin, to make the strings vibrate easily as the bow is drawn across them. If the strings alone were stretched tightly between two solid points, they would make a sound, but the actuating "pebble" would be small. When the strings are fastened to the body of the violin, the whole instrument resonates from the points to which the strings are attached. The vibrations continue into the wood itself, their character altered by the size and shape of the whole instrument. From the *f*-holes, as from the mouth of the singer, the amplified tone issues richer and more pleasing than a mere gut vibration.

The air is disturbed all around the body of the violin, and little waves are set in motion from every inch of its surface, both inside and out. The air in the studio responds. The walls, floor, and ceiling now play their part in contributing to the character of the sound eventually heard by the audience.

In dealing with music within the studio, the direction characteristic of the instruments must be considered, as well as the general room tone brought out when the instrument is played. Since music is produced for a listener, it is directed toward him, insofar as that is possible, unless some special effect is desired. *The microphone in the studio is the extension of the listener's ear.* Therefore the sound that the microphone picks up must be carefully controlled.

From the bell of the trumpet and the trombone, from the *f*-holes of the violin, the cello, and the string bass, tones are emitted that have directional characteristics. These, combined with the reflections in the room produced by all the surfaces of these instruments, are modified by the room itself. The resulting complex sound is definitely subject to control.

In ensemble playing, instruments combine to produce a compound of tones. Here directional emphasis is from the face of the orchestra to the microphone and the listening ear.

Dead and Live Studios

It is understandable that when radio first began, we were almost content to produce any sound at all. Equipped with slight working information, it easily followed that our ears became accustomed to sound production that was relatively poor. We became conditioned to something that was bad in the form of music, poor in quality and range, distorted in perspective. So deeply did this hearing habit take hold that five years ago, when new knowledge stood ready to help us improve our studios, the improved sound was not acceptable to many. What happened was probably one of the strangest things in the history of aesthetics. Radio executives accustomed to attending orchestras and opera in auditoriums where hearing conditions were good had, none the less, within a period of a few years become inured to hearing poor quality on the air. It was these veterans who gave strong resistance to changes for the better. Their hearing habits had almost a strangle hold on the further development of tone quality. This was true not only in radio broadcasting, but also in the field of recording.

Phonograph records of music were formerly made under dead studio conditions, with the microphone as close as possible to the voice and instruments. These reproductions were not good; still, it was a means by which an orchestra, singer, or speaker could be carried to the hearthside, and the performance repeated at will.

The ear accepted the sound produced by this wonderful device, and the mind was closed against critical judgment by the wonder of it.

Later, in England and elsewhere in Europe, musical recordings were made under opposite conditions. These recordings were produced in live studios. The records were heard by some people connected with a large American recording company. A few, greatly impressed, urged the making of discs under similar conditions. They met with vigorous resistance. Not only did others not like the records themselves, but they were positive that there would be no sale to the American public for records similarly made here. The arguments were prolonged over many weeks, but ended in a deadlock. Finally, it was decided to make a public test. Records were produced by the same artists under both conditions. The "dead" recordings were made as we have described. The "live" ones were made in an auditorium where conditions for a listening audience were considered to be extremely fine. The auditorium, by comparison with the studios which had been generally used, seemed immense. The walls produced vigorous reflections. Musical tones were brilliant. They did not seem to drop, the moment they were effected, and fall from the body of the instrument itself. Instead, the sound was sustained and attenuated, enriched as it passed through the great air spaces within the auditorium, given a joyous character by its reflecting walls. Both types of recordings were placed on the market. To the great surprise of the objecting group, the public not only bought the live recordings but showed preference for these by a ratio of two to one.

This was proof enough for the recording industry but still not sufficiently convincing for many within the halls of radio. For after listening, with the greatest concentration, eighteen or twenty hours a day to radio programs of poor quality, changes, even for the better, were not acceptable. Time and again we played the new recordings and the old for the diehards. Patiently we constructed large reflecting panels, placed them at intervals along the

studio walls, and transmitted orchestral music under these new conditions. All we got from our objecting group was that it was "terrible." But did I say "all we got"? One night after such a broadcast, two of us who had made the test were called on the phone by one whom we shall call a leading conservative. I listened for forty-five minutes to a tirade of bitter criticism of the entire performance. Not being able to hold the receiver any longer with comfort, I passed it to my fellow culprit and he stood the verbal onslaught for another three quarters of an hour.

It is a good thing to bear this human characteristic in mind, not only as it applied then, but as it might, in the future, apply in radio. The dislike of change, the resistance to something that sounds new, must be fought off; otherwise it becomes a barrier to the improvements that we must continue to make before attaining perfection in the broadcast of sound. It seems remarkable that such objections should arise within an industry dependent for its very existence upon the willingness to change. Broadcasting stations owe their existence to the experimental mind, both amateur and professional, which went on year after year designing and constructing radio transmitters and receivers. Let us hope that curiosity, the desire for the new and improved, which Alexis Carrel calls "commendable audacity," may always predominate in the field of radio. We can be proud of our achievements, but they have only just begun.

Modern Studios

Some acoustically inadequate studios are still in use. A few of these exist for economic reasons. Naturally, the greatest barrier to change is often the expense of rebuilding or correcting badly constructed rooms. But studios in other spots remain unaltered because of the owners' disposition to let well enough alone. Unfortunately these owners are often neither critical listeners nor well-informed ones. They are interested only in preserving equipment which, so far, has proved good enough to be profitable.

Modern studios, those newly built or reconstructed, are a vast

improvement on the old. Of these there are three general types. First are those constructed on the live-end dead-end principle, which will be discussed in detail in the next chapter. The idea in this design is that the end of the studio in which the sound is produced should be reflecting and brilliant, beautifying the tone, while the end toward which the sound is projected, in which it is picked up by the microphone, should be dead. This design tends to conserve the improved quality of the room tone and at the same time to take advantage of the more or less directional characteristics of the instruments themselves.

In the second kind of studio the walls and ceiling are treated uniformly, so that the sound produced in any part is of the same quality and character as that produced in any other part. This type of construction meets the demand for variation in characteristics by adding studios, one being uniformly live, one uniformly dead, and others between these two extremes. Each such studio is constructed in the way broadcasters believe best for the different types of programs.

Third is the studio provided with variable acoustic elements, which can be changed quietly and quickly at will to accommodate whatever type of broadcast is to be made. There are combinations of this studio form: for example, the live-end dead-end studio may contain variable elements to increase or decrease reverberations at will. Still another studio design should be mentioned, although it is not dependent upon surface treatment for its individuality. This is the multiple studio—a control room around which several studios are grouped, combining the different units participating in a program, and permitting the control by the engineer and director to be more accurate.

In conjunction with studios, rooms called echo chambers have been constructed. They are highly reverberant. The sound coming from the originating studio is transmitted through them before it goes on the air. The echo chamber will be discussed more fully in Chapter 13 on "Sound Effects."

Some of the things we discovered about musical sound are not

new to many musicians themselves. We, too, might have been aware of them before radio while we listened to music in concert halls and auditoriums. But it required the confinement of the studio, where these sounds became cloistered, for them to occur with such emphasis that their importance was noticed. Every well-informed and experienced member of an orchestra knows that certain instrumental tones, when combined in particular registers, produce apparent volumes not produced in other combinations. Strange tone colors are produced by instrumental combinations which cannot be secured in any other way. While it is desirable that all of these be preserved, they are very difficult to handle in the broadcasting studio. For example, when the tympani are combined with strings, the sound of the tympani is not nearly so pronounced as when combined with the brass in certain registers. Composers and conductors readily agree that this is so; they have noticed it for a long time and made use of it in their orchestrations. Exactly what is it that happens in the room when the tympani and brass are played together? The tones produced by the brass, the sound waves emitted by these instruments, promptly blend somewhere with those emitted by the tympani, and the quality of the latter is greatly improved. The tympani values are emphasized as in no other combination. We have not found any composer or musician who knows why, nor have we found any scientist to answer us.

The musician makes use of the fact and isn't greatly concerned about the reason. To date the scientist, apparently not aware of the fact, has not bothered to form the necessary liaison with the musician to discover the cause.

Sitting in a control room of a studio of the latest design, we noticed these sudden changes of sound value as they occur in the playing of orchestral pieces. They always come as a surprise during rehearsal. Even though the actual volume increases are not great, the apparent volume increases are sometimes tremendous; and the operating engineer, who is monitoring the program, is forced to adjust his volume control hurriedly unless he

has been consistently watching the needle of his volume indicator.

In one of these studios, which we usually prefer for the broadcasting of music because of its size and shape and acoustic treatment, we have had many complaints from musicians who play brass instruments. They complained that they could not hear their own tones. When these complaints first began, none of us paid much attention because we knew that from this studio came some of the finest renditions of orchestral music ever broadcast. But as the complaints persisted, we went to the part of the room in which the trumpets and trombones were played and leaned close to them while they were performing. Sure enough, everything the musicians had said was true. We could hear those instruments well in every part of the room except where the instruments were. The microphone in front of the orchestra was picking them up beautifully, but the man who played could not hear his own tonal inflections. We moved the brass instruments to another part of the room and changed the position of the orchestra. The same trouble persisted. None of the violinists, cellists, or any of the string, woodwind, or percussion players had any difficulty; but the musicians playing the brass instruments could not hear themselves, although they could hear everybody else. What caused it? We do not know. The condition is unique to this studio.

In other rooms, various other strange conditions occur. The acoustical engineer has not been able to discover the reason. Some day scientists will help us with causes and explanations. But so far we do not know to whom to turn for competent advice, because of the inexperience in this particular field.

The tone colors produced by instrumental combinations are not a problem but a delight, because of the great emphasis they receive in the studio. When we add an instrument to get a new musical effect, we sometimes run into difficulties. Recently we added to the woodwinds a basset horn, the tone of which lies between that of the B-flat clarinet and the bass clarinet. It proved to be more

penetrating than either of the others. As a rule, the distance between the strings and the woodwinds and their position with reference to the microphone corresponds to the difference in the volume each choir produces, a matter of only a few feet. With the addition of the basset horn, the woodwind section needed to be pushed back. No distance in the studio seemed to be great enough to prevent the clarinet sound from overriding. We were finally forced to separate the two sections horizontally and to use different microphones for the pick-up of each section. Only thus could a satisfactory balance be secured. But neither I nor anyone that I know of could tell you why the condition existed.

The modern composer, Stravinski, has dared to write for the conventional orchestral instruments in unusual combinations resulting in tone colors hitherto unheard. Perhaps the possibilities of tone production in the future are almost unlimited, but we ought to exhaust the great possibilities of the instruments that we have before attempting to change or improve the instrumental design or invent ones of new form.

The most desirable thing at present is that the scientific students of sound work more closely with the musicians. When the two collaborate, we will be able to learn by plan, not by accident in orchestration, the facts of tone production and the reason for such variations in musical color. The field for the student is, therefore, very large. What will be the design of the perfect studio? Will its walls be perpendicular, or will they slant at opposite angles? Will their surfaces be fluted or smooth, or will they be filled with irregular protrusions and indentations? Of what materials will they be constructed? How much of them should be reflecting surface and how much absorbing, and how should these areas be distributed? Is a very large studio the best all-around one for general purposes, or is that one better which can conveniently accommodate only the program personnel on its floor space? When is orchestral music preferable? When it is

transmitted by means of a long pick-up with the microphone at a considerable distance from the players? Why, at any time, is this perspective desirable? What happens to the musical sound in a large auditorium studio when this type of pick-up is used? What is the physical effect upon the listener's ear when this method is used?

We go along thinking, because of the balance and satisfying effect of the pick-up when perspective is used, that this is the one position always to be desired. Then one night we hear bursting from our loud speaker the sound of a full orchestra under the direction of Leopold Stokowski; and by the character of that sound we feel closer to the instruments than he himself as he stands on the podium in the originating studio.

On inquiring, we find out that this is indeed so. Contrary to every rule and practice for the pick-up of such orchestras, Mr. Stokowski has placed two microphones close to and in front of each section. There are twelve microphones in all. The music pouring forth is different from that produced with long-distance perspective. Every instrumental tone has a new character. The proximity of each instrument to the listener is startling in its effect. The emotional response in the radio audience is very great. This is the same composition that we heard at another time in the Academy of Music, sitting in the balcony many feet back from Stokowski's baton. It is the same composition we heard when one microphone was suspended at least half that distance away; but this is a new production of that composition. It is as if music written for one orchestra were being rendered by another with very different instrumentation. We are not entirely sure whether we like it or not, but are tremendously impressed. We want to hear it again.

Many of these strange effects are attempted in the music of dance or novelty bands; but, so far as we know, there has been no *extended* experimentation by great symphonic organizations devoted to the playing of the classic music.

This is a part of the fascination of radio, the entertainment medium. In the next decade, or at least in the next quarter of a century, we ought to go much further in this almost unexplored field.*

* See the list of laboratories where special experiments in sound are being conducted at the present time—Appendix, pages 347-380.

7

Set-Ups for Musical Programs

JUST AS IT WAS TRUE that the great portrait painters of all time appreciated the control of perspectives and color vibrations in their painting long before the emergence of the camera as a mechanical means of portrayal, just so the symphony conductors, the composers of music, and the great soloists have understood the variable colors and tones of sound since long before the emergence of the mechanical transmission of sound which we today call radio.

No good cameraman, or radio production director, could afford to ignore the great truths that the old masters of painting and of music garnered before the invention of the camera and the radio.

Our function now is, and has been, to familiarize ourselves with the basic qualities of sound which these musicians have known already, and to acquaint them with the special characteristics of the mechanical means by which we bring their music to the listener. We have learned to evaluate the musician's "idea" of his music (whether "hot," "sweet," "sombre," "delicate," "singing," or "strident," and so on), and he has come to understand that he must coöperate with us to bring that exact quality of music to the listener's ears with the proper treatment of studio and the right selection and placement of microphone. The coöperation of the musician with the studio engineer and the director of the program has been the rule and not the exception.

By using every available source of pertinent information concerning acoustics, and by taking advantage of what the musician already knows, we have achieved a rather amazing degree of success. Radio sought the assistance of the architect and the scientist; when both failed, it resorted to trial and error. For a long while resistance to change was great, because of the very human tendency to let things alone. That tendency can result in looking backward and in codifying examples of success as being dogmatically final. While the following examples of set-ups given in this chapter reveal success, they should not be construed as the last word. They are given in an effort to acquaint the reader further with radio's production problems and as a source of reference for the student or practitioner who has had no previous occasion to meet these problems.

Musical programs are either instrumental or vocal or combinations of the two. They can also be classified as serious, popular, or folk.

Serious Musical Programs

Symphony

Orchestras rendering symphonic music appear regularly each season in auditorium performances supported by society membership or subscription. Those playing in the larger concert halls include as many as 110 to 120 musicians. Also, symphonic groups have been built up by the radio networks—the NBC Symphony and CBS Symphony Concert Orchestras, and the WOR Little Symphony Orchestras heard on the Mutual Network.

Throughout the world, wherever symphonic music is performed, the instrumental arrangement most often used is much like the one illustrated on page 62. It permits the homogeneous grouping of the instrumental choirs, of which there are four:

1. *The strings:* violins, violas, cellos, and string basses.
2. *The woodwinds:* clarinets, flutes, oboes, bassoons, and English horns.
3. *The brasses:* trumpets, trombones, French horns, euphonium, and tubas.

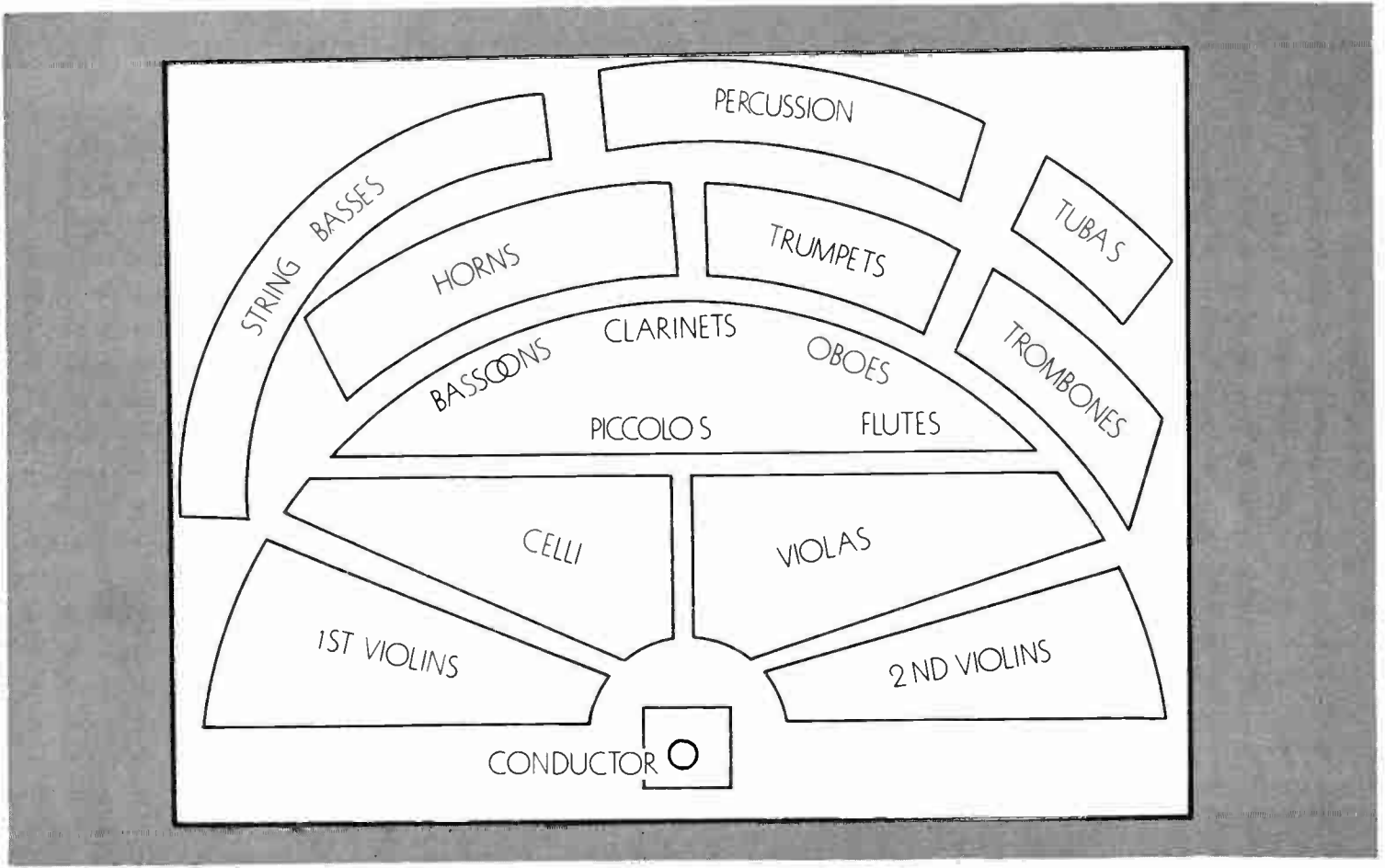


Figure 3. Conventional arrangement of a symphony orchestra.

4. *Percussion instruments* (of indefinite pitch): snare drums, tom-toms, tambourines, bass drum, triangles and cymbals; (tuned with a very definite pitch): piano, celeste, chimes, xylophones, marimbas, and tympani. The harp, a plectrum instrument, has its place in the score with the percussion group, though it really stands alone.

Symphonic scores follow this instrument-choir pattern,* and the grouping of instruments accordingly facilitates the attention which the conductor must give to corresponding sections of the score and the orchestra playing it. Of course, instruments differ from each other in the volume of sound they produce and in their penetrative quality. The strings, for instance, produce the least volume and penetration. In this subdivision the string basses are heard more easily than the other string instruments because they produce tones in the lower frequency ranges. Most penetrative of all are brass and percussion instruments.

A full symphony orchestra is many orchestras in one. A number of instrumental combinations are provided. For the scores of Haydn or Mozart, the instrumentations are quite different from those required for compositions of Wagner, Strauss, or Sibelius. No exact microphone placement will serve for all. The Beethoven Ninth Symphony, in which voices are added, calls for a spotting of microphones peculiar to itself.

The best listening perspective in an auditorium is that obtained by a seat-holder in the most favorable location. In general, the position of the microphone should approximate this location. If the auditorium acoustics compare favorably with those obtaining at Carnegie Hall in New York or the Academy of Music in Philadelphia, most symphonic programs may be picked up by the microphone suspended from the ceiling. The spot should be twenty-five to thirty feet in front of the string section and at a height of about twenty feet from the floor. The exact spot is determined in rehearsals. It should be off center to avoid converging sound waves. Suspending the microphone on a long cable facilitates moving it within a wide range during tests.

* The cuts on pages 62, 66, 75, 83, 85, 90, 92, 95, 97, 99, 100, 104, 200, 202, 248, and 250 are reproduced through the courtesy of *Variety Radio Directory,* in which they first appeared (Vol. II, pages 195-221).

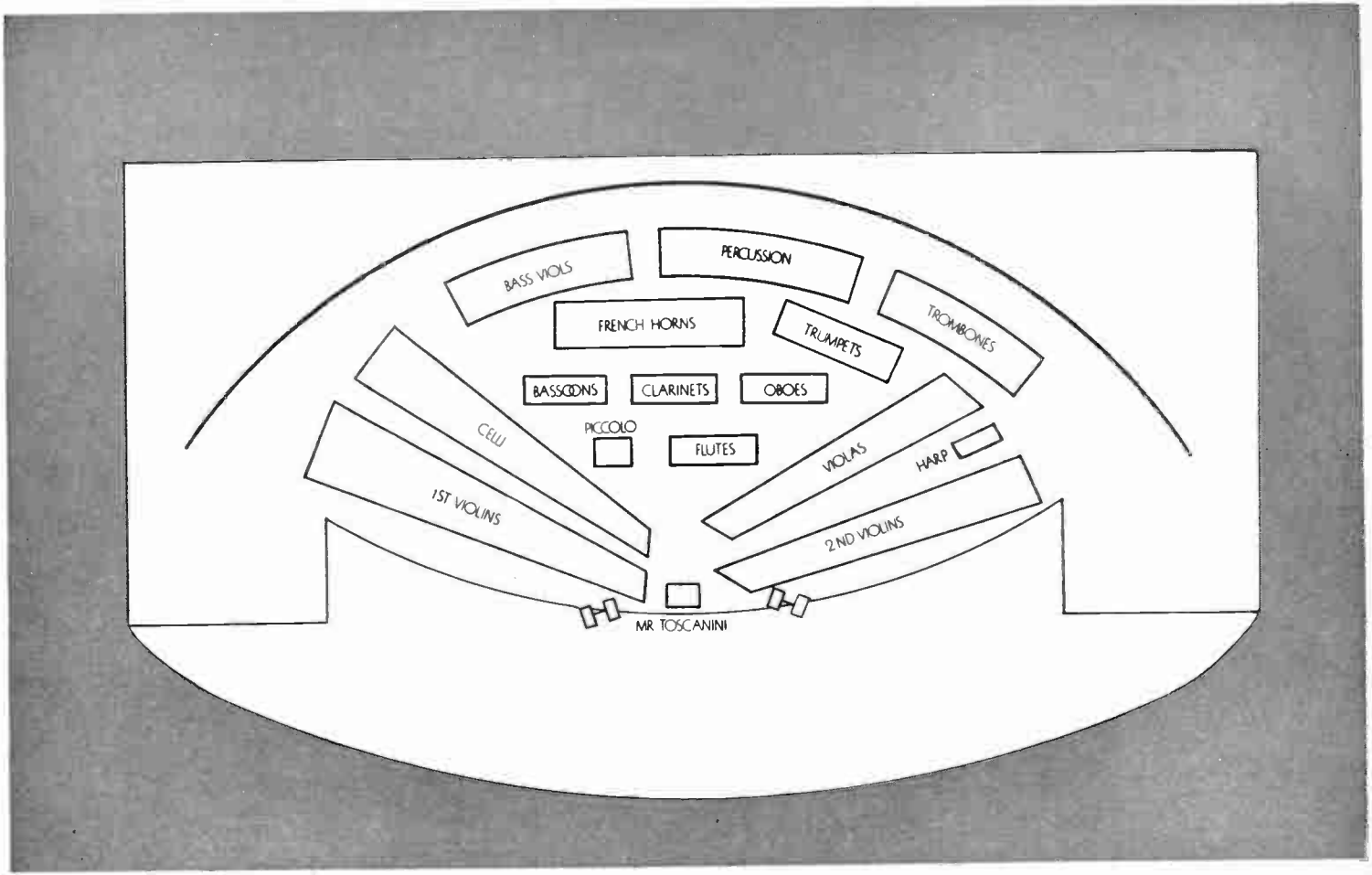


Figure 4. Set-up for the NBC Symphony Orchestra.

By the use of another microphone suspended high over the front of the stage, greater definition of strings may be obtained in *tutti* passages than the auditorium audience can hear. The use of this auxiliary microphone should be at the discretion of the director of the orchestra.

The NBC Symphony broadcasts originate in Studio 8-H, a real studio as opposed to the conventional concert hall. There Arturo Toscanini and other noted musical directors have conducted an orchestra of ninety-two men. The set-up is according to the diagram on page 64.

Though large, the stage is constructed like a genuine platform, and not like a theatre stage with proscenium arch and wings. Audience accommodations are provided on the main floor and by means of a gallery extending along the width of the studio at the rear. The studio is 132 feet in length and 80 feet in breadth.

The broadcasts are picked up by two microphones suspended over the orchestra. This arrangement is made in duplicate; that is, each unit is duplicated with two channels and two cables. The second, or spare channel, is furnished to provide for the unlikely contingency in which the main input system becomes noisy or goes dead. This is, of course, a notable deviation from the usual auditorium pick-up.

No difficulty of mixing, and no phase distortion, seem to attach to the NBC system of using two microphones. Conductor and production director may be confident that the transmission is true, and the quality high. Because of the directional characteristics of the microphones and the angle of placement, the orchestra is separated into two microphone fields with but very little overlap. True instrumental definition, good perspective, and great beauty and brilliance of tone are preserved.

On page 66 is a diagram of the set-up for the Ford Sunday Evening Hour." * The placement varies from the normal set-up

* This program is presented over the Columbia Network on Sundays at 9:00 p.m. by Mr. Henry Ford, founder, and Mr. Edsel Ford, president, of the Ford Motor Company. N. W. Ayer and Son, Inc., is the agency. The Masonic Temple Auditorium in Detroit is the place of broadcast and the orchestra is drawn from the Detroit Symphony.

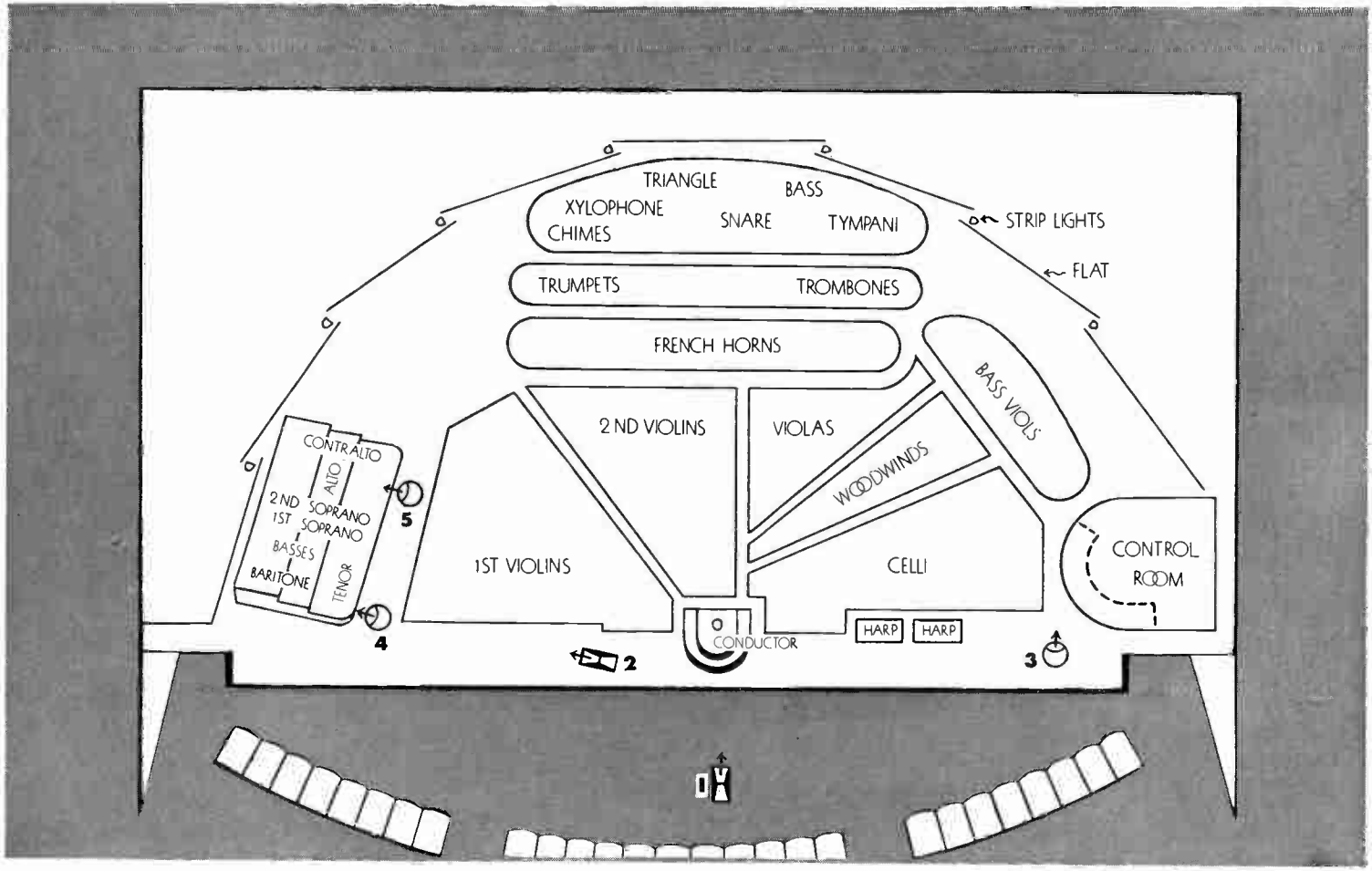


Figure 5. Set-up for the Ford Sunday Evening Hour.

and is somewhat nonconventional. Similar variations are used by Leopold Stokowski in seating the Philadelphia Orchestra on the stage of the Academy of Music in Philadelphia.

It will be noted that the cellos and bass viols are to the right of the conductor, whereas in a normal set-up the cellos are directly in front of the conductor and the bass viols to his left. This change was made expressly because cellos and basses play so many passages together, and because frequent cello solos call for an important position in the set-up.

Furthermore, with this Detroit orchestra of seventy-five pieces (as indicated in the diagram), it was discovered by experiment that the nonconventional arrangement of cellos and basses elicited a much clearer tone for radio broadcasting. Owing to some unknown factor in stage or auditorium area, a standard seating arrangement sometimes resulted in strident, heavy tones called "woofs" when the program was picked up by transmitting equipment. The diagrammed arrangement overcomes this difficulty neatly.

It was remarked before that Leopold Stokowski has a similar cello-bass seating arrangement. Still another deviation was Stokowski's placing of the woodwinds at center-stage in front of the French horns and other members of the brass choir. And Stokowski's violas occupied the space immediately behind the cellos.

In the Ford arrangement, the woodwinds are placed to give high definition and clarity, and to maneuver the clarinets into a position where they produce balance in ensemble work, and better definition in solos.

Number 1 on the diagram is the main, or orchestra, microphone. It is suspended from the ceiling about twenty feet out from the strings, and about fourteen feet from the floor. Careful attention should be given to the fact that the microphone is slightly off center to prevent sound-wave convergence.

Microphone 2 is used by soloists whose vocal production is handled so lightly that a close relationship with the transmitter is

necessary. Because microphone 1 would not completely effect this relationship, microphone 2 has been called into play.

Microphone 3 is on a stand built into a reading desk. This is used by Mr. Cameron for his talks, and is also available to the announcer.

Two microphones, 4 and 5, are placed before the stand accommodating the chorus of sixteen female and ten male voices. This stand is at the side of the stage to the conductor's left. The type of choral numbers used on the Ford program require, above all, definition and clarity of diction. Hence the two microphones. Although beautiful vocal production could be achieved via a single microphone for the entire pick-up—or, as another alternative, one for chorus and one for orchestra—the present arrangement, requiring two microphones for chorus alone, facilitates the all-important definition and clarity. To add brilliance to the musical production, a special stage set of "flats" (plane surfaces) has been built. The "flats" as used here are partially reflecting. A false ceiling is swung over the entire orchestra, 25 feet high to the front and 24 feet to the back.

When solos are accompanied by piano, that instrument is wheeled toward the front of the stage near microphone 2. The pick-up of solo voice or instrument is made directly "on-beam." But the accompanying piano remains in an "off-mike" location.

The three levels of chorus platform are built on 14-inch risers.

On the whole, the arrangements for this program are such that classical music, semi-classical numbers, and religious hymns and the talks of Mr. Cameron, can be handled with ease.

In auditoriums presenting difficulties in the form of echoes and over-reverberation, two things can be done. Either treat the ceiling and the back and side walls with drapes (or other sound-absorbing material) to bring the sound produced by the orchestra itself into easier control; or treat the stage so that it is less reflecting and brilliant, hanging the microphone at a point much closer to the orchestra, facing toward the violins. The result is not nearly so beautiful when the latter procedure is followed, but

echo and distortion are partially eliminated. Definition is greater.

Still a third plan is often possible. At many points there are highly qualified engineers, equipped with instruments, who are available to measure acoustic conditions and advise the necessary method of re-treating the hall for good broadcasting.

Ballrooms, gymnasiums, and so on, are likely to present acoustic conditions that must be met in the same way. Where the wall space is broken up by windows and where heavy drapes are available for completely covering them, a distribution of reflecting and absorbing surfaces is possible. As a rule, the floor surfaces are such that they may be bare at one end and covered with carpets at another end. The effect of a live- and dead-end studio is secured by setting up the stands for the orchestra on the bare floor, using portions of the carpet for the end in which the microphone is placed. Carpets may be placed beneath and drapes behind sections of the orchestra which prove difficult to handle. Usually these are the string basses, tympani, and drums.

It is easier to start with a room which is entirely too live and reverberant throughout and add wall, ceiling, and floor treatments of sound-absorbing material, than it is to have a room which is dead, to which reflecting panels must be added.

If the program is in a studio barely large enough to accommodate a full symphony orchestra, many of the instruments will be crowded toward the walls. There may be insufficient space in front of the orchestra for a very distant microphone pick-up.* The whole problem of set-up must be approached by trial and error. Often a rearrangement of instruments is necessary for a proper orchestral balance. In experimenting, the microphone should be hung as far away from the violins as possible, then brought in closer to the orchestra from that point if necessary. Under no circumstances should the microphone first be placed close and then moved back. After trying microphone positions in this reverse order for a half hour or more, it is likely that the

* If the point of origin is as described, an audience cannot be accommodated.

program director will accept as final a position which does not give sufficient brilliance to the performance.

Set-Up for Small Concert Orchestras

For most concert music with or without vocalists, a studio orchestra of twenty-six pieces is a very useful organization. Figuse 6 is a diagram of the set-up of such an orchestra in one of the new CBS Hollywood studios. The diagram on the floor plan of this enclosure should be self-explanatory to one who has studied the preceding drawings. It will be noticed that placement of instruments on the floor does not follow a strict conventional pattern. Instrumental position is determined by tests for balance made with the aid of the loud speaker in the control room.

The studio is constructed on the live-end dead-end principle. Three of its walls are slanted inward so as to eliminate any acoustical flutter. The walls in the live end, formed with acoustical plaster, present a smooth surface. The rear wall is perfectly flat and smooth, forming an echo or reverberation plane. This wall serves as a reflector of sound, increasing its brilliance. The dead end, or microphone area, is treated with large blankets of heavy absorbing material covered with perforated panels. A rug in the dead end may be used to prevent reflections from the floor, if this further correction is needed. Curtains are provided to cover the reflecting rear wall when desired. Rugs and curtains, or other variable acoustic elements for reverberation control, are prerequisites if a studio of this design is to be useful for all purposes.

The lighting in this studio is shadowless, indirect, and even. The glass front of the control booth has been slanted at a carefully measured angle to prevent light reflections from interfering with observation of signals. This studio is shown in figure 7.

Strings are fewer in number than would be used to balance the woodwinds and brass under usual concert conditions. To transmit enough violin tone, a compromise set-up is used. Microphone A is placed close, almost head high, with the angle of its

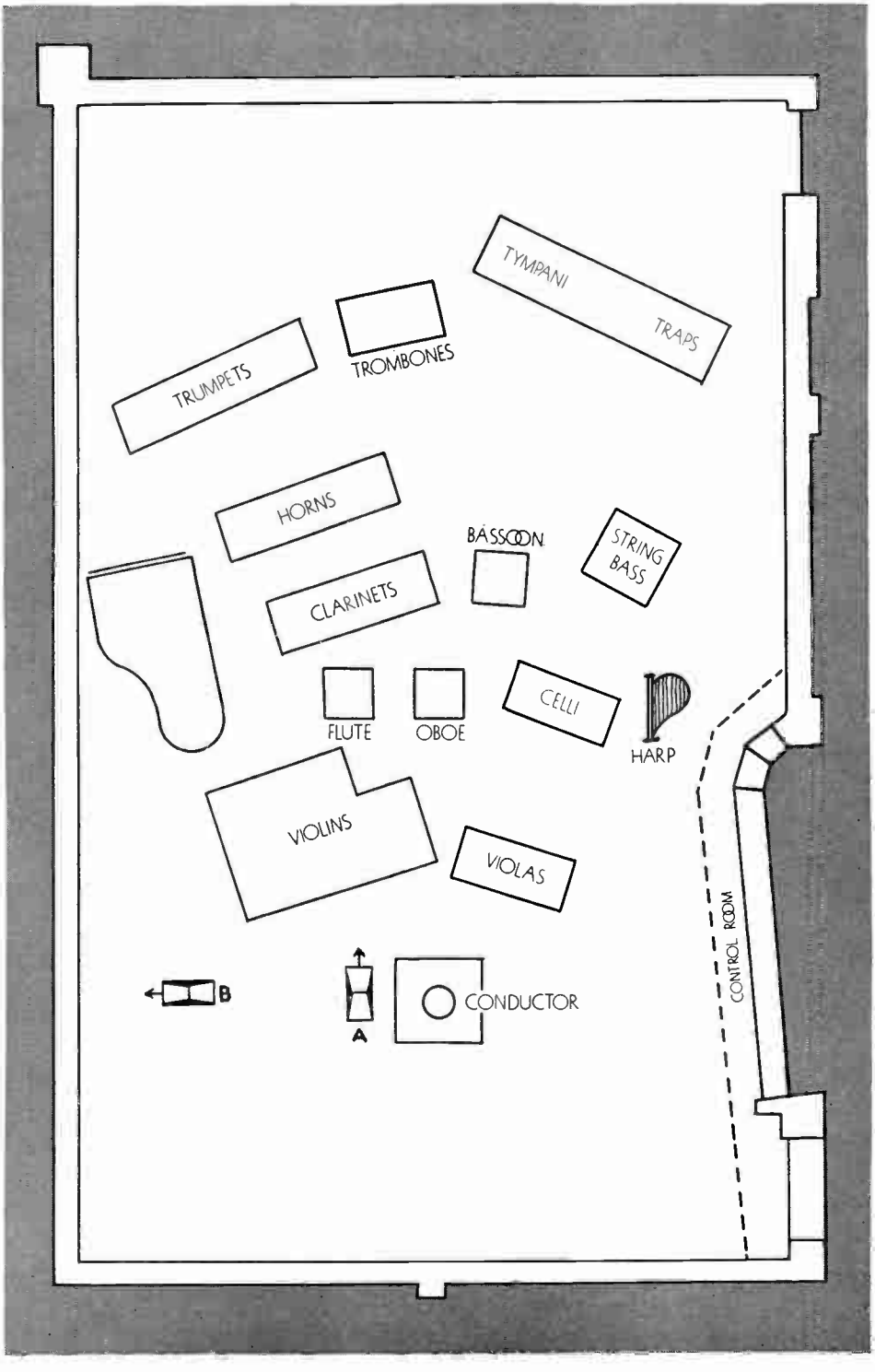


Figure 6. Set-up for a twenty-six piece orchestra.

Figure 7. Live-end dead-end studio with slanting walls.

face favoring the violins. Perspective is sacrificed for the sake of volume and definition from these instruments. Microphone A should be used for vocal soloists in concert programs if possible. When proper balance between voices is not possible on one transmitting instrument, then the singer may use microphone B provided also for the announcer. In this twenty-six piece orchestra there are eight violins, two violas, two cellos, one string bass, two clarinets, one flute, one oboe, one bassoon, two French horns, two trumpets, one trombone, piano, harp, and drums. When sustaining an orchestra of this size is too expensive; one of eighteen pieces will prove effective.

The instrumentation of any orchestra is at the discretion of the conductor or the musical director. One that is suitable for the performance of nearly every type of music, from concert to dance, can usually be organized with eighteen men. For serious music such an orchestra can include three violins, one viola, one cello, one string bass, two clarinets, one oboe, two horns, two trumpets, one trombone, one piano, and one player of other percussion in-

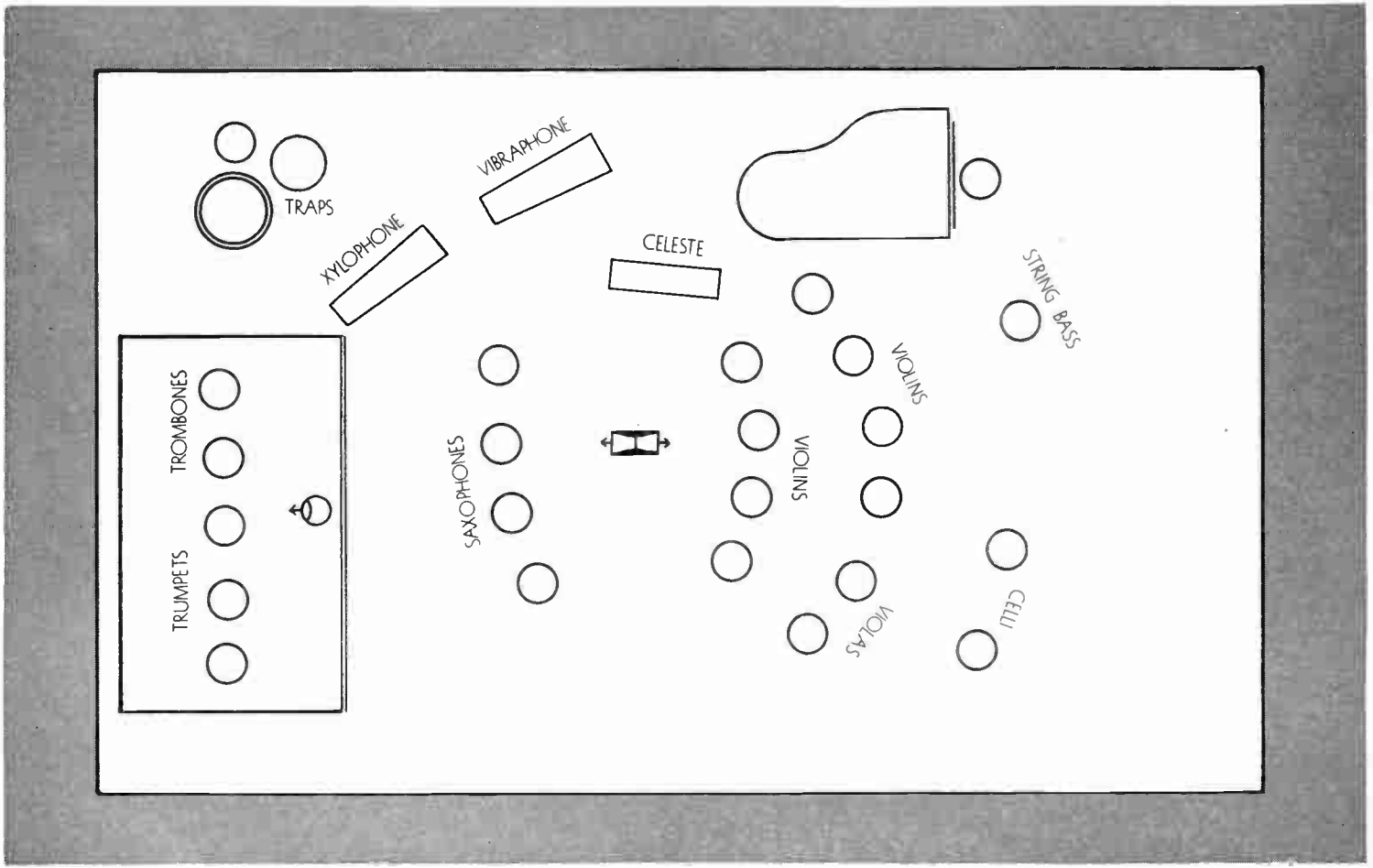


Figure 8. Split set-up for an orchestra in a studio similar to that in figures 6 and 7.

struments. One clarinetist should double on the oboe, another on the flute. The three players of woodwinds should have saxophones for popular music. An accordionist and a musician who plays guitar, steel guitar, or banjo with equal facility will strengthen this group for dance music. Further reduction in size of orchestras may be accomplished in radio stations having only small studios. The instrumentation must then be determined by conductors who are familiar with local conditions. The principles governing set-ups discussed throughout this chapter apply to all orchestras and studios, regardless of size.

Set-Up for a Salon Orchestra

Salon orchestras and chamber music organizations range in size from trios and quartets to groups of twelve or more instruments. Some of these musical organizations have important places in the life of local communities. A few trios and string quartets have enjoyed international reputations. Nearly every radio station of commercial importance has organized its own salon ensemble. The programs of these smaller groups cover the entire library of serious music except the symphonies and pieces of program music that require full orchestra.

Salon orchestras or groups usually comprise strings and percussion instruments, and specialize in serious music, semi-classical numbers, and folk airs. Occasionally, a cymbalon is added for Hungarian Gypsy numbers, replacing the piano. In such musical organizations the conductor generally is a violinist and carries the solos. It is this type of ensemble that the diagram (figure 9) has superimposed on the floor plan of CBS Studio 4.

Good use is made here of the velocity microphone,* which is especially suitable for blending tones of varying volume. The procedure for achieving such a blend is simple—move the instruments emitting light tones into the direct "mike beam," and the

* For further information on microphones of different types, see Appendix, page 333.

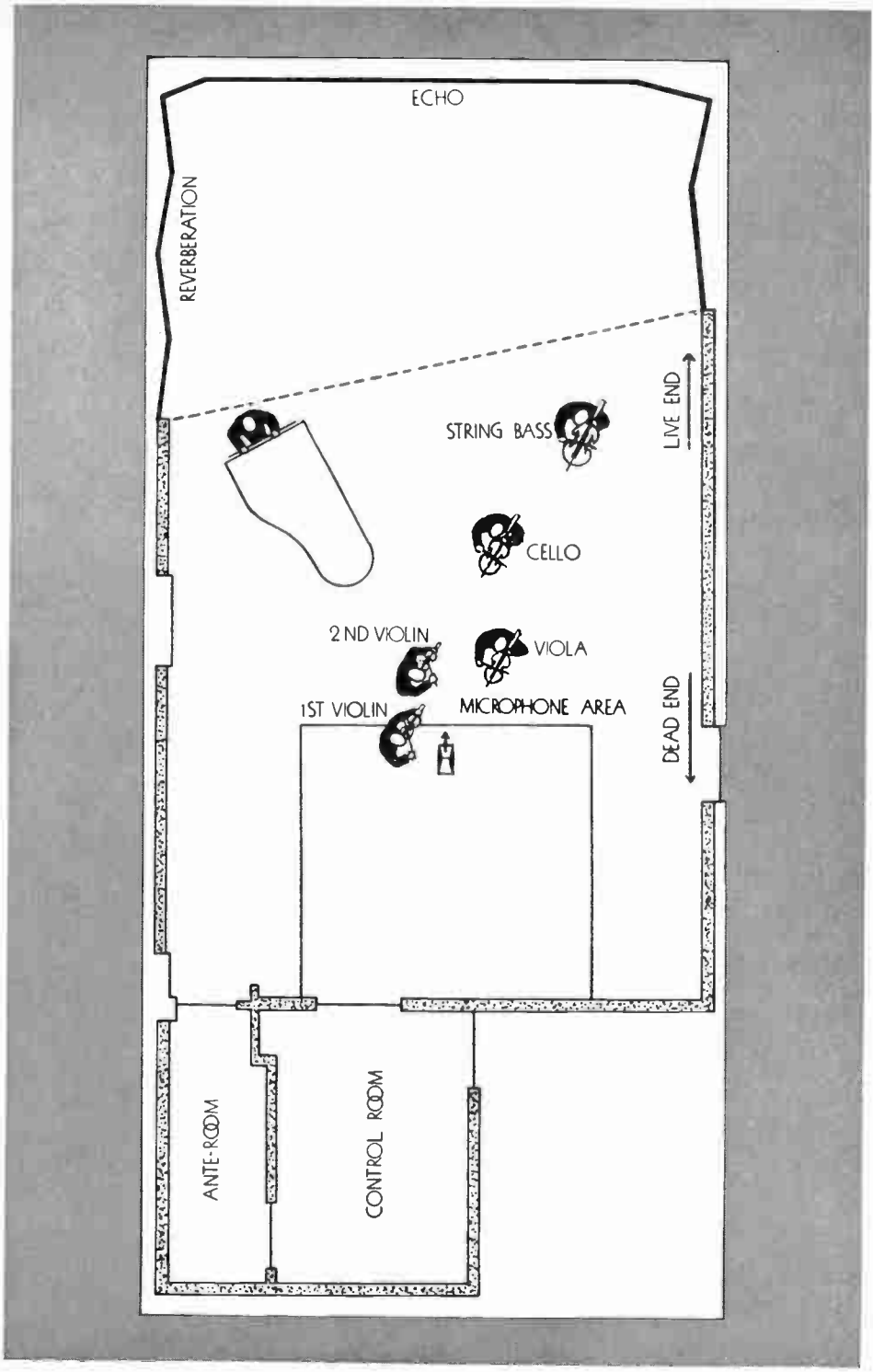


Figure 9. Set-up for a salon orchestra.

heavier instruments into the edges of the "mike beam." It must be remembered that the direct beam of a velocity microphone follows a straight line drawn through the center of its live face. To either side of this imaginary line for 30 degrees, or for a total of 60 degrees, the mike is effective. However, the outer edges of this 60-degree segment are less live than the inner portions of the segment; and with this principle in mind, tone relationships can be effectively fostered. The microphone, as here shown, is atop a stand higher than a man's head and is tipped a little so that its face forms a 30-degree angle with the floor. This eliminates all reflections except those that emanate from the hard floor—and these are desirable for brilliance. Meantime, the piano is so placed that the lid opens toward a studio wall which is treated with sound-absorbent panels for further advantages in control.

The studio has a live end and a dead end. The dotted line running behind the back of the pianist, at right angles to the wall, indicates the extent of the absorbent paneling on the ceiling and has no other reference to the floor plan. In the live end of the studio the walls have been paneled with a reflecting surface called the "echo plane." The sides, instead of being absolutely flat, are accordion-pleated, so to speak, with a series of V's. The latter prevent the sound from rebounding between opposite walls, thereby causing a "slap."

Variable acoustic elements are possible in a studio of this type. Rugs, drapes on trolleys, and so on, are live-end accoutrements which may be shifted to create variations in the liveness. The studio, exactly as drawn (with the possible exception of the rugs indicated in the diagram), provides exceptionally fine conditions for the transmission of music.

Because the principles governing placement of instruments and microphones are the same wherever good studio facilities are available, we leave the large broadcasting centers in search of a successful small station. It is found in Youngstown, Ohio. The station is WKBN. The construction of new studios has just been

Figure 10. Studio set-up for chamber music.

completed.* Studio 2 is selected in which to illustrate two methods frequently used in the broadcasting of small orchestras. A diagram of the first is shown in figure 11. The orchestra is composed of twelve musicians. Placement is that of the straight set-up with microphone at one end. In much dance music for which a strong rhythm section must be provided, the guitar is played close to the microphone—slightly off beam. Two or three violins are also more effective at close range. The proper transmission of many passages where strings are combined with the other instruments may call for even more direct focus. At such times, a standing position for the violin players is best. Placement of saxophones, brass, and drums is in accordance with comparative volume and strength of tone of the instruments. Position of trumpets with reference to the microphone is sometimes critical. They usually work better directly on the beam of the microphone, especially when muted. The trombone does not require such care in placement. With very soft mutes, a close pick-up is necessary. A second microphone may be set for players' convenience. It is opened by the engineer only when required. Subtones, to be audible, need the closest pick-up of all.

The vibraphone and xylophone produce their best tones for broadcasting when played close to the microphone. Definition is desirable if they are to be effective.

If the guitar player doubles on the violin and if players of woodwinds handle clarinets and the flute, as well as saxophones, this organization can present a large library of both popular and serious music. It should be remembered that positions of instruments in any diagram are only approximate. The studio used for illustration has uniform characteristics. As such, it is best suited to the small station where limited space must be used to accommodate a variety of programs. The floor, covered with rubber tile to eliminate noises from feet and furniture, is 24 by 17

* Full description of WKBN, accompanied by copies of architectural plans, is given by C. R. Jacobs, C.B.S. Manager of Construction Operations, in a special article on studio construction, pages 338-350 in the Appendix.

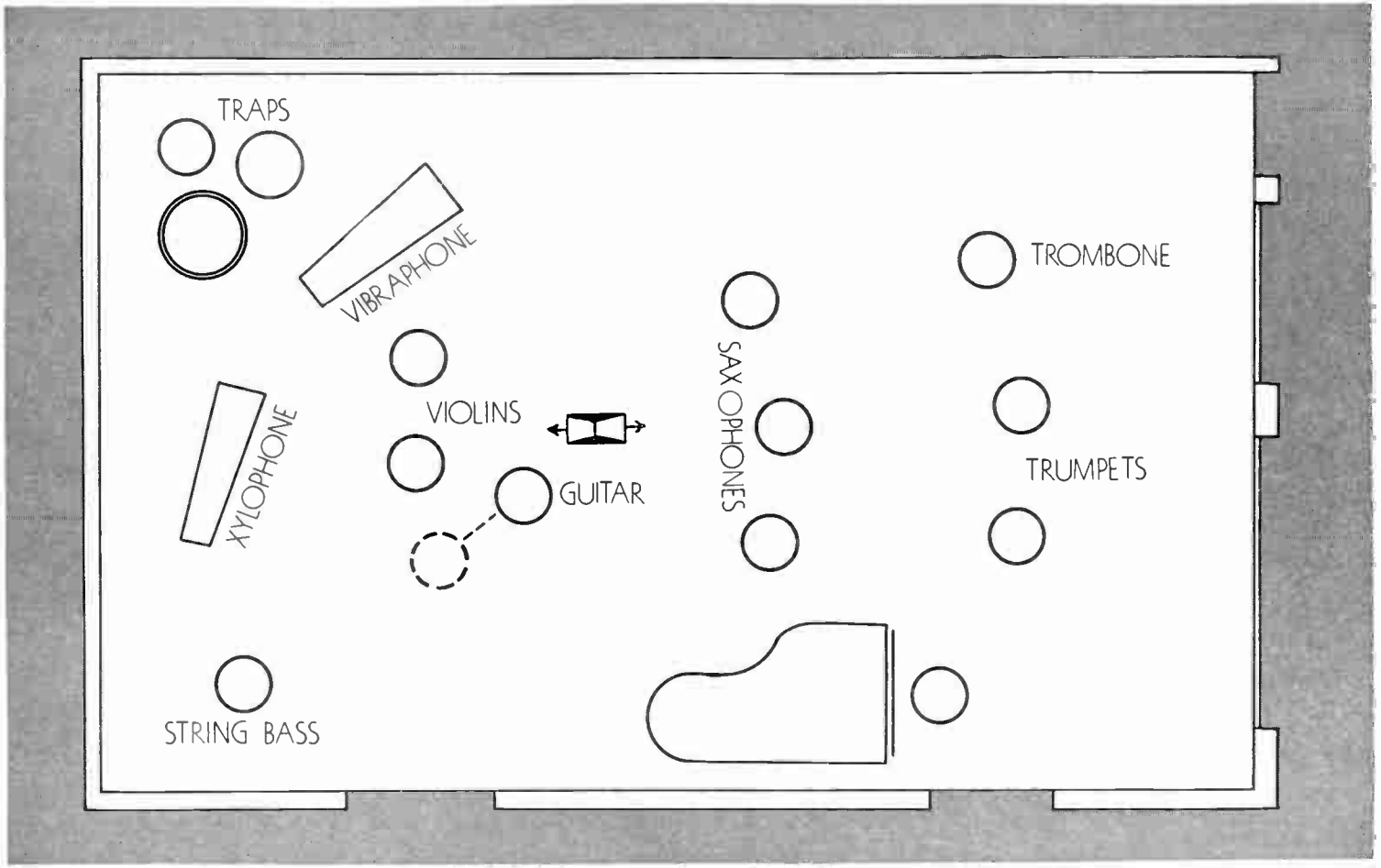


Figure 11. Set-up for a small orchestra.

feet. The total volume is approximately 3,600 cubic feet, and the reverberation period about one-half second. Acoustical treatment has been distributed in panels on the wall and ceiling so as to prevent any "flutters" or "dead spots." The reverberation is, therefore, uniform in all parts of the studio.

In figure 12 we have the same studio but with a different arrangement of instruments. This is called the "split" set-up. It is frequently used in studios of every size and on theatre stages from which broadcasts are presented. The microphone used for the divided orchestra is commonly of the velocity type, equally sensitive on two sides. At some stations the non-directional dynamic is used. This instrument, round in shape, is often called the "eight-ball." It is equally sensitive in all directions. The same set-up is possible when two condenser or dynamic microphones are used back-to-back. Two channels are monitored by the studio engineer, instead of one. Transmission may suffer in quality both because of manual difficulties and because two microphones are rarely perfectly matched.

The diagram itself discloses some of the reasons for the split. It will be noticed that the saxophones are about the same distance from the microphones as are the violins. Possible advantages are in improved clarity and definition of tone for each section. There is more room for both strings and woodwinds to move in and out with respect to the microphone in this arrangement. No bodies or music stands intervene between these instruments and the transmitter. In large studios and on theatre stages when the orchestra is used for incidental music in dramatic programs, the "split" helps to confine the music to one microphone while the cast works on another. Ribbon (velocity) "mikes" are used, and advantage is taken of their marked directional characteristics for concentrating the sources of sound.

The split set-up is frequently used for orchestras larger than twelve pieces, as previously shown in figure 11.

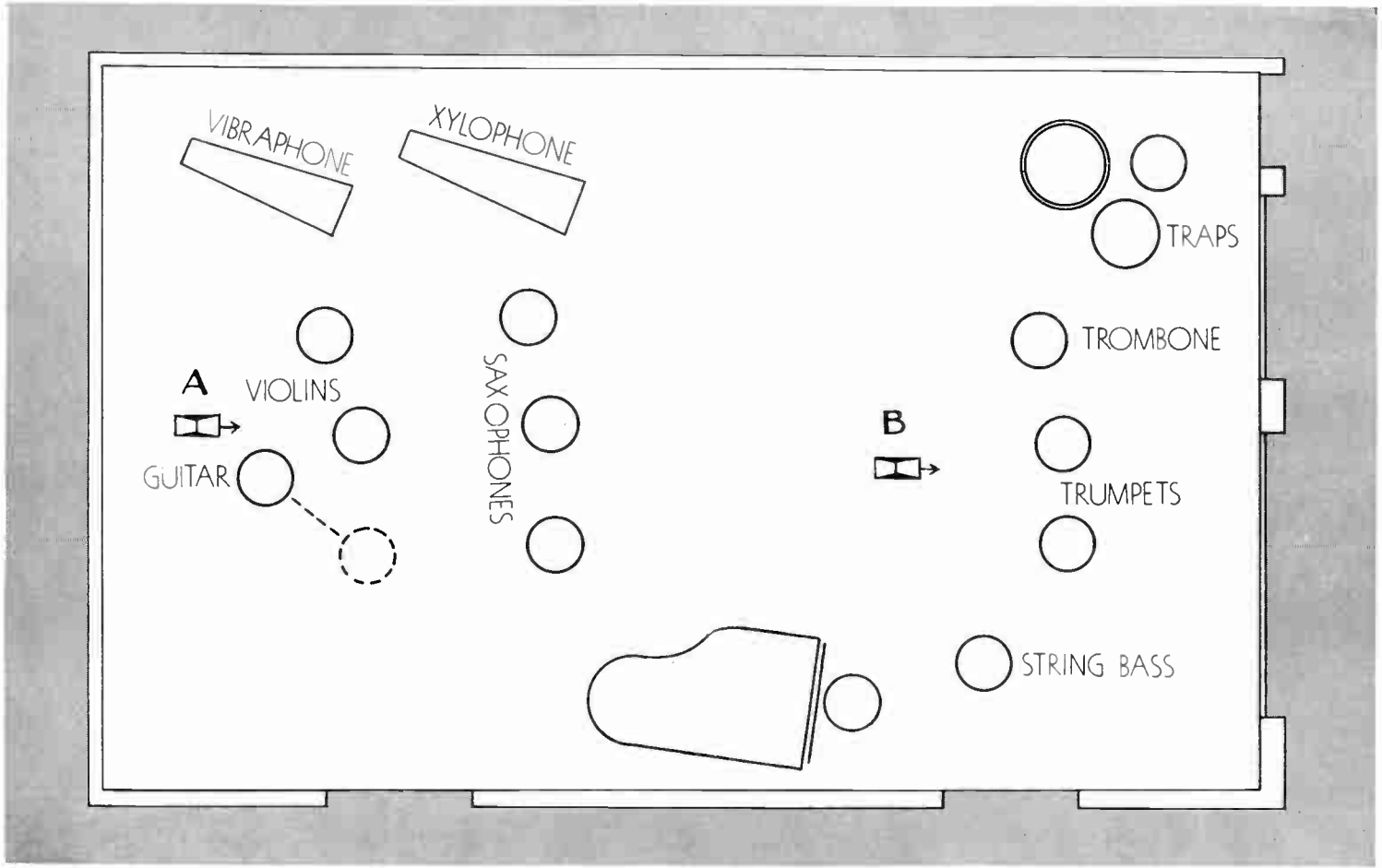


Figure 12. Split set-up for a small orchestra.

Figure 13. Studio set for performance by twelve-piece orchestra.

Instrumental Solos and Duets

Organ, piano, guitar, and accordion are frequently used in solo or duet on serious music programs. Of these the pipe organ has presented the most interesting problems.

Set-Up for the Pipe Organ

It is frequently desirable to broadcast pipe organ music from an existing installation in a church or auditorium, rather than from a specially built instrument in a broadcasting studio. (Some organists of the classical school prefer auditorium organs.) The accompanying diagram (figure 14) shows the instrument used by Dr. Charles M. Courboin.

The American Academy of Arts and Letters, where this organ is housed, has a large auditorium seating eight hundred. This organ console is placed on a stage 47 feet wide at the apron, 40 feet 8 inches wide at the back, 22 feet 8 inches deep, and 45 feet high. Obviously, the stage is intended for a variety of uses.

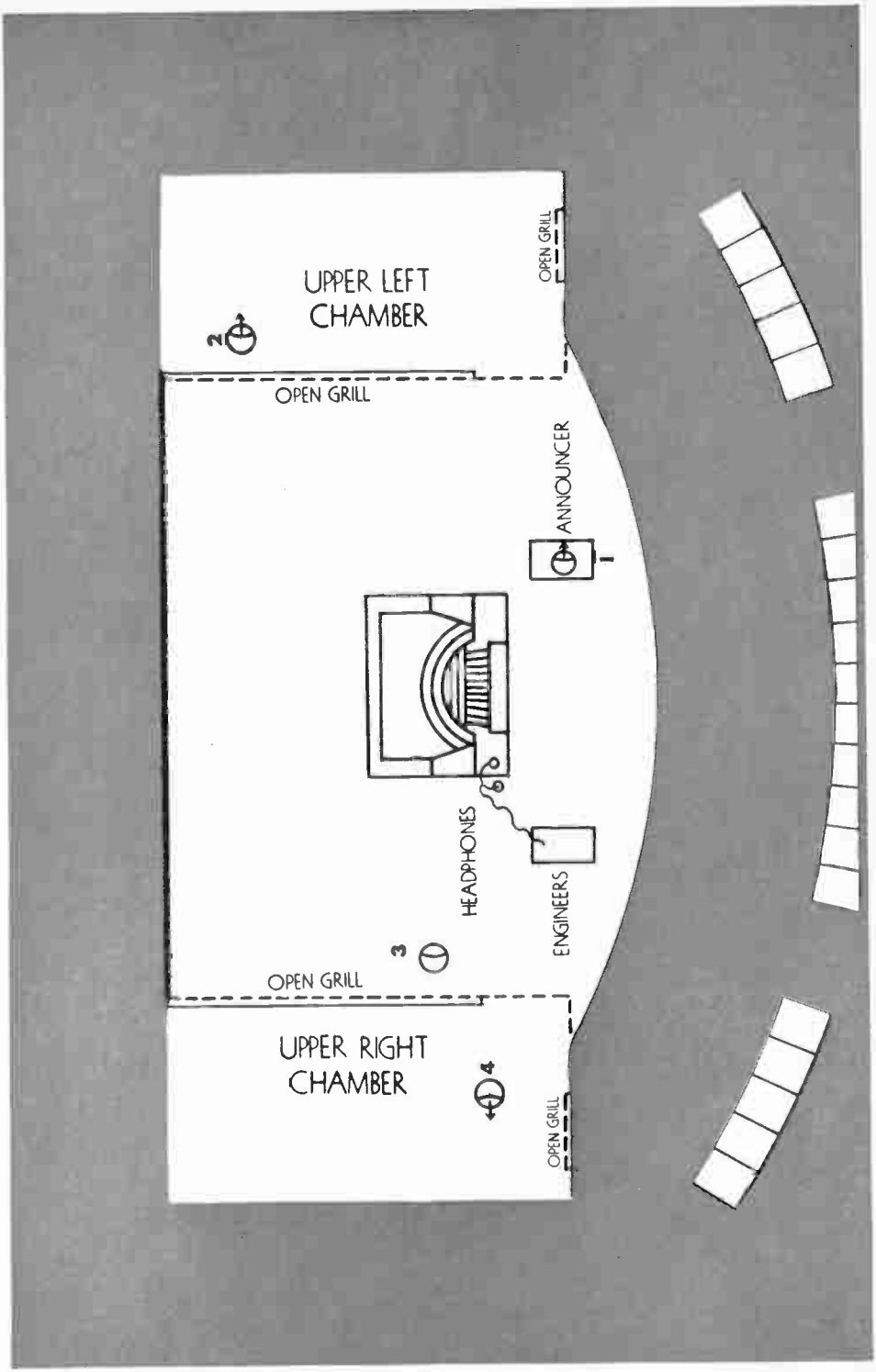


Figure 14. The Courboin organ.

The mechanism of the organ itself (pipes and expression boards) is divided into two units. One of the "chambers" contains the great, swell, and pedal divisions of the organ, while the other houses the choir and solo mechanisms. In the latter chamber are also the reeds operated by the pedals. The console of this organ includes four manuals (keyboards) and the pedal keys. With regard to the number of pipes and "stop" combinations, the organ is one of the largest.

Four microphones are used for the Courboin pick-ups. Number 1 is the announcer's microphone. Numbers 2 and 4 are organ microphones of the dynamic type. Number 2, in the left chamber, is placed about five feet from the expression boards, eight feet from the chamber floor. It faces as indicated by the arrow. Number 4, in the right chamber, is placed about four feet in front of the expression boards at about the same distance from the chamber floor as number 2, with its live face directed as shown by the arrow.

Microphone 3 is a non-directional type placed about three and one-half feet from the open grill of the chamber housing great, swell, and most of the other heavier sections of the organ. This microphone is elevated fourteen feet above the stage floor on a concert stand. It is used in conjunction with the other two microphones, its purpose being to impart a lofty "cathedral" tone (combination of organ and room tone) so desirable in the transmission of music from an instrument of this imposing size and location. Since some unwanted sound is created in the manipulation of the console, it is advisable to keep microphone 3 far enough away from the console to escape this distraction.

It might be added that the organist frequently uses a set of headphones while playing, so that he can hear the music as the listener hears it, and help in the blending and monitoring of the tones.

The Special Broadcast Organ

An organ has been built by CBS entirely for broadcast purposes. By contrast with the concert type used on the Courboin

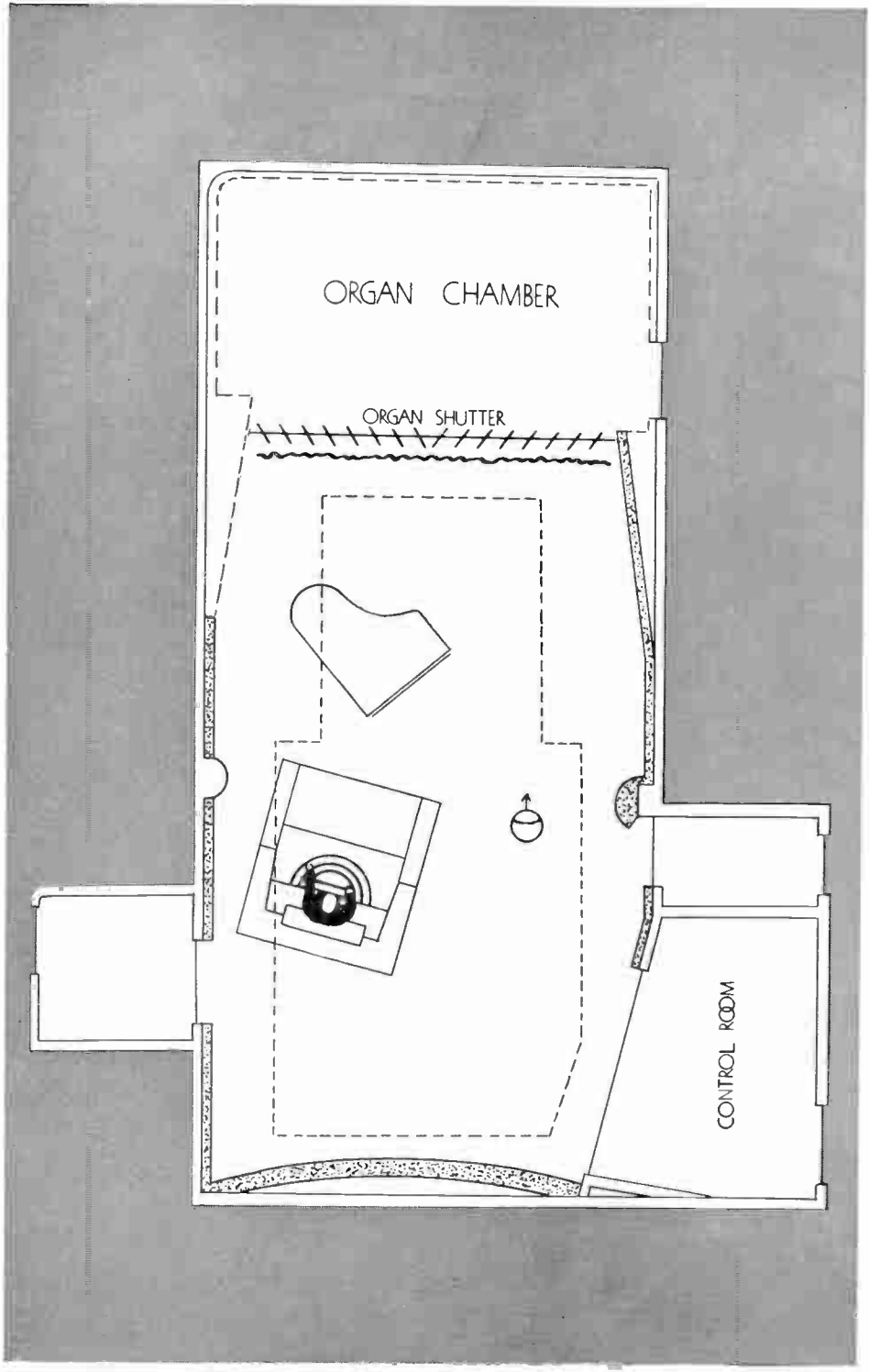


Figure 15. The CBS organ.

program, this instrument is voiced for just that clarity and brilliance, and those dramatic and theatrical touches demanded on programs of popular music. At the same time, this organ is elastic enough to fulfill such other musical functions as rendering serious classical and religious numbers with full orchestral effect.

The studio (figure 15) was designed with the idea of securing full volume range and tonal beauty within a comparatively limited space. Briefly, the specifications of the studio are as follows:

Length: 48 feet. Width: 21 feet. Ceiling height: 12 feet.

A piano also present in the studio is equipped with an electrical action which is coupled to the organ keyboard.

Note that the studio has been treated so that the organ tones originating in it do not betray the limited space. The floor is hard and smooth, and a variable reflecting factor can be introduced by means of rugs. These enliven or dampen the studio in accordance with the type of music being played. Large panels of rock wool cover walls and ceiling, producing an evenness and smoothness throughout the entire frequency and volume range.

So good is this acoustical treatment that the placement of microphones is not only secondary, but practically unimportant. In the diagram, a microphone is stationed at a point where either the announcer or the singer is in full view of the organist and the control room. Usually only one microphone is used, unless other instruments, requiring intimate pick-up, are introduced, or when a dramatic show with incidental pipe organ music takes place.

*Single Piano Pick-Up**

The studio should be large enough so that the microphone can be placed at least fifteen feet away. Farther away is often better. It must never be closer for clear transmission of true piano tones. The piano lid should be fully raised and the microphone placed head high.

Pick-up will be even over the entire range of sound frequencies

* The word "pick-up" is used instead of set-up when the problem relates to the use of microphones.

produced by the instrument. Frequent dominance of bass or treble noticeable in "close miking" will not occur. Volume peaks, difficult to anticipate in the control, will be avoided.

Two-Piano Pick-Up

The same method of pick-up should be used for two pianos. The microphone should be higher and the lids of the pianos entirely removed. The microphone must be equidistant from each and facing the point where lines drawn through the center of the sounding boards join. The instruments are, of course, facing in opposite directions, their sides close together.

The Semi-Classical or Familiar Music Program

Everything I have said about studios in the preceding sections applies to the semi-classical program. The same musical perfection must be striven for. Good conditions for broadcasting must be obtained. When not immediately available, re-treatment of the auditoriums and rooms which are used for program origination should be undertaken.

As a set-up for a varied musical program, the "Magic Key" is a good example. For practical purposes, the orchestra is considered to contain forty-one pieces, though occasionally a larger personnel is employed. The program is sponsored by the Radio Corporation of America via the NBC Blue Network. It originates in Studio 8-H, New York City, and is produced by NBC.

The instrumentation is such that the finest of serious music, including operatic, can be presented without difficulty on the same program with symphonic arrangements of popular music. Important instrumental characteristics of this orchestra are the entire sections which double in several instruments—enabling many elastic musical variations. On the diagram (figure 17) note the four stands provided for men able to play either saxophones or clarinets with equal facility.

The particular "Magic Key" broadcast from which the accompanying chart was drawn contained serious music, popular music,

Figure 16. Small studio set for one voice with piano accompaniment.

choral numbers, and accompanied solos. The Yale University Glee Club of sixty voices presented the choral numbers, while Zinka Milanoff tendered the solos. As a popular feature, Dr. Frank Black, the conductor, introduced Ferde Grofé's "The Melodic Decades."

It will be noticed that the string arrangement is quite conventional. So also is the placement of woodwinds and brasses. Because the four stands, which enable the doubling in saxophones and clarinets, are located at the back of the platform, they are raised by a special, additional elevation more directly into the beam of the microphone. Cello and brass sections are likewise raised to prevent musicians in the front of the orchestra from smothering the tones created by the musicians behind them.

In figure 17 are shown several platform levels in Studio 8-H, whence this program originates:

Level I contains the conductor's or soloist's stand and microphone, and encompasses the first two rows of the chorus.

Level II contains about two thirds of the orchestra.

Level III includes the special additional platforms placed upon Level II.

The main or orchestral microphone (1) stands four and one-half feet from the floor of the second level. It is thus some 8 or 9 feet above the main floor of the platform.

This microphone is of the velocity type, with one live face tipped so as to favor the string section and the soloist.

The soloist's platform is indicated by B. Only one microphone is used to pick up all operatic arias. This splendid arrangement is made possible by good studio characteristics. Not only is a much more faithful, distortion-free rendition of voice and orchestra accomplished, but the perspective is heightened and the balance between voice and orchestra is achieved by natural variations in distance rather than by having the studio engineer offset discrepancies by using his console controls. Production men call this method of control "board-mixing." The set-up here is definitely superior to one utilizing a "multiple mike" arrangement.

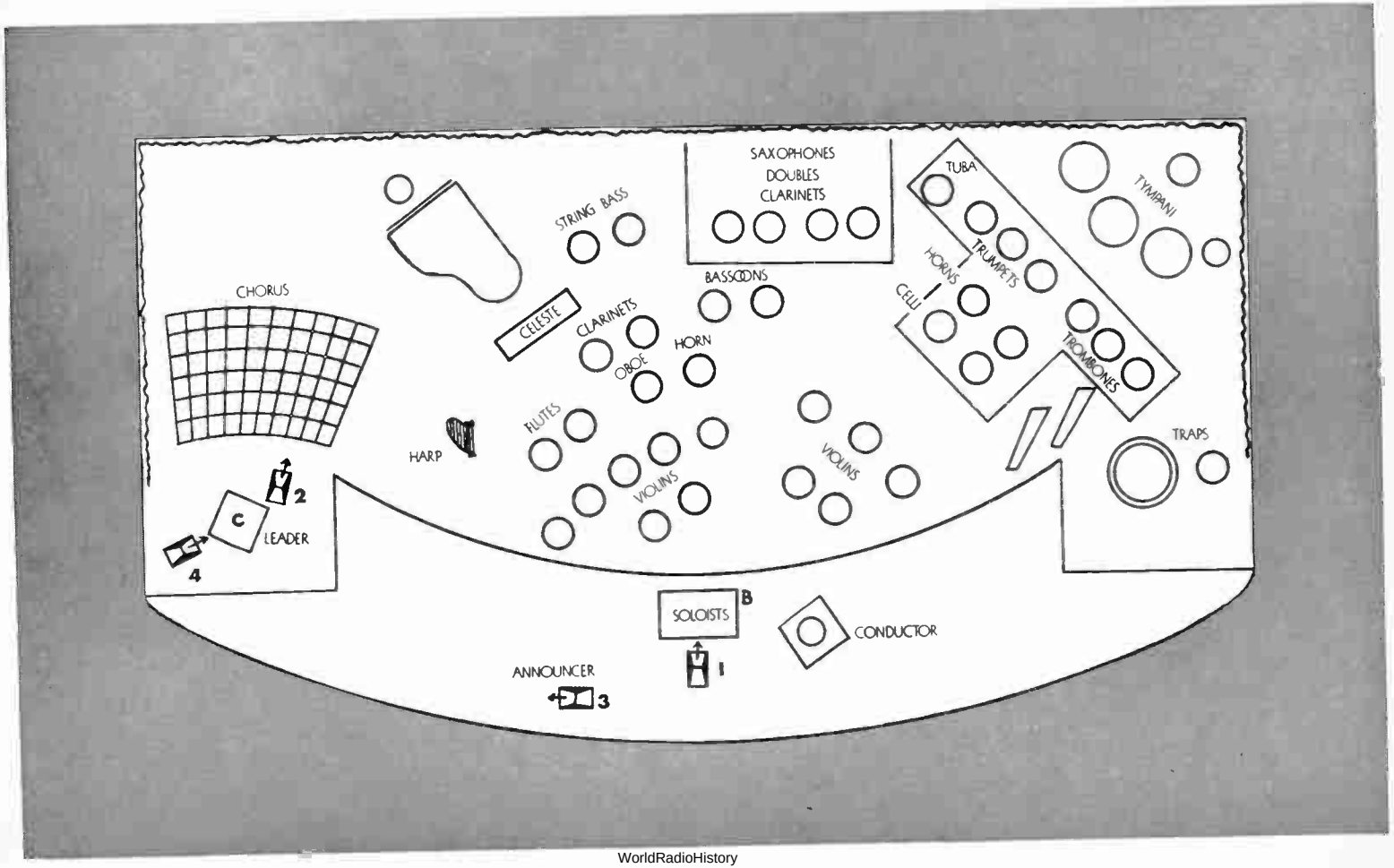


Figure 17. Set-up for the "Magic Key" program.

The chorus microphone (2) is about five or six feet from the first row of singers. Nestled within the 60-degree area of sensitivity of this microphone, each row of singers is elevated so that all are in direct focus.

Microphone 3 is provided for the announcers, of which there are two—one for the program and number introductions, and the other for commercial copy. This separate microphone enables easy entrance and exit of announcers, and in no way allows interference with the artists.

Microphone 4 is placed close to the stand (C) provided for the leader of the Glee Club. Thus, without leaving his stand, the leader can describe the music rendered by his group.

Acoustics prevailing in the 8-H auditorium are very good, particularly favoring musical programs. Adequate brilliance is provided for orchestral and vocal numbers, and clear definition is accomplished by the careful placement of microphones.

It may be mentioned that while the "Magic Key" also incorporates remote pick-ups, and sometimes drama, it is the musical portion which offers the most interesting sample of fine set-up to enhance a technically clear program.

*A Set-Up for Exotic Musical Figures**

Kostelanetz' orchestrations and tonal figures being anything but conventional, the set-up for his program is likewise extraordinary. Fortunately, the stage and the auditorium of the Manhattan Theatre are beautifully suited to radio purposes.

The back of the stage is an elliptical cyclorama, its arc extending above and to the sides of the instruments. The domed ceiling, as well as the back and sides of the stage, have been partially draped to kill double reflections or "slaps" from the smooth reflecting areas. Around the balcony, drapes are hung in such fashion as to blend with the decorative scheme and yet blot out undesirable sound reflections. In a space once occupied by boxes, the control

* This program was broadcast from the Manhattan Theatre in New York City via CBS. André Kostelanetz was conductor.

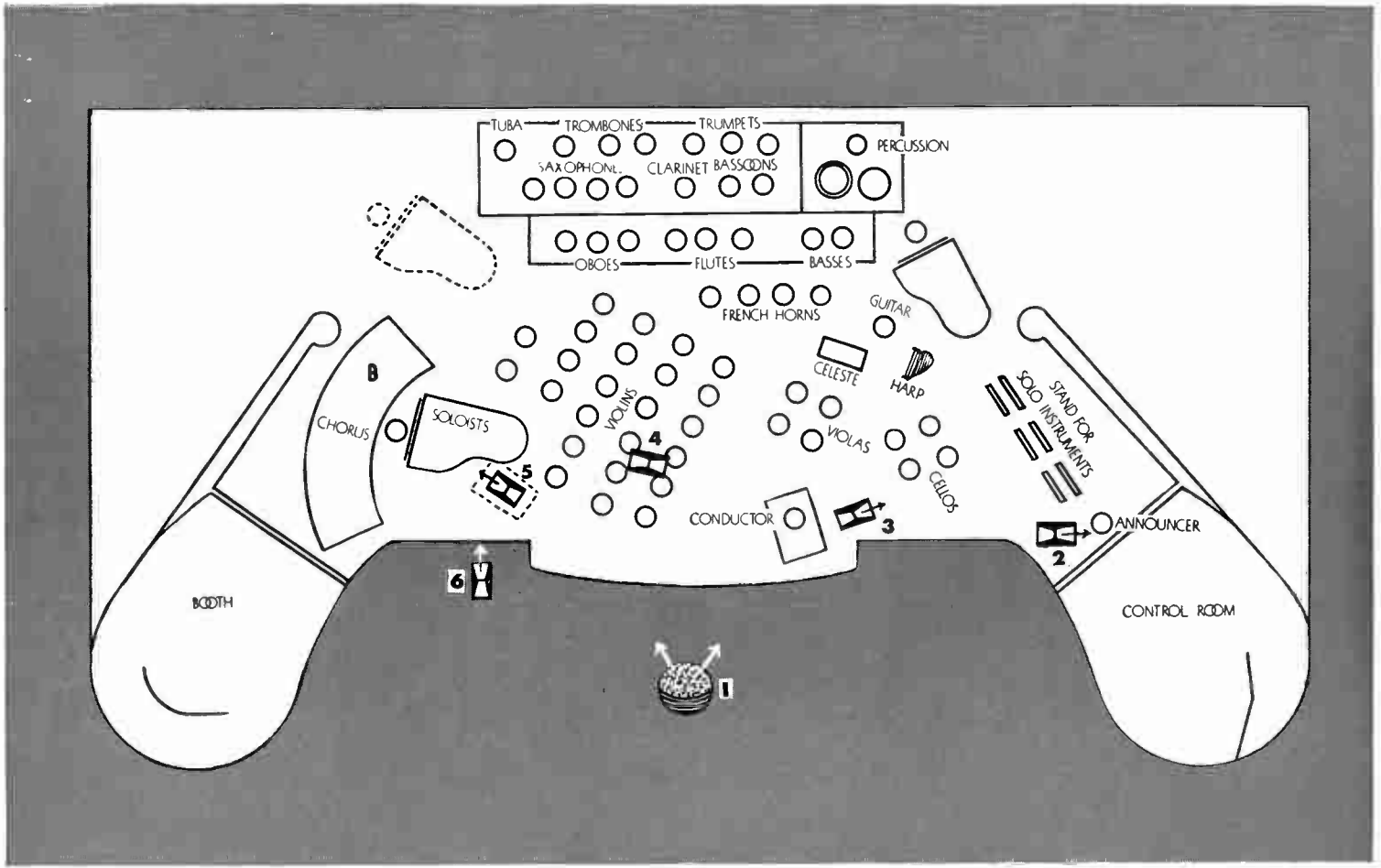


Figure 18. Set-up for a program with orchestra, soloists, and chorus, under the direction of André Kostelanetz.

booth and client booth are located. This special observation booth permits the client to talk to his associates, take notes, and so on. Radio men call it the "fish bowl."

The stage is imposing. Between the pillars of the proscenium arch is a breadth of 39 feet. The distance from the outermost edge of the extended apron to the back of the cyclorama is $44\frac{1}{2}$ feet.

The set-up indicated in figure 18 shows a good many departures from any normal musical set-up. It is the result of careful experiment, and produces faithfully the unusual voice and orchestral arrangements which characterize André Kostelanetz' work.

This program comprises arrangements of popular, semi-classical, and classical numbers. The popular music is scored in strikingly original form. Full tones are called into play and then, by contrast, sub-tones close to the microphone may follow. Modern touches and exotic, novel musical figures are part of the treatment. The ever-new variations also call for guest artists, soloists, or choruses of mixed voices.

The diagram shows two variations in the set-up. Indicated by the heavy lines is the microphone used on programs when José Iturbi was guest artist.

Microphone 1 is the main instrumental pick-up. It is located 12 feet from the stage apron, out in the auditorium, 10 feet from the stage level, and about 3 feet off center. The off-center placement, of course, prevents sound-wave convergence. All in all, the microphone's position gives just the right perspective and brilliance. If an expert member of the audience could choose a position where the entire performance would sound to best advantage—that suspended microphone position would be the expert's choice. Microphone 1 is unidirectional, permitting transmission of high quality and frequency range.

Microphone 2, also unidirectional, is placed on a stand head-high for use by Paul Douglas, the announcer, and Deems Taylor, the master of ceremonies.

Microphone 3 picks up the solo instruments. Stands contain-

ing music for these solo instruments are set at the extreme right of the conductor. Occasionally microphone 3 is open for cello solos or passages in which the cellos aim at emphatic musical coloring.

Microphone 4 is suspended about fifteen feet over the string section, in a horizontal position. It is opened only on cue, by the studio engineer at his control console, for string tonal effects and string emphasis.

Number 6 is the microphone used for the pick-up of José Iturbi's piano solos. It was placed in the auditorium about 10 feet from the instrument and adjusted to an exact 45-degree angle with the center of the slightly raised piano lid.

This pick-up viewed in its entirety permits the utmost in flexibility. The slightest sound, or the fullest voice of a solo instrument in the low-frequency levels, alike are heard to their best advantages. Fidelity is here at its highest, and all the colorful effects which the conductor enjoys are certain to reach the listener.

A more complete schematic set-up of the program is indicated by the combination of heavy lines and dotted lines. The piano used by Iturbi is moved to a position at the back and side of the stage (as indicated by dotted lines) on broadcasts presenting vocal guest artists. More dotted lines indicate the position of microphone 5, available to vocal soloist or chorus or both.

All singers are stationed several feet from microphone 5 so as to preserve the beauty of their tonal production. The chorus is placed on the stand B, which is built on three levels to keep all voices in direct microphone focus.

The Brass or Wind Band

*Armco Iron Master Program**

The Armco band is a brass or wind band of 48 pieces, all of which are indicated in the accompanying diagram. The musi-

* "Armco Iron Master" originated in the Emery Auditorium, Cincinnati, via the facilities of WLW. It was broadcast over the NBC Blue Network. American Rolling Mills Company sponsored it, and N. W. Ayer and Son, Inc., acted as agency.

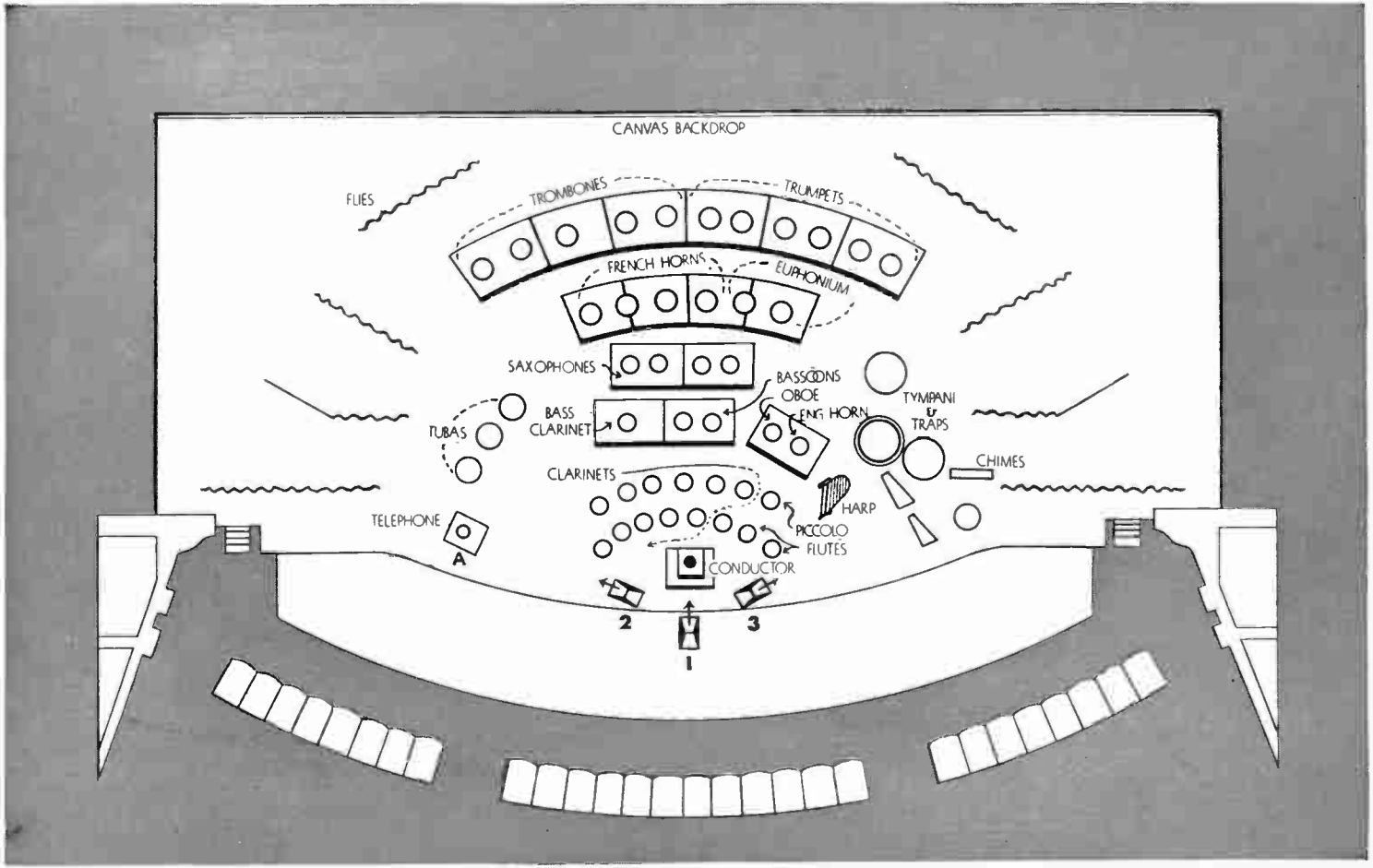


Figure 19. Set-up for an Armco Band program.

cians are set within an area about 30 by 40 feet. Thus the set-up is quite similar, in most respects, to what might be expected in a large studio.

Grouping and arrangement are formal. The clarinets and brass are seated in conventional arcs. Logical formations otherwise prevail. Tympani and drums have been moved out to the edge of the pick-up angle, where they are quite subject to control. This is a pat example of the values of the directional microphone in work of this type. Volume control is effected simply by shifting the instruments to a suitable spot on the edge of the pick-up angle where intensity is lower. How much more effective than moving the instruments to and away from a microphone, and depending on distance for volume control!

The microphone placement for the Armco program is standard. Suspended from the proscenium arch at its center, at a 70-degree angle with the floor of the stage, is the main microphone (1). Focal point for this microphone is the center of the band. The facing of the microphone favors the reeds, which are less powerful than the other instruments.

Distances are frequently measured in testing various microphone positions in order to be certain of the exact spatial relations; the written record or plot also gives radio men a reference with which to meet other similar problems. In instances such as this one involving high proscenium arches, ceilings, and so on, the use of a tape measure is difficult. Louis W. Barnett, of WLW, contrived a most ingenious plan for measuring the various distances necessary for plotting this program. Unable to set his distances with a tape line, he sighted a camera range finder—certainly a much more suitable way of measuring, and accurate enough for all purposes.

The main band microphone (1) is about 7 feet from the nearest instruments, allowing ample definition. The height of the microphone makes use of the auditorium's natural reverberations, adding brilliance to the musical performance.

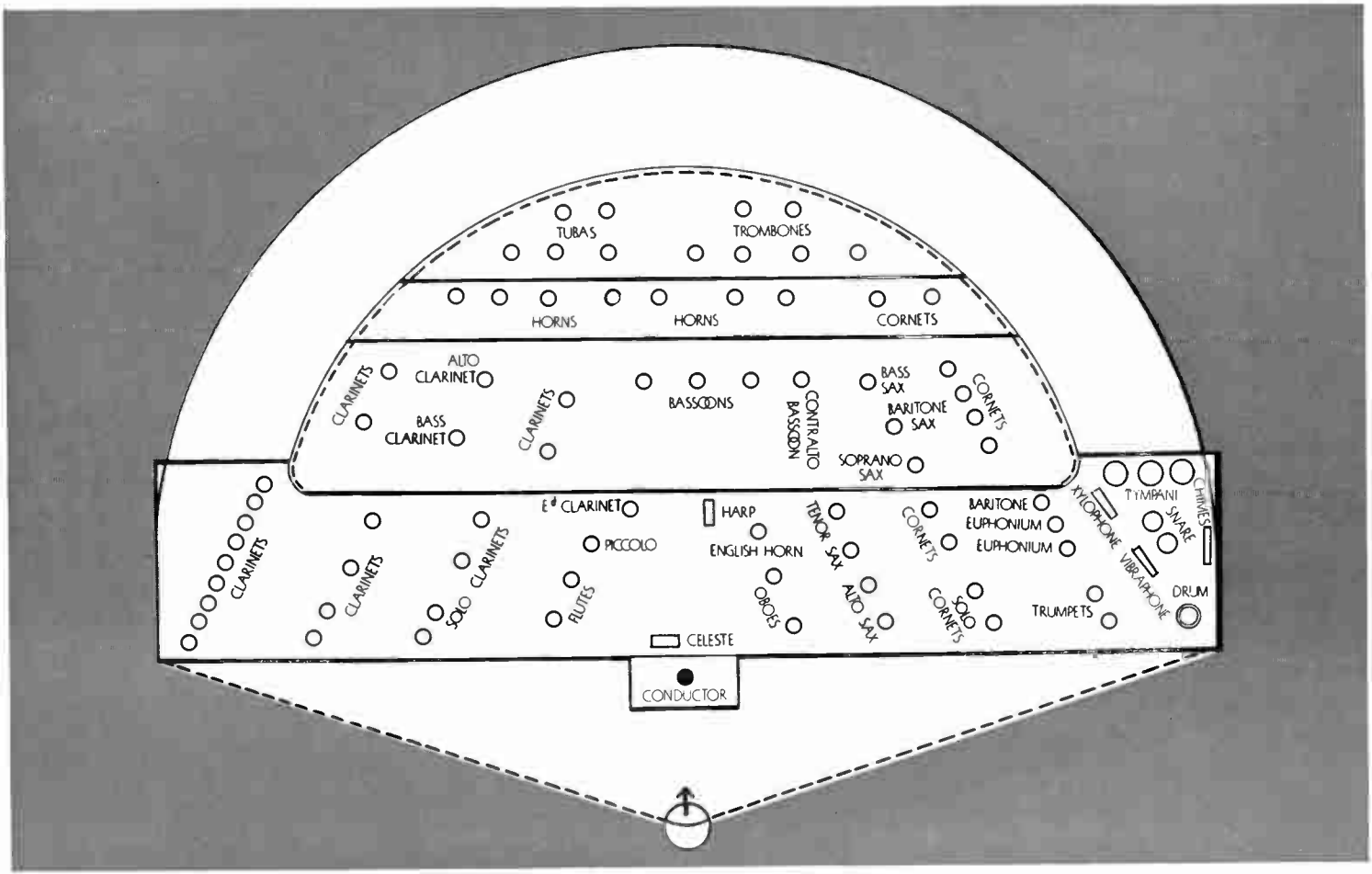


Figure 20. Set-up for the United States Marine Band.

Microphone 2 is for solos. The position of the soloist with reference to this microphone is never any closer than is absolutely necessary to maintain good definition and perspective. Microphone 2 is also used by the announcer.

Microphone 3 is for special effects. It acts as solo mike for some mutes, and for instrumental sub-tones.

A colored light signal system is maintained between the stage and the control room. In case of any trouble in this system, an emergency telephone line, connecting the production man's desk (A) and the monitoring engineer, can be used.

The Service Band

A great number of brass bands in this country appear as community organizations, or are associated with National Guard regiments and fraternal societies. Figure 20 shows the set-up of the United States Marine Band in the Band Auditorium of the Marine Barracks in Washington as it is arranged for broadcasting both from the hall and from an open-air shell.

The solid outlines indicate the edges of an outdoor shell. The dotted lines describe the edges of the auditorium shell platform.

The United States Marine Band is composed of 75 enlisted men under the musical direction of Captain Taylor Bramson, with William Sandelman as second leader. The band is arranged partly on the main floor of the platform, and on three elevations extending back, each elevation built on 8-inch risers. The conductor's stand has been built out from the edge of the platform to a distance of 4 feet. The microphone, of the unidirectional type, is placed 15 feet from the edge of the conductor's stand and at a height of 10 feet. This placement allows the entire band to be included within the effective arc of the microphone. The transmission of the band music remains in the proper perspective and is favorable to the wood-winds which, like the strings of an orchestra, are placed in forward positions because they produce less volume and penetration than the brasses.

The location of the snare drum, bass drums, and tympani at the side and edge is for the purpose of control. If these instruments were placed at the back near the center of the shell, sound from them would be so amplified and reflected by the shell itself that they would over-ride the other instruments.

The construction of a shell for outdoor concerts deserves care-

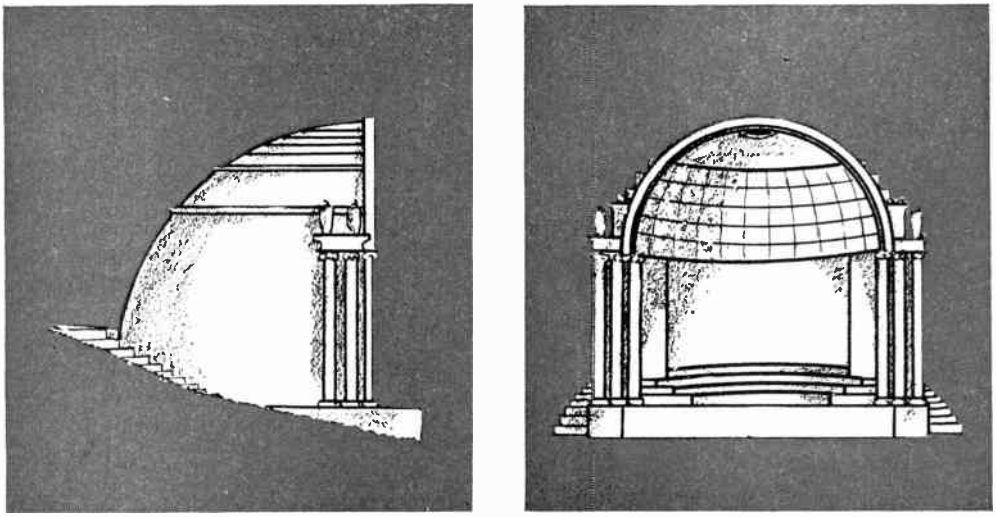


Figure 21. The shell on the Mall in Central Park.

ful study by architects and acoustic engineers. The shell at the Hollywood Bowl in California and the one on the Mall in Central Park, New York, are both exceptionally fine models for similar community structures throughout the world.

The Popular Musical Program

Dance Orchestras

The dance orchestra appears in a number of forms. Many of the bands are similar to each other in instrumentation; others vary greatly. The programs are broadcast from several different types

of places: studios, restaurants, hotel ballrooms, night clubs, and stages in the auditorium cafes designed for dining, dancing, and formal vaudeville entertainment.

The orchestras themselves vary in size from six to twenty-four or more pieces. By far the greater number of the well-known dance bands have from ten to sixteen pieces, frequently with musicians able to double on instruments. Some of these dance bands are so arranged instrumentally and the players themselves are so selected that the organization may be split into sections resulting in two or more musical units, each specializing in its own particular type of music.

The proper set-up of the dance band for best broadcasting results depends upon the type of place at which it must be picked up and the conditions prevailing. The same principles apply in the selection of the studio or in the treatment of the ballroom or night club as in the case of serious music.

The acoustic conditions in these studios should not always be the same, because the dance orchestra frequently depends upon effects for its distinction and success. Required from each instrument may not be the pure tone which the instrument was created to produce but a number of unusual sounds which earlier composers of music never dreamed of using. It may be necessary, therefore, to broadcast from a studio the acoustic treatment of which permits an intimate type of production. The "close up" use of the microphone is then important. In the transmission of the pure musical tone from a violin, the microphone should be so far away that the sounds reflected from the *f*-holes are caught in all of their beauty and elegance without any roughness or stridency. Many times when the same violin is used with a dance orchestra, it should resemble a barbaric instrument. The listener should hear harsh and heavy scraping of the resined bow across the strings in the right place and at the right time. This is essential, for example, when violins are used in an instrumentation for rumbas. Charts and diagrams which follow show orchestra set-ups with instruments arranged for playing popular types of dance music.

"Hot" Remote Pick-Up

*Set-Up of Tommy Dorsey's Dance-Band**

Here is a fine solution of the pick-up problem presented by a "hot" band in a place where dining and dancing have precedence over broadcasting.

The orchestra platform, built on three levels, was covered with light carpeting. Drapes of corded material, less heavy than velvet, shielded the back. About 14 feet over the rostrum was hung a canopy. The front and sides were open.

It should be noted that the band is pretty well divided by the placement of microphones (see figure 22).

While directing, Tommy Dorsey maintains the approximate position of the star in the diagram. When playing the "open bell" trombone in "three-way" choruses, accompanied by others in the trombone section, he takes the position marked *A.* When using the Harmon mute, he moves to position *B,* and keeps the bell of the horn about three inches from the face of the microphone. For sub-tone passages, using open bell, he likewise stands in *B* position, but keeps the bell back about eight inches from the microphone.

As previously mentioned, the microphone placement divides the orchestra into two units. Thus, microphone 1 is stationed so as to bring in the saxophones, string bass, and piano, and the other (2) catches the brass. Because of the heaviness of the brass section, this arrangement is perfectly logical, for if only one microphone were used, the brass would dominate completely the saxophones and the rhythm. Abetted by careful board control and mixing, an exceptional balance is attainable under the set-up shown.

However, the microphones must always be placed close to the musicians in this type of set-up; otherwise, the noises occasioned by the activities of the patrons who are eating or dancing would cause disagreeable distortion and background confusion.

* Tommy Dorsey, at the time this diagram was made, was playing in the Palm Room at the Hotel Commodore, New York City.

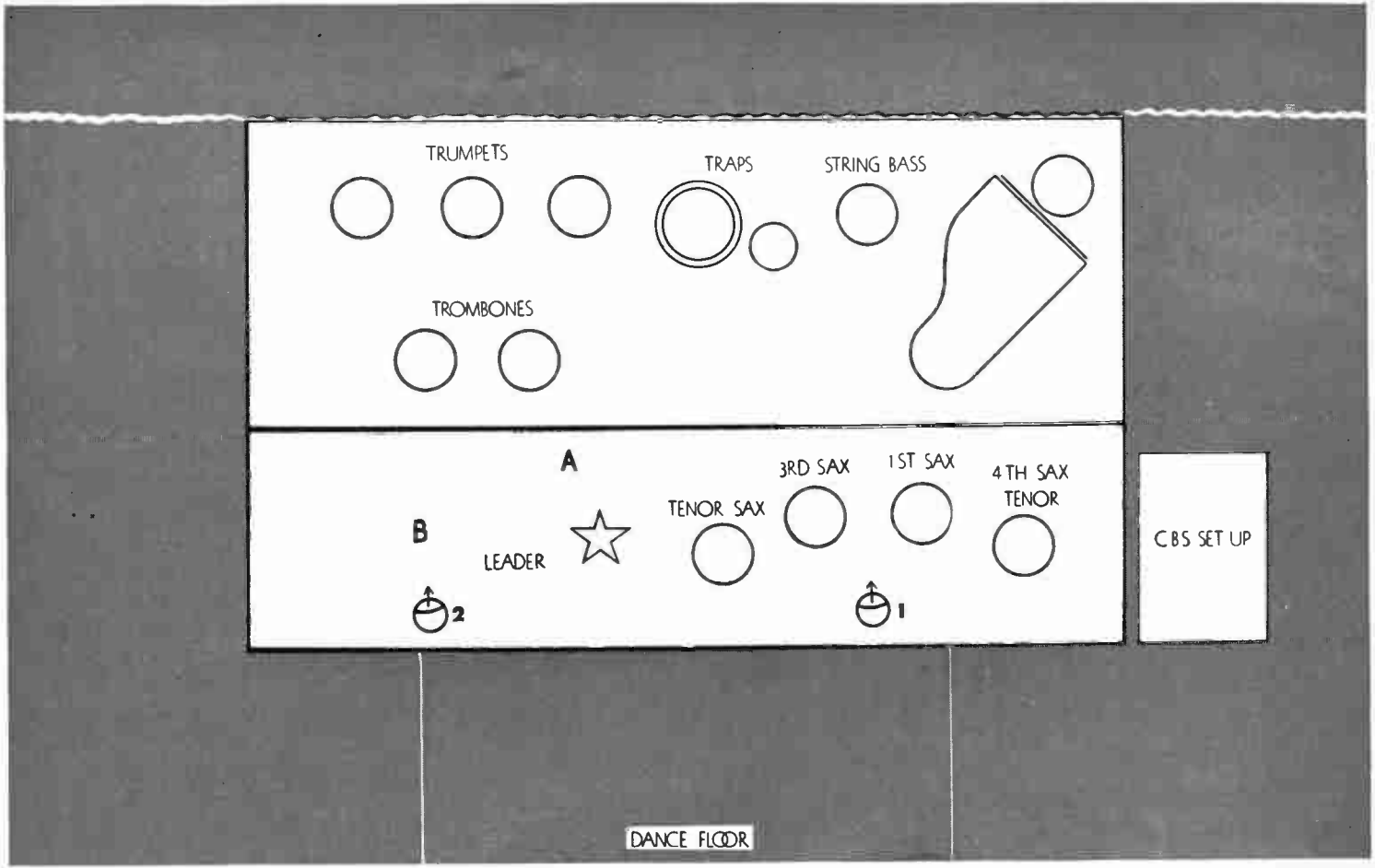


Figure 22. Set-up for Tommy Dorsey's Dance Band.

It is inevitable that the combination of drapes and close-mike pick-up will cause some loss of total brilliance. But there is a gain in instrumental definition, and definition is very important in the transmission of dance music.

"Sweet" Remote Pick-Up

*Set-Up of Orrin Tucker's Dance Band**

The set-up for a remote† on Orrin Tucker's Orchestra and Glee Club has been chosen because it offers a good contrast to Tommy Dorsey's Band. The latter aggregation is known as "hot." Tucker, by contrast, plays "sweet."

The arrangement of the Tucker orchestra is indicated in figure 23. A platform, elevated about one foot from the floor, is provided on three levels:

1. A dance floor which also provides table space.
2. A second level for tables.
3. A semi-balcony level, about three feet over the second level, also for guests.

The dance floor is approached by stairways. When filled with guests, the room is extremely good, all things considered, for the transmission of a program.

As with all dine-dance remotes, the most intimate pick-up is mandatory to overcome the confusion and distractions caused by the patrons.

Tucker has placed his trumpets on an auxiliary platform raised approximately twelve inches above the other stands. The drums have a platform of their own, only six inches in height. The Glee Club of fourteen voices (seven of which are also instrumentalists in the orchestra) sings from the first elevation immediately behind the dance-band platform. Two microphones insure defini-

* The Orrin Tucker orchestra and Glee Club was playing in the Grill Room of the Hotel Roosevelt, New York City, at the time this diagram was made.

† A pick-up not originating in a broadcasting station's studios.

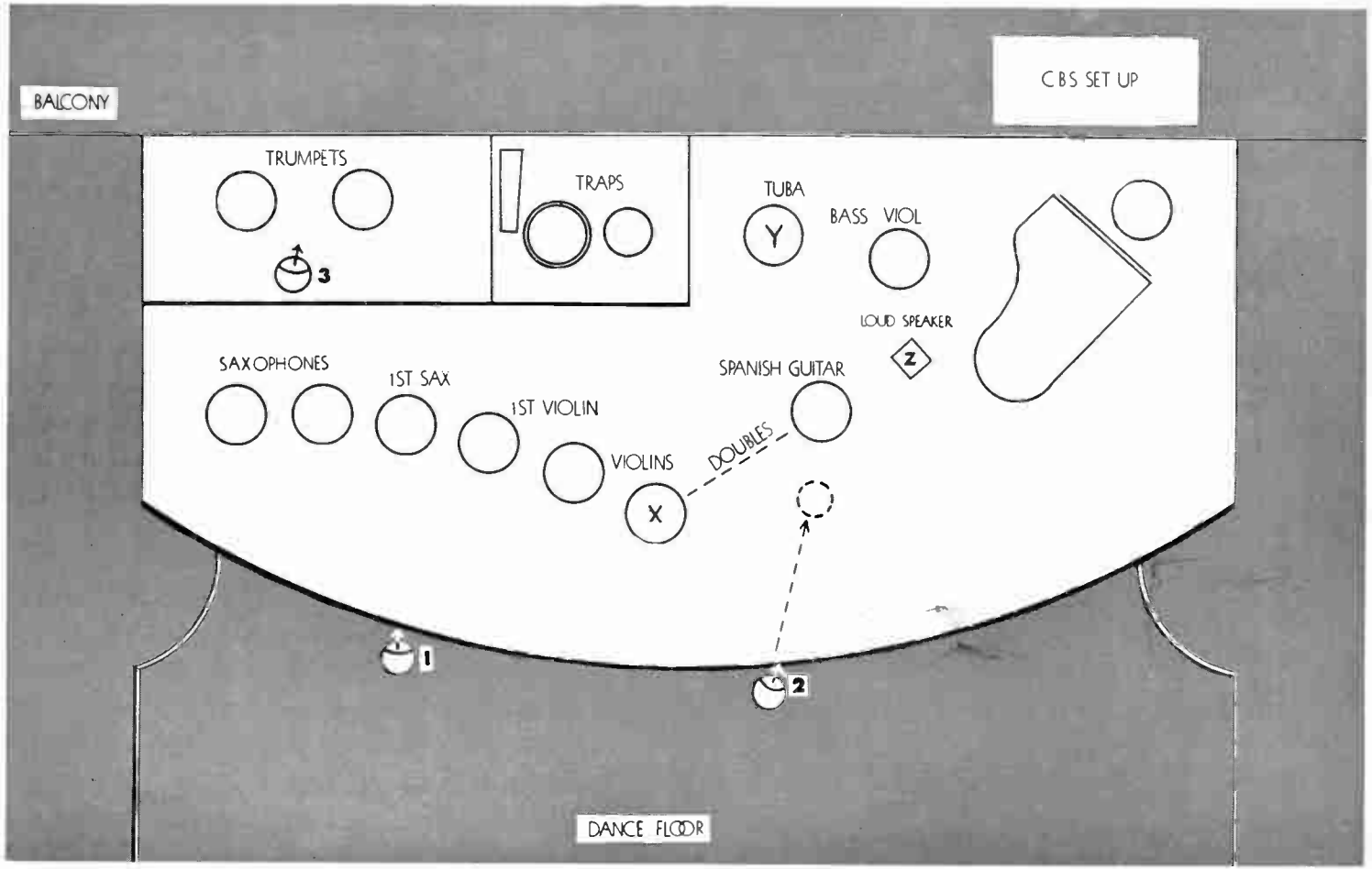


Figure 23. Set-up for Orrin Tucker's Dance Band.

tion under prevailing conditions. While this microphone set-up appears to divide the band into two separate units, such a division is not only logical but necessary for correct mixing of brasses, saxophones, piano, and rhythm. The main microphone stands, 1 and 2, are placed on the floor at the edge of the platform, and rise to an elevation of six feet. Both microphones are dynamic, and though both are continually open, phase distortion is unnoticeable, while musical definition and volume are good enough to overcome the background distractions.

Microphone 2 is used for solo passages.

Microphone 3, directly in front of the trumpets, provides a channel for the special Harmon-muted passages which are so spotted in the score that there is not time for the trumpeter to go back and forth from his stand to microphone 1.

It should be noted that in this "sweet" band the guitarist doubles in third violin. While so doing, he occupies the chair marked *X*. The bass doubles on the tuba, thereby occupying position *Y*. The guitarist uses both a Spanish guitar and an electrically amplified instrument. The speaker for the latter is located at *Z*.

Popular Song Programs

This section overlaps the preceding one because of the current vogue featuring vocalists and vocal choruses in many dance-music programs. The set-up diagrams in figures 22 and 23 show satisfactory microphone placements. Singers, adding variety to the performance of any piece, use the microphone which proves most convenient to the engineer operating the broadcast. Its selection is determined in rehearsal. Some popular song programs feature vocalists accompanied by orchestra or organ. In this classification might be included artists who sing Hillbilly music to the accompaniment of their own guitars. Although in such programs the vocal music is usually provided by a soloist, sometimes popular songs are presented by a duet, trio, quartet, or chorus. The chorus is frequently used in big production shows, where its

appearance is spotted for additional color and effect. (See figures 22 and 23.) They are seldom featured artists.

The vocal program, whether accompanied by orchestra or piano, is almost invariably in a studio. Quite a small studio may be used for a soloist and piano. The set-up is so simple that no diagram is needed. The studio for voice and orchestra must be large enough to accommodate comfortably the entire group of artists and musicians. The producer should use those principles applied in the set-ups shown in figures 22 and 23.

Folk Music

Every tribe, race, and nation has contributed to the world of music, enriching it with its original song and dance rhythms. Native instruments are essential to reproduce the character and color of folk expression. Until recent years, few Americans ever heard African dance drums, war drums, and reed flutes; Balinese gongs, bells, and xylophones; Oriental musettes; the Spanish guitar and castanets; Italian and Spanish mandolins; and the Spanish-American maroccas and clavas. The Indian tom-tom, Hawaiian guitar and ukelele, and the Negro banjo were more familiar. Today these are all frequently heard folk-music instruments. Programs on the weekly broadcast schedules present American Hillbilly music, Negro spirituals, Indian songs, Spanish rumbas and tangos, adding voices to the native instruments.

When a program of folk music is given by untrained performers or even by highly trained native groups, difficult production problems can arise unless the broadcast is carefully studied beforehand. Many of the instruments produce sound of small volume, making clean definition a prime factor. Take the Russian balalaika, for example. Except for spectacular performances, balalaika orchestras are not large. The tone produced is somewhat like that of the mandolin, guitar, and cello (when played pizzicato). An intimate type of pick-up with the microphone placed fairly close is necessary, and extra care must be taken to produce even instrumental balance. A variation of the split set-up in

figure 23 is useful. In places which use the "eight ball" microphone (a type which is evenly sensitive all around), the group of musicians may be set in a circle.

For musical color and background in a dramatic program, we sometimes introduce an Italian street musician of the kind frequently heard in our country. He appears playing an instrumental combination composed of one or more accordions and at least two reed instruments which are much like the clarinet. The resultant tone is very penetrating, and the placement of the instruments with regard to microphones must depend upon the effect desired. When they are to be used as a part of street background, they are placed in a part of the studio which is very dead; this preserves the illusion of the out-of-doors. If this small and unique musical organization is well away from the microphone, the harsher tones are not too prominent.

Many dance orchestras with established reputations in parts of the West Indies, Mexico, or South America have come to this country with their native music. The original percussion and rhythm instruments which they use call for very careful handling in the studio. As a rule, they must be brought closer into the microphone for the part they play than must similar traps and drums in the usual dance orchestra. The clavas, maroccas, gourds, bungos, timbalaes (steel string instruments), marimbolas, and bells contribute sounds that are "primitive." When strings are used in such a combination, the director usually does not seek beauty of tone but a sound which is deep-throated and has a bite. This incisiveness must be kept in mind in making the studio set-up. If there is a muted trumpet, it must be brought very close to the microphone. An open trumpet is also brought close, but placed across rather than directly into the microphone beam.

The musette, like the Italian clarinet referred to before, has a piercing tone if played too close to the microphone. Bear in mind that the musette in Egypt and India is heard out of doors. Its strains fall on the ear strangely but not unpleasantly if heard from a distance. To accomplish the same open-air effect, make

use of a deadened studio or a portion of a studio that has been heavily treated, keeping the microphone, of course, far away.

Because of their lightness of sound, some African instruments have to be brought very close to the microphone. The little piano, for example, is small enough to be held in two hands and played with three fingers. Its sound is as small as its size. Some of the native flutes also produce a very light tone, as do many plectrum instruments such as the *gurmi* or lute of the Hausa people and the bow-harp found throughout West Africa. Close pick-up is therefore necessary, and instrumental placement must be made with great care in order to catch the tones thrown out by the resonating bodies of the instruments.

The volume of African drums (like that of any other drums) depends upon their size, type, and whether they are beaten by hand or by stick. Some of the bigger drums produce low frequencies when brought into the studio. To control these, place them near the outside edge of the angle of the microphone's sensitive field. African drums fall in two general classes. The ceremonial drums are not very musical, nor are they carefully tuned. Their peculiar sound effect is not unlike a group of bass drums of different sizes. Dance drums are very carefully tuned. Each one has several voices, some as many as four. Any production using African drums must preserve these variations of tone, remembering that the very character and quality of the performance itself must be transmitted.

The music of the Hawaiian guitar and ukelele is intimate in character, and a close-up of them is usually desired. This placement, however, does not apply to the combination steel guitar that is electrically attached to amplifier and speaker. The volume of the latter instrument is limited only by the actual output of the amplifying equipment.

Chinese gongs and bells, which are like cymbals and triangles, sound musical because of the overtones or harmonics which they produce. Without these overtones, the fundamental note of any of these instruments would seem unmusical. The full loveliness

of gongs and bells is sometimes hard to capture. They call for careful preparation in the studio. At times the gong sounds better if it reaches the microphone indirectly. Again it may require the beam of the microphone to be focused on the actual spot on which the hammer falls. In general, two rules apply. If the point of origin is highly sound-absorbent or dead, a careful focus with the beam of the microphone is probably necessary. But, if the point of origin is live, the room reverberant, and the sounds reflecting, the indirect pick-up is the best one to use.

Native singers in folk music programs are often hard to handle in a studio. True, by actual measurement, the vocal volume range is not greater than the singing of many operatic pieces. It is the explosiveness, so frequently characterizing attacks in the loud passages and sudden transitions to the softest tones, that presents real pick-up problems. No director or engineer will forget his first experience with a Russian male choir. He learns that familiarity with the music and the interpretation given each part of the song is essential to a good broadcast. Without careful rehearsing, it is impossible to anticipate the extreme variations in volume level.

Before transmitting equipment in studios was as well constructed as it is now, broadcasters were unable to place folk singers far enough from the microphone to insure proper control. Now they may be kept at a distance. Choral groups of this character *should usually be six or more feet from the microphone;* soloists often as far, allowing for movement along the beam of the microphone for such variations of distance as the singer can be depended upon to make for himself.

The sharp contrasts in expression in the rendition of much folk music of this type gives it real distinction. Every ounce of care taken in rehearsal to effect a proper balance and insure control will be rewarded in the quality of the program when it goes on the air.

We have heard much native folk music sung by uncultivated voices and at other times by trained singers. From the program

point of view, both have their place. The harshness of some native voices, considered by itself, can never be called good. But this must be overlooked when the program idea is a re-creation of original mood and feeling, or the revival of the exact settings to which the music is related.

An untrained darkie singing plantation songs to his own accompaniment on a five-stringed banjo has more vitality and is more convincing than a trained baritone or tenor singing a careful arrangement of the same tunes.

The best natural singers among cowboys and hill people not only bring authenticity to American folk songs, but also add the original emotional content frequently lacking in the concert artist's interpretations.

Thus, for reference purposes, there are two kinds of programs incorporating folk music: those that re-create the native mood and background or are actually broadcast from a remote natural setting, and (2) programs using trained musicians to perform well-known folk pieces as part of the concert routine.

8

The Musical Audience

FOR THE AUDIENCE of music lovers which existed before radio became a part of modern civilization, radio had the problem of preserving the truth and beauty of musical sounds. But now radio gives music to an audience which is larger than any that ever existed before. An examination of the program schedules of the average broadcasting stations and a listening check to identify the program content have proved that between 50 and 65 per cent of the broadcast time on any week is devoted to music. On some stations running late-night or all-night programs, the percentage is higher. On others maintained for special educational or informational purposes, the proportion is in some weeks less than 50 per cent. The predominance of music is natural, since radio's approach is limited to the sense of hearing. It follows that the exclusively auditory art holds first place among all programs.

There is very little that is original in the pattern of most musical programs. Music came to radio already prepared with program forms long since accepted in concert halls and ballrooms of the world. These conventions for the presentation of music were retained by radio.

The purpose behind the broadcasting of music, however, was new, because through this novel means an unprecedented public service could be rendered. Before radio, only a few people could hear music at any particular time. Only a small, fortunate per-

centage of the population ever heard the best music. Not everyone could afford the price of admission to concerts. Some, able to pay, had difficulty getting seats. The greater number of those denied the privilege lived at too great a distance from music centers. For all of these millions of people, the opportunity to hear good music was a boon. So scores from the classic, semi-classic, and popular libraries naturally came to the air.

I am convinced that the length of the *radio* rendition of the concert program is the best. The transmission of symphonic concerts from halls at the same time that they are being played for an attending audience has become an accepted form. This consists of two hours or more of music interrupted only by a quarter-hour intermission.

In my opinion, this is too much serious music for an afternoon. The only redeeming feature in the longer program is that the intermission provides the time for able and entertaining commentators. A program consisting of an overture, a symphony, a composition of program music, and an after-piece is too much for one listening period, especially since the emotional content of classical music is high. If the symphony is one of the longer works of Tschaikowsky, César Franck, Beethoven, or Jan Sibelius, who wants to hear anything more immediately afterwards? The effect of structure and form, and the tone patterns and nuances which give the symphony its moving beauty is still fresh in the mind of the audience. Whatever follows only destroys that effect. When a musical broadcast is controlled for radio alone, it should rarely exceed an hour in length.

The program idea centering around the effort to achieve the production of true musical sound was sufficient for the earlier small audience, but the new and potentially larger audience includes millions of people who, though not completely ignorant of good music, shy away from it. They are frightened away by the difficult composers' names and the foreign titles of compositions. These people needed musical performances which took their re-

luctance into account. Some of the programs devised to meet this demand are worth mentioning.

"Everybody's Music"

The title of this series states the idea—that more men and women would derive pleasure from the world's best music if they understood it a little better. Why not, then, let them in on the approach of the composer to his work—the feelings and impressions he has striven to convey by means of sound? This could be done by pointing out significant strains before the composition was played and by calling attention to the way these themes were developed to form the melodic pattern. Once initiated, the listener would discover that the appreciation of music does not require special intelligence. It is primarily a language of the emotions, common to all.

A program in the series entitled "Everybody's Music" consisted of three compositions: "Fêtes" by Debussy, "Pohjola's Daughter" by Sibelius, and "Death and Transfiguration" by Richard Strauss. The last two composers are living. Debussy's death is so recent that his scores can be referred to as music of our time. His work is often called "impressionistic." This is told by an announcer-narrator whose attitude is that of an inquisitive listener rather than a musical authority. He has nothing high-sounding to say. Without using the terminology of the professional critic, he explains to the audience that the word "impressionistic" is used simply because Debussy gives us the spirit or impression of festivals rather than a reproduction of a particular festival.

As he talks, his story is illustrated by the playing of selected measures. His words are simple, everyday. . . .

"That's the title of the composition—'Festivals'—and the music suggests the *idea* of festivals . . . not the events. The music will make that a good deal clearer than any words can!

"Now we'll hear a few short samples of that music. At the beginning, there's a festival feeling. One commentator has called this 'rhythm dancing in the atmosphere.'"

(The orchestra plays an excerpt.)

"A little later there's a melody which we can't attach to any concrete happening; but it's such a charming melody, I think, that I've asked the orchestra to play it by itself."

(The orchestra plays an excerpt.)

"Something romantic there, all right. And there's one definitely descriptive moment in 'Festivals'—a procession passing through the scene. It approaches from the distance. . . ."

(The orchestra plays another excerpt.)

"And here is the entire composition. It may call up memories of festivals you've seen yourself. It may suggest imaginary festivals, but whatever it may convey, I believe you'll enjoy this fascinating music of Debussy."

(The orchestra then plays the entire composition, which requires about five and one-half minutes.)

"That was 'Festivals' by Debussy. Now, we'll hear music that has a fairly well-defined story. It's the work of a composer who has grown, in the past few years, from a mystery to a best seller—Jan Sibelius, the great musician of Finland. Of course, some of his compositions, like the 'Valse Triste' and 'Finlandia,' have been popular for years. But his larger compositions have been described, even by some of their admirers, as stark, grim, bleak, forbidding.

"Adjectives are dangerous things, because thousands of listeners have found that this music is enjoyable. And more enjoyable at every hearing. Last summer Mr. Barlow conducted one of Sibelius' most advanced compositions, 'Tapiola.' Some of us wondered how it would strike our friends, and we received more letters about 'Tapiola' than about any other piece that was played on these programs. Most of them said that 'Tapiola' was interesting, fascinating, absorbing . . . well, almost all the adjectives that don't mean forbidding.

"This afternoon, Mr. Barlow presents a composition of Sibelius that hasn't been heard so much in this country. It's called 'Pohjola's Daughter.' I thought that meant the daughter of a gentleman named Pohjola; but, when I looked it up, I found that Pohjola is the North Country in the Finnish epic, the 'Kalevala,' from which Sibelius has found inspiration for many compositions. So Pohjola's daughter is a girl of the North Country. There is a story. It takes many pages in the epic, but I'll try to condense it. An elderly but still sturdy hero, Vainamoinen, sets out for a journey. When he reaches Pohjola, he sees a beautiful girl seated on a rainbow. He invites her to return with him to his home, but the lady is not impressed. She tells the

elderly hero to perform a few wonders for her, such as tying an egg into knots with no knots showing. This is a pretty neat trick, but the hero does it—and others like it. (I haven't been able to find where in the music he ties the egg into knots.)

"Well, the young lady gives him a more taxing assignment. He must make a boat from her spindle and her shuttle and launch it without touching it. Now, men will do almost anything, or try almost anything when there's a girl in the picture. And the elderly hero goes to work on this proposition. But, after a few days, the evil spirits get the better of him and he concludes that his wooing isn't going to be successful. He starts home again, searching for someone who can heal his wounds—wounds of the spirit, as well as of the body. He encounters a patriarch who helps to effect a cure. Finally, the elderly hero, recovering from his injuries and his infatuation, is again at peace with the world.

"There's the story.

"The music doesn't tell it literally. That is, we don't have what we might call sound effects in the orchestra. But it isn't hard to follow the course of events.

"The elderly hero's journey starts solemnly:"

(The orchestra then plays the beginning of the composition, which opens with a cello solo.)

"As the journey gets under way, there's a triumphant outburst, which, I assume, indicates the heroic aspect of the man:"

(The orchestra plays an excerpt.)

"Right after that, he sees the girl:"

(The orchestra plays another excerpt.)

"I should say that the great English critic, Ernest Newman, suggests that this phrase refers to the hero's wooing rather than to the girl herself. Anyhow, the old hero has met the young heroine. And from that point on, we can hear how she laughs at him; how he does the impossible for her; how he fails to do the still more impossible; and how, at last, he makes his retreat and finds his salvation.

"This is really a fantasy in music—rich, brilliant music, with power in it. And tenderness and humor. 'Pohjola's Daughter.'"

(And "Pohjola's Daughter" is played in full.)

A similar introduction is given to Strauss' "Death and Transfiguration," which completes the program.

Another musical program idea combined originality with a

public service. It was called "Evenings with Papa Haydn." An impersonation of the genial Papa Haydn, great eighteenth century composer, was the distinguishing feature of this series. Each program represented one of those bygone gatherings which Papa Haydn had made famous by being its gracious host. The announcer, playing the part of one of Haydn's guests, drew out the stories which made the composer a figure who is still interesting today.

Here Papa Haydn was made to say: "Yes, music was my hobby and my profession. I found my greatest recreation at musical gatherings like these." Then he went on to tell of beautiful ladies who flocked around him. They must have been enraptured by his music, he surmised regretfully, because everyone knew that he was not handsome. He told of the time when Reutter brought him from Hamburg to Vienna, and what Philipp Emanuel Bach did for him. Chuckling, he reminisced about the playing of his Symphony in G, called the Surprise Symphony because of the trick he played on the audience who went to sleep during its slow movement. With gentle sounds he lulled them—then *crash* came a loud chord to interrupt their pleasant dreams. Once awakened, they were enthralled to the end of his symphony; and whether they were more surprised by his trick or by his lovely music, who can tell?

By bringing the audience very close to the man who wrote it, this series made the music a very human thing.

A simpler program idea, the famous project of Dr. Walter Damrosch, is to teach music to children. The program, presented by the National Broadcasting Company with a full concert orchestra, is of an hour's duration once each week. It has been enjoyed each year from October to April by children the country over.

Part III

PRECISION AND ROUTINE

9

Three Seconds' Leeway

THIS CHAPTER and the next, Chapter 10, are devoted to radio as an industry and a public service, having certain definite commercial and social obligations. Of these obligations, precision and timing are the most important. Out of the necessity for precision has arisen a body of mandatory instructions for the man in radio production; also, because radio now has a tradition of efficiency behind it, these instructions relate to all production details. Ninety per cent of the inquiries coming to the author's desk relating to production procedure concern these purely mandatory matters.

The importance of program timing in radio broadcasting was first realized in its relation to certain social obligations. The program schedule of a broadcasting station is, in fact, a list of appointments with the audience and with the performers or speakers with whom engagements have been made. In commercial broadcasting, there is the additional business commitment to the client. His appointments, as well as our own, must then be protected.

Exact program timing and precision in the performance of production and technical functions related to periods in the schedule is a necessity for the smooth operation of a network of stations. Not only does the network assume responsibility for the exercise of courtesy on behalf of each station to its local community, but

also for many stations and their neighborhoods at one time. This requires constant attention to the program parts during the rehearsal and the period of broadcast and the exact timing of these parts so that there may be no runover of even a few seconds. Portions of music, separate speeches in dialogue, and sections of paragraphs in addresses are separately timed so that the performance may move on, keeping pace with the minute and second hands.

It also calls for alertness and precision in performance from a large number of people at once as a program period comes to a close, during the half-minute break between programs, and at the instant when the succeeding program starts.

At a time when our program is a part of the service to the entire system, more than three hundred men are listening and watching their clocks as the end of each period approaches. They are waiting for the cue-words which close each program so that the operations to which they are assigned may be performed immediately and quietly.

About two hundred of these men are at repeater-amplifier locations along the network of telephone lines that connect the transmitters in the system. More than a hundred others are at local stations. Some must throw switches, cutting away from the network, and, at the same instant, couple one of their own studios with the transmitter so that announcements can be made and identifying call letters be given. No more than thirty seconds is ever allowed for these between-program operations. When that half-minute has passed, each station or a portion of the network or the system as a whole begins to discharge another program commitment.

Program performances of numerous kinds are allotted exact periods varying in length from a few seconds to an hour or more. Announcements may be made in less than thirty seconds so as to fall into the break between longer programs. Other announcements or groups of announcements may fill one minute, five min-

utes, ten minutes, or even longer periods. The conventional programs are usually a quarter-hour, a half-hour, or an hour in length. The system cue to which we have referred is given regularly at the fourteen-minutes-and-thirty-seconds point on fifteen-minute programs; at the twenty-nine-minutes-and-thirty-seconds point on thirty-minute programs; at the forty-four-minutes-and-thirty-second point on forty-five minute programs; at the fifty-nine-minutes-and-thirty-seconds point on hour programs.

During any period of fifteen minutes or more, the system may be split into a number of smaller networks. As many as four system programs are frequently broadcast simultaneously, each one feeding groups of stations tied together by a special telephone line arrangement ordered to meet these multiple requirements.

Rarely do these four programs originate at one point with complete control of the programs and the facilities for separate transmission located in one city. They are more likely to originate at three or four centers as widely separated as New York, Chicago, Washington, and Los Angeles.

Simultaneous program broadcasts over separated sections of the system have come in response to various demands. For example:

1. The content of a speaker's address is of interest to the people of New York State. There is no point in transmitting it elsewhere. Stations in the state are separated from the remainder of the system during the period of this speech. The speaker's section is served, and programs of different content are fed to other parts of the country.

2. A client wishes to reach his audience during a favorable listening hour. Because of the difference in time between the East and West Coasts of our continent, two program periods separated by several hours are necessary to accomplish his purpose. The system is divided to suit his requirements. While his program is being received in one division of the nation, one or more programs of different content are transmitted for the entertainment of listeners in other areas.

3. The conditions described in 1 and 2 may, without conflict, occur at the same time. A further division of the network would be required.

4. Programs broadcast simultaneously during the same hour need not all be of the same length. Two fifteen-minute periods in one section of the country may parallel one half-hour program in a different section.

5. The division of the system may be changed at the close of any period by the need to include different geographical areas. A section of the network may then include more or fewer stations. Two sections may be merged into one, or all may be joined together for full-network service.

The necessity for precise timing and for the exact synchronization of closings and cues is evident when one realizes that, during the periods of simultaneous broadcasts, one program may be flowing east and north over lines out of Los Angeles; another may be flowing north and west and south over lines out of Chicago; a third out of Boston to New England and New York; and a fourth out of Washington to the Southeastern states.

A change in the direction in which program transmission is flowing along the lines connecting the stations in any division of the network calls for simultaneous reversals at all repeater points along those lines. These reversals, together with the adding or withdrawing of stations, calls for coördination at all points of control. The synchronizing of cues and signals is imperative.

A highly trained and closely knit staff of eight men in the production department is the directing unit for these operations on a large network. This staff is the guard of precision. Each member is familiar with the special duties of every other. Night and day, watch is kept for the purpose of instructing all key points and program-originating stations so that there may be no operating failure. Local production managers, program directors, and their assistants are repeatedly reminded to hold tightly to the exact time limits.

A daily operations sheet is prepared which lists each program, its origination point, the studio staff responsible, its time allotment, and its traffic route over the network lines. When more than one program is being broadcast at the same time, each is listed and its separate routing described. To avoid error, the operations sheet, comprising from sixteen to twenty pages, is checked and re-checked against the general program schedules, against the commercial orders, against any special news-broadcast instructions, and against the traffic orders which are issued by telegraph and letter by the traffic department to the telephone company and controlling stations.

Copies of the daily operations sheet are sent by air mail to all supplementary control points. Any special or unusual instructions are repeated by telegraph or telephone shortly before the time they are to be put into effect. Constant reference to the operations schedule and to all special instructions is required so that the staff at every point can be alert to every necessity. For example:

Required breaks in half-hour programs may have been omitted from the written program continuity. The writer may not have known of the emergency. Careful examination of operating schedules will save the embarrassment of omitting an expected system cue. All along the network we pass the warning, "Check up! Check your program or production office if you are in doubt! Check New York, if necessary."

Omissions of cues or late cues cause system scrambles in these days of complex split-network arrangements. Let us note a few of the possible scrambles:

Suppose we are observing during one of those times when several programs are being routed to different parts of the network. If one of these programs concludes early, that section of the network will probably receive the conclusion of one of the other programs. Listeners will be astonished and station managers will be embarrassed. The operators at telephone switching points will

not be to blame. They were ordered to throw their switches on hearing the cue words at the close of the program. The failure was at the originating point.

If one of the programs runs over its scheduled time while the others are handled with precision, it will probably result in two operation tangles. The program running over may be heard in other sections where broadcasts have promptly concluded. The start of following programs must be delayed until thirty seconds after cue is given on the extended one.

Suppose an affiliated station is carrying a local program which is to be followed by one fed from the network. The local director must assume that the system program which runs opposite his own performance will be handled with precision and conclude promptly. If precision fails and the network program runs over, he will have to be content with dead air or a musical transcription until one chain program ends and the expected one starts.

A failure in precise timing may cause an affiliated station the expense of a rebate to a local sponsor. For example, let us suppose that Station WWW has a network commercial scheduled from 8:30 to 9:00 p.m., a local commercial from 9:00 to 9:30 p.m., and another network commercial from 9:30 to 10:00 p.m. If the first network commercial program runs over and a sustaining network show follows, it is likely that the runover will be absorbed during the 9:00 to 9:30 period. The network will then be on normal schedule at 9:30 p.m. Not so Station WWW unless the local commercial has also been cut to absorb the lost time. If that station joins the network again at 9:30, it will be because a local client has suffered by a shortened period.

Here is another predicament which may be caused by lack of precision. YYY is a part-time station. Its time is shared with Station XXX. Its permit to operate includes a ruling by the Federal Communications Commission that it may not run over the moment of sign-off. The purpose of the ruling is to prevent intrusion into the other station's schedule. It is also to prevent the interference, cross-talk, and high-frequency whistles which

would result if both transmitters were on the air at the same time. If Station YYY is carrying a network program during the period just prior to its scheduled sign-off, then that station will be forced to cut the program if it runs over so that XXX may have the air on time.

Not only must the program period be of an exact length, but the break or interim between programs must also be carefully timed.

Precision in handling the successive steps in making breaks between programs has been required in order that a number of operations necessary to a smoothly running network could be accommodated.

These operations have become an established routine. They depend on unvarying accuracy in the performance of each step from the giving of "system cue" to the start of the up-coming program.

Some of these operations are the familiar technical ones to which we have referred, such as the making of switches in monitoring rooms, control rooms, and at telephone switching points. Other technical necessities arise in the use of synchronizing signals, which must be timed to the second.

Program operations using part of this "break" include announcements for which smooth performance is as important as for a formal program.

Most of the breaks are for 30 seconds. Only a few run 20 seconds (on 45-minute and hour programs when no split network is involved). In any case, they must be 30 or 20 seconds, according to the operating schedule. A second or two more or less means a lapse in precision performance and may be both embarrassing and expensive because of the close timing of actions in these brief periods.

It is necessary to have stop watches and clocks properly set and under close observation. Twice daily, generally at 10:00 a.m. and 5:00 p.m. C.N.Y.T., CBS transmits to the network a time signal to enable member stations to check their operating time with the

Master Clock in the WABC Studios. Any variations in this schedule are communicated to the network by QST (telegraphic communication). Here is a brief résumé of the details of this operation:

Master control sees that the studio transmitting the signal is ready to broadcast to the network a few seconds in advance of the hour, and the studio engineer will have his "mike" ready at least two seconds in advance of the time so that the gong can be struck exactly "on the nose." No go-ahead signal is needed from the engineer. The period of reverberation of the gong is not to exceed five seconds.

Inasmuch as network stations have been advised that this gong is given exactly at the times indicated as an essential check that they may synchronize their operating time with that of the network, it is imperative that the greatest accuracy be observed in carrying out this operation.

The synchronizing time signals are, at times, not sufficient to keep a broadcasting system in perfect order. Three types of clocks are in use, all of which may be accurate. Any one may also be inaccurate. The three types are electric, mechanical, and those controlled by telegraphed impulses. Slight variations in any group of clocks will cause uneasiness among those on watch over the entire country.

Recently during or immediately after a great storm, the electric clocks in the New York studios of CBS were advanced six seconds by some modification of the alternating current which controls them. Since all the clocks in the building were affected uniformly, the change was not noticed. The fact was called to the New York station's attention, however, by a message from the West Coast inquiring why New York was closing programs and giving cues six seconds early.

A young lawyer was a guest in the production office at the time the message was flashed across the country. He heard it read and noticed the immediate concern of the staff as steps were taken to correct the error of which it had been unaware. He expressed

surprise at the prompt and serious response given to the message informing of this small discrepancy in time. He exclaimed: "I sit all day in my office and nothing happens, while here you are worrying about six seconds!"

Six seconds is a long time in radio broadcasting. A discrepancy of more than three must be explained. That is the way those charged with production operations are kept on their toes—the way radio maintains precision.

10

Check Against These Rules

THE INSTRUCTIONS in this chapter are addressed directly to the reader as though he were a recently initiated member of a radio production staff.

Much work is done on the music, the descriptive continuity, and the dialogue before the scheduling of a program. A director may have been assigned to supervise all this material while it is being put together, help the program form and order the performance in the studios. When a program is of importance to the station or the network, its construction involves the coöperation of many creative artists. A department executive in such case is made responsible for production supervision. The production staff then functions as assistants. As soon as you are informed of your assignment, find the production supervisor or the director. Learn from him the nature of the program material, thus getting the performing requirements clearly in mind.

Remember that from the point of view of the broadcaster, all the work necessary to bring the program to completion in the studio is often called the production of the show. The assistant's part is to get results from that work—the execution of the complete program idea in a sound pattern.

From the point of view of the audience, the production is the completed pattern in music, speech, effects, or their combinations. It is only what the audience hears. For this you are entirely

responsible unless your decisions regarding the studio operations and procedures are overruled. When the decisions of one higher in authority prevail, the result may be an improvement in the quality of the broadcast.

Note carefully the variations in studio technique. The accumulation of such experience provides an excellent schooling in performing methods.

Understand the studio in which you are to broadcast. Rarely are any two alike. It may be that no two are exactly alike. The same unit in one may not produce the same results in others. Find out what happens under various conditions and set-up arrangements. Don't worry about *why*. No one knows the reasons for some of the apparent idiosyncrasies of studios. Be wary of anyone who thinks he knows all of them!

Remember that, in spite of the increase in acoustic knowledge, most of it has come through trial and error in studio construction and operation. The practical approach is better than the theoretical. It will remain so until the scientists explore a great deal further into the unknown acoustic field.

Proceed about your work in an orderly fashion. Give attention to every detail. Never assume that someone else will cover these details just because he has done so before.

Detailed Instructions

Coördination with Other Members of the Production Personnel

Satisfactory program production requires a smooth-running studio organization. The personnel will perform the necessary duties best if its efforts are coördinated, and if an atmosphere of good-natured coöperation is maintained at all times.

Know the other men. Be as familiar with the essential requirements for the proper performance of their duties as you are with your own. Enjoy their capable performance of these tasks. Never show strain.

Study the instructions for the announcer. Make it easy for him to follow them. Know what is demanded of the engineer, the musician, the artists, the sound-effect technicians. Do everything that can be done to facilitate the work of each without intruding into his special province.

The Technical Apparatus

The studio engineer is in charge of all transmitting equipment in the studio and control room. He is responsible for its care and operation. Where the microphone shall be placed is a production matter and should be decided as such. The moving or adjusting of microphones or any other parts of the pick-up mechanism must be left to the engineer. Leave it to him unless he approves of volunteer assistance, as when portable microphones are used.

Technical Advice

The studio manager will find it advisable to consult frequently with the highly qualified engineers, his associates in program production, in order to keep familiar with the characteristics and uses of the constantly improved transmitting equipment.

Microphone Placement

To determine the proper placement of microphones for a given type of program, take into consideration the directional properties of the particular microphone, its amplitude, and its frequency response characteristics. Each type of microphone has a directional characteristic peculiar to itself. Both horizontal and vertical plane directional pattern and frequency characteristics should be considered in connection with intended use and placement. Some microphones are unidirectional (W.E.* 618-A Dynamic), others are bidirectional (RCA 44-A Velocity), and still others are nondirectional (W.E. Non-Directional Dynamic) in the horizontal plane.

* Western Electric.

These characteristics are extremely important and some of them are useful for discriminating against undesired relationship between sounds from different sources.

The use of modern, high-quality microphones precludes the usually undesirable practice of multiple microphone pick-ups that was formerly expedient with inferior equipment. Only when special effects are being tried should more than one microphone be used for the pick-up of a performer (or group of performers) working as a unit in an orchestra or chorus.

Each of two or more microphones are usually at different distances from any given source of sound. In consequence, the sound waves do not reach the microphones at the same instant. Distortion is quite likely to result.

This practice does not, of course, preclude the use of several microphones for the pick-up of a program comprising a number of distinct groups of performers, such as orchestras, chorus of voices, cast, sound effects, and so on.

For this type of pick-up it may be desirable to employ a microphone for each group of performers. Have each microphone so placed that, by taking advantage of its directional properties, a minimum amount of sound is picked up from any other than the intended source.

Nor does the practice ignore the use of any number of microphones for experiments with new colors and effects in music, or other sound combinations.

Control Room Monitoring

Frequency response characteristics of the average human ear vary over wide limits, according to the intensity of the sound reaching the ear. Most studio managers and directors carefully balance their programs in rehearsal, running control room speakers at a very high level. This high level is not maintained in the receiving sets throughout the country. Many unsatisfactory productions are received in homes today because this variation in reproduction level is not considered.

The average listener does not care to reproduce music or sound at the same volume level that is usually heard in studio control rooms. Surveys indicate that the level of most home speakers is surprisingly low. This divergence from the reproduction level of the control room speaker explains the change in balance between orchestra and vocalists, between voices of cast and sound effects or background music, so frequently noticed when listening to a program on the outside.

The careful director and the production assistant remember the importance of having the loud speakers used for program monitoring during rehearsals and broadcasts operated at levels closest to the reception in the average listener's home.

The operating engineer will be a constant source of information on the effects of different types of technical equipment and their various parts on instrumental and vocal production. With him can be worked out a useful list of varying effects produced by different uses of that equipment. Such collaboration leads to skillful performance.

Coöperation with the Conductor

Whether music forms the major part of the program or only appears incidentally as background, the conductor is the one who knows just what he wishes the audience to hear. With the orchestra as his instrument, he plays with definite musical colors and nuances in mind. The conductor depends, too, on the studio manager for the set-up that will keep his musical ideas clear in transmission.

The studio manager knows exactly what the conductor desires to produce, and if the conductor has unqualified confidence in the production director, he may gladly leave the decisions regarding quality of transmission to him. There are so many different musical ideas, however, so many carefully planned musical effects, that it is unwise for the studio manager to assume sole judgment. What he hears in the control room may be satisfactory to him, without being the combination of sounds which the conductor

wishes to be heard. *Insist that the conductor come to the control room to pass upon the pick-up, and remain there until the musical balance meets with his approval.* He can frequently conduct his orchestra during these tests through the window of the control room. If this is impractical, there is almost always a musician who can be concert master.

Reporting for the Program

Studio managers and announcers charged with program responsibility, must be in the studio or at points of remote broadcast, at the time scheduled upon the Daily Operations Sheet, the Assignment Chart, or departmental notices. When a rehearsal period is not shown on such assignment schedules as falling immediately prior to the air performance, staff members must report to the point of broadcast at least fifteen minutes before air time. Any failure to do so would be reported by any other member of the program staff, allowing sufficient time to substitute other personnel, and insure the proper production service. The reporting of another's tardiness must not be considered a kind of tale-bearing. It is thoroughly understood that an unexpected emergency may be the cause. The show is the thing. Adequate personnel for its production must be on hand on time regardless of emergencies. A staff no larger than necessary for the production has been assigned. The absence of anyone calls for the immediate appointment of a substitute.

The Production Log

Wherever you work, in a local station or at one in which network programs originate, accurate records are required of all production operations. Production logs divide into three classifications: (1) program (both sustaining and commercial), (2) stand-by, and (3) audition.

The production log for all programs, sustaining and commercial, shows the actual time of rehearsals as well as of the air shows, and the extent and the reason for overtime, if there is any. Inac-

curacy or omission on these records may be expensive and embarrassing to the broadcasting organization. They may work a real hardship on the performers. Actors, artists, and musicians are frequently paid in accordance with this record of performance. Any carelessness on the performance record may cause delay in the accounting department. Failure to give an exact list of actors, artists, musicians, sound-effects personnel, and so on, is inexcusable.

Program Record

A log of the program itself is required for ready reference, to establish what actually transpired in rehearsal and on the air. The routine of the show, each item of music, speech, and dialogue must be listed separately. Each item records the performer and the actual time of performance from the moment it began to its end. This performance record may be needed after a program has been broadcast to establish a performance fact. Such a record may also be used for the make-up of a permanent timing record of music. This will serve to indicate the actual time taken by each standard piece of music and each particular arrangement, with the variation produced by the interpretation of the conductor.

Written program material (whether speech or dialogue), is noted on the record and substantiated in the permanent files by a certified copy.

Certified Master Copy

A master copy for the broadcasting company's record must have all continuities for all shows conform in every detail with that which is used on the program broadcast. It must be signed by the director, the studio manager or production man, and by the announcer. It is necessary to check this certified copy carefully during the actual performance, and to see that any changes from the original script are incorporated. Omissions should be noted, and all changes written in legible form. Attention must be called to such alterations by a notation on the production log.

Stand-bys

A stand-by program has been set to protect the actual scheduled program. If an unforeseen emergency interferes with the scheduled entertainment, the stand-by program becomes immediately the actual airshow. Stand-by programs originate in a main studio to protect a network program originating at some other studio point or to protect a local program originating in some local spot. Stand-by logs must be kept with the same accuracy in regard to detail as that required for the regular program log. Remember that the scheduled program for that period may call for performance under conditions that prevent an accurate record being kept at the originating point. Careful listening, therefore, is required of the staff members of a stand-by studio. An accurate record of the program will be expected both by the department heads and by the government. If it is not possible at the time to hear the names of speakers or performers distinctly, or the titles and subjects, a check by wire or telephone to the point of origination may be required. This would follow directly after the end of the period. In any case, immediately advise the production office. The necessary information for the making of a log can then be secured as quickly as possible from those in authority who were present at the place of origination.

It is required that a written report be made on the back of the stand-by log, commenting on the quality of the program. This covers its contents, musical balance, quality of pick-up, entertainment or educational value, and any other pertinent information that contributes to the report's completeness. Stand-by records on all national programs and all programs originating at unusual spots should include the quality of transmission, intelligibility, whether or not in the opinion of the listener the program constituted worth-while entertainment.

Certain rules for the handling of stand-bys have grown out of experience. These must be followed without fail. Where a representative of the production and announcing staff are assigned,

both the studio and control room must be covered. Contact must be maintained between the two to insure prompt and suitable action in case of program failure at the point of origination. Every part of that action will be indicated by signals predetermined between the two.

Sometimes only one staff man is assigned to cover the stand-by. A similar procedure, involving the use of prearranged signals, must be employed with the engineer in the event of an emergency.

Constant vigilance is necessary. Studio discipline is essential. The man in charge of stand-by production is responsible for the control and performance of all musicians and artists assigned to the fill-program. These performers must remain quietly in the studio, except, of course, for any necessary rehearsal. The musical routine or other program outline must be on the stands. At least three musical numbers must be selected in advance in the order in which they are to be played in case of a break. The form of the emergency announcements must be determined in advance. Announcements identifying the music of the emergency program should be carefully considered. Members of the production staff and all those related to the stand-by must remain in the studio until the period is ended. Failure on the part of the staff to give careful attention to these matters has always come from the neglect of some part of these instructions. Beware of inattention and over-confidence. A thousand stand-bys may be arranged and never needed. We cannot tell, however, what the thousand and first will call for. Be always on the alert. You are there for that purpose. In case of a break or any kind of program failure, be very deliberate in broadcasting from the stand-by studio. The listening audience is well aware that breaks do occur. Everyone knows that light bulbs burn out, that the same switch, thrown every day for many months, at an unpredictable time will just not respond. The audience realizes that it takes time to repair any kind of electrical equipment, even to replace bulbs and tubes. Dead air from thirty to forty-five seconds is natural. It sounds like a great deal more to those of the broad-

casting staff, who are unaccustomed to silence. The novice is likely to become panicky after ten seconds have passed. Take your time. Check with the master control room. You may find out the nature of the break, and whether the program failure is likely to be a permanent one. Make sure the announcer is prepared with an appropriate variation of the standard form given to him in his instructions in order to meet the emergency. This form is explained more fully in Chapter 11, pages 159 to 162. After the necessary announcement is made, then present the stand-by program as required.

Audition Logs

At an audition, radio performers are tried under actual broadcasting conditions. It is important that the audition log be kept as carefully as a program or stand-by report. Note the correct name and address of the person auditioning, either for the station or the client for whose favor the audition was presented.

Network Cue

At the close of each network program, the broadcasting company is identified by name. This identification is the accepted cue to long-line engineers of the telephone company, and to operators in master control; they at once make the necessary switches to accommodate the succeeding program. Everyone knows various forms of this network identification. "This is the Columbia Broadcasting System," "This is the National Broadcasting Company," or "The Mutual Broadcasting System." There is then a time allowance of a few seconds for the necessary switching and the identification of the station. The interval between the network cue and the beginning of the succeeding program may be anywhere from ten to thirty seconds.

An interval of dead air may elapse before programs are resumed, but never for more than a few seconds. Theme music may be used as a fill-in.

The singing of words of even a signature song must be avoided

during and after the system cue. Only instrumental music or humming should be heard in this interval. This avoids conflicting sounds and enables easy identification by the listener of both the network and the station.

Split Networks

The number of split network originations is increasing. These are due to the dividing of the network, allowing commercial clients to use groups of stations for their programs which coincide with market coverage and appear best suited for their advertising and publicity purposes. CBS often has as many as four separate broadcasts routed to different sections of the network at the same time, in order to insure perfect synchronization at the instants when these programs open and close. The most exact timing is required. The network cues, given at the close of all these programs, must occur simultaneously. It is obvious that there can be no run-overs of even a few seconds where split network operations are involved, without completely disrupting the normal function of the entire system.

Prevention of Run-overs

The staff members of studio management are held strictly responsible for getting their programs off the air on time. "On time" means on the second. Except where split networks are involved, a total of three seconds' grace is permitted. A run-over beyond three seconds is not tolerated. If it occurs, in spite of the best efforts of the studio management, the runover must be explained immediately. It is up to you who are charged with this responsibility to point out to the director or the supervisor of production the imperative necessity of coöperating in this vital matter. Do this regardless of whether he is an employee of your own broadcasting company or a guest who represents the agency or client. Have it clearly understood that nothing must interfere with your bringing the program off exactly on time—"on the nose." Tact, judgment, and foresight must be used in the en-

forcement of this rule. Adequate measures must be taken to anticipate a possible runover. To meet such a contingency you may have to insist upon conferences to determine provisional cuts in advance of the air time.

Remember that the broadcasting stations and the networks are service organizations. This fact should be the key to all your relations with those in the studio and through the program performance with the public. Advertising clients and agency representatives are well aware of this. They understand that the service to them does not extend beyond the facilities, the content of the program and the manner of presentation. Understand your station and network requirements regarding each program. Find out in advance how each particular period is related to other periods which precede it, run parallel to it, or follow it. Then you will know whether an emergency might extend the period beyond its given time.

General Program Regulations

Edited Copy

The final copy of the program content (provided for use in rehearsal and actual broadcast) passes through the hands of an editor for approval. He checks its compliance with all program restrictions applying to both sustaining and commercial air shows. It may be marked "editor's copy" to denote this approval. The studio manager, however, carefully checks to see that it conforms with the regulations. These regulations vary somewhat at different networks and stations. Each broadcasting organization has its own advertising policies. The policy may restrict the amount of time permitted in any program period for commercial announcements. This type of restrictions in force at CBS is here given as an example.

Length of Commercials

After 6:00 p.m., New York time, commercial announcements, including dramatized commercials, gift offers, and contests, shall not exceed:

1. Two minutes and 10 seconds on quarter-hour programs.
2. Two minutes and 30 seconds on 25-minute programs.
3. Three minutes on half-hour programs.
4. Four minutes and 30 seconds on three-quarter hour programs.
5. Six minutes on full hour programs.

On daytime programs, before 6:00 p.m., New York time, commercial announcements shall not exceed:

1. Two minutes and 55 seconds on quarter-hour programs.
2. Three minutes and 45 seconds on 25-minute programs.
3. Four minutes and 30 seconds on half-hour programs.
4. Six minutes and 45 seconds on three-quarter hour programs.
5. Nine minutes on full hour programs.

Other Regulations

It rests with the editor to enforce the broadcaster's policy, which excludes from the network all advertising of laxatives, laxative properties, deodorants, and depilatories, as well as disagreeable reference to diseases, symptoms, and anatomical functions offensive to good taste. The signature of a member of the editor's staff on all scripts indicates that he has passed on the copy. Members of the production staff check their copy for this signature, report to the editor the introduction of any material not approved, and render him every possible assistance.

Clients are usually advised that the first announcement of any contest to be broadcast must be in the hands of the editor at least two weeks in advance. This allows time to submit it to the Legal Department for any changes or revisions that may be necessary. It is imperative, therefore, that no contest copy not previously approved by the editor be introduced into any program. Producers will report any such occurrences immediately.

Copy which has received the signature of the editing department has been checked on all points in script form. If, however, in actual rehearsal it seems to the studio manager to contain too frequent mention of trade names or monotonous repetition, this

should be called to the attention of the editor. An auditory impression frequently varies from a "reading impression."

Personal Endorsement

No staff announcer is permitted to give his personal endorsement to an announcement. The use of the first person singular is prohibited for everyone, unless he be in the direct employ of the client. The editorial use of the first person plural is so common that it is not always necessary to delete it from commercial copy. The wording of that copy may not be such as to make its prohibition necessary.

Direct Communication

The federal laws limiting the license of radio stations prohibit the use by such stations of all direct or person-to-person communications. Particular care must be taken to see that the phrasing of announcements which acknowledge correspondence on programs where fan letters are used do not include direct address.

Music and Lyric Restrictions

Copyrighted Music

There are two classes of restricted music: (1) copyrighted music for which we may obtain permission through the American Society of Composers, Authors and Publishers, and (2) copyrighted music, both American and foreign, for the use of which negotiations must be made with the rightful owners.

The second class of restricted music is owned largely by foreigners, particularly the compositions of Puccini, Charpentier, Debussy, De Falla, Ravel, and Prokofieff. All foreign compositions must be checked very carefully.

Applications for permission to play restricted music must be made to the executive or department charged with this responsibility. If permission is obtained, the approval for its use should be noted on the musical routine of the program, or on the final

program continuity, by an "OK" or other predetermined sign. This applies in all instances where such numbers are played, regardless of whether the broadcast is over a network or a single station. The studio manager must not permit any music not previously free for performance to be played. In this connection it should be noted that portions of restricted numbers come under this ruling. They cannot be interpolated without special permission. Permission to interpolate restricted music is usually denied.

Dedication of Musical Numbers

In many stations a rule, based upon accepted good taste in broadcasting, precludes the dedication of musical numbers to individuals. This ruling includes prominent personalities, since songs have been published based on some well-known character without, in most cases, mentioning the person's name. If these numbers are performed at all, announce them without mentioning the individual who is referred to, even if it is in the dedication.

Lyrics

There is a long list of songs with prohibited lyrics. These have been censored by many stations and networks because they refer to prohibited drugs or to action or behavior directly contrary to law or good taste. No word commonly used in a derogative or scornful sense of any race, creed, or personality may be used in lyrics or speech. In other entertainment fields there is apparently no objection to the use of such words in lyrics of "Old Man River," "Glory Road," "Limehouse Blues," and "Sleep Kentucky Babe"; but the audience in theatres and concert halls is self-determined. In radio it is not.

Dance arrangements of religious music are almost universally prohibited in radio.

New Music

Great care must be taken in broadcasting new and original

music, especially that in manuscript form. See that clearance and permission has been granted by the owner.

Changing Lyrics

The lyrics of published songs cannot be changed or parodied unless permission has been obtained from the copyright owner. Care must be exercised to prevent any original or parodied words from going on the air until this written authorization is presented. It is especially serious to permit the changing of words of a production number or a specially restricted show tune.

The use of lyrics in the composition of dramatic dialogue is covered by careful regulations.

Every station should be supplied with the restrictions imposed by all musical associations. If the station is not supplied, these printed restrictions are available. Every important broadcasting station gives the members of its staff copies and lists of numbers specially restricted either by owners of the copyright or by the station managers in line with the special broadcast policies.

All of the above instructions are based on the assumption that the studio manager is acting as assistant to the production director or supervisor in connection with all programs. If he is directing as well, they do not completely cover his work. He will then be undertaking work qualifications for which are dealt with in Chapter 13.

Suggestions to the Assistant Director

A studio manager may be assigned the responsibility for all the work that is required to bring the program to completion. He may have to find the idea and develop it, write whatever script may be required, select the entertainment units and material, and direct the entire show. Such responsibility may not come to a man until he has proved his talent and capabilities. Therefore, to the ambitious assistant director we give the following, which are in the nature of suggestions rather than directions:

General Culture

Learn as much as you can of the literature of your language, especially drama. Attain sufficient acquaintance with other languages to understand idioms that have come into uniform use. Develop the ability to edit and, on occasion, write a good script. Be alive to the possibilities and dramatic impressions of sound in all its variety as related to drama. Gain the human graces of courtesy, diplomacy, good nature, self-control. Avoid showing strain despite the fatigue or irritation attendant on work with others. Be informed on programs that develop within the industry. Be familiar with the important trends in the show world.

Music

Become thoroughly acquainted with every type of instrumentation—standard symphony, dance, variety, and novelty. Acquire a thorough knowledge of instrumental balance. This can be done only by intense and prolonged listening. Get the same kind of knowledge of vocal balance and vocal production. Understand the characteristics peculiar to each instrument and type of voice. Become closely acquainted with all types of musical composition. Learn to follow musical scores. Become as familiar as you can with the detail in all well-known compositions.

Personal

Remember, whenever you are in the studio or at remote points, you may be the only representative of your entire broadcasting station. Maintain a professional attitude at all times. Wherever you are on duty you will be continually subjected to public scrutiny. Your appearance and deportment should always reflect favorably upon the organization you represent.

Part IV

SPEECH

11

The Announcer

IF MUSIC RATES FIRST in the number of programs broadcast, speech and dramatic programs are a close rival. The number of drama programs (daytime serials, theatres of the air, and so on), news commentators, and assorted lay speakers heard daily over the air testifies to its audience approval and growing popularity. In consequence, writers literary, dramatic, and expository now write for radio and speakers, religious, political, and personal speak for themselves or their beliefs over the air. Everyone wants to speak into a "mike," or to be an audible participant in a program.

However, the first voice to be considered really important for the microphone was that of the announcer. He was the man who early in radio tied the musical programs together and read the first commercial announcements, and who, for his station, had to comply with the Federal Trade Commission's rules for signing on and off the air.

To the average listener, all that seems to be required of the radio announcer is that he stand before a microphone and read a prepared statement with a reasonably good voice. And many a lad throughout the country is sure that his voice is pleasanter than the one he hears through the loud speaker. Because of the glamor and monetary rewards, thousands of young men, mostly from small towns, arrive in the broadcasting centers ready to be radio announcers. Or they write stating their qualifications and mentioning the high opinions of relatives and friends. To their consternation they find that getting the job is not as simple as all

that. Merely to read acceptably what someone else has written regarding the presentation of an artist, or to identify the music which an orchestra is about to play, requires some of the highest qualifications in all radio work.

Performers in this field are selected with the greatest care. Usually they are tested in preliminary auditions. Then there are still further auditions before they are trusted even on a trial basis with a part of the program material. Any recall after the first hearing means that the man has shown personal qualifications and revealed the cultural background so essential to an all-around announcer. The standard of judgment is high and the weeding out severe.

An applicant may possess the most beautiful voice quality yet not be able to handle all phases of the announcer's work. For the voice of either speaker or singer is only an instrument, a means of expressing personality. Through his voice the young aspirant reveals whatever education, true culture, and broad experience he possesses.

The elimination test consisting of a series of auditions is a satisfactory means of selection when the number of candidates is large. It is particularly good for stations which cannot compete with others for announcers of reputation and experience, as well as for local stations that wisely select as much of their personnel as possible from their own communities. Usually, a home-town boy creates more interest by his announcing than a stranger who is better trained. Then, too, many sections of the country prefer hearing their own inflections and pronunciation. A Vermonter would sound strange to people in Birmingham, Alabama, who would wonder why a station selected a man with brittle Northern speech when there were so many young men close at hand "with such beautiful voices."

Competitive auditions are also necessary, because a new industry has neither precedent nor personnel upon which to draw. There are, as yet, no training schools to prepare young men for the specific requirements.

The production department of the Columbia Broadcasting System sends the following reply to inquiries regarding the requirements for acceptable candidates for announcers:

There are no vacancies in our staff, and we are not at this time looking for radio announcers.

When we do look for them we seek for candidates among men who have:

1. A college education or its equivalent.
2. A proved experience as announcer in one or more of the broadcasting stations in the country.
3. Excellent diction and accurate pronunciation not identifiable with any particular section.
4. Voice and air personality which is distinguished without affectation.

The National Broadcasting Company and the Mutual Broadcasting System have equally high standards. Many important stations insist on similar qualifications.

The first sentence of the above letter is true, because as fast as vacancies occur they are filled by candidates on the preferred list.

In New York, not so long ago, one system could not secure the highly trained men it desired. During a year, therefore, it heard 1,252 men who had applied for announcers' jobs. These men were not auditioned because of any immediate need, though there was always the hope of making many discoveries. They were heard as much for a good will gesture as anything. It was a courtesy to those who sincerely felt they were capable of coming into the radio world. Of the aspirants who were heard, nine tenths were immediately discounted. Only eleven were capable enough to be called for a third audition. Of the original 1,252 men, two were finally employed.

Many are curious to know what the audition material is that applicants are asked to read. First the applicant is handed a sheet upon which is typed the opening or closing station identification, which runs: "This is station WWW, owned and operated by . . . (and so on)." This is familiar to all who get up early enough or stay up late enough to hear the station signed on or off.

It is a very simple statement and should be read very naturally. More often than not a new applicant delivers it with a grand flourish.

Part two is a section from the news of the day. This material, provided by the press bureau, is not easy to read. It takes for granted a familiarity with current events and the pronunciation of place and proper names both foreign and American. Indeed, knowledge of the rules and pronunciation of nearly every language is required.

During any year, the first news-flash of any day may have been from Paris or Berlin, the second from South America, the third from China or Japan, and the next from a city on the Mediterranean. Every day new names appear and new facts require mention. Anyone interested in doing so can make up his own news audition material from the daily papers and weekly magazines, using the contents of headlines and first paragraphs for flash copy. Examples are not included here because these test-scripts should contain news of the day—not old stories.

In the third place, the aspiring candidates are asked to read a typical commercial announcement. This bit of program material is very precious to every sponsor. In the words of the "commercial," "the product must be sold." The announcer is the salesman.

We cannot single out any single commercial announcement as an example for fear of seeming partial. For the sake of illustration, therefore, let us create an organization and present an imaginary product under an entirely new name.

The Program-Closing Announcement

ANNOUNCER: Tune in tomorrow night for the next episode of the Sky Riders. This drama of man's conquest of the air is brought to you each evening at the same time by the makers of AVIOL,*

* If by any chance this name can be identified with a company or product which exists, that circumstance is entirely by accident.

the lubricant for high-speed motors. You undoubtedly turned to this program for your entertainment tonight for the same reason which led us to choose it as a means of making a daily visit to your home. The Sky Riders' story is one of faith and endurance. The makers of AVIOL are doing their part to conserve the endurance of the motors of the planes in which our pilots in the uncharted sea above the clouds speed their wings in faster, surer flight.

AVIOL is the perfect motor lubricant by severest tests. Today you too may have the perfection of this high-test motor oil in your car. To every car owner in America we say: "The easier you make the work for your motor, the easier your motor will make driving for you." Drain out the old oil and fill up with AVIOL, the oil they call the motor's friend.

The fourth part of the reading, consisting of words and connected phrases, reveals the aspirant's knowledge of their pronunciation and meaning. It also discloses a great deal about the candidate's education and background.

Here is a list of words jotted down while listening to over four hundred broadcasts from a half-dozen important stations during a two-month period in 1938:

Words of Today Easily Mispronounced
34 English Words

gubernatorial	premiere	bulwark
Catalan	library	repercussion
comptroller	obstetrics	European
temperature	nothing	contrasting
camera	deluge	president
query	soviet	alimentary
inquiry	sixpence	envoy
mistrust	sonata	Venezuelan
results	integral	cholera
Sierra	fantasy	stomach
join	ruins	
American	forward	

11 American or Anglicized Personal Names

Scheherazade	Iolanthe	Eccles
Adolf	Frankfurter	Knudsen
Marquesas	Josiah	Carnegie
Eamon de Valera	Corcoran	

8 American or Anglicized Place Names

Calvary	La Follette	Norfolk
Balearic	Melbourne	Laredo
Middletown	Tucson	

17 Foreign Words

Napolitana	linda	huera
Reichstag	élégie	Sudeten
salon	Habanera	plebiscite
von	völkische	gitanas
peon	heil	paso doble
romanesca	serail	

19 Foreign Personal Names

Vlatko Matchek	Bela de Imredy	Frederick Delius
Miron Cristea	Gaetano	Smigly-Rydz
Le Brun	Saint-Saëns	Benes
Ciano	Corbin	Fuehrer
Nils	Flandin	Phy Phahol Pholphay-uha
Guillaume	Kogushigi Ugaki	
Cárdenas	Hore-Belisha	

20 Foreign Place Names

Lerida	Andalucía	Helsingfors
Eire	Kaunas	San Joaquin
Memel	Albaniz	San Luis Potosi
Pago Pago	Burgos	Mijares River
Vinaroz	Moscow	Gandalfo
Venezia	Prague	Le Havre
Tortosa	Hankow	

And here is the test list of words and phrases which reveals a candidate's word experience and any inclination to slip into pronunciation faults peculiar to the section of the country from which he came.

aspirant	laboratory	unctuous
formidable	controversy	incognito
strata	oyster	Spokane
catholicism	allies	fascist
singer	preferable	interlocutor
equitable	pianist	combative
polyphonic	biography	hangar
amenable	revocable	adult
Tuesday	longitude	gala
lamentable	peremptory	artificer
advertisement	athletics	contemplative
literary	exquisite	exemplary
Iowa	finger	president
Leicester	polyphony	promulgate
apricot	dishevel	attaché
aspirate	again	hunger
superfluous	third	encyclical
schism	amenity	bestial
omniscience	prelude	mischievous

(Read the following rapidly)

I just threw him and hog tied him over in the old corral. It was quite a fracas but I had a fine time.

* * * * * *

Take the tar road and drive carefully in case it rains. My stars and body! That boy shouldn't be allowed to go to the fair alone. What is his father thinking of anyway? He has his own idea I suppose. It seems like it was only yesterday that I shut him up in the closet for running into Mrs. Hicks' baby carriage with his velocipede.

* * * * * *

Where are all the people? Yesterday thousands were in this square. Thursday they were using firearms.

* * * * * *

They have been here and gone—half an hour ago. They took a bath in that swimming hole. Well, we gave them a good Charivari last night. Don't know whether it was the guns or that conch Ed brought up from the south that scared them most.

A fifth section of the audition material is sometimes called the *"pièce de résistance"* or the "shock copy." The candidate reads:

In the last of the series of symphonic concerts we heard:

"Passacaglia" by Girolamo Frescobaldi, "April Nocturne" from the "Canta Primavera" by Vittorio Giannini, and the "First Suite of Antique Airs and Dances" by Ottorino Respighi. The suite is in four sections: "Ballata," "Gagliarda," "Vilanella" and "Paso a Due e Maschera-ta."

A rousing refrain of ancient times—a setting by Saint-Saens of Victor Hugo's ballad "Le Pas d'armes du Roi Jean" ("The March of King John's Troops"). It is a colorful air filled with flourish and bravado —such a tune as the *chevaliers* of old may have sung as they marched off to fight against the enemies of France.

Hector Berlioz has written a memorable setting of Goethe's satiric poem, "Chanson de la puce" ("The Song of the Flea"). It is a ballad sung by Mephistopheles during the wine-cellar scene in "The Damnation of Faust"— a sarcastic refrain about a flea who dresses in silks, becomes Minister to the King, and makes his relatives lords and ladies of the Court.

Candidates found pages of script in their hands containing names of composers and titles of music such as these:

"Till Eulenspiegels lustige Streiche," by Richard Strauss.

De Falla's "El Amor Brujo" and the "Jeu des vagues" from *La Mer* by Debussy.

The overture to *M. de Porceaugnac* by Lulli.

"The Swan of Tuonela" and "En Saga" by Sibelius.

"Wotans Abschied und Feuermusik."

"La Fille aux cheveux de lin," a "Fandango," by Joaquin Turina and the "Malagueña" by Ernesto Lecuona.

Pieces by Gounod, Offenbach, Griffes, Bizet, Berlioz, Delibes, Ravel.

Instrumental names were frequent. Oboes, celestes, tympani, viola d'amour, celli.

Announcements constantly call to mind such musical terms as *capriccioso, chiavette, chromatics, pizzicato, scherzo, mazurka, allegro, stringendo, andante con moto.*

* * * * *

It isn't expected that any man, however experienced, can walk into a studio for an audition and do a perfect job with this material. Nervousness alone would account for some errors. These

test continuities are made so difficult, not with the idea of catching a man on mere pronounciation, but because in reading this material, the contestant shows what he does with a word that he isn't sure of.

Sometimes men with fine voices have managed to get hold of this test material before hand. Painstakingly, they memorized the correct pronunciation of nearly every word. To their great surprise they failed to impress us. Their parrotting was utterly unconvincing. It was patent in each confident sounding syllable that they really knew nothing about the musical literature to which they were referring.

On the other hand, some men who made glaring errors in pronunciation showed a background full of listening experience, if not the experience of a practiced musician. This immediately revealed, in spite of mistakes, their very fitness for announcing programs of this type. Here is the reason for the letter stating that a college education "or its equivalent" is required. The fact that a man has been through college is not a guarantee that he is fit. We all know men of broad knowledge whose formal education stopped with high school; through reading, travel, and contacts with people of aesthetic achievement, they themselves have attained a high culture. Such men, however, are admittedly rare.

One of the most successful announcers is a man who came to New York from a small town a number of years ago. He was heard while announcing an important program, the entertaining units of which were on tour. The troop, consisting of an orchestra and singers, visited a great number of American cities during the series of broadcasts. Each program originated in a different spot, and the local production and announcing talent was used as much as possible. In one city this young man was selected to announce. His work fit the program like a glove. Instead of playing a part in a verbal program, he became immediately a part of the entertainment itself, entering personally into everything that went on. His delivery was joyous and enthusiastic. When it came to the commercial announcement, the listener was made

to feel that this was the happiest moment in the announcer's life, when he could bear testimony in favor of the product. This fitting of the announcer to the program itself showed that he was an intelligent showman. The importance of his promotion to headquarters staff was self-evident. When he came to New York, he was given other programs, some of them very different from the one that brought him to our attention. He immediately encountered unfamiliar terminology.

In those early days he stumbled over many a word. His pronunciation of some musical titles was nothing short of remarkable but far from correct. Still, no one regretted having added him to the staff. His employers knew he had the capacity to acquaint himself in these less familiar fields. More than anything else they wanted to preserve the happy disposition he was able to project every time he appeared on the air. He set himself to study musical terms to the extent of mastering the rules of pronunciation. Soon he was assigned to and ably handled programs of serious character, but he was always likely to stumble over a word or a phrase.

At one time, in announcing a message from the White House, he jumbled the President's name three different ways before finally pronouncing it correctly. We heard him chuckle to himself as he struggled through the various forms, until he came out with the correct one.

One or two of the responsible executives were very upset about it, but there was no reason for embarrassment. It was a very human slip. In his intense desire to do the thing exactly right and in the excitement of the moment, he could not make his tongue and lips obey his mind.

Members of the staff assigned to the White House for that part of the broadcast said tears rolled down their cheeks as they struggled to control their laughter. I have no doubt the President himself would have laughed, had he heard it.

If he had done this sort of thing repeatedly, because of self-consciousness or lack of coördination, he could not of course have

lasted long. However, his occasional slips, all of which he caught and handled in a most natural manner, only proved his fitness for his work. He never lost his head, and he became one of the most important American announcers.

Besides the qualifications already referred to, actual experience on some radio station is very valuable. This is a rigid requirement to be acceptable as a candidate on any of the networks.

Regardless of how it has been acquired, a broad educational background is essential. As I have said before, an announcer does not deal with words alone. What is needed is an understanding of their meaning and some cognizance of the subject matter. When the announcer refers to a musical composition, historical personage, or a literary work, the significance it has for him is faithfully reflected. The announcer is an ambassador. He is a liaison officer between the elements which lie behind the microphone—the program, the client, the product—and the listening audience. On a commercially sponsored program his function may be twofold: to present the program and to advocate the use of the product. To carry out this double function requires both character and competence together with all that can be summed up in the phrase, "a pleasing personality." I do not mean to imply anything precious or esoteric; but, if an announcer's attitude toward people in general and toward the work he is doing is friendly and enthusiastic, the listener is likely to think, "Why, I'd like to meet that chap."

An announcer must have flexibility, because emergencies constantly arise in broadcasting. He must have the ability to think quickly and accurately under pressure. It is one of the prime tests of his value to the company.

Programs are scheduled; artists are expected to appear. Sometimes they arrive late, or even fail to appear. The very rarity of these occasions makes the announcer's behavior at such times a test of his faculties and presence of mind. Also, on isolated occasions, because of earthquakes or other unforeseen accidents in nature or in the equipment, a program specified for a certain time

does not go out. A break in the flow of transmission occurs. Throughout the country loud speakers are silent or emit a crackling noise. If the trouble is near the point of origin, the audience must be reached from another quarter where the staff is standing by to cover just such a program failure. The announcer must think fast and accurately. He must be as composed as if these emergencies were a usual occurrence.

Prepared announcements for a program frequently come in at the last minute. The announcer must be able, after one glance at his continuity, to grasp its content and establish its mood. Furthermore, he must be able to write his own when none is supplied or to make a few notes and ad lib the announcements if necessary.

He must be adaptable, able to present a program of serious music with the dignity required, and a short time later be one of the "gang" announcing a Saturday night swing session.

If the would-be announcer has had some training in music or acting, these are valuable qualifications.

As for diction and accent, the goal is naturalness, preferably speech that is not clearly identified with any particular locality. His must be a well-developed organ of speech.

After an examination of the announcers of a national network's key station, we realize that they come from every part of the country. Representative voices hail from the cold mountain country of northern New England, from the plains of Texas, from the soft Carolinas and from our melting-pots of Eastern cities. From North, South, East, and West they come. Yet all these sectional characteristics have been so modified by effort, travel, and experience that the announcers themselves never reflect their exact origin in their radio voices.

Mandatory Instructions to Announcers

In spite of the increased efficiency of technical and general program operations, emergency situations have arisen and will arise from time to time; and it is your responsibility to deal with them calmly and intelligently. You must carefully school yourself in

advance regarding the manner in which you intend to meet any possible contingency; then, when the occasion arises, apply this predetermined procedure wisely and effectively, rehearsing in advance the part you will play in the event of an emergency. It may not seem pertinent to you at the time, but it is only by anticipation and adequate preparations beforehand that emergencies may be met most capably when and if they do arise. We must be doubly assured that there will be no blunders, no inept or inefficient handling of operations.

The following emergency announcements are included here so that you may memorize them thoroughly and be prepared to employ an appropriate procedure whenever you are confronted with an operating emergency.

There are two types of program failures from remote points:

1. *Failure at the beginning of a program.* In the event a program fails to start within forty-five seconds of its scheduled time, the standard form of announcement is, in effect, as follows:

> We regret that owing to operating difficulties we are unable to present immediately the program of . . . . In the meantime, we offer . . . .

Then fill with stand-by program. Upon being notified that transmission is clear for the scheduled program, fade out the stand-by music and announce:

> The operating difficulties which necessitated the delay in presenting the program of . . . have now been cleared, and we take you to . . . [point of origin].

2. *Failure after a program starts.* In the event of line failure of more than forty-five seconds' duration after a program has taken air, the following announcement should be made:

> Owing to operating difficulties, there has been an interruption in the program of . . . . We hope to be able to resume this program in a moment or two. In the meantime, we present an interlude of. . . .

Before permitting the resumption of the program, the stand-by music should be stopped and a further announcement should be made, substantially as follows:

The operating difficulties which necessitated our interrupting the program of . . . have now been cleared and we return you to . . . [point of origin].

At the conclusion of this announcement, *and not before,* on cue from the man in charge of production in the studio to the engineer in the control room, the regular program resuming transmission through the studio channel should then be fed to the stations so controlled.

Short-Wave International Broadcasts

On international short-wave programs when service is interrupted for longer than, say, forty-five seconds, and the engineer in the Master Control Room advises that the program is not coming through, an announcement substantially as follows may be made:

We regret that atmospheric conditions (or difficulties in short-wave transmission) have so far prevented our bringing you the program of . . . . However, we are confident that these difficulties will be overcome shortly and that we will be able to present this feature.

Then fill with the stand-by program until able to resume the international program, at which time the stand-by music is to be faded out and an announcement reintroducing the short-wave broadcast given. If, however, the program fails to come through at all within its allotted period, then common sense dictates a closing announcement at the end of the stand-by fill expressing regret over the inability to present the program in question (which must be identified by name) and indicating the reason, as suggested above, for such failure.

It will sometimes be found necessary to rewrite the closing announcements on short-wave international broadcasts inasmuch as there may be unforeseen variations in the program at its foreign originating point. For this reason, the broadcast must be scrupulously audited by the announcer in charge of the stand-by so that his closing announcement will be an accurate summary of what actually went over the air during the short-wave period.

There are occasions when the transmission of overseas programs

is so imperfect as to prevent complete understanding on the part of the audience, but not so imperfect as to require a cut. On such occasions, the announcer should interrupt the program at appropriate times with explanatory announcements. For example, we had a program from London consisting of a sound picture of England's city, town, and country life. It was a forty-five minute program; the continuity from England was difficult to understand. Static interference interrupted. Several times during the period the following announcement with suitable variations was given:

Although atmospheric conditions are not entirely favorable to the re-broadcast of this unusual sound picture of London, the British Broadcasting Corporation, in collaboration with the . . . Network, is attempting to take you on a scenic round of historic England, the City of London, visiting hotels, night clubs, music halls, municipal parks; hearing the street noises or motors and tram cars; presenting a sound picture of the evening scene in England.

This broadcast is similar in content to our recent broadcast of a sound picture of New York. Now back to England.

Be sure to check with the Production Manager or his assistants as to whether international programs should be cut and as to the type of explanatory announcement which should be made if cutting is necessary.

Failure of Speaker to Appear; Lateness

There are several instances in which a scheduled speaker's address cannot go on: arrival in studio too late for rehearsal of speech, failure of speaker to appear at scheduled time of broadcast, or the unlikely event of a speaker being unwilling to comply with the continuity restrictions dictated by broadcasting regulations or good taste.

Should it develop that, for one reason or another, the speaker and program in question cannot go on, the announcer is to say:

We regret that the program of (identify the broadcast by title) featuring a talk by (name of speaker), originally scheduled for this period, will not be heard.

Then proceed with the stand-by program, making a similar courtesy announcement at the end of the period.

If, by any chance, your speaker fails to appear at the scheduled time, but you have reason to believe that he will be delayed rather than absent, an announcement identifying the program and speaker should be given, adding that:

Mr. Doe has been unavoidably detained and, pending his arrival, we shall hear . . .

Then present stand-by music. Call the production office to advise it of the situation, so that it may contact the proper authority for instructions in the event that the speaker does not arrive at all, or else arrives so late as to render his going on inadvisable.

Substitution of a Program for the One Originally Scheduled

Whenever it is found necessary to substitute one program for another originally scheduled to be heard, a courtesy announcement must precede the substitute program. Ordinarily, the canceled program may be referred to as "the program originally scheduled at this time." There are many instances, however, in which the canceled program is of such importance—either by virtue of its special audience interest, or because it has been particularly publicized—that it must be identified in an opening courtesy announcement and again at the close of the substitute program. Generally the courtesy announcement will appear in the continuity for the substitute program.

While the foregoing is intended as a general basic outline for handling emergencies, it is, of course, expected that in all instances requiring special handling, or when there is any doubt whatsoever as to proper procedure, you will not hesitate to communicate with the Production Office.

*Stand-bys**

Certain rules for handling stand-bys have grown out of ex-

* The instructions for stand-bys are essentially the same as in Chapter X but are included here for special reference to the authority of the announcer.

perience. These must be followed without fail. Where both studio manager or director and announcer are assigned to stand-bys, both the studio and control room must be covered, and contact must be maintained between the two so that in case of program failure at the point of origin, suitable action may be taken, at the time indicated for it by pre-arranged signals between the two.

When the announcer is also acting as the studio manager and if he and the engineer are covering the stand-by, a similar procedure involving the use of pre-arranged signals in the event of an emergency must be employed.

The studio manager or director or the announcer in charge of the stand-by studio is held responsible for the discipline of the orchestra assigned to the stand-by. Members of the orchestra must remain in their seats and be quiet except, of course, when the orchestra is rehearsing. In any case, stand-by music should be on all stands and at least three numbers of the musical routine selected in the order in which they are to be played in case of a break.

Members of the production staff must remain in the studio until the assigned period is completed.

Early System Cue

When the system cue is given more than fifteen seconds and less than five minutes early, local identification should be given twenty seconds after system, and stand-by studio continue to feed without announcement until five seconds prior to the scheduled moment for the beginning of the next program.

When the system cue is given as much as five minutes early, the remaining period should be filled with stand-by music (with announcement) in a short but complete program, ending with system cue and local in accordance with regular procedure.

We must be very deliberate in taking air from stand-by studios in the event of any kind of program failure. The listening audience is well aware that breaks do occur. Dead air of from thirty

to forty-five seconds is a natural result. This gives time to check with master control to ascertain whether or not the program failure is likely to be a permanent one. The standard announcement from the list contained in this chapter can then be used; then, if necessary, the program may continue from the stand-by studio.

Station Breaks

As a means of enabling stations which may not be taking the next program of a sustaining artist or feature to cut from the network during the announcement of the date and time the program will next be heard, such announcements are given at the end of the program preceded by the announcer's name as a cue and a two-second pause.

These announcements always end with the phrase "Eastern Standard Time" or "Eastern Daylight Saving Time." The local stations are in this way enabled to cut away, if they are not taking the next program, to give such local announcement as may be required, and to tie in again with the network for the system cue and the theme music which follows.

Federal Communications Commission Ruling on Announcement of Call Letters of Broadcast Stations

Each licensee of a broadcast station shall announce the call letters and location as often as practicable during the hours of operation, and in any event before or after each program being broadcast. In no event shall more than thirty minutes elapse between such announcements, and insofar as practicable these announcements shall be made on the hour and half-hour. These requirements are waived when such announcements would interrupt a single consecutive speech, play, symphony concert, or operatic production of longer duration than thirty minutes; and in such cases, the announcement of the call letters and location shall be made as soon as possible.

Call letters of stations need not be announced within thirty minutes or less of the previous announcement but shall be made as near thereto as practicable. During variety-show programs, baseball games, and so on, of an hour or more in duration, the call-letter announcements shall

be made on the hour and half-hour within a five-minute period thereof. That is, the half-hour announcement shall be made between twenty-five and thirty-five minutes after the hour, and likewise the hour announcement shall be made within five minutes of the hour.

Ad Lib Announcing

After a speech has been given over the network, do not turn to the speaker and say: "Thank you, Mr. So-and-So," or "We appreciate your having spoken," or any comment of that nature.

Rather make just a straight announcement of what has been on the air. In other words, "You have just listened to Mr. So-and-So talking on such and such a subject," without any additions such as "the brilliant talk of . . ." or "the interesting address of. . . ."

Avoid the use of such phrases as: "You have been *enjoying* the music of . . ." or "You are being *entertained* by. . . ." Nor should you say: "We hope you have enjoyed So-and-So as much as we have in the studio." Instead of either of these, say: "You have been *listening* to the music of . . ." or "You have *heard*. . . ."

On the opening announcement at the start of half-hour sustaining programs, don't say: "You will now hear thirty minutes (or a half-hour) of music by So-and-So's Orchestra"—because a number of stations may take the programs for only fifteen minutes; therefore, this announcement may cause considerable embarrassment to affiliated network stations.

After Required Middle Breaks

On half-hour programs, it is never permissible to re-introduce a program with such remarks as: "We *continue* with the music of," or "So-and-So *resumes* the program with," because certain stations may just be joining the chain at that time. For this reason it is imperative that no reference be made to that part of the program which preceded the break. It is enough merely to re-identify the program as if it were just beginning: "We present the music of. . . ."

The excessive use of trite phrases in ad lib announcing quickly becomes tiresome to the radio audience:

At this time we bring you. . . .
Their own special arrangement. . . .
Now we hear. . . .
And now we present. . . .
Ladies and gentlemen. . . .

These should be avoided as much as possible. The too frequent use of "Ladies and gentlemen," particularly in dance-orchestra programs, must be avoided. The use of "Thank you, John Doe" by one announcer to another in multiple-point news broadcasts may easily be overdone and had best be eliminated entirely.

Refrain—whenever possible—from referring to the time of day in introducing network programs. While an announcer in New York may be saying, "We present this afternoon," it may be only morning in California. The public resents this difference in time being brought to its attention.

Time Checks

Announcers assigned to the responsibility of programs originating in hotels, restaurants, and ballrooms remote from the main building must obtain time checks at least five minutes prior to air time, as the private line is used to feed cue to the remote engineer for the five minutes preceding the air show.

Conciseness in Announcements

The announcements of individual numbers or groups of numbers should be as concise as possible. Rather than detracting from the announcer's individual style, conciseness will add to it, as he is very apt to become tiresome if he attempts to ad lib extended descriptions of the selections played or of the setting. In this type of program, the announcer is assigned to give credits and identify numbers only.

No attempt to be facetious, to pun, or to wisecrack about song titles, situations, and so on, will be countenanced. Announcers

must confine themselves to brief, direct, conclusive comment in presenting the selection to be played.

Introducing Final Numbers

It is poor showmanship and creates a negative impression in the minds of hearers to introduce the concluding number with such a phrase as:

Finally the orchestra presents. . . .
In conclusion. . . .
Closing the program. . . .

When Announcer's Name Is Not to Be Used

There is an old accepted and unwritten law in radio for announcers, which has grown out of the inherent courtesy of those announcers themselves; namely, not to use their own names on any program comprising a speaker. The announcer should not use his own name unless he is required to do so as a cue; in general, too frequent use of the announcer's name must be guarded against.

12

Radio Drama Comes of Age

DRAMA—whether presented on the stage, on the screen, on printed page, or by radio—needs no justification here. As a cultural influence in the life of any presumably civilized people, it is a minimum essential. The problem in radio was to develop the use of the medium so that drama written for it might be accorded the popularity and respect enjoyed by its closely allied media—the stage and the screen.

If at the beginning it seemed perfectly logical that radio broadcasts of music would be effective entertainment, the outcome of the dramatic program was not so certain. There were all sorts of theories on the subject. Most of them arose from the fear that the cancellation of sight would negate all but a few of the dramatic forms.

There was the problem of clearly identifying characters to the listener. Would he know and recognize two different women by their voices alone? It became obvious that this difficulty could be solved by casting actors whose voices were sharply differentiated. But the fear of confusing the listener still persisted, and one of radio's earliest theories was that the simple one-act play form with very few characters was the only drama form usable on the air. Radio looked in the direction of the theatre and admitted that as a dramatic medium the theatre would always excel in subtlety of conception and expression. The fact that radio could capitalize

on its newspaper-like function by using simple informative speech directed at the listener seemed to prove further that the more fictional dramatic form would never be popular.

However, when radio's first amateurish attempts at the dramatic form met with such enthusiastic response, discussion was reopened regarding which dramatic ideas would lend themselves most readily to broadcasting techniques. Some believed radio better suited to the epic story than any other conventional dramatic form.

The advantages of radio as a medium for drama were not early appreciated.

Writing the Radio Drama

In contradistinction to the playwright, the radio writer can avail his imagination of the same broad panel as the novelist. Music and a great variety of realistic sound effects help him change his scenes convincingly. Because there are no physical backgrounds to build and paint in order to provide the audience with the illusion of reality, radio drama has even greater freedom than the theatre or motion picture. There is nothing to prevent the radio writer from changing his scene of action from Alaska to the island of Bali or the planet Mars; neither is he forbidden in the use of time. It may be Genesis or a conjectured future. A radio writer may arbitrarily limit his drama to a form which is complete in one broadcast. In this form he controls himself by the same considerations as the playwright. But the playwright *must* limit himself to a form, from ten minutes to six hours for a performance, whereas the radio writer may inaugurate a serial drama like "Myrt and Marge" which, at the moment of writing, has already run its fifteen-minute period five times a week for a number of years. The only dramatic form which cannot be broadcast is pantomime—and even that can be described.

A play is a result of collaboration. Five individuals or groups of individuals enter into this coöperative work—the author, the producer, the actor, the scenic artist, and the audience. The

dramas which appear in playhouses, on the stage, or on the screen are not complete until each of these groups has contributed its part. This fact has been so emphasized in all works on the theatre that it requires no further elaboration here.

In radio these five are the same except for the scenic artist. But this does not leave an omission. The scenery in the theatre of the air is more elaborate than any other. The only boundaries are those that have been set by nature and experience upon the imaginative powers of the audience and the ability of the radio craftsman to suggest by word and sound.

The scenery of the stage is three-dimensional. That of the screen can vividly be made so by a new technique, utilizing a two-color filter for the eyes of the spectator. There is some promise that the illusion of three dimensions may soon be brought about even without the use of this device.

The scene which may be set for the radio play extends not only in three dimensions. Time, which gives the fourth dimension, is as easy to manipulate as any of the others.

The skills that produce the scenery in the theatre of the air derive from the crafts which combine in the production. We first consider the writer, for with him the play begins.

To the experienced dramatist, when he approaches radio, an apparent lack of scenery will appear as a limitation. He misses the painted set. It is hard to realize that every glorious vista that nature conjures may be conveyed by a few well-chosen words, a bar or two of music, or an authentic sound effect. These years of radio have discovered amazing lengths and depths in the imagination of the unseeing audience. As Coleridge said, "The eyes make pictures when they are shut."

The author is not circumscribed. The origins of good writing for the radio theatre are essentially the same as for any other stage. They spring from the same gifts of imagination and insight, the same mastery of words. Although a deepening of the perception of the listener calls for new technique, a new range of expression and interpretation is provided. New tempos! The author's

words pass the actors' lips and reach the listener in the furthest outpost the instant they are spoken. New thresholds of sound! The softest whisper may be heard.

Words that fly with such speed must be chosen carefully. Words in the air are spent just as they fall. And they must be words strong enough to stand alone. Unassisted by facial expression and gesture, accompanied only by suggested action, the syllables themselves must bear the weight of thought.

In writing for radio it must be taken into consideration that the vast unseen audience partakes separately of the play. Listeners do not take contagion from each other, nor feel the surge of emotion that often runs through the pit and gallery of a crowded theatre. Authors for the stage count on this. The radio dramatist cannot. His million hearers cannot amplify effects.

Any complete discussion on writing for radio must necessarily be a book and not a chapter. In these pages I merely write from the point of view of one who has an experience with the direction of the written dramas that come into his hands—and with the general pertinence of writing as it relates to production in the theatre of the air.

This first of the collaborators, the author, should gain a thorough knowledge of all production procedures by actual experience in the studios. He will then understand what each of the others can contribute. As he writes he will have the director, actors, and sound technicians in mind, as well as his audience. What he writes will call for special studio behavior from one or all of the producing group. Two scenes of action will become controls of the final form of his manuscript: one within which his characters move, and the other when the director, engineers, and performers are at work. And not only will his written play be more suitable for radio, but his pleasure in writing it will be enhanced.

The stages of theatre and screen have their conventions and techniques. They are continually being improved and elaborated. The rules are arbitrary. When there is a departure from them by the author, it must not be by accident. The great modern drama-

tist Eugene O'Neill wrote a play in which he extended the use of the stage whisper to a new role. In it the actors spoke out loud, yet to no one in particular, such thoughts as would not be voiced in real life, and rarely on the sound stage even as an aside. The utterances were alternated with customary phrases which carried the fundamental lines of the play.

It was fine that O'Neill did this. Writing on two planes of consciousness was a new expression for the American stage—and a new device was needed to meet it. In leaving the beaten path, this playwright proved himself great because he pointed out another route.

Conventions, acceptable to the audience and useful to the members of the collaborating group, have developed in the radio theatre.

Those currently in use will be adequate for most dramatists until better ones are discovered. An intimacy with the studio will uncover new ones. In the visual theatre there are curtains and brief periods of darkness to denote the passage of time. In the radio we have substituted music, sound effects, fading, and instants of silence. The "curtains" may be music, colored according to the dramatic mood or suggestive of the coming scene. Or they may be carefully rehearsed effects of wind or sea, sounds of a swiftly moving train, or the chug-chug of a boat, that serves to bridge time and distance between scenes. An instant of silence may be radio's counterpart to the moment of darkness on the visual stage.

Radio dramatists and directors discover how intimate this new theatre can be. Despite the unlimited attendance, the audience can be brought close to hear the lowest-voiced confidences—the hushed words breathed at a hospital bedside, whispered protestations of love. . . . Such close contacts are not possible in a playhouse. In radio they are achieved by picking up low voices on a separate microphone so close that they are audible over the backgrounds sounds and conversations. This is a new dramatic perspective. Imagine the variety of perspectives made possible by

several microphones, by using frequency filters* or mechanical sound amplifiers!

In writing legitimate drama, tradition has the author commence each scene and act with description of the set. This is later constructed to his specifications. In the script for a radio play, the author sometimes does the same. If intelligently read by an actor or narrator, he can help the listener construct the scene better than any group of architects, carpenters, and painters. A vivid description of Johnny the Priest's saloon, or the stern of Old Chris' Barge at once transports the audience into a scene of "Anna Christie" with such suggested realism as would gratify O'Neill. New times, new devices! The swing of the pendulum carries us forward, but it swings back to do so. If the dramatist renews his acquaintance with the ancient Greek theatre, he may find in the messenger who trod the stage erected beside the temple of Dionysus, and in the chorus which chanted tragedies unseen, the prototypes of announcers, narrators, and formal voices of radio.

The technique of writing for radio sums up to this: that the author must constantly think of both the production and the aural effect of his play, the action in the studio and the final form in which it appears to the public. Yet, though two decades have passed since this drama form originated, many manuscripts are still being returned to be rewritten. These writers do not know the mechanics of sound effects or of the manual,† electrical, and vocal effects available in any good sound library. I do not recall more than three authors who ever took the trouble to spend a week with the sound-effect technicians and their equipment to find out what combinations can be produced. The execution must be left to the sound engineer, but the smart and successful writer of the future should know these things.

Much has been said about the adaptation of stories for dramatic production in radio. We sympathize with the difficulties of condensing a three-act play, which normally lasts two and a half

* See the Glossary, page 360.

† These are discussed at length in Chapter 14.

hours, into a broadcast of less than thirty minutes. To be sure, it is equally difficult to adapt an author's script written especially for radio, in which he has obviously not even taken the time element into account. Sometimes a play is submitted consisting of eighty typewritten pages, enough for an hour's performance. The work of cutting becomes serious. To try cutting this to fill a half hour-period without suffering loss in the broadcast is difficult. If scenes are finally eliminated because there is not time to play them, they should have been left out in the first place, for if the play is a complete thing, not padded with unnecessary dialogue, it necessarily suffers by being slashed. Therefore the author is the logical person to do the cutting and trimming, and he should know why. He should know that he has twenty-nine minutes and thirty seconds of the half-hour to fill, inclusive of explanatory announcements and the opening and closing credits. He must be able to sit down and write such a drama, allowing the specified time for announcements. In his script he cues in all of the sound effects, the manner in which each scene fades, its transit into the following, also exact instructions for the actors and any hints he may have for the director's convenience. I think he should even know what recorded and mechanical sounds are available, test the difference in character and quality and explain in his cues exactly what he wants.

There is one writer who has a library of recordings of sound effects. These he plays over and over at his home. There may be others who do so. It is hoped there are. Owing much to this practice and to his familiarity with the studio techniques, he has produced radio dramas of great merit. Such care in preparation explains why he is one of the industry's highly paid writers.

Two Radio Dramas

"Ma and Pa"

Radio drama has, in fact, reached such a convincing point in its development that the network must be especially careful to let the

listener know that what he is to hear is fictitional and not real. Thus, a radio play may be simple in form or cast, or as complex in form and cast as an epic dealing with the movements of a whole race of people. All types of radio plays have been successfully broadcast, ranging from the simplest homespun drama to the more pretentious epic which strains all the resources of a station; and, of course, each type of radio drama must be judged by what it sets out to do.

A series like "Ma and Pa" though simple in form may enjoy great success. A cursory study reveals how one writer made "Ma and Pa," a man and his wife, interesting enough to have held its audience for a year. Ma and Pa are very typical Americans. While they are more representative of Cape Cod than Western Oregon, they have greater appeal to the listeners because they belong to a certain community which the listener likes to think of as truly American, whatever city or state he lives in. There is a native charm in the simplicity of Ma and Pa; in their quiet humor, homely philosophy, and amusing shrewdness. Their speech is, of course, of that clean New England phraseology and inflection heard in the narrow isthmus that juts out into Buzzard's Bay.

We are still a country dominated by the spirit of the early settlers; and the setting and characters of this drama were taken from one of the many sections where pioneer qualities still linger. The writer might have chosen to get his background for this story from the rich sources of literature dealing with the men who traveled up and down the Ohio and Mississippi Rivers working and fighting along those shores; or from the many legends of the plains, or yarns of the Western cowboys. Although a typically American philosophy and wit may be discovered in these sources, the author of "Ma and Pa" put his own life into his writing by choosing a section with which he himself was familiar. He was born and raised in Massachusetts. He knew his Cape Cod, so there he went. Cape Cod—quaint, serene, sufficient unto itself—a land of farms, lakes, rolling fields, and thick forests almost sur-

rounded by the sea. Dotted over it are immaculate white cottages, tucked away between sheltering elms.

In one of these little white cottages Ma and Pa lived. In the front yard was a dory. Rescued from the sea when worn out in service, it found harbor. It was filled with earth and served as an enormous flowerpot. Upon its lap-streaked sides it bore the inscription "Ma's Foode Shoppy." It told of an attempt to adjust life to changing economic conditions.

Ma is a straight, small, energetic woman, sharp in feature and sharp in wit. She is a little bossy, yet always with a kindly twinkle in her eye. Pa, the listener is asked to believe, is large, slightly stooped, and rather gangling. His keen sea look belies the slowness of his movements. Neither of them is young. Pa, fearless in the face of ocean storms, had long been a little cowed by his dominating wife, but he evades any issue, and avoids conflict by another form of shrewdness.

These visual impressions of the characters are important and useful to the radio writer, but in the actual execution of the manuscript the radio writer must see *for* the listener. The easiest way for the writer to fulfill this obligation for the listener is to have one character describe another.

A few other characters, mostly neighbors, come into the scene to keep the story moving, to add elements of humor and character relationships, and to disclose reasons for dramatic struggle and provide the necessary situations.

This series of "Ma and Pa" is one of the most interesting and successful ever attempted on the air.

At the other extreme was "America's Hour," an epic about our country. It was thought to be a bold attempt in radio. It had, of course, to be different from the usual re-hash of a textbook on American history—something more vital.

Each week the dramatization would deal with some phase of American life: the story of the railroads, the story of oil, the story of American medicine, the story of aviation, the story of agriculture, and the story of American forests. In each period the producers aimed to bring to the audience scenes which sketched the

American pageant as both forefathers and contemporaries moved everywhere within our borders to possess the land.

To every American such plays have some personal meaning, and in this day it is considered a good thing to recall problems which faced Americans in the past, and to show how they surmounted them. Earlier difficulties were, after all, as forbidding to our forebears as any which are presented now.

This hour did not fail to supply a welcome chord of faith and courage in the minds of those who made up the large audience. It was extremely successful. The response was gratifying.

Here, then, is the theme. What of its development?

The general idea for a dramatic program, to say nothing of a series, is a vague and general thing until it becomes concrete first in a synopsis, then in a written play.

"The Drama of the Farms"

I select for illustration steps in the preparation of one of the series in "America's Hour," called "The Drama of the Farms":

Beyond the streets, the factories, and the homes, at the very foundation of this infinitely complex industrial civilization of ours stands the farmer and the ranch owner. Back of these ranches and farms lie three centuries of growth. To the days of the pilgrim fathers we return for our first episode. The clearing of the land and the sowing of crops in a new and perilous country supplies the first dramatic scene. For the next we swing to the South to an early cotton plantation. Here we are naturally led into the dramatic story of Eli Whitney's cotton gin, which saved the plantation owners in the midst of a desperate economic crisis. In prairie schooners we follow pioneer farmers to the West. The time is at the close of the Civil War.

Then comes the story of the settling of grazing lands; the old Chisholm cattle trail, running from San Antonio to Fort Worth and Doan's Crossing on the Red River; fights with outlaws; movements of cattle in enormous herds; wild stampedes. We ride with the cowmen north from Texas to the fat summer grazing lands of Wyoming and Montana. We press westward to a

new frontier, where tall grain elevators were to stand along the railroad. Down the Great Lakes we plough in slab-sided freighters carrying American wheat to Eastern cities and ocean ports for shipment overseas. Then, of course, there is drama of grain farming on an enormous scale: the denuding of the lands, the loosening of the top soil, the coming of the droughts—this last, a new thing to face.

We must have in our drama some modern farmers recalling when they first arrived and broke virgin soil with tractors and gang plows, when the crops grew so rank and tall they feared the planting could not ripen before frost, when heads of oats contained two hundred grains and the yield stood breast high as far as the eye could see. In our last episode we see nothing but dust —dust that bellies and swoops before gales which drive across the prairies and into cities, halting traffic, stopping work, closing schools. In the open spaces it grinds the paint off houses, buries small animals, drifts over roads until they are obliterated. It climbs air currents to a height of ten thousand feet. A new record in the immensity of waste and destruction!

The last step in developing a dramatic program is the writing of the script. As an example of the finished work an episode of the "Drama of the American Farm" is here reproduced.

Note the time record on the margins. The notations on the left of the page and the inside column on the right are rehearsal timings. The column at the extreme right of the page gives the timing of the air show. Some studio managers prefer the use of one margin for rehearsal and the other for actual air record. Others keep both on the right, crossing out the first timing as the final one is recorded. The entire performance of the program lasted one hour. According to the rehearsal timing the narrator should begin the introduction of the episode at 30 minutes and 10 seconds after the hour started. In the broadcast this point was reached 15 seconds later. The variations in the time required for the different speeches between air show and dress rehearsal are clearly shown by the figures.

30:10 30:10 30:25

NARRATOR: Each year the great herds moved north from Texas to the fat summer grasslands of Wyoming and Montana. Five, ten thousand cattle on the move, prodded onward by lean, hard-riding cow punchers, tanned to the color of their saddle leather. Some of the herds stayed north and the cattle business gradually branched from the Mexican to the Canadian border, dominating the great open stretches of the West. But as the decade of the 70's

30:35 30:35 30:43

progressed, the Homestead Law began to have effect. Fewer covered wagons now . . . but the pioneers still keep pressing westward . . . still keep pushing back the frontier. In western Kansas in 1885, Phineas Burch, a wheat farmer, rests beside his plough to eat the food brought to him by his young son. . . .

30:55 30:55 31:05

BURCH: Is your momma gettin' the kitchen painted, Ran?

31:00 31:01 31:10

RAN: Yeah. . . . I been helpin' her with it. I'd ruther work out here, though, Pop, with you. Kin I plow awhile?

BURCH: You're a mite too light yet, Ran, to sit a plow.

31:10 31:10 31:20

But don't you worry, son. Look at them fields stretchin' out there, farther than the eye can reach. There's all that to plow, and more. Wouldn't wonder if there'd be some

31:20 31:20 31:28

of it left, time your own son comes along.

RAN: Kin I climb up on Dolly and ride a piece with you.

BURCH: Shore. But not far 'cause I got to seed this patch

31:30 31:30 31:38

by end of next week. Spring's gettin' along. Seems like the seasons out here rush up on you even more'n in Illinois. . . . Giddap, Dolly. . . . Go along, Jim. . . .

31:40 31:40 31:49

SOUND—He slaps reins.
Horses drag plow.

RAN: Whatever happened to all the Indians, Pop?

31:50 31:50 31:57

BURCH: Why they was in this country not so long ago. Government's got 'em all on reservations.

RAN: I wanted to fight Indians out here.

SOUND—He puts his hand over his mouth and gives an Indian call.

32:02 32:02 32:09

BURCH: Don't even think that'd scare 'em up, son. Nope, there's nobody left to fight, but thar's plenty of work to be done.

SOUND—Galloping hoofs.

RAN: (Scared) Who's that comin' Pop? P'raps it *is* an Indian. . . . Giddup . . . Dolly . . . run.

32:15 32:15 32:22

BURCH: Whoah! It ain't nobody but that rancher from down the road, son.

SOUND—Horse gallops up and stops.

BURCH: Howdy, Mister Dixon.

32:23 32:23 32:30

DIXON: (Brusquely.) Burch . . . I want to talk to you.

BURCH: Why . . . of course.

DIXON: I've been riding over my east forty just now and what'd I run smack into but a *fence*. . . .

32:30 32:30 32:38

BURCH: Why, yes . . . Mister Dixon . . . I put it there, fence in some hogs I'm plannin' for.

DIXON: Hogs! It don't matter to me what filthy beast you wanta bring into this country, but that fence'll have to come down. Fact is, it's down already, 'cause my men tore it out.

32:45 32:45 32:53

BURCH: Now looky here, Mr. Dixon . . . you ain't got no right . . .

DIXON: I dunno where in tarnation all you nesters are acomin' from. You're settlin' like locusts, till a man don't know where to turn.

32:55 32:55 33:02

BURCH: Now Mr. Dixon, we got a right here. It's a free country.

33:00 33:00 33:07

DIXON: It don't look free to *me* any more. Got so many fences around me it's gettin' so I feel like a gol-darn chicken. (Seeing new cause for rage.) What are them posts over there by the road?

BURCH: Why, those. . . . Why I was aimin' to string barb' wire. . . .

DIXON: (In a rage.) A fence right beside the road! Them posts are comin' right out now.

33:15 33:15 33:20

BURCH: Now, Mr. Dixon . . . you wait a minute.

SOUND—Hoofs and wheel distantly.

DIXON: (Panting.) I'll wrench 'em out. . . .

33:24 . . 33:24 33:28

RAN: (Scared.) Pop, don't try to fight him. He's rarin' mad. Please don't fight him! Please don't.

SOUND—Horse and carriage pulls up.

MRS. DIXON: (Insistently.) Whoa, Belle! (Calling.) Frank! Frank!

33:30 33:30 33:34

DIXON: Katherine . . . what are you doin' out here?

MRS. D. What are you tryin' to do with those fence posts, Frank? Lands knows they don't belong to *you.*

BURCH: He's aplannin' to wreck my farm, Missus.

33:39 33:39 33:44

MRS. D: Don't you mind him. He's kinda teched in the head on one subject—fences. Frank, you come here.

BURCH: I'd like to be neighborly, Mrs. Dixon. I don't want no bad blood. I'd even be willin' to tell Mr. Dixon anything I could about breedin' stock.

33:53 33:53 33:59

DIXON: *You'd* tell *me* about how to breed cows.

MRS. D: Now you listen to him, Frank. Don't be so unneighborly.

BURCH: Don't seem to make sense to let a herd run crazy, Mr. Dixon. I hear tell over in East Kansas visitin' my wife's people, about a breed just over from England. Herefords they call 'em . . . and it makes a fine cross with Longhorns.

34:15 34:15 34:22

DIXON: Keep your advice to yourself.

BURCH: Can't figure nohow why arey man'd waste land like this on steers—it'll grow anything—but if you want to run a stock farm. . . .

DIXON: I run a ranch . . . it's no darn stock farm.

MRS. D: Frank, you get in this buggy with me and tie your horse onto the back.

34:29 34:29 34:35

DIXON: I'll be plum glad to get out of here any way at all.

MRS: D: You oughta be ashamed . . . with a child lookin' on. (Calling.) Little boy. . . .

RAN: Yes ma'am.

MRS. D: Tell your mother I know what it's like to get settled, and I'll send her over a batch o' bread next week.

RAN: Yes ma'am.

34:45 34:45 34:51

MRS. D: And is there anything *you'd* like to have, sonny?

RAN: If . . . if'n I came over some day, could I sit on one o' them pinto ponies you got. . . .

DIXON: (Gruffly.) Come over when you want to, son . . . but you was born too late ever to get much fun outa a paint pony. . . . Giddap, Belle . . . giddap.

35:02 35:02 35:08

SOUND—Slaps reins.
Horse starts moving off.

(TIME LAPSE WITH EFFECTS)

35:18 35:18 35:23

DIXON: Giddap, Belle . . . giddap.

MRS. D: Well, Frank Dixon, calmed down any?

DIXON: Ooomph.

MRS. D: Ain't you more'n a mite ashamed of yourself?

DIXON: Ooomph.

MRS. D: How long you figure you're goin' to keep up this fightin' with every new settler comes in here . . .

35:31 35:31 35:36

DIXON: I dunno. I hate 'em.

MRS. D: Frank, those folks have gotta work and live jest's we used to. We did our part buildin' up this country but we can't keep to ourselves.

35:40 35:40 35:44

DIXON: Darn fool hoe men! They've spaded up the whole Chisolm trail.

MRS. D: Why don't you get some English stock, Frank, and figure out some cross with the Longhorn that'll give it more beef than brawn. . . ?

DIXON: What fer? Straight Longhorn has served us purty well to date. . . .

35:55 35:55 35:58

MRS. D: Longhorns was well enough for the old West, Frank, but the West is changin'. The open range is jest about finished. More'n more dirt farmers are comin' every year.

DIXON: What's that got to do with tryin' out English stock?

36:09

MRS. D: Jest this, Frank . . . cross breeds bring better prices and the time's come when you can't afford to raise scrub cattle on land that costs you money.

36:20 36:20 36:24

DIXON: Guess you're right, maw, but doggone it, I don't like the idea nohow.

MRS. D: Fiddlesticks. You done some fine work oncet, Sam. You pioneered this country. Goin' to stop now jest cause things are changin'?

DIXON: No, maw, don't spose I will.

MRS. D: You ain't too old to change with the times, are you?

36:40 36:40 36:42

DIXON: No, I hain't any sech idea in my head. . . . An' I s'pose you are right. S'pose I done as much as anyone

to make this neck of the woods fit for human habitation but I don't seem to like it as well now humans are moving into it. I don't like 'em—I like cows.

37:02 37:02 37:04

MUSIC-CURTAIN

FADE MUSIC INTO NEXT SCENE

Between simple and pretentious dramatic productions lie thousands of kinds of radio plays for single broadcasts or for series.

We have one-hour air versions of the classics—Shakespeare, Marlowe, Moliere—and of the Pulitzer Prize plays; revivals of "Bertha, the Sewing Machine Girl," "The Black Crook," and "Ten Nights in a Bar Room"; experiments in drama by the able authors associated with the British Broadcasting Corporation; reserved periods for proving and developing dramatic techniques in NBC's "Radio Guild" and Columbia's "Workshop."

In this experimental field intelligently directed work has gone into the preparation and direction of plays. Outstanding playwrights, poets, actors, and directors are participating in this experimental work. Significant productions have resulted, which would receive mention here if reporting were our purpose.

But all radio dramas would be willingly classified as experiments by their authors, adapters, and directors. This end of the industry is a workshop, whether so labeled or not. There has been much sincere, able workmanship resulting in finished and capable entertainment. There has also been trash. I regret whatever commercial success attends the presentation of some of the unworthy shows. I believe that general intelligence is higher than it is frequently judged to be. The success of the better dramatic entertainment supports my view.

Whether the plot of the radio play partakes of the simpler experience of a "Ma and Pa," or the racial experience in the westward drive of a great people, the idea must take form in the written drama.

Ideas suggested for broadcasting are still undeveloped. One inexperienced youth suggests that his idea of a dramatic series based on life in a boarding or rooming house be used. Fair enough. Wherever life goes on there is drama. We ask for more —the theme of the story—the central struggle around which the dramatic series will be woven. Perhaps there is a script? No! Just an idea of a boarding house. Then it is explained to him that program-ideas must be more definite. Suggestions concerning a particular house, the description of the landlady and a few of the guests were given.

But making suggestions—such as mentally to peel off the front wall of the house and fill the room with actors as though it were a stage—take time. Program directors, though charitably inclined to the newcomer, usually have their own perplexing problems to solve. If the idea is crystallized to the manuscript point, criticism and suggestion is a much easier, because more specific, task.

There are many kinds of ideas, but the only ones useful to the producers are those which are given body in a completely written play. If it is a series, then there must be a few completed episodes, and a synopsis of the rest.

"Ma" and "Pa" were carefully delineated characters in a written play. They did things and said things, first in the author's thoughts, then on paper. That is why a director could take the author's place when the piece finally came into the studio; why the actors could restore to the characters their physical dimensions and powers; that is why they finally sounded real on the air.

Many inexperienced persons have the impression that radio is still an amateur's picnic ground. We have able dramatic writers, associated with the network organizations and many stations, who can develop ideas. But themes of their own choosing are usually more fruitful than any brought in by the novice. Anyhow, it is common knowledge that there are no new basic ideas. The amateur has selected his pattern from those at large. It is the

original twist that is given by a clever imagination that makes for novelty. The successful radio dramatist entertains us by letting us look at the old idea from a new angle.

In considering a radio drama for a single broadcast or a series, the basic program idea is, of course, immediately identified with the idea back of the manuscript.

13

Directing the Dramatic Program

THE SHOW, on paper, is placed in the hands of a director. He should not have to do any of the author's work; his work is to get it on the air. He should be able to get the mood, the feeling of locale, the rhythm of action, by one careful reading. If he is not enthused by the play, it must at least be clear to him. Naturally, it is better if he likes it and is glad to direct it. In any case he reads it again. All the effectiveness of the play becomes translated into sound. He hears it. The actors speak. Pa and Ma are talking. Now he sees more because of what his imagination hears. Windows go up, doors slam, cars whizz by on the new road in front of Ma's Foode Shoppy. One stops. Action! Sounds of action, words of action. All this is what the director must get through the transmitter when he takes a play into the studio.

He goes over the manuscript again. This time he makes notes. He sees the sound perspectives, and writes in the margin (if the author has not correctly done so) the positions of actors with relation to microphones. Perhaps a modification of the normal characteristics of the transmitting equipment will be desirable. He marks a passage to be tried on a filtered mike,* and makes a notation to talk to his studio manager and the operating engineer

* A microphone in which the tone characteristics are changed by eliminating or augmenting frequencies.

about it. On the edges of this copy of the script go also notes on background sounds. Are they near or distant? Under how much of the dialogue should the sounds extend? He plans to avoid any conflicting sounds. He is after clarity, not confusion. He makes an appointment with the sound-effects section to discuss details; also with the musical conductor if incidental music is required. But neither sound effects nor music must attract attention to themselves. They must be carefully selected. The manner of their performance must be clearly understood by the director and his assisting craftsmen so that effectiveness, and not irrelevant distraction, ensues. But before going into any conferences, the director selects his cast.

Casting the Drama

This part of the director's responsibility—casting—is more difficult than may at first be imagined. It is true that the actors' physical characteristics are unimportant. The actors' appearances do not have to correspond with the author's conception of his characters. Their movements and gestures need not be watched. It is not important for them to know right or left stage, upstage or down. As yet they do not have to be photogenic. But the concentration on a single quality—the voice—is precisely the reason underlying the difficulty of radio casting. Nothing can be left to physical grace or beauty, to gesture or facial expression. The actors' gifts must be translatable solely into the voice. Character delineations, mood reactions, nuances—all the subtle meanings—must be conveyed by their manner of speaking words into a microphone.

The problem of casting is a serious one to many stations and broadcast centers because really good actors are always hard to find. In a large amusement center, the available number of good actors and actresses with microphone experience makes the casting job easier. Casting lists are obtainable, and there are bureaus which keep records of actors. The director is fortunate if he is

familiar with the work of a great number of experienced actors and has made use of them before.

Among the available male and female leads, character men and women, ingenues, juveniles, child actors, and so on, will be a number with stage experience. Some will have had good training or have appeared on so many radio programs that their technique is excellent. Another dependable group may have had little or no stage or screen experience, but does have talent and a constant experience with radio. This group can by no means be classified as amateur. Many stage and screen artists are considered unsuitable because their voices are not trained to be complete organs of expression. Other stage players have enjoyed no working association with the theatre of the air.

The amateur and student theatres have not yet provided an appreciable amount of talent for radio. This may not be the case when better knowledge of the medium and better facilities are available in local home and college centers. I hope to see, in connection with local stations and in colleges and universities, the springing up of Little Radio Theatre Groups. Out of them could come skilled dramatists and talented players. Such a movement would do a similar service to radio as it has to the legitimate stage.

The director selects his cast from trained players. Not only do they know how to deliver their lines at microphones, but they understand the sign language and the verbal instructions given during rehearsal and broadcast.

Type casting is done in some instances. It is impossible to avoid the conventional association of voices with a number of common theatrical roles. A certain type of voice will invariably cause its owner to be cast as a seaman, or a gangster, or a policeman, and so on. But versatile actors, who can do subtle or obvious variations of these theatrical types with their voices, are usually chosen for character roles.

Auditions play a part in the selection of a cast, though not in the immediate problem of casting for a particular show, for which the

director depends upon the lists and his knowledge of the actors' ability and experience. But unless the actor is a star and came to radio by divine right, he will at some time have been heard in trial readings.

The audition for the actor is never a completely satisfactory thing. Neither the director nor the candidates accomplish quite what they want. The director never really knows what an actor can do until he is assigned to a part and gets into it with the rest of the cast before a microphone.

The actor may or may not be permitted to deliver or read lines of his own choosing. If a long speech is used, it will not reveal his capacity for intelligent handling of dialogue. Something from a stage play may tell little for radio purposes. But the audition may be counted on to reveal several important things. It should tell whether or not the person is acquainted with studios and microphones. Usually it does. Unless an actor is experienced or is permitted to observe others preceding him, he will seldom walk up to the microphone and read or speak into it with ease. Occasionally a director is fooled. A candidate is selected because of his apparent familiarity with studio procedure, only to have it discovered in rehearsal that he had never been inside a studio nor close to a microphone before the audition.

The type of voice, the capacity to express the human emotions, versatility in characterization, ease and confidence in the studio, and much about the personality of the player are observed in audition by the experienced director. This director uses some prepared scripts and provides another voice for dialogue. Without script he engages the actor in conversation over the microphone, feeding him lines from the control room to get his reactions.

A trained player without radio experience has more to offer than one who comes from another occupation. *The best radio actors are the best actors.* It is a pity there are not more of them wherever radio programs originate.

Having chosen his cast, the director gives a copy of the script to each member, with appropriate counsel. He should call a special

preliminary reading rehearsal for the purpose of confirming his choices. His possible decision to let some of the cast double in roles is enough reason for further concern. This early rehearsal will include also some experiments with the microphone. There is little enough time for a regular rehearsal by the entire company, with sound effects and possible musical curtains. Everything that can be settled beforehand will save time and give peace of mind. If possible, these pre-rehearsals should be in the same studio which will later be used for the regular rehearsal and air show.

Once in the studio, the cast is led through a first reading. No microphones! Let's get a conception of the drama as a whole, become acquainted with the author's people. Find out what situations he has maneuvered them into, or rather allowed them to get themselves into. For people in plays, as in stories, have ways of their own. They can even get their author into trouble.

An intelligent actor gets a clear picture of the person he is to represent. He must get his own mind working like that of the character. It is an interesting game as well as a necessary exercise. If the role is a typical one, he recalls someone in real life who is like the character he is about to play. He may even think of several real people and make a composite for his own imitation. An experienced actor will probably have played similar roles or have seen them played.

A certain famous actress, when reading a part for the first time, recalls out of her stage and life experience many men and women who help her own characterization. She says it is quite an exciting experience. One of the best character actors in radio says that his own wife cannot tell when he is on the air, except in straight roles in which he plays closer to his own personality, unless she has been told in advance. He plays a role even when acting as master of ceremonies. He can be a police chief, a patrolman, magistrate, gunman, sneak-thief, courageous fool, slinking coward, plainsman, farmer, urbanite, fiend incarnate, or kindly priest—whatever the author and director may wish. One di-

rector particularly admires this actor's ability to play a fat man on the air, conveying an impression of avoirdupois by the use of his voice alone. His first steps in characterization are to read his part and then to call on his varied experiences to produce the prototypes. They are his models for his work, call it art or craft as you will.

Doubling

When it is expedient to have an actor play more than one role, a skilled character actor of the kind we have just discussed should be selected. Many dramatic programs permit character doubling, even having one artist play several parts, though the total number of lines read by one actor taking three or four parts, of course, may not equal those given to the leading actor.

Another sort of doubling common in radio is the impersonation of headliners, statesmen, politicians, and so on, in dramatized news programs. These voices are handled by specialists who apparently belong to two different schools. One group comprises character actors, who not only mimic the voices and inflections of the persons depicted in the news drama but also manage to make their own minds follow the news characters' processes and attitudes. The other group is composed of imitators. They are clever at duplicating another's vocal production. Some of the results are startling.

Both methods require careful study of the voices and distinguishing characteristics of the personage to be imitated. The actors try to see and hear the people in action. If they cannot, they study newsreels carefully and listen to records. They "catch" men and women in public life each time they appear on the radio. Every word of theirs quoted in newspapers, magazines, or books is read and re-read aloud so that the impersonations may include a duplication of the mental processes.

If something of the man himself is captured by the actor, it serves a better purpose than mere parrot-like imitation. A young

actor was cast in the role of Mussolini. On the air his work was most convincing, even though by a later comparison via a recording of the show, it was not an exact mimicry. But it was better and carried more weight than if it had been done by a mere imitator of sounds.

All doubling trials and tests must be made with microphones, for the microphone seems to play pranks with voices. It also provides trick ways of getting vocal effects. Various microphone distances are tried. Some microphones, notably the dynamic, permit the actors to work very close. Voices used only a little above a whisper close to the diaphragm have the effect of coming up to the ear of the listener. The normal characteristics of the voice may be so changed that a child can be made to sound ghoulish! The villain can often be made more evil and sinister—almost brushing the cheek of the audience with his menacing breath. That is, of course, if the director is not squeamish about what he thinks his listeners can stand.

To establish perspective, variations in the pitches of voices are tried. Different amplifier levels are tried to transmit the same voice level at various distances. Some of these effects are already known to the experienced director and actor. Others may be experiments, but the first rehearsal with the cast establishes a reservoir of studio techniques before the general rehearsal. Not the least is that the director knows if his casting is right. If he has miscast, there is still time to change.

Conferences

With the assistant (the studio manager, or the production man), the engineer, and the sound-effects technicians, the director settles matters of microphone placement and effect production, making sure every kind of equipment is available. Then he and the musical conductor select music to be used as curtains, for closing sequences or backgrounds. These will maintain the atmosphere and moods of the drama.

Back to the Script

Perhaps the author has not taken every production necessity into consideration. It may be a good show in spite of this, but changes will be needed.

If the piece has been purchased and the author is not available, the director makes these changes himself. Naturally, it is better if the author can be there to make all writing changes, knowing the reasons for them, and cut if the work is too long for the time allotment. He should stay through rehearsals and broadcasts. Such care will improve his subsequent work.

Sometimes lines need changing because the actor has difficulty with the particular word combination of the original. Or the end of one scene is not written in such a manner to dovetail into the following one. Words spoken at the end of a scene fading out for a transition must never be climactic; nor can the lines fading into the next transition be important. They are too likely to be lost. Difficulties with the form of a written scene often arise from the conflict between visual and oral portrayal. Because this conflict happens oftenest in the adaptation of some stage plays to radio, let us take "Craig's Wife" as an example.

This play, by George Kelly, was a great success on the stage. Later it was produced as a motion picture. Having won the coveted award, it was presented in a radio series called "Pulitzer Prize Plays." * Many readers will remember it. Near the opening of the play Mrs. Harold, the housekeeper, pictures Mrs. Craig's fanatical orderliness. You clearly feel that this extreme orderliness is an evil obsession when Mrs. Craig becomes irritated over falling rose petals, seeing them as so much litter upon her neighbor's lawn. In unmistakable words she reveals the depth to which her tyrannical tidiness has rooted itself in the utter selfishness of her nature. All this is in vivid dialogue which requires only to be condensed for the air. When Mr. Craig smashes a statuette as an expression of his personal rebellion as well as a symbol of the

* Presented by NBC in the summer of 1938.

smashing of their marriage, he himself explains this connection in the lines of the play. But at the end, the aunt, niece, husband, and housekeeper leave Mrs. Craig. Word comes that her sister (whose illness was annoyingly untidy and troublesome) has died. A bunch of roses are brought to Mrs. Craig by a neighbor.

In the stage production of this scene she wandered alone, round and round the living room while the awful emptiness of her house and her life dawned upon her. Her eyes widened in wonder and fear. As she clutched the roses tightly in her nervous pacing, their petals loosened and fell. *And Curtain!* That was all on the stage. That was enough. Everyone saw what had happened. Not a word had to be said.

But how to get that last scene on the air? That was a real problem. Rose petals make no noise when they fall. What to do? Here is what was done. Words were given Craig's wife—words for her thoughts as she wandered about when all had gone. Crystal Herne spoke these lines:

> People who live to themselves . . . live to themselves . . . Miss Austin . . . said. . . . But then one must . . . one . . . must. . . . Those roses . . . petals . . . falling . . . petals falling. . . . And the scarf . . . ! Well, perhaps tomorrow . . . perhaps . . . perhaps . . . tomorrow. . . .

Her voice failed at the end and the curtain music came up full to close the period. No one in the listening audience failed to get the full implication. Thus, the poignance of the dramatic situation was successfully carried over from a visual medium to radio without loss.

Many directors insist on an early first rehearsal and make it a complete one so that director, assistants, and cast can listen to a recording of the show and correct their form, the production methods, and the performance. This preliminary sound version of the play shows what the audience will hear.

Many of the Columbia Workship experimental dramas are produced this way. The rehearsals for "Gang Busters" require three days. Each day a recording is made, or the show is heard in audi-

tion. The "March of Time" performance is rehearsed for several days and auditioned carefully each day by a critical group which does not see what is going on in the studio. The minds of these responsible listeners are not distracted by the movements of actors or staff. They get the sound picture only and judge it accordingly.

Whatever the necessities, everything must be done to make a good show. Recently, an especially tricky dramatic program was rehearsed for five weeks, three nights a week, and recorded for criticism on four different occasions. It is an extreme case because it was an unusual production involving the use of native African drummers and singers who spoke little English, some of whom could not read the lines, and of whom one had a major part half in native African and half in broken English, which he therefore had to memorize. The show went on the air, however, without a hitch or missed cue.

Into the Studio

The director knows his script by heart now and his assisting staff are familiar with it. The director calls the entire personnel of the show into the studio for the general rehearsal.

The necessary equipment, furniture, studio instruments, and sound-effects apparatus are properly placed, if everything is well organized and the staff members know their jobs. There may be reasons for relocation of a few of these properties after the rehearsal gets under way. The need for rearrangements is discovered as the sounds of each scene are projected. But not much changing about is necessary if the studio is well known and the work of preparation carefully done.

Let us have a look into various studios now to see different rehearsals in progress. There is a similarity of set-up, but each has its distinctive characteristics and each of these rehearsals has a different staff in charge. As we observe the rehearsals in progress and the final studio placements which are established, we draw careful diagrams of the floor plans, make notes of the studio design, and mark the set-up in the diagram for future reference.

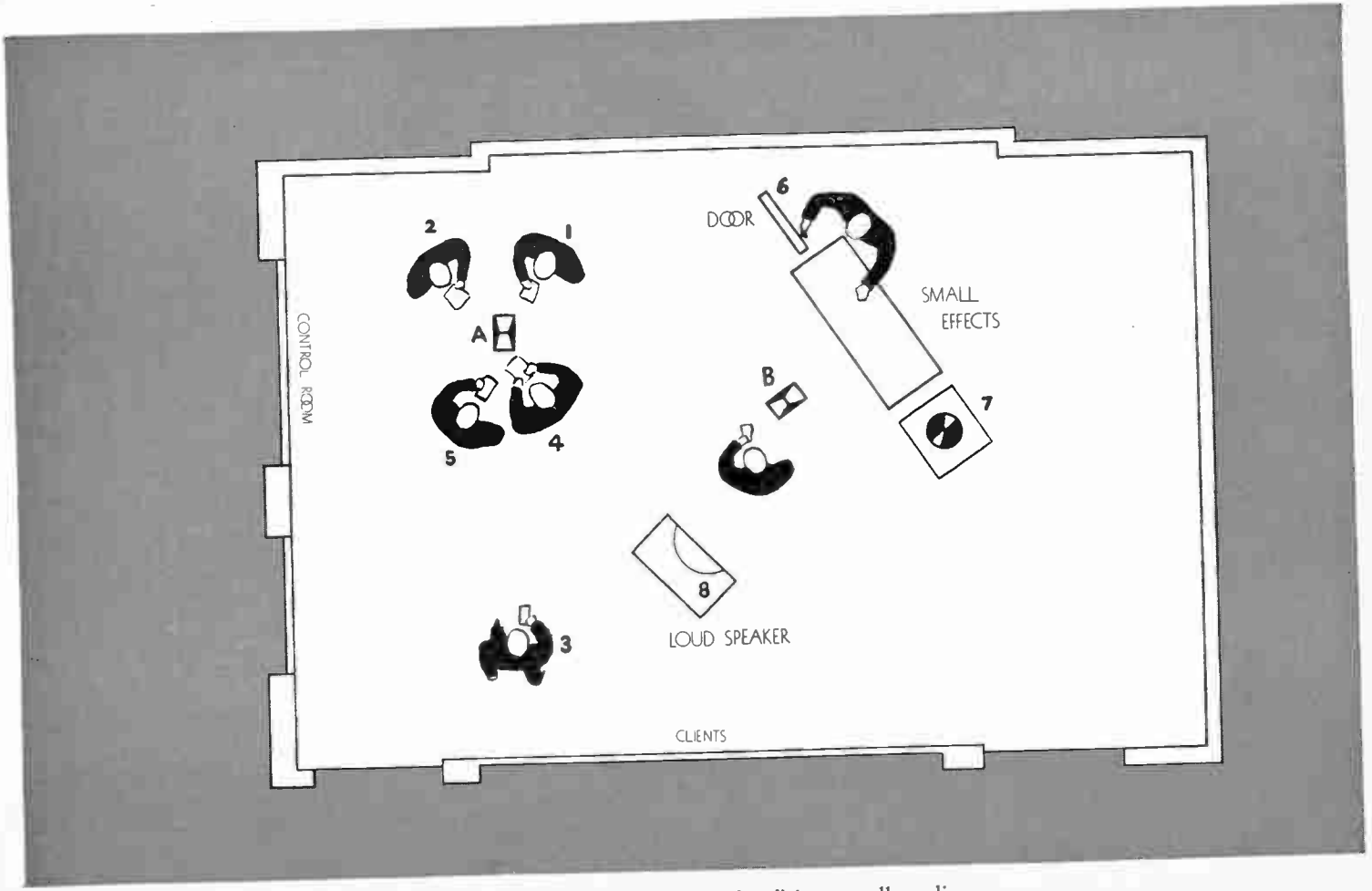


Figure 24. Set-up for "Ma and Pa" in a small studio.

"Ma and Pa" is in the first studio. The room itself is not large. Not much space is needed. The cast is small, and in this episode of the series the sound effects are very simple. No music is used. That eliminates problems. Our diagram is drawn (figure 24). The studio is 24 feet long by 15 feet wide. The acoustic treatment facilitates sounds which might be heard in a Cape Cod home—in any home, in fact. One microphone is used for the cast. It is of the velocity type: live on two faces and insensitive on the sides. At this excellent instrument, actors can stand opposite each other while reading dialogue. A number of voices may be picked up in different perspectives at the same time. The illusion of fading from fore to background is accomplished by the sideways movements of the actors within and outside of the effective pick-up angles of the microphone. Pa and Ma, their niece, a guest, and a neighbor are at work around microphone *A*. The main characters are 1 and 2 on one side. Horace, who has just come in, letting the door slam as he enters, is "off mike" at position 3. The door which was opened and closed noisily in perfect synchronization with his movements is at 6, and the sound of this carefully constructed prop is picked up in microphone *B*. The man with one hand on the door knob and the other on the long table is the operator of sound effects. The other actors, 4 and 5, are the niece and a guest who are "on mike" opposite Ma and Pa, because the scene is at a table in the Food Shoppe where the guest is being served.

The director is insisting on careful visualization of the scene. The sound-effects man works with the dishes and spoons on the table, making them fit naturally into the tea-room conversation. These properties are few in number. The general tea-room sounds are provided by an authentic recording which is being played on the single turn table (7) and reproduced through the combination amplifier and speaker (8) into microphone *B*. The actors are instructed to use natural body movements as much as possible. Coördination gives their interpretation ease. Also at *B* is the figure of a neighborhood boy who is employed by Ma as a

handy helper. The only speeches he makes in this episode are from the cellar where he has gone for some currant jelly. The sound of his voice correctly places him because the output of microphone *B* is switched to feed through an echo chamber before being mixed with the other sounds going out on the air. This device is described in Chapter 14.

Ma turns to speak to Horace about his noisy entrance. To give the illusion of the new direction in which her voice is being projected, and to avoid a sudden rise in volume level, she cups her hand over her mouth and turns her head a little away from the microphone. She may take a step backward at the same time, to make her shout easier to control.

Let us look at the next studio. Here we find ourselves in a larger room. It is Studio 3 at Columbia's headquarters, WABC in New York. The rehearsal is for a performance of "Gang Busters," * a commercial program. A representative of the agency is producing the show. The director is still on the broadcasting staff.

Quick-paced sound effects in a specially treated studio lend sparkle to this speedy series of dramas. From the standpoint of set-up ingenuity, these sound effects and studio treatments are of especial interest.

The set-up is the standard one established by many months of rehearsals and air shows. We set about drawing our diagram and inserting the placement of cast and equipment (figure 25).

The diagram shows the studio with its unusual wall surfaces and other accoutrements fulfilling the live-end dead-end principle.

The live end comprises a rear wall covered with wood paneling. It is a perfectly flat reflecting surface over which curtains may be drawn to provide variable acoustic value. Brilliancy for musical programs or dampened effects for drama are equally possible. The side walls in the live area are a series of panels staggered in

* At the time of writing, "Gang Busters" was sponsored by Colgate-Palmolive-Peet for their shave creams and soap. Benton and Bowles, Inc., was the agency.

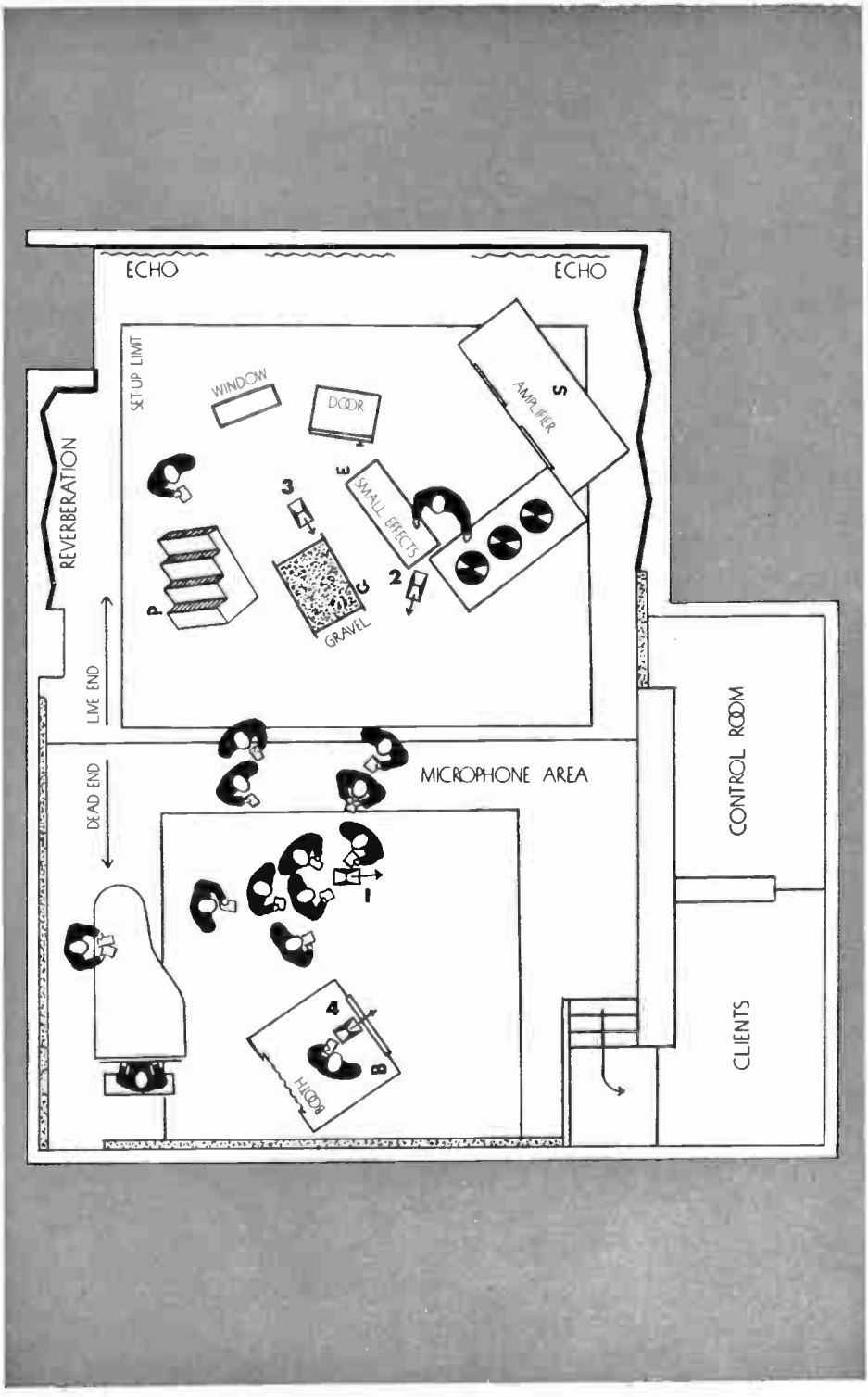


Figure 25. Studio set-up for "Gang Busters."

the form of a succession of V's. This produces a fine reverberation surface, but the V's prevent direct reflections between opposite wall surfaces, called "slaps," which would otherwise distort the clarity of sound produced in this area. The ceiling is of plaster and the floor linoleum. The dead end or microphone area, clearly marked in the diagram, is treated with panels of rock wool covered with a perforated material on both walls and ceiling. A large rug hides the floor surface. Obviously, there is no reflection of sound here.

At the cast microphone (1), in the dead end, a section of the program in which ten voices are being used in different perspectives is in progress.

At the other end of the room is a triple turntable for the playing of sound-effects records. This table is equipped with spotting arms and a mechanism which can drop the needle on any point of a selected groove in the record. This instantly and invariably creates the desired sound. The turntable, with its four pick-up arms, appropriate mixers, switches, and high-low frequency filters, also permits the blending of several records into a compound sound effect which is picked up on the sound microphone (3) after being emitted from the giant loudspeaker (*S*)*

E is the small-effects stand on which specially designed pistols, blank cartridges, and so on, are placed, together with other paraphernalia not of the recorded type.

G is the sand box in which footsteps may be made as required to accompany the dialogue.

P is the little stairway on which indoor and outdoor footsteps are created, the effect of walking up and down a verandah or between floors within a house. Prop door and window likewise are indicated in the diagram. For many of these sound effects a certain amount of reverberation is desirable. Hence, the live end of the studio is most satisfactory for their set-up and placement. Should the acoustic treatment be varied, the curtains are always available to facilitate the effects.

* See Chapter 14, p. 226.

B, well up in the dead-end of the studio, is a special booth constructed of "flats" (plane surfaces) with small glass windows (see detail drawing, figure 26). Rock wool lines the flats on one side, making the booth highly sound absorbent. Smooth reflecting surfaces characterize the other, the live side. When the three-sided construction is put together with the dead sides turned in, and the adjustable cover is clamped over the top, microphone 4 inside will catch voices or mechanical instruments under dead con-

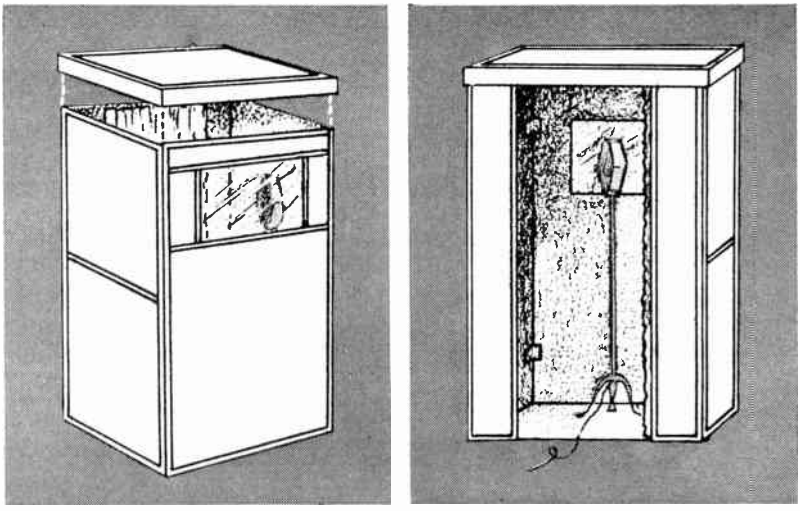


Figure 26. Booth constructed with acoustic screens.

ditions, such as prevail out of doors, or in foggy, rainy weather. With the reflecting side turned in, the booth becomes extremely reverberant—aptly creating the illusion of a speech resounding through a great hall, a person speaking in a telephone booth, or voices conversing on cellar stairs.

At another rehearsal, in another studio, they are not having such a comfortable time because the studio is not large enough. The rehearsal is for an important audition. It is hoped that a client will buy the prospective program as a vehicle for his radio advertising campaign. A larger studio should have been employed, or two studios used in combination, but this happens to be the only

one available. The problems of perspective are hard to solve in this room. The director and his associates are discussing and experimenting.

The scene being rehearsed is one from an Armistice Day drama, an aftermath of the war. The audience is taken close to the bedside where a disabled veteran is dying. Beside him, seated on the bed, is his sweetheart. The soldier's head is pillowed on her arm. Things intimate and precious are being said in hushed voices. The window is open, and away down the street is heard a band headed in the direction of the room. The dying soldier boy hears it in the distance. When the parade approaches, he asks that the window be closed. He wants to shut out the false, deceitful music. It isn't the sound of victory. There is no victory in war. This is the singing of a mad Lorelei whose mouth drips blood as she lures young men to drink from her gruesome cup. Behind the martial music lie the wet, stinking trenches, the vermin, the dead men, and the rats. The soldier is going to join these dead men, these rats. Why must he be taunted by the trumpets men use to drown the cries of the dead? *Shut the window!*

Under other conditions it would be easy to shut a window, and, as it closed, fade out the sounds of the approaching parade. But to get real, as well as imagined, distance between the several units of a dramatic performance, there must be room to separate cast and sound effects from the band. In this small studio everything is on top of everything else. Band and actors and sound effects are crowded together by the inflexible walls.

Various microphones are set up for the units with what little separation can be secured. But the intimate speech has to be heard in the foreground. The window must sound as if it were being closed at the other end of a large room. A band must approach from the distance. The cast microphone and band microphone cannot both be open simultaneously. Certainly not a sound-effects microphone too. When this is tried, no potentiometer (volume) settings on the three microphones (or even on two) could secure the effect. One microphone finally produces a

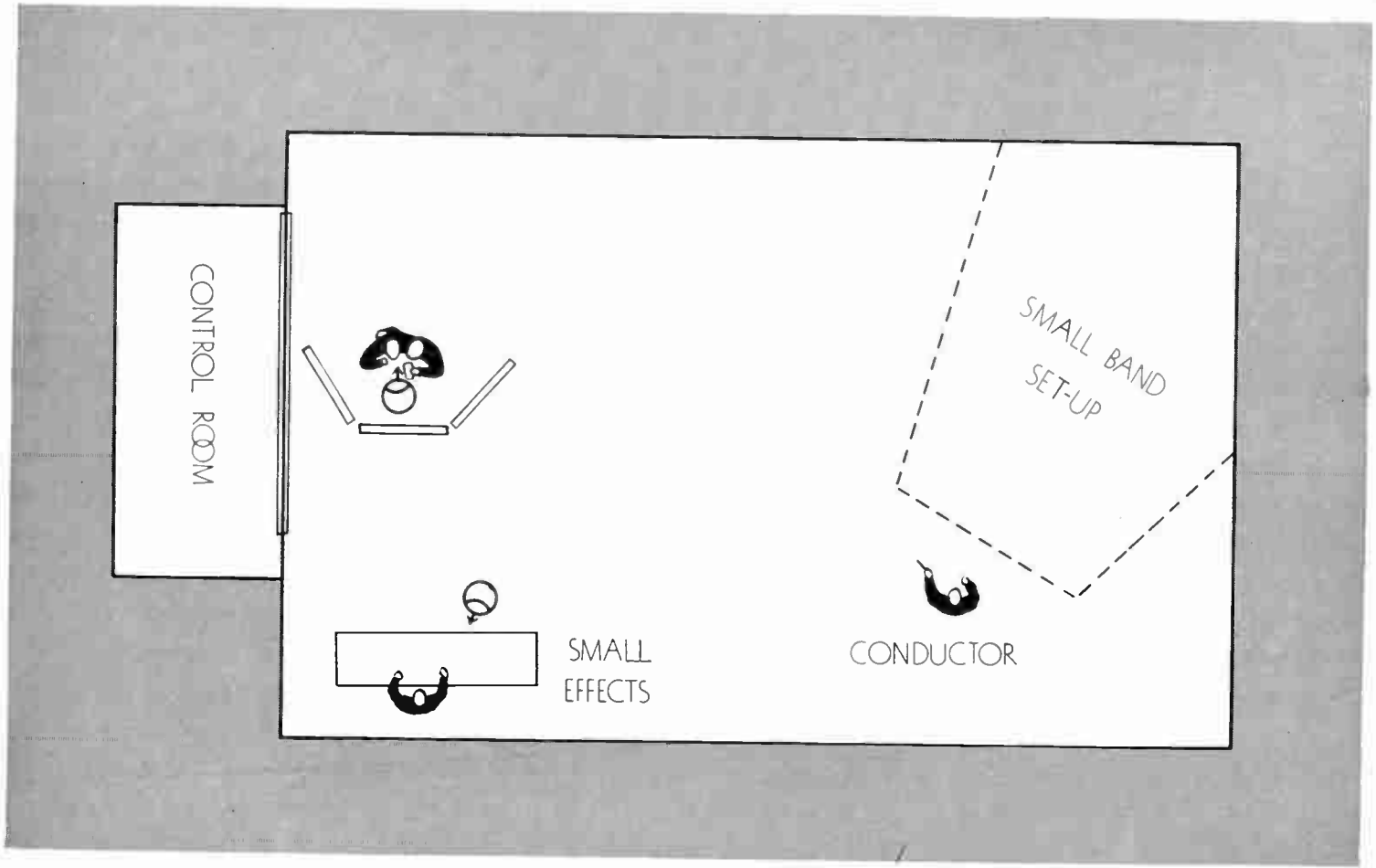


Figure 27. Unsatisfactory set-up. The studio is too small for proper dramatic perspectives.

somewhat gratifying result. (See figure 27.) Note that the one microphone is well up in one end of the studio, which is 25 by 40 feet with a 12-foot ceiling. This microphone is partially blocked off by a three-sided screen, the inside surfaces of which are covered with a heavy layer of absorbent material. Close to this microphone are the young actor and actress, seated so their heads can be together for their quiet dialogue. On one side is the sound-effects technician and his equipment. Indirect pick-up of his carefully constructed prop window (see page 326) is the way chosen to get the perspective approximately correct. At the other end of the studio are the musicians. Their marching piece is picked up on the cast mike which is farther off-angle than the sound effects. With this set-up, the actor's faces in front of the microphone serve to partially blanket the sensitive face of the instrument. Then, with the band leader controlling his musicians in accordance with the director's signals in the control room, very slow crescendos and more abrupt diminuendos are used to give the illusion of the approaching parade, the closing of the sash, and the final passing of the band as the soldier's soul moves on with it.

How much more easily it could have been done in a large studio! What would have been done with these units is shown in figure 28. This drawing is based upon actual experience with other programs presenting the necessity for similar sound montage. The larger floor space permits greater actual separation and partial isolation by the use of additional screens to form an acoustical fence both for the cast and the band. The diagram is self-explanatory.

The most useful, but most expensive, space arrangement for the control of montages and perspectives is provided by the multiple studio unit. Figure 29 shows this arrangement; and, assuming that the production problems are similar to those just described, or with even greater difficulties, added by complicated sounds and vocal effects under more than one atmospheric and acoustic condition, this arrangement of studios is the only one which will be perfectly satisfactory, as is clearly shown in the drawing. The

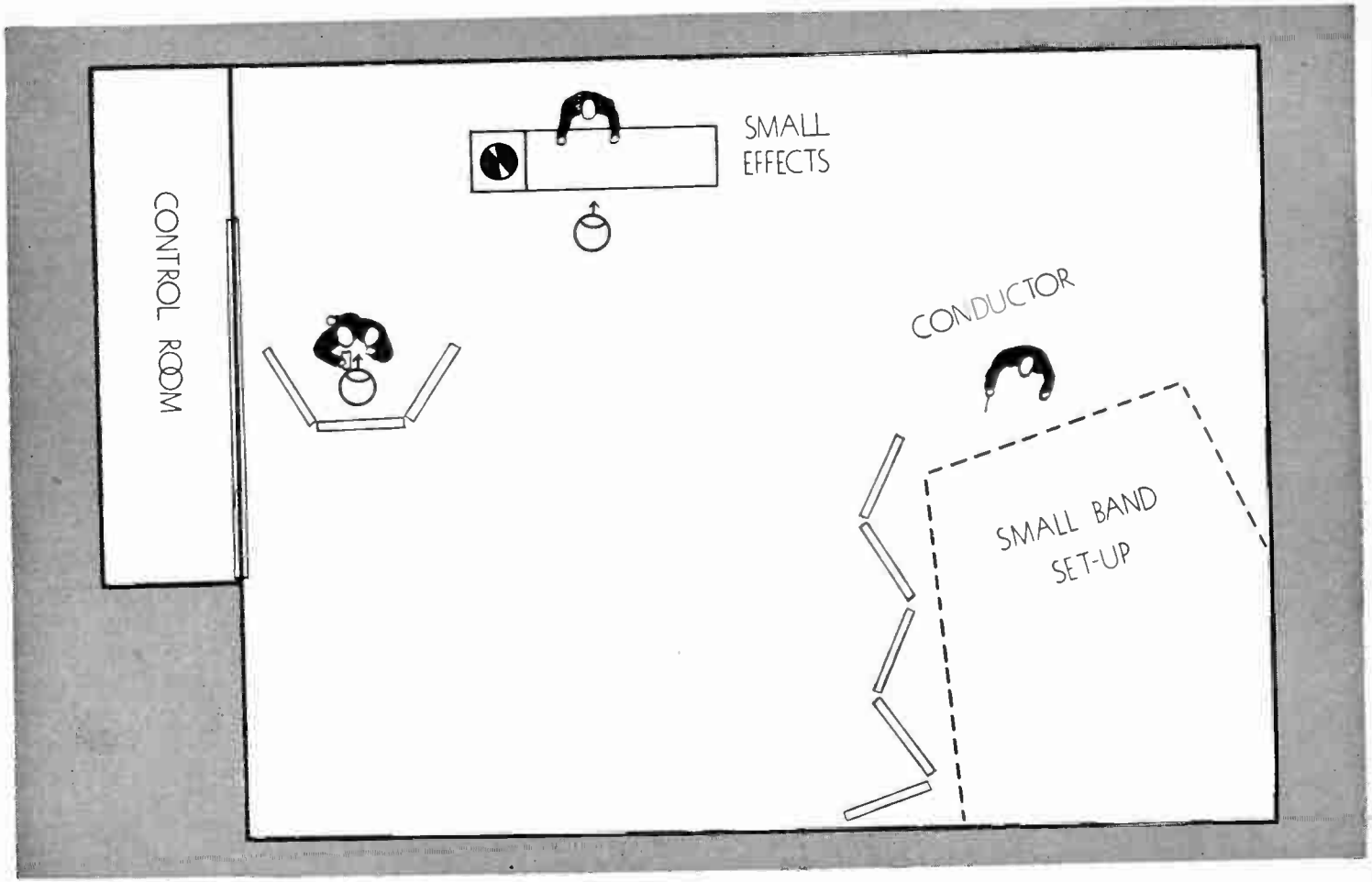


Figure 28. A large studio provides greater separation of cast, effects, and music.

studios are built about one controlling monitor room. The cast works in one, the band or orchestra in another, and the sound effects are produced in a third. Sometimes the effects may be correctly produced in the same studio with the cast. Again, the cast may be divided and used in two of the studios of the unit. A division of both cast and sound is often useful, two studios being used for the separate groups.

A number of programs are produced in two studios under the usual broadcasting arrangements, but in this case the performers in one work blindly or have earphones provided for cues. The director does not have control. Sometimes because control is more important than a possible effect, the values of division are sacrificed to the greater necessity of constant directorial supervision, as in the case of the small, crowded studio we just left.

The control of the director is extremely important. This we can see in any rehearsal. The reason is clear. In each program there are a number of people—actors, assistants, sound engineers, musicians. Unlike the preparations for a stage play, they are *not* drilled until each word and action has become almost automatic. Rehearsals may consume a number of hours in each of several days. Lines and cues are not memorized for radio. Only one of the group can possibly get the full program values out of the script, and he is the director. He is the maestro who, by his personality, clear signals, and gestures, weaves the pattern of vocal and instrumental sound. The interpretation is in his hands to control.

Theatres and auditoriums crowded with spectators are in use in several centers for the production of dramatic as well as musical and variety programs. The orchestra is up-stage center or to one side. The cast microphones are usually close to the edge of the apron. Sound effects are placed on stage in full view. The audience is intrigued by the mechanics of production. Many of the variety shows contain dramatic interludes in presentation. Figure 37 shows clearly the arrangement of the units and parts of equipment.

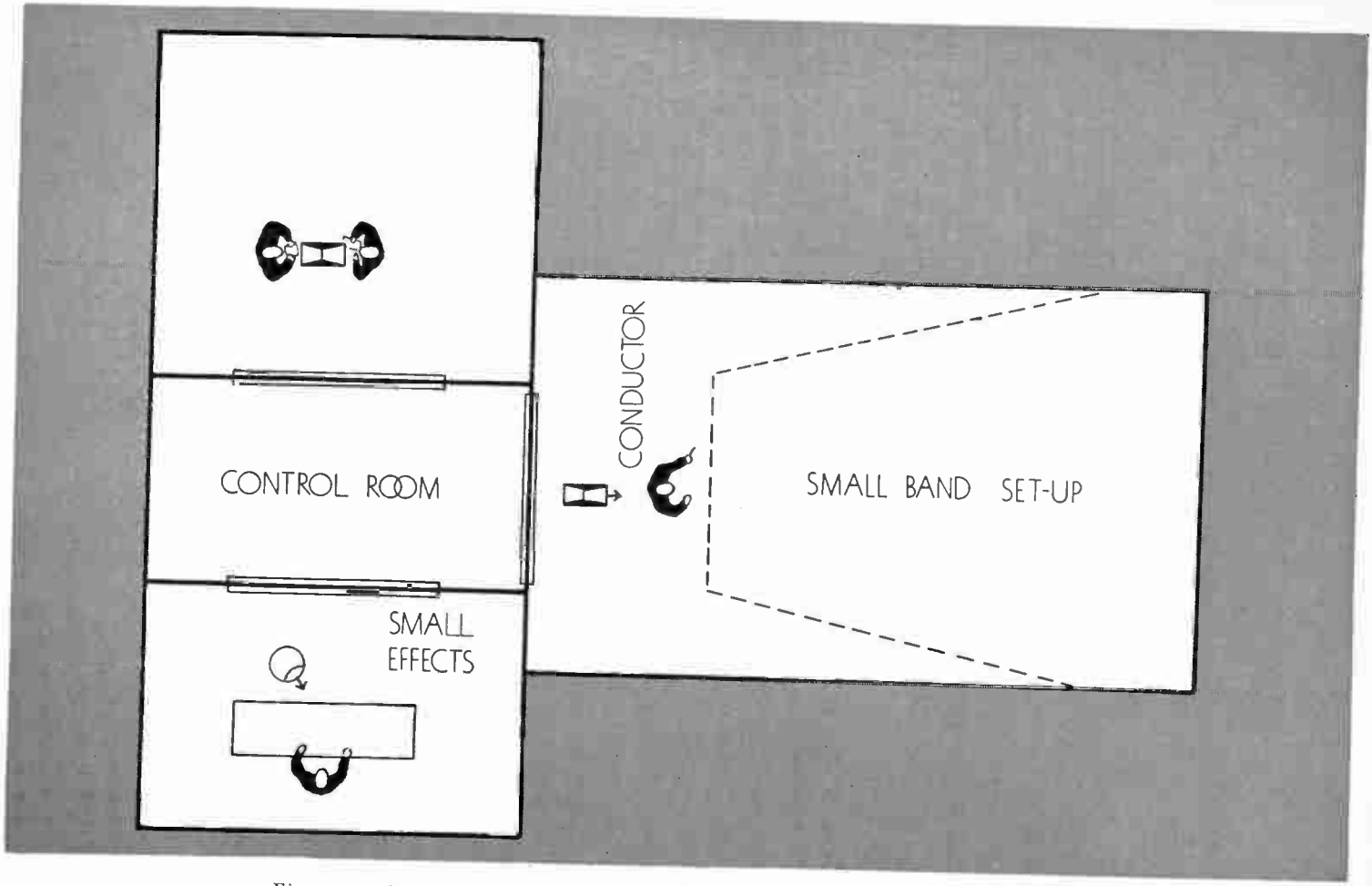


Figure 29. Multiple studio arrangement for best separation of cast, effects, and music.

The appearance of actors in costume is the exception rather than the rule. A dressed show is too likely to bring audible responses from the studio audience, the causes for which are not clear to the listeners. It is the listener who is our chief concern, and not the audience before us. The invisible listener is the power that keeps visible men, minds, and equipment working in periods ranging from fifteen minutes to one hour, eighteen or more hours a day, three hundred and sixty-five days each year.

Visualize the vast organized army of directors, assistants, production men, engineers, technical students, artists, and executives who are at work (to name only part of the crew) behind the little knob which you turn to bring the program into your home.

Perhaps it is easier now for the ill-advised client about whom I spoke in an earlier chapter to realize how naturally interference in the execution of so highly specialized an art or craft can jeopardize or make impossible the success of a program.

14

A Pistol Shot

AGAIN AND AGAIN it happens in radio that one function or one problem becomes so important as to enlist the interest and assistance of all departments. This is as it should be. I have written about the idea and the execution of a radio drama as though those two always took the foreground of the broadcaster's attention. Chapter 15, dealing with the studio engineer's province, clearly shows how the task of transmitting by radio frequently occupies a first-rank position.

The summer of 1938 marked the end of a long period of research and experimentation devoted to what on the surface appears to be one of the simplest sound effects: the sound of a pistol shot. Previously it had never been right, although experimentation had gone on for nearly ten years. How long is the duration of this sound? Two tenths of a second? Slightly longer, if the studio in use is fairly live.

The public would have been surprised on entering the studio in which production men crowded to hear this perfect shot fired. Gathered around the table was a distinguished group of men. Included were the chief sound-effects technician, his assistant (who was the real genius in the experiments), an official representing the Remington Arms Company, another representing Colt's Patent Arms Manufacturing Company, the ballistic expert of the New York Police Department, and an Inspector of the New York Police. Every member of the sound-effects section who could be

Figure 30. Special gun for sound effects.

free from his duties was present. People from other departments dropped in when they heard what was going on.

On the table in the studio lay a revolver and several boxes of blank cartridges, each box marked by numbers and letters indicating the particular powder content of the shells inside.

Seen from a distance, the gun resembled a regular long-barreled .32 Colt revolver on a heavy frame. Closer examination showed that the barrel itself had been carefully slotted, plugged

at the end by an inch of solid steel and reduced to a size smaller than a .32 bore. The chamber was in two parts, the after part being left only long enough to accommodate the blank .32-short shells. This after part turned. The forward did not. A bullet would make it jam. The gun was constructed to conform to the laws of many states governing the carrying of concealed weapons. It was not possible for this gun to be used as a firearm, yet it conserved every value in its construction for making the sound of such a weapon. The blank shells which were tried in the gun contained various powder charges made up of different components.

Beside this revolver on the table lay an ordinary .32 calibre starter's gun, also several other guns sold for use as noise makers on holidays, plus two or three foreign and American sound-effects pistols.

For a period of an hour and a half we heard all of these guns fired with the blank cartridges available for them. The new revolver was fired with a different kind of blank shell which was there for final testing. We listened from different positions in the studio with relation to the microphone. In the control room we made careful comparisons of the sounds at these different points between the old guns and the new ones. It was evident to all that the new blank cartridge, containing a mixture of several powders in measured quantities, produced the most convincing sound. Those of us who knew how many years of experimenting had led up to this triumphal day were eager to hear the details. The others who had dropped in were intrigued by the thought of such unimaginable attention to details. They sat spellbound while the story unfolded. Here is the substance of it.

The Story of a Shot

When sound on film became the major concern of motion-picture producers, there were several serious problems in recording. The pistol shot was one of the most troublesome. On the sound stage or in the studio, a microphone was set and opened properly for the dialogue. The force and volume of the sound of

the firing of a blank cartridge was too great for pick-up on it. Dialogue had to be spaced, allowing the engineer time to turn down his controls and accommodate each shot. If this was not done, damage to the recording apparatus resulted. The light valve, consisting of a strand of wire slender as a human hair, was so sensitive that any sudden sound of high level would spread or blow it out. In sequences where dialogue and shots were indicated simultaneously, either the dramatic tension or the effectiveness of the shots had to suffer. In any case, a nearby shot of any caliber recorded through an almost closed transmission channel sounded like a cap pistol.

Experiments were begun. New, empty blank shells were purchased. The primers were exploded and the priming cap countersunk below the surface of the end of the shell. Holes one sixteenth of an inch in diameter were drilled through the primers. Toy paper caps were then inserted on the primers. Powder for the shell was measured with a pen-nib and various amounts were tried. The wadding used was absorbent cotton sealed with candle wax. The experimenter was kept busy trying out cartridges of all calibers with various powder charges. With none of the facilities of an arms or ammunition manufacturer, the loading of innumerable shells required remarkable patience. Fire crackers of every description were tried as substitutes, without satisfactory results. The experiments led to shells which were easier to control. Shooting scenes were improved in the sound picture theatres.

But radio directors were not benefiting by these improvements. We had to get the experimenter before we could enjoy the results of his work. In radio studios the problem was even more difficult. These rooms were treated for either music or drama according to the best knowledge available. They were smaller than sound stages. Sounds were more confined. They were influenced for good or ill by the reflecting surfaces. A new experimental technique was required. Different priming caps and powder mixtures were tried. In addition to a sound problem there appeared one of fumes and odor. A hundred or more

shots fired in a small studio during a rehearsal period produced gases which were offensive and irritating.

Then the interest of the arms and ammunitions companies were enlisted. Several visits were made to their plants and shots of all kinds were tried on their private proving grounds. The companies volunteered to undertake the work and expense of research in the hope of providing both a gun and the shell which would meet our requirements. The first four years of experimenting were conducted with their help; and, because no one engaged in the work would admit defeat, we finally have the only revolver and blank cartridge producing the expected ring and menace. It makes the sound of death-dealing both in the studios and on the air. The illusion is perfect for the listener when gangsters are being pursued by G-men, or when soldiers are using side arms in combat.

Describing the last step in the creation of this revolver will illustrate the attention given to the most minute details in the entire series of experiments. A determined sound-effects technician, together with the ballistic expert of the police department, made a trip to Hartford, Connecticut. There the final touch was put on the operating mechanism of the gun magazine. In ordinary revolvers built to fire a shell that contains a full charge and a bullet, the construction allows for a definite amount of reaction and recoil in the magazine of the gun. When a shot is fired, the firing pin is released, strikes the cap, fires the powder and causes the explosion, which drives the bullet through the barrel. The explosion of the shell causes its rear to be forcibly driven against the collar around the firing pin. It is also somewhat flattened and driven back into the chamber aperture which surrounds it. This reaction leaves the shell firmly held in this aperture; no projection of the rear of the shell will interfere with the turn of the revolving magazine.

In the special gun the violent reaction did not occur, because of the different powder and because no bullet was fired. The back

of the blank cartridge was not always held, therefore, sufficiently close and firm by the aperture in the magazine. Sometimes it projected more than it should, causing the magazine to jam as it revolved. This was corrected in a new construction of the pistol.

Other Sound Effects

The story of the development of a satisfactory shot for sound effects may surprise many people who presumed that there was a full library of effects, all ready and waiting, when radio first came upon the scene. Every well-equipped theatre had certain mechanical effects backstage: the thunder drums and thunder sheets, wind machines, blank pistols, and revolvers, even a device for making the sound of surf washing upon the shore. And in the orchestra pit boat-whistles and comedy-whistles were provided by the drummer. The performer on the traps also had his wood blocks and his coconut shells for imitating horses' hoofs. That was about the sum total of sound effects. In broadcasting, many of these were of little value, because the sounds rarely seemed real when brought into the studio and transmitted.

For years, other matters occupied the minds of the radio station staff. There was music and speech; there was comedy and song. To broadcast these was amazing enough.

Eight years had passed since the first radio broadcasting stations were operating. When we needed the sound of a bell in conjunction with a ship's telegraph system for a dramatic episode, we put a few tickets for an important broadcast in our pocket and paid a visit to the manufacturer of such equipment. From him we borrowed a bell of the correct size and left the tickets in payment of the loan. If it was a fire siren that we wanted, we went to the city fire department and borrowed that. We did not expect that we would some day require all these things and many more on the shelves of a large sound-effects library. Then came scenes in which the authors of radio drama required something new in the way of an effect, something that could not be

borrowed. We had to simulate these sounds. We spent endless hours experimenting with all kinds of materials. To outsiders the time may have seemed wasted.

On Armistice night in 1928 we astounded the world with a two-hour dramatic performance. There were episodes which powerfully unfolded the story of the Great War, America's participation in it, the signing of the treaties, and the welcome home. One scene dramatized the dedication of the grave of the unknown soldier. At eight o'clock at night, after rehearsing all day, we suddenly realized that we should give the effect of a volley being fired over his grave. The playing of taps was taken care of. That was easy. But where would we get the sound of a volley of guns? The volume would probably blow the transmitter off the air. We thought perhaps three rifles would do, so three were procured. Since the studio was one of the earlier types with windows leading out to a terrace, we fired round after round from the terrace into the night air. It was convincing enough to bring the police quickly up in the elevators to find out what the war was all about, but the sound was no good for broadcasting.

With flat pieces of wood we pounded on leather pads on tightly stretched drum heads, placed close to the microphones, and at a distance. Everything we could lay hands on was pounded on everything else. Still nothing sounded like a volley of shots. All through the night we worked on this one effect. The engineer, who is technical chief of the largest network in the world, was then operating the equipment in the control room. At six o'clock in the morning we had just about given up hope. But we were still poking around the building in search of something else to pound with. Suddenly we came upon two things that had not yet been tried—some small curtain rods and three large corrugated pasteboard boxes. Back we went to the studio for another experiment. Kneeling on the floor around the boxes we took lengths of curtain rod in each hand, and at a given signal brought them down sharply on the cardboard boxes, turning with

doubt and misgivings toward the control room to see how it had come over. The engineer's face was all smiles. He waved his arms and blew kisses, indicating that the long night vigil was ended. Of course each of us had to go into the control room to hear the sound before we were convinced it would measure up to our requirements. By the time we were finished, the curtain rods were bent and the boxes were beaten to a powder. When the program took the air we did not make a sound like a volley of rifles, but it was closer to it than anything else we had tried.

As writers and directors became more sound-conscious, the staff turned its hands toward inventing adequate mechanical devices. The first sound pictures came upon the scene about this time. We thought that here we might find an answer to our effects problems. But the picture producers had to discover their necessity for convincing sound effects before making any special effort to create them. At first, it was enough that people could be heard as well as seen on the screen. When sound effects did occur in pictures, they were no more convincing than our own.

With the coming of the animated cartoon, specialists in this field arose. A few men who had produced effects for the theatre became aware of the need. They earnestly set out to discover mechanical devices capable of producing a great variety of sounds. One such pioneer so constructed his equipment that it could be combined in a structure the size of a small pipe organ. He built it in sections so that it could be taken apart for easy transportation or coupled together for use. This enormous compound of instruments he operated from a high stool placed in front of it. Within reach of his hands were electric buttons that controlled gongs and bells, rattles and horns. There were valves which, when turned on, permitted compressed air to play on whistles and horns of every description; cranks close at hand for turning gadgets which produced locomotive-like sounds; string could be pulled, releasing quantities of glass or pieces of metal to imitate crashes. On a little table beside his stool were similar bits of paraphernalia such as

guns, telegraph keys, and coconut shells. The shells were beaten rhythmically in sand boxes, or pounded on a heavy piece of curb stone to resemble horses' hoofs on streets and roads. A crank turned one machine which rubbed the outside surface of a broad wheel against a canvas ribbon. The tension of this material was easily adjusted to produce the howling and screeching of a hurricane, or the soft moaning of a summer zephyr.

When this contraption was reported, no one believed that a single person could possibly own or operate such a thing. A photograph taken with the ex-drummer at the console convinced station authorities that it was not all a figment of the imagination. After some persuasion the manager set aside, in his regulation program budget, a sum of twenty-five dollars. This was the price paid the inventive genius to perform upon the whole works over the air while an announcer described his action. The program lasted fifteen minutes. Such a series of sounds was never before produced for the amazement of the public. But we had in this man—a road breaker in an important branch of the broadcasting art—one of the few who had taken trouble to invent electrical and mechanical equipment.

The ex-drummer sold his services and the use of his mechanisms to producers of motion pictures and to radio stations. In a year he was employed by a broadcasting network to furnish effects for all programs originating in the New York studios.

Contemporaneously with this experimental work, manually operated and recorded effects were being produced in a few widely separated broadcasting and sound-picture centers. From the motion-picture industry we expected much more than we received. Of course, sounds in almost unlimited variety were being recorded on film and wax for synchronization with pictures. These transcribed effects, although very poor in the beginning, were an aid to realism. The rapid improvement of recording apparatus for both film and disc made the realism greater. At present in the picture theatres we have the sound of

nature in her calm and in her violent moods; we have the auditory effect of trains, airplanes, automobiles, and machinery. They are all pronounced quite perfect by movie audiences. Yet out of the miles of sound track producing effects with pictures, only a comparatively few feet would be useful for radio purposes.

The reason for this is neither hard to find nor difficult to understand. Just remember that sound pictures make use of two gates to the mind: the eye and the ear. The sight that captures the scene and action assists in perfecting the illusion. Sound effects may actually be unreal in themselves, yet still aid in creating atmospheric reality. Imperfect sound may be used without seriously marring the effectiveness of the show. And it is. This fact can be easily verified. Attend any motion picture theatre. Allow enough time to sit through the program twice, and take someone with you willing to assist. For the first part keep your eyes shut. Listen! The music and voice may be reproduced beautifully. Basic effects will be easily recognized. Trains, airplanes, and automobiles, will, of course, be identified. But try to determine from the sound alone where and what these mechanisms are with relation to the actors and the audience! Is the train close by or in the distance? Is it speeding along carrying actors and audience with it or does it sound as if it were running alongside at a distance of many yards? In short, is the sound in true perspective? Most likely, it is not. Let us take a part of the dialogue delivered by two actors who had previously talked of boarding a plane. The whirr accompanying their voices resembles a machine circling overhead at a distance of a thousand feet. Your companion whispers the information that the actors are seated in the cabin of a flying plane. Then comes the newsreel. The audience witnesses the picture of a great wall falling. An amazing sight that should produce an equally harrowing sound. No such sound is heard in the theatre, however. What accompanied the wall was a sound that could be as easily produced by a shovelful of coal. You rightly decide that the effects are

taken from sound tracks improperly recorded or carelessly chosen.

In radio such sound is not possible any more. You couldn't, even if you wanted to, "get away with it."

Most sound recordings made to sell to radio-program and independent picture producers are equally poor. Many have sold only because of the comparative indifference to authenticity in the picture industry; and to radio broadcasters who were restricted to either poor recordings or manual effects. For a long time no recording company took the trouble to ascertain the real value of its recorded effects. Then, radio stations complained about their poor quality. We suggested that the manufacturer send representatives to the studios and see how their product could be improved. Our request met with no response. As late as the year 1935 it looked as though the larger broadcasting companies would have to produce their own libraries of recorded effects. Then we received news that saved us this great effort and expense.

A new recording company was heard from—an entirely new kind of recording company, comprising engineers who had been quietly at work for a number of years perfecting the recording of sound effects on film. They proposed re-recording this sound on wax for use in radio-program production. Since the recording company was located in New York, we were invited to listen to some of it. With high hopes we went to a private studio and heard nearly a hundred thousand feet of it. An entire day was consumed in this audition. Some of it we asked to hear again. Our disappointment was very keen. The engineers had been studying the sound picture rather than the radio. Not ten feet of it was high enough in quality or pattern to meet our broadcasting requirements.

The recording group was no less chagrined. What revived our hope was that they understood our detailed criticisms of the film recordings and were even more determined to get us what we required.

We wanted records of sound that, if used in the theatres, would reach out from a pitch black screen or stage and be the embodiment of wind or thunder, train or bombing plane, crashing car or bursting dam. In real life these have emotional effects. In radio sound they must have the same.

The men we were talking to were in earnest. They got the idea. During the following six months they redesigned their special film-sound recorder so that it was possible to take it anywhere and into any kind of vehicle under all conditions without the sound track being spoiled by distortion or vibrations. Again we were asked to listen to the results. The experience will never be forgotten. Neither time nor expense had been spared in the effort to capture in sound the vivid reality itself. They had actually accomplished it. We heard the first series of realistic sound sequences. It was sound that needed no picture and no verbal suggestion for identification. The sound spoke for itself.

The value of an auxiliary company with such high ideas of service to the radio industry can hardly be overestimated. Each record on its lists had been submitted for test to several broadcasting companies. The approval of the broadcasters had been secured before any were sold. We tried them on rehearsals and programs, both commercial and sustaining, to be sure they would stand up under the critical ears of a number of production directors. The recent improvement in sound effects in important network shows owes much to the expert knowledge and painstaking care which have gone into the making of these precision, studio-tested recordings.

That is another chapter in the brief history of sound effects; and brief though that chapter is, its happy conclusion came none too soon. The day has arrived when neither the broadcaster nor his audience is satisfied with less than authentic sound in true perspective. The illusion must be as perfect as the original. Whether the sound pattern be designed for realism or fantasy, notice the dependable uniformity in the quality and clarity of

the sound threads with which they will be woven. Whether it is a pistol shot which must be produced manually or a recording of a raging flood reproduced electrically on our effects turntables—the thing required is an admirable unconcern about time and expense for patient experimenting and repeated tests. If secondary quality and workmanship is accepted in radio, it is only as a temporary measure until the precise effect mechanisms are produced.

It is a pity that producers and directors in stations throughout the world are not more exacting in their requirements. We should make faster progress. The amount of misinformation going around about the production of effects has resulted in much amateur performance where a truly professional one might reasonably be expected.

Radio sound effects are required to do many things for the listener. They are a graphic and swift method of implication. True, exact writing and careful speech is for many purposes superior to sound effects. Each has its limitations. Both are required. Within the language itself the necessity for sound effects is shown by the many onomatopoeic words in use. These all have their origin in imitative sounds. There are no satisfactory synonyms for *buzz, hum, bow-wow, splash,* or *crack*. Interestingly enough, the common sounds from which these simple colorful words spring are often difficult to reproduce in the studio. When effects are carefully planned and produced we have the time, the weather, and the setting for the scene. Action is held up or hastened, distance is covered for the transition of scenes, and in the variety of perspectives of effects new dimensions are disclosed and realism intensified.

There are several ways in which a number of sounds may be reproduced or simulated. The different methods of sound production give rise to the following classifications:

1. Recorded.
2. Manual.
3. Electrical.

4. Mechanical.
5. Vocal.
6. Acoustical.

The place in the list corresponds to the importance of the sound so produced in modern radio production. Seventy per cent of the sound effects produced at the headquarters studio of three major networks are recorded. Airplane motor sounds from planes of every description: transports, bombers, and fast pursuit ships, singly, in pairs, in squadrons and in flights, as heard on the ground and in the air, from the ground, and from cockpit and cabins are recorded; also automobiles of all representative types, modern and old. Their sounds were taken while standing, idling, moving at various speeds on the straightaway, uphill and down on the roads, streets, and speedways. Trains of all kinds were taken under every listening condition and in all perspectives. Boats, motorcycles, electric cars, subways, elevated railways, machinery, signal horns, sirens, harbor sounds, traffic noises, cheers, jeers, applause, laughter, winds, thunder, rain, explosions, confusion of voices both happy and enraged, bird songs, animal cries, hurdy-gurdys, merry-go-rounds, hand organs, and calliopes are now available.

The recordings available for broadcasters today are produced and distributed by six companies (listed in the Appendix, page 332). Some recordings are very good; some are very poor; others are indifferent and useful only as long as no better recording of the desired sound is procurable. Some recorded effects are made directly on wax or discs surfaced for instantaneous transcription. These are pretty bad. Some pressings are made on cheap material and sold to the gullible. The surface noise is so high compared with the signal sound that it is a wonder they have existed this long. Other pressings are made on a better lacquer type of material; and while the surface noise is reduced, the badly recorded sound is more prominent than ever. Much of the sound is obviously not authentic in origin. Some of it is badly faked. All of it is poor in pattern and arrangement. Other

recordings are made from film—not film track especially produced for radio sound effects but film bought from libraries and originally produced for picture synchronization.

This type of sound is better than recordings direct to the wax or acetate recordings. The pressings are on a very fine-grained unbreakable material. Some of these records have proved very useful. Still other and more modern are the ones described earlier in the chapter—recorded on film especially for radio use, designed according to the specifications of the sound departments of the networks, put through program testing before release. These are delivered on pressings made of a special material that is durable and free from off-center distortion and disturbing surface noise. Nearly all are 10-inch double-faced records.

Some records have a number of unrelated effects recorded on

Figure 31. Special triple turntable with speaker.

the same side. This makes them impractical for use in a well-equipped effects department. Naturally, those made with related effects on each side and with a close relation between the effects etched on both of the sides are preferred. This method makes for ease in playing, blending, and cataloguing. Some effect records contain sequences of sounds running for long enough periods of time to be useful under dialogue, and for blending with music or other effects without constantly re-spotting the pick-up needle.

There are many to choose from: transcriptions of such short duration as to make the operations of the effects engineer most difficult; some containing both actual and dramatic perspectives; still others in which it seems that both the mechanism which re-

Figure 32. Close-up of the triple turntable showing spotting arms.

corded and that which produced the sound were merely set going and allowed to run.

Recordings that have in them imagination and full knowledge of the requirements are on the market. They are as easily procured as those that require the aid of verbal suggestion in a program before they are readily identifiable.

Multiple-Record Effects

The value of recorded sound effects may be greatly extended by the use of two or more in combination. Frequently the sound of the scene is made up of a number of different sounds in rapid sequence, overlapping, or heard simultaneously. As many as seven turntables at once have been used in order to combine and relate recorded sounds and so produce the sequences and blends required by a play. Plenty of rehearsal time is needed for these large combination effects, and pains must be taken to correct the volume for the desired distance perspectives and a proper balance between those used together.

Turntables and Speakers

A great variety of turntables for professionals and amateurs are used for sound-effects record reproduction. The tables must be well made—not toys. The loud speaker and amplifier used with the electric pick-up should be of the high fidelity type. Turntables used in broadcasting stations differ in construction and quality of material. They range from the single portable type to the triple table fitted with variable speed control, variable high and low frequency pass filters, and instant-spotting devices.

The most perfect and completely equipped triple turntable is one recently designed and built for the Columbia Broadcasting System's New York Sound-Effects section (figures 31 and 32). This equipment is completely automatic. It is a perfect precision instrument, every part of it hand-tooled and every moving part hand-machined. In spite of its great size, it is built like a

fine watch. The moving parts are operated by synchronous motors. These drive the turntable mechanism, parts of which are made so exactly that they caliper within one two-thousandths of an inch. The variable speed is positive for an indefinite period, at any setting between 10 and 120 revolutions per minute. The settings themselves are accurate to within 1 per cent of any desired speed. The speed control is like a volume control, and as easy to operate. Changes are made smoothly while the table is in operation.

By a gauge reading, a sound recorded at any point in a groove on the record can be located. The pick-up needle can be set at that spot with unvarying precision. By throwing a switch, the pick-up arm is lowered to that spot so accurately as to instantly cause the reproduction of the selected sound. This accurate operation may be repeated indefinitely once the instrument is set. It is so fine in its selectivity as to split words and give the desired syllable without fail.

This is, of course, an expensive mechanism, probably the only one of its kind in existence. There will be others, no doubt, produced to accomplish the required work with accuracy.

The second type of turntable speaker amplifier combination for recorded sound effects is one that can be built by the staff of nearly any station. It can be constructed in units of one, two, or three turntables. The amplifier and speaker may be enclosed in the same cabinet or in a separate construction. The Sound-Effects Sections of the National Broadcasting Company and the Columbia Broadcasting System have specifications which are available for any who desire to produce these units.

For those who use such carefully worked out plans, little need be written here. For those who construct their own, out of materials of their own choice, several important suggestions should be made.* Extreme care in design and construction of this piece of sound-effects equipment is necessary. A photograph of this type is reproduced on page 321.

* See page 320 in the Appendix.

Portable Turntable Equipment

Often programs originate at points far removed from the regular studios. These may be produced in auditoriums or ballrooms. Occasionally they are performed in the open air. The sound-effects technicians and their equipment will be needed on some of those remote originations. The necessity for transportable equipment is sometimes as great as the need of portable microphones and amplifiers. Turntables, amplifiers, and speakers can be constructed by an adaptation of the equipment described in the Appendix (page 320). The separate units must, of course, be compactly built so that cases and cabinets are small enough to carry. In broadcasting stations where the demand for sound-effects service is not heavy, these units serve the double purpose of meeting both studio and remote requirements. At centers where there are heavy demands on the sound-effects department, portable instruments provide an excellent auxiliary service. The compactness of equipment of this design is clearly shown in the illustration.

Manual Effects

Sound effects which are produced by hand and foot operations are not so necessary as they were formerly. The majority of these were poor imitations of sounds and have been replaced by excellent recordings of actual sounds. The good ones have been retained, however, because they synchronize perfectly with speech or suggested action. Their distance perspective, their character, and their timing requires a coördination not possible in any other production methods. The opening and closing of doors and windows, the movement of furniture, the handling of almost any material object, the firing of rifle and pistol shots, walking on various surfaces, riding horseback, and accompanying hoof-beats all may partake of the character and mood of the persons in the drama at the moment they occur. For example, doors opened and closed by a person who is in a hurry, or provoked, or is

stealthy in his movements, sound very different from doors opened and closed by the same individual when he has plenty of time, is calm, and is under no necessity to be quiet. Some directors have the actors operate these pieces of mechanical equipment themselves to match mood and sound more exactly.

Electrical Effects

Electrical sound effects are found in great number in the well-equipped effect libraries. Parts or whole mechanisms often may be picked up from junk and second-hand dealers. A number can be found discarded around the home. Motors of all sizes and descriptions, electric horns, vibrators, violet-ray and other high-frequency machines, toy transformers, electrically operated bells, chimes, and buzzers can be made to produce either their actual or imitative sounds. Fans, and sirens ranging in size from the small

Figure 33. Turntables constructed as portable units.

automobile type to the heavy fire signal, come in this group. The ingenious technician will be able to repair and adapt many electrical parts and spend comparatively little money in assembling this part of his effects equipment. Audio frequency units, oscillators, photo-electric devices, and electric pick-up arms are among the newer and more unusual electrical effect mechanisms.

Mechanical Effects

Under this heading come all kinds of clocks and spring, weight- or water-driven mechanisms, bird boxes, music boxes, bells, and performing toys and noise-makers of every description. Some of the shelves in a large effects library would provide material for any boy's holiday. Grown-ups also enjoy playing with the effects in this group. Turn most people loose in either the library or the laboratory of a well-organized effects department and it will be difficult to get them away.

Vocal Effects

The use of vocal organs to create sound effects is limited, for few people produce them properly. Some gifted imitators of birds, animals, and insects have acquired their techniques by years of practice and attentive listening. These talented folk are usually found in the large entertainment centers. They have been used on many important programs. The howling of a wolf, the barking of dogs, the call of the whip-poor-will, morning dove, or bob-white, and, occasionally, the cry of a baby, are produced by employed imitators. There are situations that cannot be met without them. Neither recorded nor actual sounds can be made to take their place—when such sounds must come in promptly on cue in proper perspective, and be paced with the dialogue or other action of the drama.

Acoustical Effects

Variations in the character and quality of sound effects may be accomplished by the acoustic conditions under which they are

produced. There are no such things as "acoustical sounds." Many changes may be made by livening or deadening the area in which the sounds are made, or by transmitting the sound through an additional studio or chamber before it reaches the air. This treatment applies to all sounds produced by the five methods described.

The simplest means of accomplishing acoustical changes is to block off a given part of the studio with specially treated screens. These can also completely surround the area, forming a booth.* The additional studio or room through which sound is passed after it leaves the originating point is called an echo or reverberation chamber.

One type usually calls for original architectural designing or planned building reconstruction before it can be installed. It consists of several long tubes or tunnels. Into one end of these, sounds from the originating studio are poured by means of a loud speaker. The other ends of the tubes enter a little room, the walls, ceiling, and floor of which are smooth, highly reflecting surfaces. Here the sound is again picked up and mixed with the output of the original studio. The reverberation is provided by the surfaces of the reflecting tubes and room. The amount of echo or time-lag which is added to the sound is determined by the length of the tube or tunnel which is used.

Recently a form of echo chamber which does not require building planning or reconstruction has come into use. Necessity forced the imagination that conceived it and finally brought it into existence. With space provisions in a building for the tubular type of chambers, every available surface was considered and rejected. This became a serious space problem. We tried to find a solution. Some of us in the conferring groups were not trained engineers or construction experts. Perhaps that is why we let our imagination run wild with the possible bends and twists these tubes might make in becoming adapted to available space.

* Note the diagrams and drawings on pages 200 and 202 of the studio and booths used in the production of "Gang Busters."

Without expecting serious consideration we suggested the maze. In our thoughts of the problem of sound entrances and exits, the picture of a crystal maze came to our mind. In fancy we were chasing sound reflections and our own reflections around a labyrinth in a ridiculously amusing search for a way out. "Why not a labyrinth?" Much to our surprise one of the engineers answered, "Why not?" And a strange "day-mare" took substance

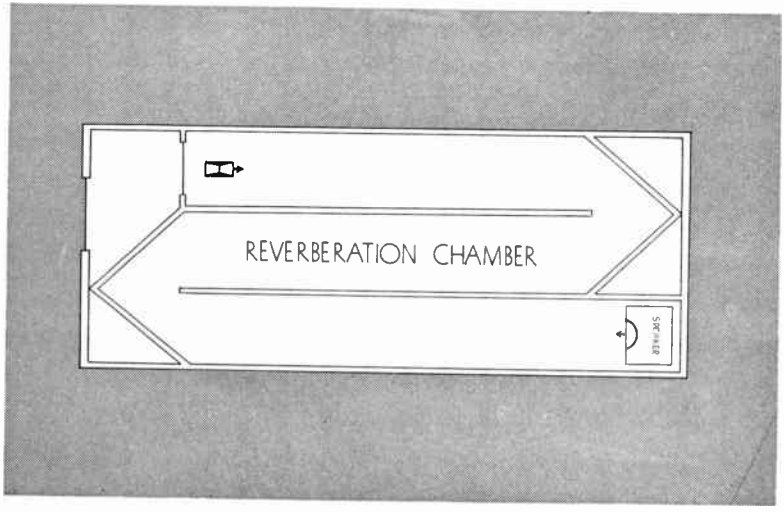


Figure 34. Labyrinth reverberation chamber.

in the form of our highly successful labyrinth reverberation chamber. The room is large enough to provide a partitioned labyrinth ninety feet long. The sound is fed in at one end through a loud speaker and picked up by a microphone placed at the desired distance. The greater the distance, the greater the signal-time lag will be and hence the greater the echo effect.

Sounds are projected into long cardboard tubes, megaphones, barrels, opened pianos, and reflecting studio corners. The resulting effects can easily be discovered by home experiments. The part of this book dealing with sound effects may be of some importance to almost any reader. The amateur may have no end of fun fooling around with gadgets, turntables, and records. Sound

effects are a fascinating hobby. These amateurs sometimes come upon things useful to the industry, just as amateur radio operators have been responsible for many important advances in broadcasting.

But especially to the employed sound effects man, these pages, together with the appendix on sound, form a sort of handbook, although he may already be familiar with some of the things in it. Perhaps a technician reading this may recognize a device he was first to construct and use. If so, I hope he lets me know about it so that proper acknowledgment can be made. Who made the first contraption consisting of a frame strung with wires and suspending wooden pegs for simulating marching feet? Nearly everyone says "somebody on the West Coast created that." I would like to know who he is.

Detailed instructions for the production of all the fundamental effects has place in the appendix for specializers. That section was prepared by one of the most adventurous chief-technicians in the field. Beginning as an amateur, he now heads the effects section of the production department of the world's largest network.

Directions for Sound in the Script

Let us have a look at some manuscripts prepared for radio dramatic programs containing complete directions and cues for the required sound effects. The excerpts are from the script of the Anniversary Program of the American Red Cross. They provide useful illustrations of the sounds produced by recordings. They are also good examples of manuscripts prepared by an author who made himself familiar with what sounds were available before writing. The program originating point was so far from the studios that portable turntable equipment was used. Six turntables were set up in order to accommodate the effects records which were called for. The script speaks for itself. The listener is already familiar with the conventional voices and the devices used in both impressionistic drama and realism on the air.

Opening

SOUND	ROAR OF HURRICANE WITH OVER- AND UNDERTONES OF RUSHING WATERS, AUTOS COMING TO BRAKE-SCREAMING STOPS, AIRPLANES ROARING, FADING INTO NARRATOR	All Records
NARRATOR:	When disaster strikes . . .	
	UP VOLUME 7 SECONDS	
NARRATOR:	The Red Cross responds.	
SOUND	RUSHING WATERS, HOWLING GALES, HOWLING WIND, CRACKLING FIRES, EXPLOSION	All Records except Crackling Fires (C)-
NARRATOR:	Today, the Nassau County Red Cross, through Columbia's Department of Talks, brings to the CBS Network a story of the Red Cross in action.	
SOUND	RUSHING WATERS, HOWLING GALES	Records
VOICE I	Are you safe?	
VOICE II	Safe from the forces of nature.	
SOUND	WINDS, EXPLOSION	Records
VOICE III	You think you are!	
VOICE I	How do you know?	
VOICE II	Listen to this!	
VOICE I	During the past ten years, there has been an average of 92 disasters a year that needed Red Cross relief.	
VOICE III	Last year, there were 106 disasters in 36 states, Alaska and the District of Columbia.	
VOICE I	Only 12 states in the Union escaped some type of catastrophe during the year.	
VOICE II	Cloud bursts! . . . dust storms . . . earthquakes.	
SOUND	WIND	Records
VOICE III	Epidemics . . . explosions . . . fires . . .	
SOUND	EXPLOSION	Record
VOICE I	Floods . . . hail storms . . . hurricanes . . .	
SOUND	RUSHING WATERS	Record
VOICE II	Landslides . . . mine explosions . . . tornadoes . . .	
SOUND	THUNDER STORM	Records (A) and (B)
VOICE III	Typhoons . . . wind storms . . .	
	PAUSE	

VOICE I — During the past 56 years, the flag of the Red Cross has flown upon every scene of major disaster in the United States.

VOICE II — It has been the Great Mother that brought food, clothing, shelter, medical aid, and rehabilitation of homes and families.

VOICE III — . . . To more than 2,000 scenes of disaster, large and small, at home and abroad.

VOICE I — Thousands of families would have been left homeless and hopeless if it hadn't been for the Red Cross.

VOICE II — Floods in the Mississippi, Ohio, in California and New England . . .

VOICE III — But you don't live there!

VOICE I — Tornadoes in Missouri and Indiana . . .

VOICE III — But you don't live there!

VOICE II — Hurricanes in Puerto Rico and Florida . . .

VOICE III — But you don't live there!

VOICE I — Drought in the wheat belt . . . dust storms in the middle west!

VOICE II — Slow, creeping disaster in the burning sun!

VOICE III — Farm lands turning into desert.

VOICE I — Cattle dying in the field throughout many mid-western states.

VOICE III — But you don't live there!

VOICE II — You are safe?

VOICE I — Only until disaster strikes! Listen. . . .

NARRATOR: On the afternoon of March 15, 1936, all was quiet and peaceful in the city of Belleville which stands in the heart of a prosperous agricultural community on the Illinois side of the Mississippi, just south of St. Louis. In stores and offices and plants, men were winding up the day's work. In homes, kitchens were fragrant with the odors of home cooking . . . and then . . . listen. . . .

SOUND — WIND — Record (A)
Gradually Rising

GIRL: Say, Mother, it's getting awfully dark, all of a sudden. And the wind is blowing awfully hard.

MOTHER: That's right, Marilyn. Looks like a storm is coming up.

GIRL: A big one, too; I hope Daddy gets home before it breaks loose.

MOTHER: Run to the door and see if he's coming.

SOUND DOOR OPENS—TERRIFIC GALE OF WIND AND RAIN — House door prop and Records

GIRL: (Off Mike) Oh, Mother, Mother—come here quick! Why, it's something awful.

MOTHER: Gracious me! It's a cyclone. There's your Daddy now!

SOUND CAR DRIVING UP AND COMING TO A STOP. WIND EFFECT LOUDER — Auto Record Fade-in

MOTHER: Hurry, Ben, come on in quick before you get soaked to the skin.

FATHER: I'm coming.

GIRL: Look Daddy, look Mommy, Look! It's a tornado!

MOTHER: See it coming up the road.

GIRL: A big, black funnel. It is diving and dancing . . .

FATHER: Like a black devil of destruction!

SOUNDS FURY OF TORNADO INCREASES WITH ENORMOUS CRASHING SOUNDS — All Records

MOTHER: Heavens above! It is lifting up those houses like match boxes!

FATHER: It is coming this way!

SOUND CRESCENDO OF STORM INCREASES WITH TERRIFIC ENERGY AND LASTS 30 SECONDS

FATHER: Run for the cellar! Quick now! Everybody down into the basement. Come on Marilyn. Come on!

MARILYN: But Daddy, one of the big steel towers has been blown right across the railroad tracks and there is a train coming!

(Off Mike) A passenger train, and if it hits that steel tower on the tracks, it will be wrecked.

SOUND DOOR OPENS — STORM UP!

MOTHER: Marilyn, Marilyn, come back! . . . Oh, my poor darling!

FATHER: It's too late now, Mother.

SOUND DOOR SLAMS

MOTHER: She is gone—bless her heart.

PAUSE

Wind Record — Train Record

SOUND FURY OF WIND SOMEWHAT SPENT . . . RUMBLE OF TRAIN — Be sure sound is that recorded in locomotive cab.

ENGINEER: Gee, boy . . . I'm glad that's over. For half a minute I thought that twister would lift us right off the tracks.

FIREMAN: Same here, Bill. But . . . by golly . . . take a peep at Belleville! Houses are scattered all over the west part of town. And there are fires almost everywhere! You said it . . . that tornado certainly hit this town . . . look! Someone is running down the track.

ENGINEER: Yes, a little girl!

FIREMAN: Waving her arms! Brakes, Bill! Stop! . . . Quick!

SOUND TRAIN COMING TO SCREAMING EMERGENCY STOP (Test Record)

GIRL'S VOICE: (Fading out on) The tornado blew one of the steel towers across the tracks, that's why.

ENGINEER: Great Scott! . . . what a narrow shave!

NARRATOR: With typical speed and efficiency the Red Cross stepped on to the job as a trouble shooter. Cars were speeded from nearby St. Louis with nurses, doctors, and emergency supplies. Meanwhile, in Springfield, a hundred miles away, a Red Cross instructor is giving lessons in first aid to a group of troopers of the Illinois State Police. They are in the yard outside of the Police Barracks, learning how to operate the two mobile State Police first aid units. (Suddenly over the Police Radio System. . . .)

RADIO: (Through filter) Springfield Headquarters calling all cars of the State Police in Southern Illinois. . . . Calling all State Police Cars in Southern Illinois. . . . Give close attention. . . . Proceed at once to Belleville for disaster duty. . . . Proceed at once for disaster duty. Tornado just struck the town.

TROOPER I: Hear that?

INSTRUCTOR: I certainly did.

TROOPER II: Good thing we left that radio running.

TROOPER I: Betcha, big boy.

INSTRUCTOR: Yes, fellows . . . and here is where we put theory to the test of practice.

SOUND CROWD CONFUSION

Come on, get going all of you. These two mobile units . . . on your way . . . pile in the best you can.

SOUND EXCITED VOICES

SOUND MOTORCYCLE ENGINES BEING START-

ED, CARS DRIVING OFF WITH SCREAM- All Records
ING SIRENS FADING INTO THE DIS-
TANCE

Excerpt II

NARRATOR: It required a catastrophe like the World War to place the Red Cross in its proper niche as the Greatest Mother on Earth, in days of peace as well as during times of conflict. Among the factors which lifted the Red Cross to the heights of usefulness it has attained were the vision and spirit and courage of one man—Henry Pomeroy Davison. Prior to the World War, the Red Cross had been active in the alleviation of human needs and suffering, but on a small scale. When the curtain rose on America's entry into the World War, in April 1917, the main drive was for men, munitions, and money.

SOUND MARCHING MEN Record CAISSONS (Props)

VOICE I Men for the Army.

VOICE II Men for material and munitions.

VOICE III Money for men and munitions.

VOICE I Millions upon millions for Liberty Loans.

VOICE II Millions for the Red Cross.

VOICE III The Red Cross.

VOICE I Eight million Chapter women making over 300,000,000 articles for relief.

VOICE II Valued at nearly 19,000,000 dollars.

VOICE III Home service for soldiers and their relatives.

VOICE I Canteens all over the land.

VOICE II The Red Cross Motor Corps.

VOICE III Hospitals for the needy.

VOICE I That was at home. . . . But abroad . . . the Red Cross stepped to the fore.

SOUND AUTOMOBILE Record (A)

VOICE II Red Cross ambulances at the front.

VOICE III Red Cross nurses and doctors in chains of hospitals reaching from the field of battle to peaceful areas.

SOUND ADD ARTILLERY, MACHINE GUNS, AND RIFLES Warfare Record

VOICE I Care for blinded and crippled soldiers.

VOICE II More than 100,000 tons of food, clothing and medical supplies.

VOICE III Courage and hope—food, clothing and shelter for fear-stricken mothers and starving children in countries ravaged by war.

VOICE I Millions of dollars—hundreds of millions of dollars spent here and abroad by the Red Cross in its heart-stirring role as the greatest Mother in the World.

SOUND ALL SOUND—OUT

Excerpt III

NARRATOR: When Spring comes, there are other things in the air besides the scent of flowers. For in the springtime, Mother Nature is apt to lift the lid of the Pandora Box of trouble and set free those hand-maidens of Death and Disaster—ice and snow that melt too quickly for rivers to handle them—torrential rains that fall in a steady deluge—all of which combine to produce floods that sweep away human lives, homes, and happiness.

SOUND ROARING OF FLOOD WATERS Record

VOICE II Floods!

VOICE I Floods in the Ohio Valley.

VOICE II Floods on the Mississippi.

VOICE I Floods in New England.

VOICE III Floods in California.

VOICE I Floods in Pennsylvania.

VOICE II 1927 . . . floods in the Mississippi Valley . . . 26,000 square miles covered by water . . . four and a half million people affected . . . 246 lives lost . . . damage to homes, cattle, and farm lands amounting to 125,000,000 dollars.

VOICE I More than 100,000 people evacuated from danger areas by the Red Cross.

VOICE II More than 600,000 men, women, and children looked after by the Red Cross.

VOICE III More than a quarter of a million head of livestock belonging to 60,000 families cared for by the Red Cross.

VOICE I More than 300,000 refugees returned to their homes by the

Red Cross when the flood waters receded, and given a new start in life through the Red Cross aid.

NARRATOR: When disaster strikes, the Red Cross responds with every means within reach in this age of mechanical development. Radio, whose voice neither wind nor torrent can quench . . . sturdy out-board motors that hold no fear of rushing flood waters . . . fast moving cars . . . swift airplanes . . . all bring relief and rescue. Half a century ago, the Red Cross, then in its infancy, sent relief by runner, by horse, and by wagon to pioneer families in northern New York isolated by enormous forest fires in the Adirondacks. Newspapers then hailed this errand of mercy as *flying* to the rescue. Now airplanes have given new speed to rescue work. . . . Army, Navy, and Marine Corps planes flying on rescue missions for the Red Cross have saved untold lives among flood victims. This work first began in 1927. . . . Let us fly down the slipstream of time to January 1930, when the Wabash River went on the rampage. Ice jams spread freezing streams of water over thousands of acres, making rescue difficult—impossible. Owing to the frozen roads, even horses couldn't break through. Men—heroic men—by sheer strength of will and purpose, drew sleds across the icy wastes—then came the airplane. Sound background of airplanes in flight Record

SOUND AIRPLANE CROSSING FIELD PRELIMINARY TO LANDING Records

GENARO: That looks like Lieutenant Peck's ship. . . . I'm sure glad he got back.

VOICE I Yes, Lieutenant Genaro, this is pretty bad weather for flying.

GENARO: Well, at times like these you can't pick your weather.

VOICE I And we are all proud of this chance to show the Red Cross what the Army Air Corps can do in rescue work.

SOUND PLANE TAXIING UP, OFF MIKE Record

VOICE II Yeah, but that won't save you from a crack-up.

VOICE I Gosh, just look at those clouds.

VOICE II They're hanging so low that even the ducks are walking.

GENARO: No birds flying but the Army birds, eh?

VOICE I You said it, Lieutenant. The Army and the stork.

GENARO: The stork? What do you mean?

VOICE I Well, you know every day flocks of brand-new babies arrive in refugee camps.

VOICE II Yes, and they name all the boys Noah in honor of the flood.

GENARO: But here's Lieutenant Peck now. . . . Let's hear what he has to say. (SHOUTING) Hello, Walter! How did you make out?

PECK: (COMING IN FROM OFF MIKE) Okay, Lawrence. I've got to hop on the telephone right away.

GENARO: Find something?

PECK: Yeah. Down the line I counted more than 20 homes all flying distress signals. In two places the signals called for doctors.

GENARO: Say, those medicals certainly take it on the chin working the way they do.

PECK: Right you are, Lawrence. I wouldn't want to be in their shoes.

RYAN: 'Scuse me for butting in, but where can I find Lieutenant Genaro?

GENARO: I'm Lieutenant Genaro. What can I do for you?

RYAN: My name is Tom Ryan. I live down in Vincennes. The Red Cross sent me up here to guide you to a place down the river where food and supplies are needed mighty badly.

GENARO: Well, you've come to the right man at the right time. My ship is on the line with the motor all warmed up and loaded with stuff packed in blankets. So if you are ready, we'll hop.

RYAN: Okay.

GENARO: Say, Walter, let Mr. Ryan have your parachute.

SOUND AIRPLANE IN FLIGHT. THE DRONE OF THE ENGINE CONTINUES AS BACKGROUND THROUGHOUT THE CONVERSATION, WHICH IS LOUD OVER THE ENGINE. Record

RYAN: There it is, Lieutenant, right ahead.

GENARO: Okay, Mister. Get ready to drop those bundles. I'll get down a little closer.

RYAN: Seems to me you're close enough now. We're right *on* the tree tops.

GENARO: Yeah, but not *in* them. Now, when I shut off the engine, toss out a bundle.

SOUND ENGINE THROTTLED DOWN. SOUND OF WIND WHISTLING ON THE WIRES Records

GENARO: Now!

RYAN: (GRUNTING) There! There it goes! (EXCITEDLY) Look out! Look out, Lieutenant! The bundle blew open and the blanket . . . the blanket is in the rudder.

GENARO: You're telling me! I almost lost control of the ship. We've got to land.

RYAN: Where?

GENARO: On the ice. I hope it holds.

RYAN: Gosh! Well, I'll try anything once.

GENARO: Get down on your seat. Fasten your safety belt and hang on. Here we go!

SOUND BUMPING SOUND OF SHIP MAKING ROUGH LANDING WITH DEAD ENGINE Records

GENARO: Gosh, we made it!

SOUND CONFUSION OF VOICES IN THE DISTANCE GROWING LOUDER AS LARGE CROWDS OF PEOPLE COME UP Records and Actors

RYAN: Well, folks, how's that for special delivery.

NARRATOR: The annals of Red Cross relief work are crowded with heroic exploits of airplane pilots—civilian, Army, Navy, Marine Corps and National Guard—flying over land, sea, and mountains on rescue missions to victims of fire, flood, famine, and storm.

The sounds of floods and tornadoes, of thunder storms and driving rains, of warfare, trains, police cars, and ambulances, were all the real thing captured on records. The manufacturers provided all the necessary perspectives. On top of that, they caught the dramatic power in the sounds themselves. Their method of recording enables them to theatricalize the sound sequences, giving us the equivalent auditory effects in our radio playhouse, as the theatricalized stage settings of a Gordon Craig or a Max Reinhardt create for the eye.

I have still another purpose in calling attention to this script. The sounds called for are recorded and available to any local,

commercial, or university station. The time for tinkering with tricky gadgets to produce good sound has passed. Now, the small station can convincingly produce a program like the one reproduced with little expense and no worry as to the authenticity of the sound.

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The Layman Speaks

WITHOUT EXAGGERATION I can say that every facet of human existence is grist for radio's mill. The layman in the world outside the studio is frequently radio's most exciting source of interest. Because those programs devoted to reporting the activities of the layman set an example for the layman who intends to speak himself, I include them in this chapter.

Sports

The games and contests of every season are on the air. Some of the best-known radio personalities are specialists in this field and are awaited eagerly by the stay-at-home fans before the broadcast of every great sports event. The best of these announcers are masters of description and authorities in the sports to which they accept assignments. The perfect coördination of sight, memory, and speech, with speed and precision, is one of the most magnificent by-products of the industry.

Special Events

Howard Hughes circled the globe in less than four days. Nine announcers, as many special officials and contact men, and as many engineers from one network key station sprang into action at the start. Like Mr. Hughes, they remained on duty day and night. At every spot on the earth where his plane was likely to

be sighted or where communication with it was possible, special representatives were commissioned to get into action. How many others, not only in America but in every country in the world, were concentrating on the radio broadcasting of this event? It would make an interesting piece of research getting the answer to that question. I would guess in the thousands!

The order went out: "Get Hughes and every detail of description of him, his companions, and his plane before the take-off, during the take-off, in the air, at Paris, over Berlin, at Moscow, at Fairbanks, Alaska, at Minneapolis, and at Floyd Bennet Field when he lands." It was done. The flight made radio as well as aviation history.

So every event of front-page importance that can be observed on the ground or in the air is described simultaneously over a thousand transmitters. If that is not possible, a first-hand story is given the waiting listeners soon after its occurrence.

A king abdicates; another is crowned. The voices of both are heard 'round the globe. A flood inundates parts of five states. From planes and river boats, and from the tops of buildings, accurate reports are made not only to acquaint the public with the extent of the disaster, but to render assistance to the victims. War comes in Africa, in Europe, and in Asia. From there, commentators describe the horror, accompanied by the sounds of machine guns and artillery. Advocates of each side in the deadly struggles state their positions to an amazed and apprehensive world.

Radio reporters are a trained and experienced group, ever alert to get the persons and stories that make headlines. *News* has been their life work. The head of the Department of Special Events is as alive as a city editor or the chief of a world news service. He has under him specialists in national affairs, international relations, sports, and so on.

Whether it is the marriage of a princess or an ex-king, the arrival of one Zeppelin or the burning of another, the proved and heralded achievement of a wealthy aviator in the most modern of

planes, or the surprise flight of a poor Corrigan in a nine-year-old crate held together by twisted wires, if the news is *important* news, it pushes aside other programs, commercial as well as sustaining, and goes on the air. Above all other things that radio does, this personal news service recaptures that earlier sense of radio's importance. Perhaps it brings to both listener and broadcaster the real romance of the air.

The speaking staff responsible for actual descriptions must be carefully chosen. Among them are news commentators with international reputations, engaged especially for the broadcast of significant events. Others are announcers with a special fitness for this type of work. They are alert and well informed. Of equal importance is their experience in overcoming difficulties occurring at remote points where special-events programs frequently originate. The rear platform of an observation car, the deck of a ship, the cockpit of an airplane, inside a diving bell or suit, one corner of a burning building, or the control room of a submarine may be the remote point assigned. Almost any strange or unusual place has been hurriedly turned into a broadcast studio. And there every strange bodily position has been taken by the announcer in order to perform his job. Men announcing news events (whether as specialists or as announcers on emergency assignments) must keep informed—and ready.

One sports announcer, acknowledged to be the greatest yet to appear in radio, is always prepared. Between sports programs he is at his typewriter, pounding out factual material about the contending men or teams, their records—everything that an authority should know about the game and those engaged in it. He has plenty of descriptive material handy to fill in any lull or intermission. He even has compiled a vocabulary for every event. In moments when description has to compete with the machine gun speed of the action, we never hear him fumble.

Nothing can be done without this preparatory grind. Like the star comedian's lines and the extemporaneous speaker's illustra-

tion, it sounds as if it were shaken out of his sleeve. That's the beauty of it.

The day the *Queen Mary* steamed up New York harbor to her pier where she finished her maiden voyage, two announcers were sent to sit in a window at the end of the pier. One was an old hand at such assignments. The other, a young guest announcer from a distant local station, wanted experience. They had, of course, a microphone. For some reason or other, the regular announcer had to leave the window to work his way through the crowd and return before the time set for his descriptive part in the program. He never returned to the window. An emergency police regulation prevented. The visiting cub announcer sat with the microphone in his lap and the "cans" on his ears waiting. Suddenly the ball was tossed to "our announcer, seated just below in the window." He said later there were only two things to do: either to say "He ain't here," or to go ahead as if it were his full responsibility. He did the latter, and filled a fifteen-minute period with the most sensational descriptive material we had heard in many a day. People in offices at the station left their desks and stood around the loudspeaker. What he was giving was not only a brilliant but also an accurate description.

And all during these fifteen minutes he was looking at the flat black plates on the side of the ship. That was all he could see—not even a view through a porthole!

How did he do it? He knew the *Queen Mary* from stem to stern. He had followed every description of her since her keel was laid in the Clyde until the day of her arrival. He remembered the names of her officers and important people on board. He had her dimensions, her equipment and her speed. He was prepared!

Commentator and Audience Participation

"America's Town Meeting of the Air" provides us with a program of commentators and audience participants. This well-

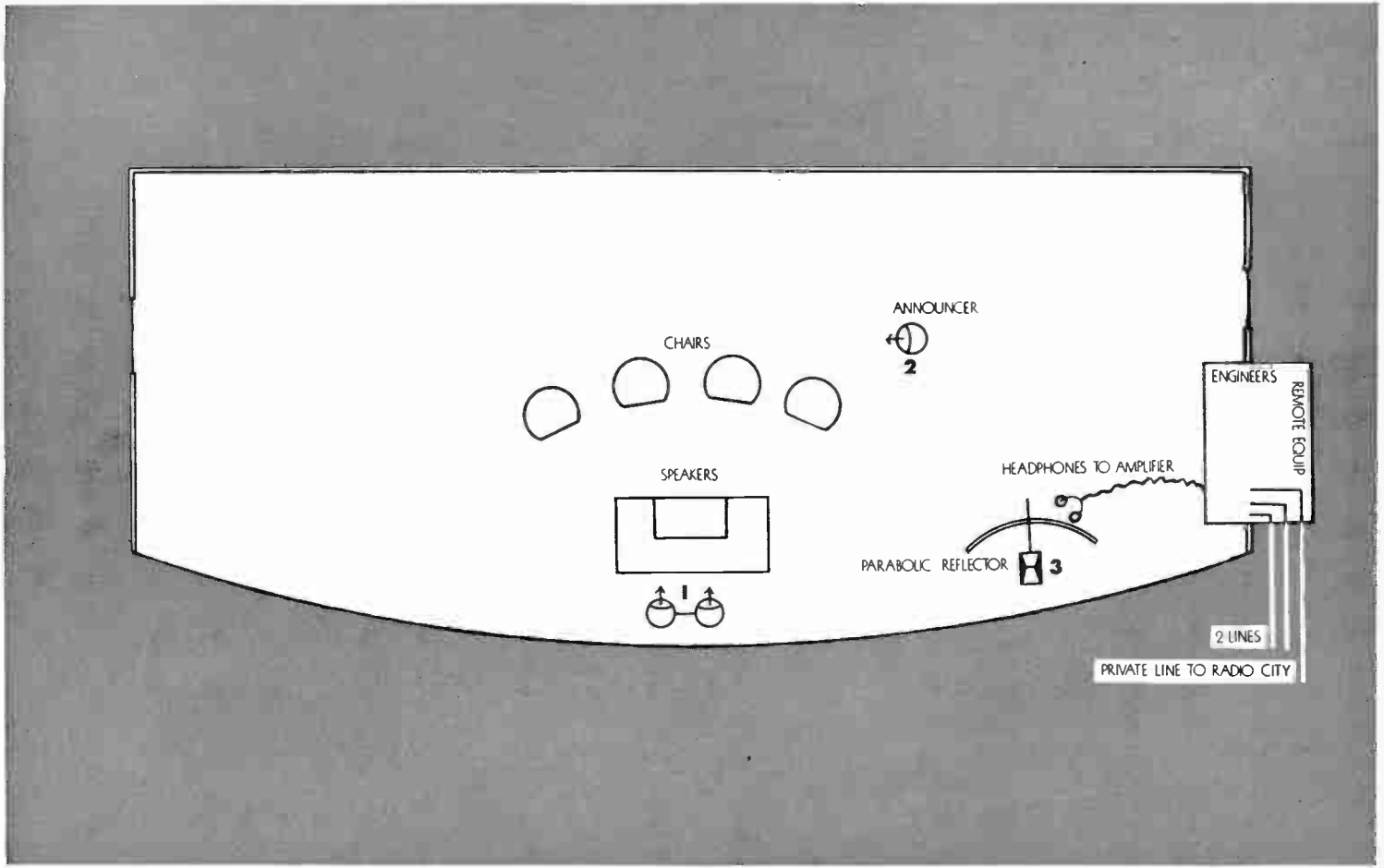

Figure 35. Set-up for the Town Meeting of the Air.

known NBC program embodies educational as well as entertainment values presenting prominent speakers on socio-political questions in a public forum. Figure 35 shows the set-up in Town Hall Auditorium.

Noteworthy from the set-up angle is the fact that the entire broadcast is caught by microphones located on the stage. Both simplicity and speed are virtues of the arrangement.

The speaker's stand is of the public-address type, supplied with inductor microphones (indicated at 1 in the diagram). Microphone 2 is used by the announcer and the "Town Crier"—the latter being the bell-ringing gentleman whose Colonial cry briefly opens and closes the session. A separate microphone for these performers facilitates smooth entrances and smooth timing.

Mounted on a parabolic reflector, microphone 3 is used to pick up those audience participants who wish to ask questions or engage in debate. It has a concave face, and is made of spun aluminum. Functioning as a sound concentrator, it can be focused with great accuracy by the operator by means of a small hole which serves the same purpose as a sight on a rifle. Sounds are scooped up within the parabola and reflected into the live face of the microphone at its center (see figure 36).

The characteristics of this combination instrument are such that high frequencies are favored over low ranges. This makes the parabolic microphone perfectly suitable to voice transmission, though great fidelity in the pick-up of music is not possible.

The Layman Is Worried

Audience-participation programs are steadily increasing in popularity. A certain very convincing reality comes with the comparatively unpolished or unprofessional speech of the man whose occupation is *not* broadcasting. The listener enjoys hearing someone who sounds as though he were unrehearsed. But, if I am to judge from the quantity of mail received from those who have spoken or who expect to speak on the air, the broadcasting layman is not so happy about the prospect. The layman wants

to know how to eliminate his fear of speaking, what to say, and how to say it in public. And certainly nothing could be more public than a radio broadcast which goes out to a million people. Whether what he says ever reaches the air or remains confined within walls only to be remembered in the minds of a few auditors, the rules are the same.

Volumes have been written on the "art" of extemporaneous speaking and enough has been left unsaid to fill many more.

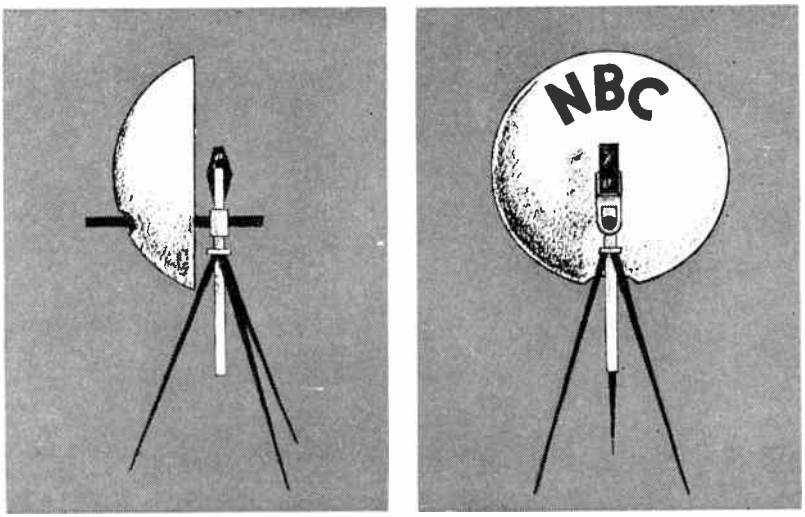

Figure 36. Microphone with parabolic reflector.

Since there are so many public meetings, local gatherings, and other occasions when the average man may be called on to speak, these remarks are for him.

The value set by speakers upon similar material which I wrote for a pamphlet distributed by the Talks Department of the Columbia Broadcasting System several years ago and requests from a number of speakers for a fuller discussion of the preparation and delivery of a radio speech prompts the inclusion of the following material.

The first rule for public speaking is: *Have something to say.* The second is: *Say it.*

If you want to test the truth of these rules, go to an acquaintance of yours who is emphatic about his inability to speak in public. Listen to him talk in his business office or at a luncheon table or in any social circle. At any time or place he will be able to talk fluently on any subject he is enthused about.

Recently a young man stated that every time he even thought of facing an audience, he was suddenly stricken with paralysis of the vocal cords. Later, at a luncheon to which were invited several of his acquaintances and also strangers, I began to draw him out regarding his previous experience. For several years this student had been a clerk in a large drug store. This store was located on an important corner in the city where many interesting things occurred during the time he was employed. While taking care of customers or working behind the prescription counter, many stories were told that could be compiled into a very interesting address. Only a few questions got him started on a delightful narration. The moment he got into his story, his face brightened up, his eyes sparkled, and words came freely. In ten or twelve minutes he told many things in an engaging way. He fulfilled nearly all of the requirements of a public address, without any noticeable stricture of the vocal cords.

Naturally, there is a certain amount of embarrassment connected with the formal appearance of a man before an audience. He is aware that all eyes are on him and all ears open for what he is to say. No man, however experienced, who has a respect for his listeners or his subject, can completely escape some small degree of self-consciousness. But he can do just what the young man did at the luncheon—launch into a discussion on which he is thoroughly informed and in which he is interested. The slight nervousness will soon pass. After a few occasions, even the first difficult moments become less troublesome. When this fact was pointed out to the young druggist, he put his finger on the whole

secret of public speaking in his reply: "Why, I was not trying to make a speech, I was only telling things I knew."

There is nothing mystic about the art of speaking in public. Every normal man, who has no physical impediment, not only possesses all the essential qualifications, but unconsciously exercises them.

First of all it is necessary to remove some popular but absurd notions on the subject. These can be gathered under the familiar expression, "the difficulties of thinking on one's feet." The prevailing idea is that public speakers are so remarkably gifted that they can address an audience on any subject at the drop of a hat. It is presumed that they rise, think the subject through, reach their conclusions, and in an orderly manner present their thoughts with force and eloquence—all in one act, the same act and within the same few minutes of time!

There are, true enough, speakers who claim to possess such a unique genius, crediting their ability to divine inspiration. Such a thing, is of course, pure nonsense. My answer to it is the aphorism of Sam Jones, famous evangelist of a generation or so ago: "A lot of speakers think they can open their mouths and God fills them. He does. He fills them with air." The inspirational idea is one that redounds to the honor of the speaker, and it is to his interest to spread the belief. However, his "art" lies more in the craft of clever and forgivable deception than in any extemporaneous genius.

One famous speaker used to deliver the same address several times. He was noted for his impromptu remarks. At each time at exactly the same point, he would pause and say, "It just occurs to me. . . ." Perhaps it did just occur to him, but it had occurred to him many times before.

Recently a great state celebrated its 75th anniversary. At the ceremony the audience was told about the famous founder of that state. He was a noted lawyer, its leader and first senator, and famous for his ability to speak extemporaneously. It was not

mentioned, however, that he had a secret regarding the latter gift. At one time he wrote in a personal letter:

> Whenever I appear at a banquet, a public meeting or a religious gathering, I am inevitably called upon for a speech. I always acquit myself with a measure of credit. Throughout the State and in Washington I have gained a reputation for thinking on my feet. You may find, if called upon unexpectedly for a speech, that it is about the hardest work you have ever tried. It will be a good thing if you know how it is done. Here is the way: I make sure that I never go anywhere without having prepared myself with something to say.

This does not mean that the extemporary speaker does not "think on his feet," but he thinks thoughts he has thought before. He follows a path with which he is familiar.

It does not follow that he thinks no new thoughts on his feet. At least his thoughts take new form, and it is the greatest advantage of this style of speaking—new views and new expressions of the old truth are struck out of the very fire and heat of delivery.

In other words, the real secret of any speech lies in its preparation, either in the mind or on paper. The delivery of the words may need practice to achieve the intimate style which makes you friends with your listening audience, but no matter what your style or how beautifully you deliver a speech, nobody will care very much unless you have something to say. The best way to know what you are going to say is to prepare yourself in advance. For that reason I am including the following advice on how to prepare a speech.

Getting Ready to Speak

The Preparation

As long as possible before your speech, select your theme.

For the present, avoid all books and other helpful sources pertaining to it. Let your own mind do its work first.

Whatever your subject is, be sure you understand the general field in which it lies by experience, observation, and study.

If you do not, then choose another theme in a familiar field.

A big subject is no assurance that it will be a big speech.

A recent broadcast of a debate between two school teams provided a fine example of such overreaching. The subject was international in its scope. It called for an extensive knowledge of recent history, diplomatic documents, trade agreements and practices, international law, and social psychology; and it demanded an experience with human nature beyond these youthful minds.

How much better it would have been if the pros and cons of student self-government had been presented. One school enjoyed self-government, and the other the rule of a wise faculty. By actual experience and a record of the years under both disciplinary plans, each side would have comprehended the full meaning of the resolution. The boys would have known what they were talking about.

Better the story of "Two Years in a Drug Store," which the young man knew, than a high-sounding speech on City Government about which he knew little.

Hold the familiar subject in the back of your mind for a while. Let it lie there and "soak."

Be sure it is a subject of common interest.

As often as convenient, draw it out and examine it. Every time you draw it to the front and look at it, its appearance will be a little different.

Try to see it in all of its phases and from every angle.

Every time you take it out and hold it before you, it will be dragging something else with it out of the subconscious: associated and related ideas, qualifying thoughts, memories of experiences you had forgotten.

Carry a notebook with you!

Jot down ideas which strike you as important. Ideas have a way of not staying up front. You are liable to forget them again. Do not fail to *keep* the pocket notebook.

If you are to say anything especially "pat" on your subject, it

will be out of the pigeon-holes of the mind that it springs. Here is the source of inspiration—or illumination, as it is called. Such thoughts and pictures are elusive.

Capture and hold them by jotting them down.

Note the relation of the subject to your own life and work. What makes it vital?

It is the vitality of a thought that gives it importance. How your subject is related to your daily existence and that of your neighbor gives a purpose to your speech.

Enough people talk just for the sake of talking. They are time-fillers. But you have a definite end in mind. It must be worthy of the time on the air or in the hall or on the soap box.

What you say must also be worthy of the place and the subject and the audience.

Don't go at this work fretfully.

Avoid worry!

Keep cool!

Even if you have tonight's deadline to meet, be deliberate about your work.

It takes some time for an idea to germinate in the mind. Yours will grow and unfold, if you give it time.

Panic will act on the mind like a powerful soporific. The blood will leave your head and go to your feet. You will want to run, not think.

When the theme of your speech begins to open up before you—as it will until you think you have enough matter to talk about for a week—then–

Look into it.

Try to locate the central thought that gathers up in itself the whole subject.

Find it and put it down.

That is the heart of your speech—not a dozen scattered ideas, but one thought which has the kernel of the matter in it.

You now have your subject, its central thought, and a number

of notes in the little book—ideas, illustrations, points you think should be made—perhaps just a long jumble of things you could say about it.

You are ready for the next step, which is:

Arrange Your Outline

Ask yourself and answer clearly four questions:

1. Just what is the *thesis* of my address?
2. Just what *emotions* do I wish to evoke by my speech?
3. To what *action* do I wish to incite my hearers?

Set down the answers to these three in the little book.

Everything worth speaking about is meant in some way to be lived.

Even a simple narration has the purpose of interesting the hearer and suggesting further thought on the story content.

A funny story should make the listener laugh and send him along chuckling, in a better mood to undertake his duties which were making him take things a little too seriously.

A speech that does not incite to action is a failure.

You can incite to action only by impressing a thought which awakens emotions, stimulates desire, and moves the will.

Now that you know what you are going to do and what you have to do it with, the next question to be asked and answered is:

4. How am I going to *do* it with this material?

The answer will be the outline of your speech.

Take your notes and arrange them with this end in view.

Put down the main points and group the thoughts, illustrations, and suggestions around them, connecting each to its natural associate.

Be clear in your statements.

Try to put primary things in their first place and others in their natural order.

Eliminate all abstractions.

Great truths are self-evident. They need picturing to make

understanding easy, analogies and comparisons in things more familiar to make their application plain.

The simpler and more common these are, drawn from nature or everyday experience, the more effective will be the speech, and the more lasting the impressions.

Don't try to say everything at once; no man can do that.

After you have all your notes arranged in what seems to be a sensible and satisfactory way, *set them aside for a time.*

Try to forget the whole matter.

Think of something else. Play golf or go fishing.

After a while, go back and look at them.

Ask yourself, "What would Bill Doe of Little Horse, Pennsylvania, or his brother John in Cone City, Montana, make of all this at 6:15 P.M., Eastern Daylight Saving Time, on Saturday the 11th?"

If you suspect it would not be completely clear to either of them, try different arrangements.

Get your outline so lucid that you can look in at the beginning and see through to the end.

Try to relate the parts as closely as the three parts of a syllogism, so that when you have finished your first point the others will follow naturally, as if by necessity.

Do not attempt to write your speech in full at this point. If you do, the memory of that first manuscript will be so tenacious that you will have a hard time changing it.

Do not begin to memorize this material. You have yet to do the real writing in a free and easy style suitable for the spoken rather than the written word.

If you hold these thoughts in the exact form in which you now have them, your manuscript will likely be declamatory. Far too many of them are.

Remember, a declamation is not a speech in any language.

You are not yet telling your story to anyone.

This preparation is for your own sake.

You are being sure you know something about your subject.

Finally you have arranged your subject matter into the outline of a speech that would convince and persuade you.

Will it affect others in the same way?

Is there any more pointed way of putting the thought, any clearer illustration that would make it more forceful?

If you know of any, put it down. Then you are ready for the next step:

Read What Others Have Said on the Subject

Because you put off reading until this stage of your preparation, you will have little inclination to borrow extensively from others.

If you have done honest work, you will like your own better than that of the wisest man on earth.

A shepherd lad once lived who loved his sling and pebbles better than the king's more persuasive arguments of armor and sword, and he did greater execution with them.

In your reading you may find some good illustration, or some quotable expression of thought which will add force to your speech. If so, use it, *giving credit to the author.*

You will by this time have so much of your own to say that you will not hesitate to give credit for what you borrow.

Your fellowship with authorities sometimes strengthens your position.

Now take half a sheet or less of note paper and put down the outline in small compass, but so that it is clear to you.

Put It Away for a While

While you are resting, let me offer the following additional advice:

Avoid lengthy introductions. When you are known to your audience and your subject is not new, avoid introductions entirely.

If you are a stranger, make your introduction brief, modest, and with a view to gaining the attention and sympathy of your audience.

Be careful in your use of illustrations.

Story-telling may be your forte, but it is the least profitable of all things in a formal address.

If your point may be elucidated or enforced by an illustration, use it, but be sure it accomplishes its purpose.

You can never impart what you do not know.

This is also true of emotion. If you do not *feel* the truth, it is unlikely that your hearers will. Here lies the reason for the failure of much talk.

There is a lot in the man behind the speech.

Uncover your thoughts—*not your written notes*—and try them out on a friend. Make sure he is an honest friend and not a "yes" one. Tell him your idea. Talk it to him. Is he interested or bored? Did you get his interest at the start?

Don't talk too long.

Few radio speeches are over fifteen minutes in length. That period is long enough for a speech anywhere. It is difficult to hold close attention and interest for a longer time.

Remember the colored student who said, "Our hygiene teacher certainly gives us long lectures. He talks it in and then goes on talking it all out again."

You are a salesman. Ideas are your wares.

The beginning and the end of the speech are very important.

The best time to start is when you have something worthwhile to say. The best time to stop is when you have said it. An abrupt ending often lends force to a speech, just as a loud report will startle you when a dying strain would only put you to sleep.

Now Write

Write as you would talk. Use your skeleton outline—no fully, laboriously written material.

Write nothing from verbal memory. Let nothing be a repetition of the writing in your notes, except quotations. Be sure quotations are exact.

Call up your thoughts. Let them take word form naturally. Capture your scenes as they come up before your mind's eye and describe those mental pictures just as you see them.

Your audience will then think as you think and see what you see.

Make your points in short sentences, for the most part. Be terse and direct. Let the big idea come out. Be clear about it.

About facts, be concrete and specific. Too many ideas in one speech are confusing. You cannot talk well about many things in a short time.

Do not crowd the minutes and seconds.

An average typewritten line requires three seconds for reading or delivery. Allow time to take four seconds for many of them, with pauses in between.

Never be rushed or out of breath.

Never be so inconsiderate as to hope to run over the specified time allotment.

Use the plain language which is natural to yourself and your audience.

Do not try to be impressive. Some speakers impress themselves rather than their audience. Self gets very monotonous. Your subject should furnish you with something better to talk about.

Avoid long, high-sounding words. The greatest thoughts that have ever been uttered appear in simple language.

To begin or start is better than to commence. To chew is better than to masticate; avoid than eschew; look than behold; find out or make certain than ascertain.

The pretty and sensible home-town girl was right when she warned her Senior boy friend the night before he received his diploma: "Don't ever get highbrow with me, Jimmy! I'd rather be kissed than osculated. I'll always wear stockings, not hose. I have an animadversion to dwelling in munificence and dining ostentatiously or partaking of elegant viands, although I like a roof over my head and good food. I notice from your letters that you

have learned some words. Some of them are honest. Hold on to them. Others belong in a dream world we will never see. If I may be allowed one slip of the tongue, these have a pungent aroma. Do you get what I mean?" *

Use epigrams.

Keep dry statistics out.

Refer your audience to a book or report if you think some of them will want this material.

Translate mass figures into pictures. They will then be more to your point.

Don't be argumentative with others unless you are in actual debate.

Don't throw verbal mud or rocks. If you are in debate, be smart about it.

Even if you come from Texas, be a Yankee on this occasion. Get the interrogation point on your side, and keep it there.

You can always force the other man to be clear, and you can often drive him to the truth of the matter by a question.

You may have to straighten yourself out somewhat. If that is needed, then all the better.

Be careful about humor. Let the story teller and the comedian handle humorous material unless you know from experience that you are exceptionally good at it. (I mean experience more trying than the old home guard.)

Let coarse language lie in the gutter where it belongs. It need not foul up the air waves.

Form the habit of thinking about your listeners.

Like them! They will recognize it if you do, and will respond in kind.

Better not speak too much about yourself. Let your publicity agent do that for you.

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* J. M. Steadman, Jr., has an interesting article on affected and effeminate words in the quarterly *American Speech*, February, 1938. Columbia University Press.

Except by way of substantiating facts by personal experience, avoid it.

Be so full of your subject and the kindly neighbors who will be listening that you live yourself in your speech.

Talk it out that way on paper and—*your speech is written.*

More and More Professional

Many program periods are devoted to political campaigns, addresses by Senators, Congressmen, government officials, and persons especially qualified in the field of public service. Equally important and authoritative voices are heard on international questions through the facilities of home and foreign stations. State and civic, governmental, economic, and social offices and organizations are represented. Speeches, interviews, and occasionally dramatized stories cover the fields of public interest, health, safety, crime prevention, social security, farming, housing, charity, and religion.

I have dealt with the essential matters related to the broadcasting of programs in this group in previous sections of the book.

The natural fitness of some important leaders of public affairs for the intimate style of radio is notable. They are learning fast not only what to say and how to express it, but also how to deliver it in this very personal medium of radio. Everyone holding an important office in government, public welfare, and business should realize the importance of devoting considerable time and effort to acquiring ease and effectiveness in radio.

When you make your speech, remember that the usual style of platform address is acceptable to the radio listener only when he is hearing the broadcast from an auditorium or an outdoor meeting. He knows then that he forms part of a large gathering and he expects less intimacy of delivery. The announcer introducing such a program will clearly explain the purpose of the occasion and depict the atmosphere so vividly that the listener will become one of the actual crowd there. If the comments of the master of

ceremonies are cleverly high-lighted, the listener, sitting in his home, catches the mood accompanying the banquet, political meeting, or religious service. However, this type of program is never as satisfying as the one addressed directly to the at-home listener, when the speaker keys his style to the intimacy of the home.

Speaking via the radio in this way is different from any other form of public address. It is extremely personal.

I think one of the causes of "mike fright" to the speaker is the stress placed on the idea that millions of people are tuned in on his broadcast. These listeners, after all, are composed of single individuals or comparatively small groups. They are, therefore, never a part of an audience in the conventional sense of the word. The speaker's approach is that of a friend who enters the living room to impart something, and it is important to his listeners only because it relates to their daily lives.

In addressing large meetings, an intimate type of delivery is consequently unnecessary. Raising the voice in volume and pitch, in an oratorical manner, has absolutely no place before the microphone. The speaker should approach that universal ear as if he were approaching one person. He may find it helpful to picture someone he knows sitting in front of the speaker. Formal phrases are out. He talks quietly to his friend as if they were face to face. The changes of pace and inflection need never be more exaggerated than they would be in conversation. The pauses are those required by the meaning to be conveyed—they are never the stereotyped ones which orators use as dramatic flourishes. True, the address has been written and must be read; but it must sound as though it were being spoken, escaping the usual stiffness which accompanies the use of a manuscript.

But this emphasis on the necessity of experienced public speakers to adopt a more personal, non-declamatory style when broadcasting has caused a few of them to go to the other extreme. It is equally wrong to change to a colorless discourse in which the

voice loses power to express the variety of thought and feeling needed to give life to an address.

One brilliant man, well known as a writer and lecturer on themes of public interest, came to radio as a means of reaching a still larger audience. No one in his field was more analytical or thought more clearly on significant events transpiring in the world. At first he expressed his thoughts extremely well. Though his subjects were difficult for the average man, he ingeniously clarified them by the use of illustrations and figures of speech. This done, he worked hard to change his manner of delivery to sound as though he were talking to individuals or at most, very small groups. Reversing his former style, his speaking became quite dull and monotonous. The very effort he made to become more intimate took the life out of his delivery. Despite all the eloquence and power in the words themselves, much of their beauty and forcefulness was lost somewhere between the microphone and the listener's ear.

To develop a happy, friendly speech to an audience of one, he had made it a practice to come into the production office, seat himself just across the desk and read his commentary exactly as he intended to before the microphone. This scene he kept in mind when he went into the studio for the scheduled period. He visualized one person across the table from him as the only listener.

So far, so good—but the practice lacked the emphasis, color, and feeling needed to hold the listener's attention. He was surprised when told this and replied, "I thought I was meeting the requirements when I lowered my voice and used a conversational style. I thought that was the all-important thing in radio."

He had not realized that he thought of the radio address too exactly in terms of the rehearsal. When he came into the office, one could see across the desk that he was interested in his speech, enthusiastic about the points of view he was expressing. This visual impression, combined with his reading, caught attention and held keen interest until the paper was finished. This was his

trouble: in picturing his listener to himself, he neglected to consider the fact that *he* could not be seen. The animation of his facial expression and gestures—indeed of his entire body—was lost on the hearer; none of it appeared in his voice. Throughout his life this man had counted on the visual as well as the oral impression for the effect of his speech, and he had neglected to train his voice as a complete instrument for the expression of his personality. It was necessary for him to add something else to this practice period.

The next time he rehearsed he was to think of his listener as being blind. To convey his thoughts and emotions which he himself felt, everything had to be expressed in his voice. The subject was very carefully studied. He found that changes in expression and feeling, caused by alterations of thought and impressions, were accomplished by the voice in four ways: by variations in volume, variations in pitch, variations in intensity, and variations in the stress-time factor—that is, the duration of a word or syllable sound. Further experimenting with these factors improved his delivery.

Variations in volume are less desirable in radio address than in the auditorium style of speaking. Any sudden increase in volume, difficult to handle in the transmitting equipment, may cause blasting and distortion that sounds disagreeable on the air. Letting the voice level drop at the close of the sentence is one of the commonest faults. On very few occasions is this effect a pleasant one. According to an old story, there was once a very beautiful woman who spoke on the dearest subject known to her. Her lover, describing her speech, said that "as she approached the end of the expression of her thoughts, her voice died away in delicious suffocation." There may still be rare occasions when the intimacy of speaker and listener make this kind of voice fainting effective. A good rule in radio, however, is to sustain a normal volume level to the final syllable of the last word in each phrase and sentence.

Variations in pitch have much to do with making speech musical. Melodic quality is desirable provided it is free from affectation, so as not to attract attention away from the words and thoughts to the mere sounding of them. In radio there is room for more variety in pitch by voices trained for flexibility and range. Throughout the middle and lower registers the tones are more pleasing. Pitching the voice higher for the purpose of emphasis only results in irritating the throat as well as the listener. Any sudden change in pitch is unpleasant.

The stress-time factor appeared to be very important in the study given to the speaker's problem of complete vocal expression. In listening to many good radio speeches it became apparent that an increase in time was always given to words calling for emphasis. Words not important, yet of even a greater number of syllables, were by comparison spoken hurriedly.

Intensity is a matter of feeling. A speaker, responding to his own thoughts, can reflect intensity in his vocal production. The more his speech is cultivated and the more poise he possesses, the less likely will his emphasis find expression in volume and pitch. Great force may be evident behind the delivery, but not in loudness or stridency. Words are accompanied by a vibrance in keeping with the emotional content of thought. The listener catches this quality and responds to the man's own sense of the significance of what he utters. *Variations in time-stress and intensity are effective.* The microphones and transmitting equipment are most responsive to these forms of vocal emphasis.

To recognize the effectiveness of these four forms of changes in the expression of words, it is a good exercise to take any speech and read it out loud. While doing this, exaggerate the delivery, stressing those words and phrases that seem to require emphasis, using each of the four means mentioned above.

Reading Aloud

The best practice for anyone hoping to excel in delivery is to read aloud. The most advantageous material for this purpose is

the printed speech. Leave alone the essays, stories, or literary work prepared especially for reading. Authors and playwriters use different language. The man writing for delivery selects words and phrases with more thought of their sounds. Every moment you can, read aloud. Reprints of public speeches in the daily papers are good. Read anything and everything you find as long as it is material that was written to be spoken.* Your ears eventually become accustomed to the sound of your own voice. Then you acquire a feeling for words which are prepared for public address.

Rehearse with the Microphone

No one should approach the microphone for the first time just a few minutes prior to his radio speech, no matter how much previous radio experience the speaker has had. Broadcasting companies always set a time for microphone rehearsal before a speaker goes on the air. The amount of time spent in this way will reward both the speaker and his audience. The staff on any broadcasting station will gladly extend the usual rehearsal time to make a performer familiar with the equipment and the studio.

The first step is a voice test on an open microphone. This test is to discover the normal condition of the speaker's voice and to establish the proper distance from the microphone which he should maintain. Every possible assistance is given to establish the relationship between himself and the microphone which permits his voice to reach the listener in the most natural and pleasing way. If any faults in delivery exist, these may be eliminated during rehearsal. Frequently the production director helps with suggestions on enunciation and clear diction. Or he can assist the speaker in discovering his most pleasing voice register, and so add charm to the speech as it finally goes on the air.

* An excellent collection of material is to be found in *A Practical Study of American Speeches*, edited by Herald M. Doxsee. Bruce Publishing Co., 1935.

The Open Microphone

The microphone is a very sensitive instrument. Its improvements from year to year only make it more so. The slightest sound, the most subtle inflection, inaudible even to the speaker, may be picked up and greatly amplified in transmission. The rattling of paper sounds almost thunderous, so that the manuscript must be handled very carefully. Papers must never be clipped together. As each page is read, it should be dropped from the hand so that it falls quietly to the floor.

Breathing should be silent, deep, and deliberate. To the speaker who has learned to use his voice properly, breathing is not troublesome. Each intake of breath should be from the wide mouth and throat. If the mouth is not open, and if the throat passages are not free and clear, the breathing will sound like escaping steam. For a few seconds before the transmission of a radio address, and for many seconds after it comes to its close, the microphone is open. The speaker must maintain perfect silence until he is given the cue to begin. He is careful to say nothing after he is finished, until informed that the broadcast period is ended and the transmitting equipment shut off. The open microphone will pick up any sound, whether intended for the listener or not. During the broadcast period neither the microphone, the stand upon which it rests, nor the cables leading to it should be touched.

In rehearsal, signals are established between the studio director and the speaker. By this silent means of communication the performer maintains the correct distance from the microphone. He knows whether his voice is coming over satisfactorily. His tempo may be varied by these signals so that the speech fits properly into the exact time set for his broadcast. It scarcely need be said that the broadcast period must be one of precise minutes and seconds. The introduction, speech, and closing announcements must fill this exact time without a variation of more than two or three seconds.

Pleasing the Ear

Assume that a speaker has written a fine and interesting speech. He has mastered an intimate style of delivery and is not afraid of the microphone. He is now left with a mechanism more personal than any of them, the sound of his own voice.

Proper voice production is more important in radio broadcasting than in conversation or platform address because, on the air, the voice becomes the full medium of expression of the man; and the microphone picks up every variation in sound. Radio and telephone engineers refer to the microphone in this connection as "a device for converting the energy of sound waves which a speaker produces into electrical energy that has similar vibrational characteristics." The sound of the voice is translated into electrical energy and back into sound without distortion. Improperly produced voice sounds become more noticeable; faults in speech more apparent. The necessity for the improvement of vocal production is obvious.

Use of the Voice

The human voice is a compound instrument, the construction of which may be compared to some of the units of a pipe organ. The sound production is similar. As I have stated in the chapter on musical programs, when dealing with the problems of sound, the voice is an instrument, perhaps the most delicate and flexible of instruments. Without possessing as great a range of sound frequencies as some of the man-made devices, it is capable of beauty of tone production far above that of any manufactured instrument.

To carry the simile further, the sounds of the voice are produced by a "generator" and a resonator, thus resembling a woodwind instrument. The "generator" is a set of folded vibrating membranes called vocal chords. These chords work in combination with the resonating pipe, compound in its structure and containing three modifying air cavities in the throat and head. The

whole instrument is actuated by the human air chamber, the lungs.

The proper use of the voice is indicated when we consider it as an air-controlled instrument. The muscular control required for the change of tension on the vocal chords is practically involuntary. All the muscles within and surrounding the instrument must be sensibly relaxed for the voice to function properly—in speech or in song. This condition is of the utmost importance.

Bad vocal production is common. Tones that are flat, choked, strident, nasal, sharp, and hard are caused by unnatural strain upon the muscles of the throat, the mouth, and the upper part of the chest. The tone-producing cavities are half closed and pinched because of incorrect muscular control.

As an experiment, listen carefully to the speech of those about you. Watch face and throat muscles as they come into play for the formation of words. The strain will be more noticeable in many of those who speak in public, or who sing, without having mastered a course in voice training. Other speakers, falsely assuming that opening the mouth and making use of the lips for articulation is too laborious, will try to talk with as little effort as possible. Through teeth almost closed and partially opened lips these people converse during all their waking hours—and some in their sleep. This habit, due to laziness or self-consciousness, pervades the land.

The free use of all of the muscles is not nearly so tiring on both speaker and listener. The first rules for the use of the voice are as follows: Relax the throat. Keep the muscles of jaw and mouth at ease. Let all the resonant cavities around and above the vocal chords be open and comfortable. That, their natural condition for natural speech, permits the tongue, palate, lips, and teeth to perform in true but unstrained articulation. The speech may be precise and pleasing. Allow the column of air which actuates the vocal chords to play freely upon them. If a louder tone is required, let the air pressure be greater.

As variations are produced in the same manner as in a pipe organ, suppose we examine that instrument. In it we find a set of reeds surmounted by pipes of various lengths. The latter are set upright in a small air chamber. This chamber is supplied from a larger chamber, which is kept full by a blower or bellows. The pressure may be varied and controlled by the force behind the bellows, or the speed at which the fan revolves and the angle at which its blades are set. Do we want ten pound pressure, evenly distributed at the valves of these reed instruments within their separate sound boxes? Then we set the apparatus and arrange the pipes leading thereto to produce that pressure. If we require forty-pound pressure, to produce a different kind of tone, then we create more wind action to play upon the actuating reeds.

The human lungs are the blowers for the organ of the voice. The power behind them lies in the muscles that control the diaphragm. Here the variations of volume are determined. The muscles of the upper chest, the neck, and the throat produce a sound which the speaker thinks is stronger—but it is never a good tone, and if this wrong production method is used the voice will tire fast.

Exercises for Improving and Strengthening the Voice

There are so many excellent teachers for both speech and singing that it is not necessary to go into the subject except to contribute some helpful hints. These came out of unique experience in which I found some methods not usually known.

Many years ago it was my good fortune to study public speaking under J. Warren Lytle of the Pittsburgh Academy. First he taught the usual positions of the mouth, teeth, tongue, and throat for the proper formation of word sounds. But since most people speak within a very limited range of sound frequencies (except for the overtones their voices produce) his primary interest was in production and quality. And because he and his students were

more interested in speaking than in singing, he had originated a strange, new practice method: a drill that would not require the use of ordinary vocalizing. Dr. Lytle found that in the whisper and by whispered exercises, he was able to strengthen and extend his own vocal powers to a remarkable degree.

The whisper exercises are grouped under two heads: the *expulsive* whisper and the *explosive* whisper.

The first time he demonstrated what he meant by these two kinds of whispers, we students laughed. Had it not been for Dr. Lytle's own personality and confidence in his system, we would probably have thought the whole procedure ridiculous. Some students did withdraw from the class, but a few came back after they saw the results. Those of us who remained in this unique sound laboratory have had reason to be glad ever since. If the method was remarkable, the results were all the more so. Voices that had started as thin piping things became rounded, strong, flexible instruments for expression.

Since Dr. Lytle's death I have endeavored to carry on the use of this method and have been able to help many speakers, in radio and elsewhere, who found their organs of speech inadequate. Personal instruction over a period of many weeks is necessary, however, because the steps taken by the student must be watched by an observant teacher. Unfortunately the use of a book is impracticable, as much can be acquired only by imitation.

The *expulsive whisper* is the speaking of words in a whisper without the use of any real tone but by making use of the full strength of the air chamber, the diaphragm, and the muscles which control it. The effort for perfect diction, the forming of all word sounds, is greatly exaggerated by the use of the mouth. Words thus formed without tone are projected with the utmost force of which the student is capable. If the work is not done in a large room, the student is to imagine that his listeners are at a great distance from him and that his whispered words must reach those on the outskirts of the crowd and be clearly understood.

This is an unusual use of the breath for most people. Portions of the lungs are rapidly filled and the air is expelled in a way that has not occurred in previous behavior. More likely than not, the student will grow dizzy and faint. One young lady decided to practice at the top of her porch steps, projecting the whisper with the intention that it be heard across the way. She did not take the precaution of holding to the pillar of the porch which was right beside her. Growing dizzy, she fell down the steps, skinning the side of her face. This same sort of faintness is caused by using the lungs for unusual exercise after having remained idle for some time. As a matter of fact, to have these unfilled cells stretched and opened up and filled with enervating oxygen is the best thing for them. If the exercise is practiced faithfully, before long the lungs will not be satisfied until each day a certain amount of this heavy breathing is done.

Not one real tone should be made during this practice. The mouth and throat are held open and free. Sometimes after very few weeks, the second series of exercises is undertaken spontaneously.

The second exercise is the *explosive whisper*. As the student loses self-consciousness and his muscles strengthen, the size and flexibility of the air chamber increase. One day he finds himself making a sound in his throat which he had not intended. The character and quality of the sound is very strange. Is so similar to the ventriloquic that at least five students in the class when I studied were able in a year to practice ventriloquism. These sounds are produced by the stricture of the inner throat and the vocal chords, caused not by musular effort but by the involuntary result of the explosive blast of the air which has forced through.

At this point in the exercises, a new depth and timbre appears in the voice. There is not any noticeable increase in the upper register, but the increase and extension in the lower register is very great. Women who have screechy voices can develop soft, mellow tones. Men whose voices are high pitched, metallic and

hard, after faithful study, acquire the resonant tones of a well-trained baritone.

There are other methods of voice training, of course, perhaps better known and more popularly fancied, and which may produce fine results. But the best voice in the world is still useless for radio unless the man behind it has something to say.

16

Other Forms of Radio Programs

Variety Programs

A VARIETY SHOW is salmagundi. The elements that go into this compound, the amount of each, and the manner of their blending determine its tastiness as a dish or its value as a show. In vaudeville or variety houses this type of show has appeared since the Civil War as a compound of unconnected acts which all together are intended to form a well-balanced entertainment. It has appeared as a revue held together by a thread of continuity, a theme, or loosely woven plot. An entire day of radio entertainment is really a variety show. In the half-hour radio show the producers try to have something for everyone, and to see that each program part is well performed.

The formula "something for everybody" is quite popular with the producers of both commercial and sustaining programs. It is like firing a shotgun. A lot of little pellets leave the muzzle of the gun and spread as they fly toward the target. Some of them, maybe all of them, will score a hit. If the radio variety gun is properly loaded with carefully selected popular stunts, it is sure to hit the fancy of almost any listener.

Some radio producers tie their shot together with threads. The program corresponding to this becomes a variety revue. The thread that holds the acts together is often woven by a master of ceremonies. He may or may not be the featured artist or com-

edian on the program. Quite frequently there is a story or setting which provides the links and the final unity. Such a program seldom has a serious story or a serious master of ceremonies, nor does it try for great unity. That would be disastrous. If there is any program which to the listener should be all in fun, without effort or labels, it is the variety-revue type.

Of the most popular programs, nine out of the first twelve during a recent twelve-month period were of the variety-revue type. Six out of nine were mastered by top-ranking comedians. The other three were dominated by popular personalities, among the highest-paid entertainers in the show world. That record is a good key to the success of the presentations.

Four of these shows followed a continuous idea, involving a permanent imagined setting throughout the series. Three of them nearly always contained amusing plots which colored, if not controlled, each weekly performance. Seven of them held reasonably true to a set form into which the comedians, guest stars, stooges, musical numbers, and mock-dramas were made to fit with great regularity. This routine itself has become as much a distinguishing mark for some programs as the fanfares, theme songs, or introductory announcements which quickly identify other programs. All of the above-mentioned ranking programs were commercial.

Not all revue-type air shows are so successful. Many observers believe that their strength and popularity is in direct ratio to the ability and popularity of the leading comedians. To a certain extent this is true. In eight of the nine programs, the stars have either originated or developed a program structure. In four of them much of the material, at least the showman's twist, was contributed by these stars. Often the gags and bits of situation-comedy prepared by highly paid writers are pointed and embellished by the comedians who are to play them. The less successful revues or variety shows lack good material, or strain for an "idea," or need clever enough performers to put them over. Miscasting, too, is the cause of a number of failures, and lack of

showmen for leadership and direction is the cause of other disasters. Good drama may hold together without stars. Talent as well as showmanship is responsible for the successful musical program. But headliners are most necessary in the variety show. Often the directing genius of this kind of program himself needs the guidance of expert directors.

To give the reader an idea of how these factors for failure work out, I have taken as much of an actual program as I could without naming the program. An idea of what to do can be gained by studying what *not* to do.

The program had a title which suggested the setting and the mood. The motif was not good enough, however, even for a burlesque. This was a bad start. So was the attempt at an amusing imitation of another program which was itself worn pretty thin.

But the program had a well-known personality. He was good. The public had frequently expressed approval. He needed a vehicle in which he could travel along naturally and comfortably. In this program he was tied to an unnatural one because it sounded big. He needed material and situations. What he got was worn out puns and a few gags from Eli Perkins, Bill Nye, Joe Miller, and *College Humor*. He had no straight man or character actor of any ability to serve as a foil. Too much of the humor was in story form, and not enough quick dialogue. His supporting artists, singers, and musicians lacked inspiration. They were not inferior but none of them was big enough to take strong hold and lift the show. The choice of music and the routine of the program followed no clever plan. There was inept striving for a relationship between dialogue, music, and other ingredients.

The program labored, moved slowly. Slow pace indicated a lack of confidence on the part of the performers. Cues were not picked up properly. Some of the allegedly humorous material was not funny. And yet not one of the performers was an amateur. How professionals can sometimes produce a mediocre or

poor show may be hard to understand, but weeks of doctoring and attention cannot save a weak basic idea.

There is much guesswork in the doomed variety show. But there is none in the program I now consider. I choose it because of the genius of the complete showman who was starred and the exceptional ability of his directing associates.

On seeing or hearing this showman grip the heart of his public, winning from it laughter or tears, his seems an impromptu performance. This is his art. There seems no need for assistance, rehearsals, or even a set show. But behind this seemingly impromptu facade is infinite attention to the minutest detail. Every great comedian must acquire an unusual capacity for hard work. He is usually not a funny man. In private life he probably is more serious than the average person. He has the gift of being able to appear funny, but his native talent is only the beginning.

Suppose we observe this comedian after the close of one week's program. The announcers have hardly finished the identification of the network and stations before conversations pertaining to the next performance begin. This is not the moment when the thought and work on it commence. That next show has actually been in the works for some time. Preparation is not a week but many weeks ahead of the time for execution. The season started that way. But the moment one performance ends is an appropriate time to finish plans for the following one. That very night intensive work starts which will set the form and perfect each separate act and item.

The material which the writers have prepared is assembled. The orchestra conductor, as well as the musician who coaches the chorus, scrutinizes the musical arrangements and sets the time and places for advance rehearsals. Soloists get to work on their selections. Auditions are held for actors and singers required as extra personnel. The director of the program is himself a clever writer, a good musician. He has had exceptional training and experience in newspaper work, the theatre, advertising agencies, and broadcasting. He knows the exacting standards which the star-pro-

ducer has set for both his own and his associates' preparation work. He enters into the examination of material and arrangements, attends the auditions and conferences. Sometimes he contributes his own lines, lyrics, and music to add originality and snap to the show. His chief, the star, is constantly turning the parts of the program over in his mind, for they must pass the tests he has learned in his long experience to apply to every word and act. He has learned how the mind of an audience works, what may appeal and what is likely not to go over. Any hour, day or night, he may call his director to make suggestions or criticisms. Close observation of this group at work reveals that there is no eating, drinking, or sleeping that is not related to the performance. But that is show business, no matter what the medium for communication, wherever it is found. That is why it often is amusingly referred to as "not an occupation but a disease."

The show takes form on paper; its parts sound well in early readings and rehearsals. Now, on the day preceding the broadcast, the show is ready for a preview.

The radio show is produced in a theatre or auditorium and transmitted from there. An audience is present. The theatre is, therefore, filled for the preview. The audience has the last word on any show. A democratic method of regulating the final performance is therefore instituted. Since the entire radio audience cannot have its say until it is too late, a representative group passes on it. After all, it's their show.

The theatre audience at a preview is considered as a house of representatives only. It forms the link between the players and the listeners. Something alive on the other side of the microphone! Without those faces peering out of the darkness beyond the transmitter, a performer whose experience was in the theatre is sometimes at the mercy of a jinx. He can't get rid of the idea that he is speaking only to himself.

Into the theatre, then, for the preview—the laboratory performance—the entire troupe goes. The air show will run for a half-hour. The preview may run from forty minutes to an hour. It

is a laboratory performance. Part of it is pure experiment. How else can new ideas be tried?

Notes are carefully taken of all audience reactions. The entire preview is recorded. When it is over, the star, his director, and associates spend a large part of the night conforming the show to the audience's reaction and their own ear-opinion. The electrical transcription which was made is played. The first purely auditory impression of the show is gained by the major performers themselves. The applause and laughter is evaluated. So is their absence! Before the radio show takes the air, the form and content are as nearly sure-fire as they can be made. Barring human elements, accidents, and variables both in the audience and the performance, the show will be a success.

A stranger picking up a copy of the script prior to the broadcast might be puzzled, for on the script are typed the words "laughter" and "applause," so that time may be allowed for them. He will be surprised at the way these expressions of the actual listening audience correspond to these notations without suggestion or cue. Those who have followed these showmen through the days of careful work are no longer surprised.

If the radio performer is popular, he has a high regard for the audience. By some means he gains close acquaintance with his listeners and lets them have their part in shaping the show.

The Set-Up

The stage or auditorium set-up of the variety show is determined by the principles which govern the pick-up of the units which enter into the performance.

Whatever has been learned about the set-up of musical and dramatic programs may be put to work by the director, the studio manager, or the production man. A number of diagrams or illustrations are, therefore, unnecessary in this section. The diagram reproduced on the opposite page will be sufficient to illustrate satisfactory arrangements.

In the accompanying diagram, the placement of performers

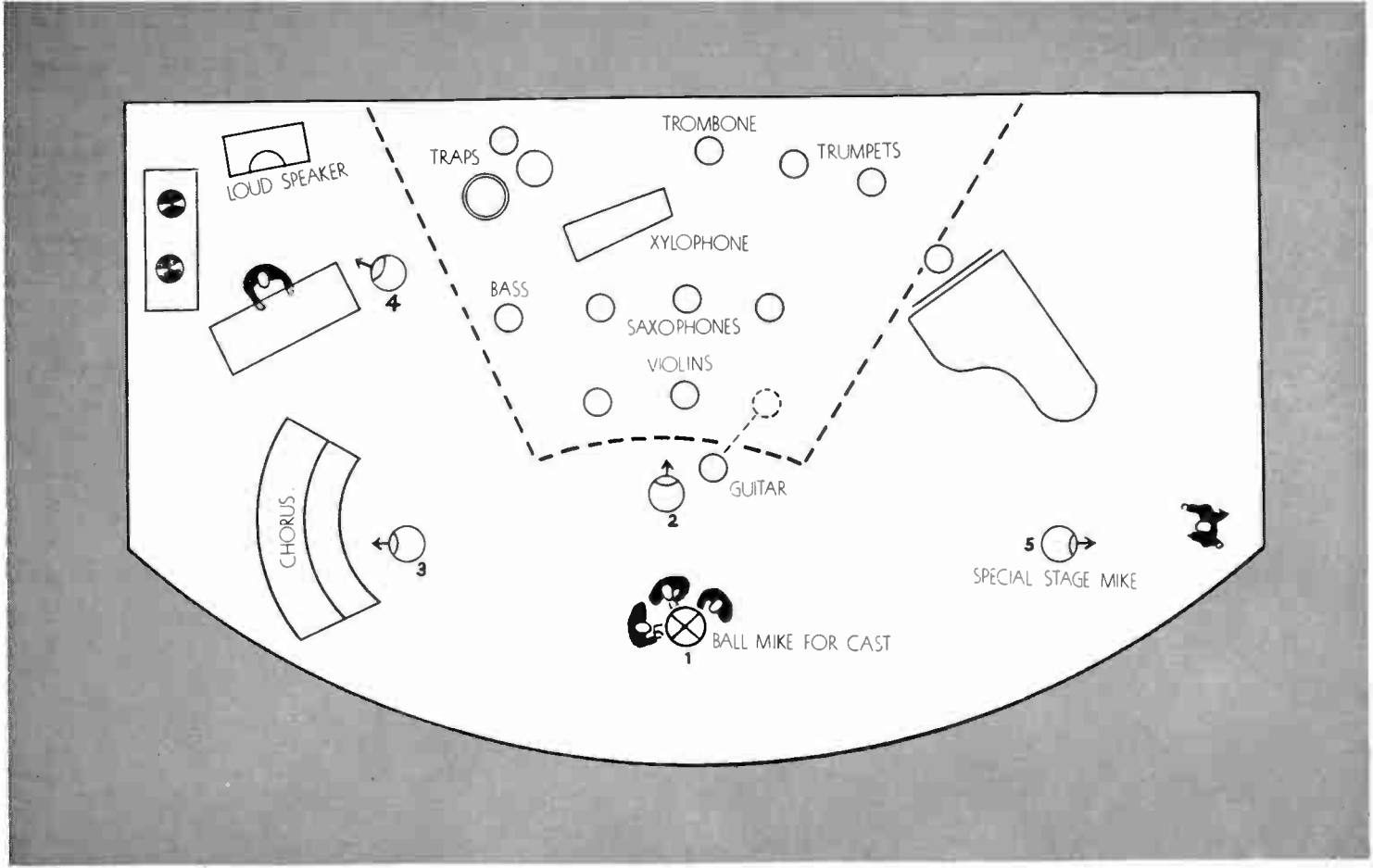


Figure 37. Set-up for variety show with comedian, dialogue, orchestra, chorus, and soloists.

and equipment is basically correct both for studio and for stage presentations. There is only one microphone (5) which is used exclusively in stage or theatre production. (See figure 37.) This is required to pick up the voices of performers as they enter. It is extremely important that this or a portable microphone be used if the performers are not present at all times during the broadcast so that sound-entrances may coincide with their appearance on stage. Unless this precaution is taken, both in the placement of equipment and in the preparation of lines and cues, some audible expression from the witnessing audience at seeing the performers' appearance may confuse or offend the listener who cannot observe the reason for laughter or applause.

It must be clear that the placements in the diagram are suggestions only. As we have discovered in our study of other radio shows, much depends on the size, shape, and acoustic conditions which prevail at the place of broadcast.

Educational Programs

It may seem strange to speak of top-notch variety programs and educational programs in the same breath. The educator must admit, however, that success at reaching millions of listeners at once is as much his objective as it is that of a variety show.

There are as many theories behind the building of an educator's program as there are theories of education. While I do not speak as an educator, I know that the same factors come into play in the success or failure of an educational program, as of any other. The idea, the execution, and the transmission of the program by radio are pertinent to its success. Educators who wish to make their programs successful can learn a great deal by comparing their programs with every other type described in this book.

One might think that a star comedian could rest on his past success and approach the microphone with little or no preparation. I hope I have shown the error of such a supposition. It is equally impossible for the educator to approach the microphone feeling that the loftiness of his purpose is so well established in the

minds of his listeners that he may attack his subject with little regard for those factors in program success which hold the listener.

The conditions in the classroom, where a student desirous of learning, respectful of the authority of his teacher, listens attentively no matter how dull the personality of the speaker, do not apply on the air.

There are so many other ways for a person seeking education to satisfy his desire that it is extremely unlikely that many will listen to a dull program. Nor am I suggesting that the public cannot stand quality. The finest symphonic music programs and dramatic programs have met with gratifying public approval. *High quality is not a barrier to success!*

How much formal education can be given by radio, and how it will be presented, is not within a showman's province to decide. The educator wants to serve the public just as the showman does. He must if he is to survive. It is both his business and his pleasure. He, therefore, provides programs that can correctly be called educational and informational. Some of them are so labeled in their introductions. They have recognized supplementary values and are governed by carefully selected academic committees. They follow a curriculum form and are augmented by accompanying literature consisting of outlines, helps for the teacher or student, and suggestions for supplementary reading and study. They include projects in education for both children and adults. There are both network and local station programs of this kind. An exposition of their purpose and plan is available in both book and pamphlet form, as the bibliography of the appendix will reveal.

Numerous other programs making up a remarkably high percentage of the regular schedule have a cultural and informational content. These are to be found in both the sustaining and commercial listings. Attention has been frequently called to them in printed brochures issued by the broadcasters.

If the program offered frankly as an educational one is to reach

others besides persons who are bent on "becoming educated," or at least those who are not shy in the presence of the term, it will first have to be a *good program.* It must be as interesting and entertaining as any in which the intent is only to amuse. Compulsory education undoubtedly raises the general level of human behavior and provides our citizens with the capacity for living on a broader and higher scale. But the very idea of compulsion inhibits many. Even the best efforts of college students may be prevented by it. The radio listener has the option of turning a program off the very second his interest flags. This is program failure, no matter what kind of program it is. Any educational radio program should invite the listener with enjoyable systematic attention to a field of knowledge. Some of the courses provided through radio facilities have done it by dramatizations, such as language lessons involving "give and take" between teacher and pupil, which is always human and often amusing.

The producer of knowledge programs can show his respect for his social function as a teacher by investing time, money, and effort in studying all other radio programs. Such an approach will serve to reduce the amateurish writing, acting, and producing to which too many of these programs are subjected.

There was good music before radio came on the scene, but the broadcaster had to find ways to present it to the listener. There was drama before radio, but radio drama presented problems never met before by writers, directors, or producers. The educator must do as much as these broadcasters to bring satisfying educational programs to the radio audience.

We are a knowledge-hungry nation and there is a *potentially* good future for the educational program. With greater effort on the part of the educator, I can see no reason for anything but success in this field.

But the educator has still another function to perform, and the men in radio look to him for help. Radio needs more capable men to carry on its work. There are full courses in journalism; why not in radio?

It is heartening to hear of college departments being established for the purpose of giving adequate professional training in the theatre arts. There are universities where full credit is given toward the arts degree. Certainly we need some Masters of Theatre or Radio Arts. More Bachelors will help. The entertainment world is bigger than it ever was. It is a field embracing many opportunities for original expression.

The word *radio* is large. It includes the man occupied in the industry, the student seriously preparing to enter it, as well as the audience for whom the programs are produced. All have a part in the work which will determine the uses of broadcasting facilities and techniques. Only in radio is there such a close union between those who apply the sciences and the arts and those for whose entertainment and information the presentations are made.

It is because of its compound nature that radio cannot be crystallized into separate functions or viewed independently of each other. In whatever phase of program production one may specialize, it is necessary to be as familiar as possible with all. Versatility is an asset to the one who does not attempt to work all phases at once. A study of and experience in every department makes intelligent coöperation easier. Coöperation is necessary to success in this many-sided business. An almost constant stream of artists and performers passes in review as the programs succeed each other in the daily schedules. Personalities of every kind and from every business and profession make use of the air to inform the world. Every important organization for social welfare is represented. The public is frequently invited to engage in actual broadcasts. Never has another medium offered people in general such opportunities for self-expression. The programs giving the people actual participation have become numerous. The general knowledge of the personnel in program production should therefore be extensive.

Television?

This book is about radio programs. Television is *video,* some-

thing that can be seen. Radio is *audio,* something that can be heard. Anything written now about combination sight and sound program production would be about as valuable as an article on Sound Pictures would have been in 1927. The combination in pictures started the other way around, sight—and then sound. Despite the reverse process, based on our long experience with sound pictures, certain studio procedures are indicated.

The script will probably resemble that prepared for sound pictures. Scene areas will be described, camera angles will be designated, visual distance perspectives as well as sound perspectives will be called for. Motion picture backgrounds will be written in. These will be studio sets and exterior scenic transparencies, either from stock shots or specially photographed. Also blends of sound on film to be synchronized with scene and action. Transition from one scene to another in both dramatic and musical shows may be accomplished as it is on the screen, by blending picture and sound on film, then fading and dissolving the synchronized whole. Changes in time, changes in season, changes in location will be made easy by such methods—in the use of all of which the successful script writer will need to be intelligent.

Because of the necessity for a split-time performance as well as a demand for authentic auditory effect, special sound-on-film will be a requisite. Recordings can be matched behind any desired scenes. Exact timings can be noted. At first, the various sounds will be on numerous short lengths of film. Composite negatives may be made from splicings. Prints will be taken from the full strip of the required length and time for actual use in a televised program.

The sound-effects man on the television show will have to be able to produce, at a point out of vision, minor sounds called for in conjunction with dialogue. In addition, he must be expert in the cutting and editing of sound track.

It follows logically that the personnel producing the televised program will be greater than in radio. Several cameras will be used. An operator will be required for each camera. Exact

aural perspectives, as well as visual, will be essential to a television program. The poor combination frequently found in sound pictures, described in Chapter 14, will not be tolerated. They cannot be, in an industry whose pride has been in sound to begin with.

Sound will be picked up on some adaptation of the usual picture studio microphone suspended on a silent movable boom. To maintain constant sound perspectives during the action of performers, each boom will need to be moved. An operating engineer will be required to work it. The microphone will be kept beyond the field of the camera lens and out of the frame of the receiver screen.

In the monitoring booth an engineer will act as operator of the controls of the outputs of several cameras. He will adjust the clarity of the image transmitted from each camera, and also the brilliancy of the background, which must appear in the television receiver with the same illumination the scene itself manifests through the little studio window. An audio-control engineer will also be present. Unless a universal system of automatic control for some of these operations is adopted, the video man will be as busy as the proverbial one-armed paper hanger with hives!

In the beginning of television the pick-up of the sights and sounds at a sports event should not present so many audio problems as the studio show. The major source of sound may often be a Ted Husing or a Clem McCarthy, adding exciting and evocative description. But this is guesswork. It may be—Who knows exactly? We are far ahead of ourselves. It will be better to wait another ten years before writing a book on the production and direction of televised programs.

Radio is still our major occupation. Television is still a series of experiments.

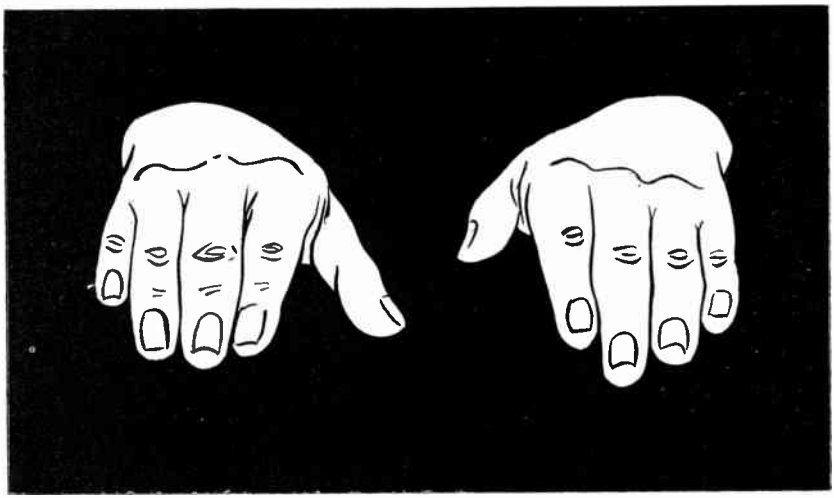
To the further advance of radio, may the readers of this book contribute much.

APPENDIX

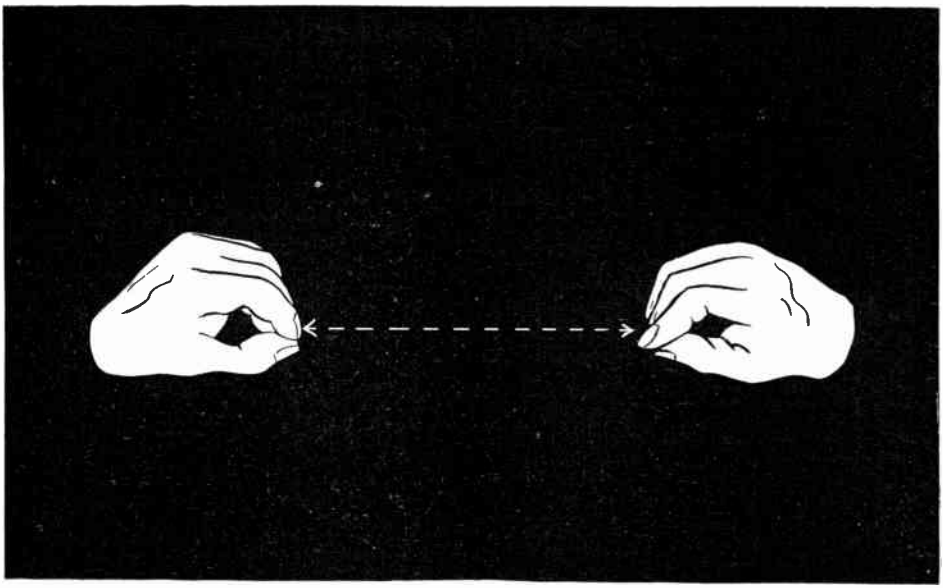
Studio Sign Language

THESE pages explain the silent signal code used in the studio or in the adjoining control room while a program is being broadcast. These signals are a means of communication between director, production man, orchestra leader, musicians, cast, announcers, and engineer.

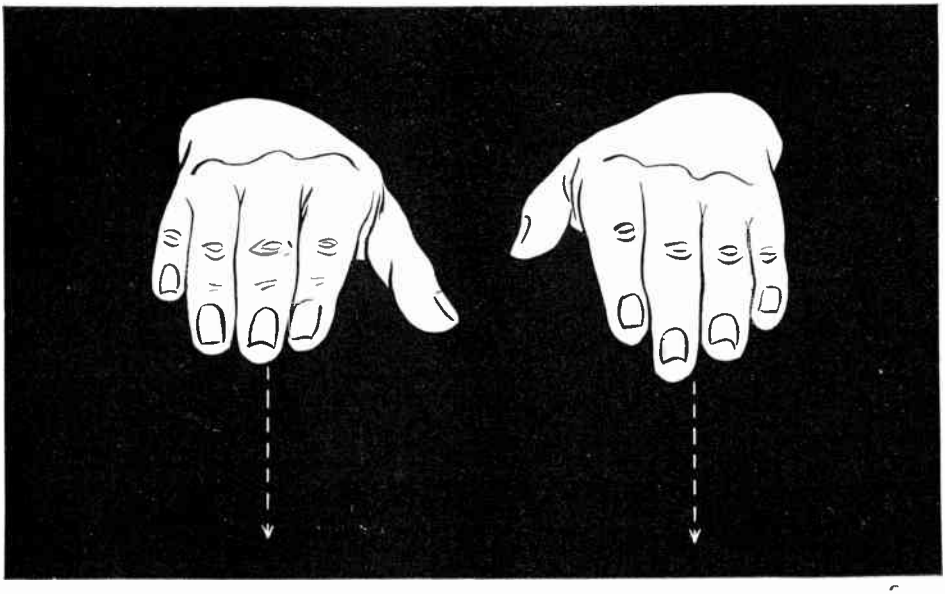
The twenty-five illustrations that follow are reproduced through the courtesy of *Variety Radio Directory,* in which they first appeared (vol. I, pages 328-337).



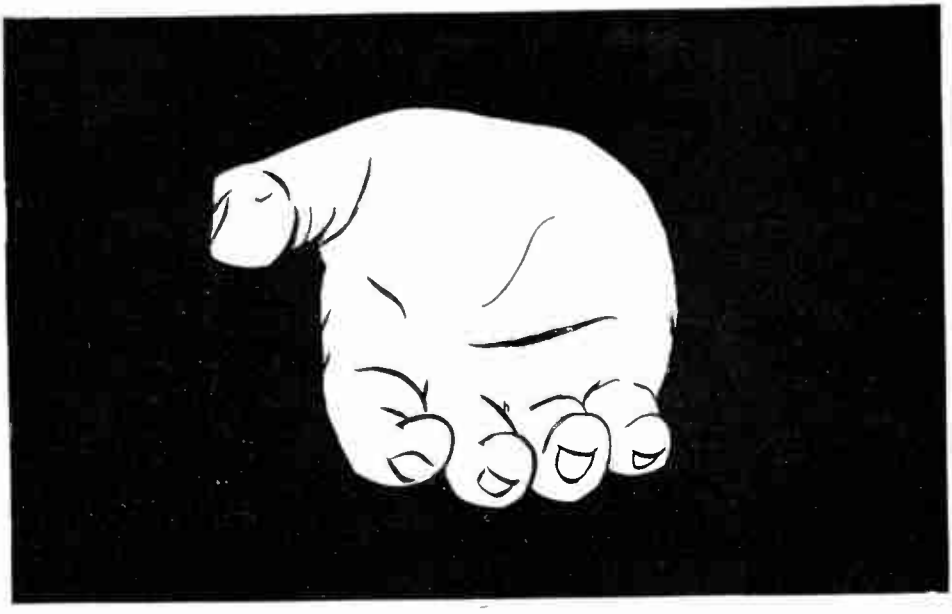
Any reference to *balance* (alternate hands in up and down motion). This signal may be used by someone in the studio as a question regarding musical balance directed to someone in the control room who is able to judge, or as a statement by persons listening in the control room. With a smile and nod, it means balance is good. With a negative head shake, balance is poor.



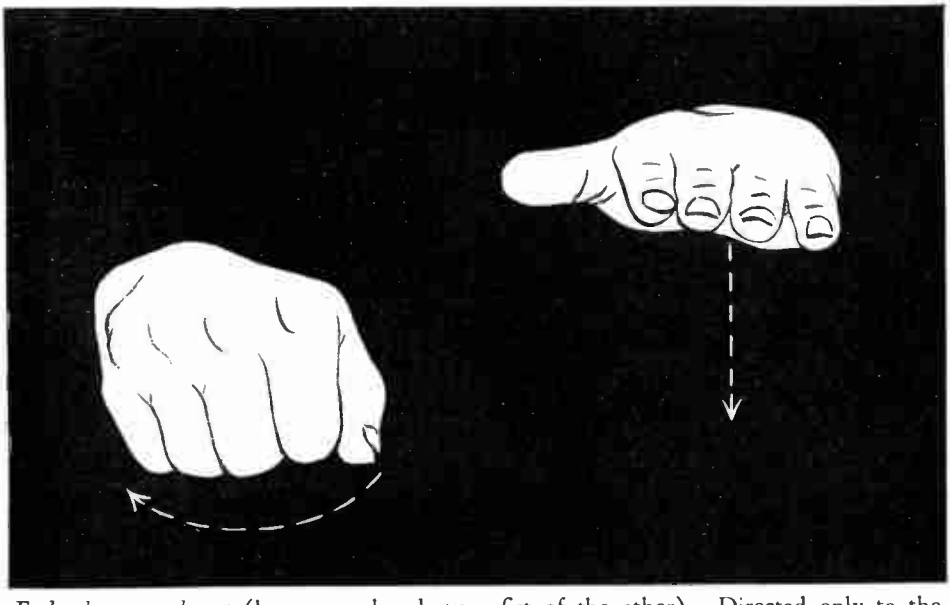
Stretch it out; slow up.



Lower the volume (drop hands slowly).

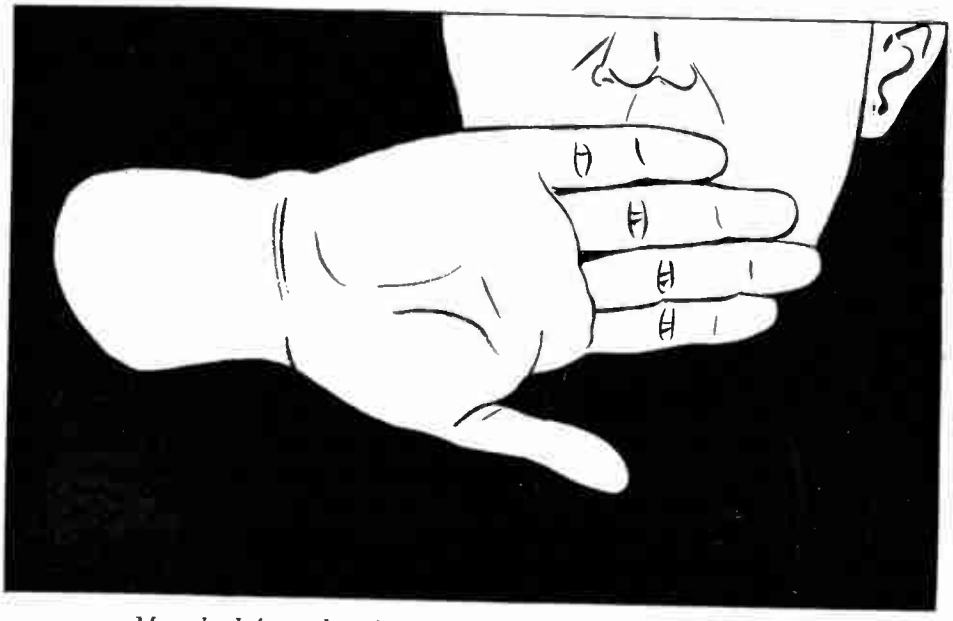


Increase the volume (move hand upward).



Fade down and out (lower one hand; turn fist of the other). Directed only to the engineer in the control room.

Move closer to the microphone (bring palm toward the face).



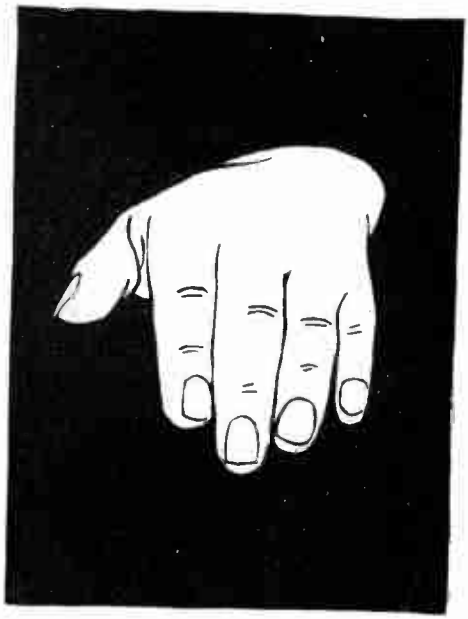
Move back from the microphone (move palm away from the face).

Cut! An order to the studio engineer to close the microphone circuit.

O. K. Everything is all right.

Is the program running *"on the nose"*—according to schedule?

We are meeting time requirements properly, according to schedule; we end "on the nose."



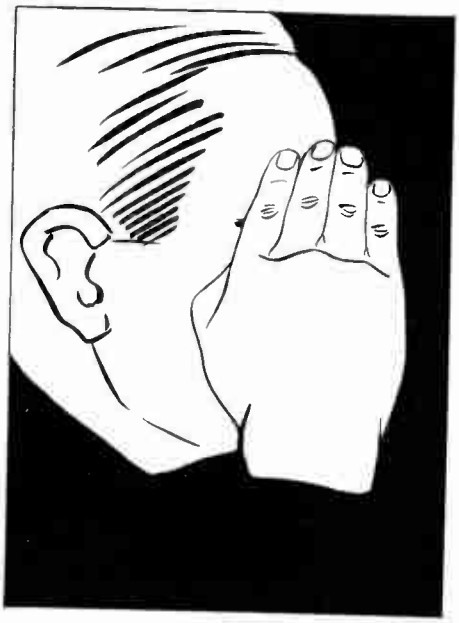
Take it easy.

Watch me for cue.

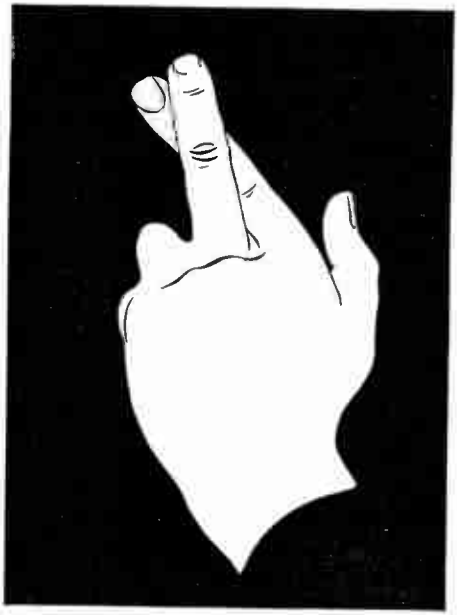
How does it sound?

(1) *Conclude with the chorus* (conductor's signal).
(2) *Give the Network cue* (network production signal).

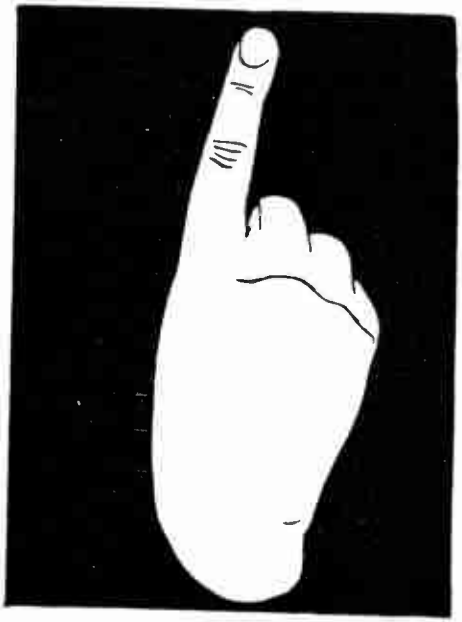
Start playing theme music.



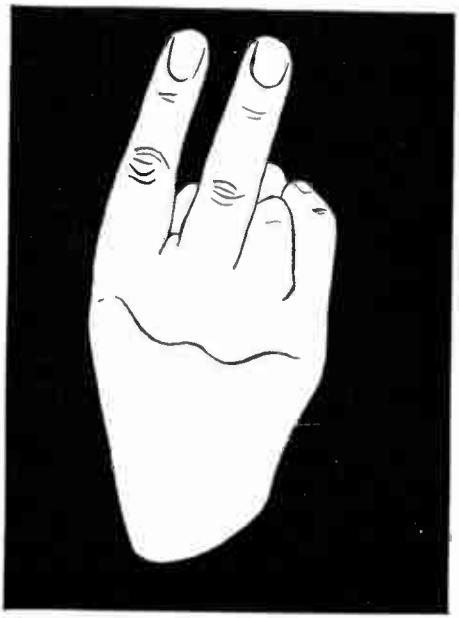
Play the fanfare.



Repeat. (Refers to music only.)



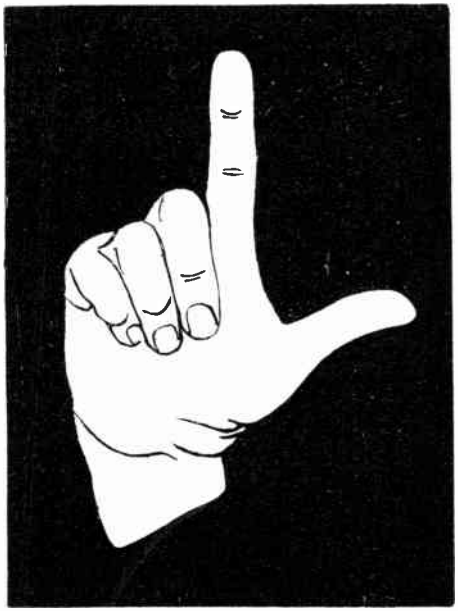
Use first ending and repeat chorus.



Use second ending and conclude. (Refers to music only.)

(1) *Give!* Put all you have into it.
(2) *Continue playing* (conductor's signal).

Play it all. Avoid provisional cuts. (Refers to either music or dialogue.)



Make local (give station identification. Directed to announcer).

Speed it up.

Someone has "*pulled a beard.*" (See Glossary of Production Terms, page 360.)

The Basic Sound Effects and How to Produce Them

By WALTER R. PIERSON, *Director, Sound Effects Section of the Production Department, Columbia Broadcasting System, Inc.*

SOUND EFFECTS are produced in many ways, and they may be combined in innumerable patterns. Any one of these combinations may call for the blending of several records or the use of a number of pieces of mechanical equipment.

I list here only the basic sounds from which the variations are derived and with which combinations are formed. The apparatus described and the records listed in this section are those for which we have obtained the greatest demand during six years of department operations.

Practically all recorded effects are manufactured on 10-inch double-faced discs to be played at a speed of 78 revolutions per minute. With few exceptions, the opposite faces of records bear different recordings. A list of the manufacturers of these records with their addresses may be found at the end of this section for the convenience of those who wish to obtain complete catalogs.

Sound-effects records should be played upon equipment built for that purpose, some of which is described later in this section. The numerous variations obtained by playing these records are part of a very important technique.

Sources of materials for construction of mechanical and electrical effects may be found close at hand in any community.

Airplanes

Sounds of airplanes cannot be convincingly produced except by actual recordings. Some of these records listed below were recorded inside the planes during actual flight. For airplane crashes, see "Crashes."

Masque Records

M 103 A—SINGLE-MOTOR ARMY PLANE

Engine starter, motor starting, idling, taxi, take-off and flight. Sound recorded inside plane during actual sequence. (3 min. 7 sec.)

B—SINGLE-MOTOR ARMY PLANE

1. Idling.
2 & 3. Take-off.
Perspective from ground.
(1 min., 27 sec., 30 sec.)

M 104 A—SINGLE ARMY PLANE

1. Flying with motor missing. (48 sec.)
2. Single-motor fleet plane gliding for landing with wind in struts, side slipping, landing. (1 min. 52 sec.)
All sounds recorded in plane during actual sequence.

B—SINGLE-MOTOR ARMY PLANE

Continuous circling overhead. (2 min. 45 sec.)

M 105 A—DIFFERENT TYPES OF ARMY PLANES

Diving and zooming at high speed. (5) Cuts. (1) 20 sec. (2) 15 sec. (3) 12 sec. (4) 13 sec. (5) 12 sec.

B—LANDING IN FOUR GROUPS AND TAXIING TO HANGER. (2 min. 55 sec.) Continuous sequence, ground perspective.

M 106 A—ARMY PLANES IN FORMATION

Maneuvering overhead. (3 min.)

B—AIRPLANE TAKE-OFFS (four cuts)

1 & 2. Army bomber. (20 sec. and 25 sec.)
3. Two single-motor army planes taking off in formation. (25 sec.)
4. Three single-motor army planes taking off in formation. (35 sec.)

M 101 A—DOUGLAS TRANSPORT PLANE D2A

Battery starter, motor starting, idle, taxi, rev-up, take-off, and flight. 2 min. 50 sec.
Sound recorded inside plane during actual sequence.
Courtesy TWA.

B—DOUGLAS TRANSPORT PLANE D2A

1. Motor starter, motor starting and idle. (1 min. 18 sec.)
2 & 3. Taxiing and rev-up. (27 sec.)
Sound recorded inside plane during actual sequence.

M 102 A—DOUGLAS TRANSPORT PLANE D2A

Flying, landing, idle. (2 min. 44 sec.)
Sound recorded inside plane during actual sequence.
Courtesy TWA.

B—SINGLE-MOTOR ARMY PLANE

1. Landing and idle, inside plane perspective. (50 sec.)
2 & 3. Single-motor Stinson plane landing. Ground perspective. (30 sec.)

Victor Records

SE 30—Challenger Plane (both sides same)

The speed of these planes may be varied by changing the speed of the turntable as desired. This operation also changes the tone of the effect. For example an excellent dirigible effect is produced by slowing down M 106 A to 45 r.p.m., or it may be used as the interior of one of the new clipper-type ships by playing at 60 to 65 r.p.m. and tuning the tone control so as to cut off some of the high frequencies.

Interior perspective of most closed cabin planes can be more convincingly played with the high frequencies subdued.

Blending from one portion of a record to another portion of another record is necessary to make the sound follow the script sequence of action.

Animal Sounds

Mechanical equipment for these effects is not good. They may be made by an animal imitator who has specialized in this work, or by recordings. Many different types of these records are available. All stations should stock the common effects such as cows, chickens, horses, dogs, birds, lions, and so on.

Autos

(Including police cars, trucks, auto skids.)

Auto effects are always produced from recordings. Different types of cars, starting, stopping, skidding, and so on, are widely used. Slowing down or speeding up the turntable and varying the tone control are essential aids in making these records fit the action.

Gennett Records

AUTOMOBILE 1008 A—(6 cylinder) 3 cuts.

1. Shut door, start motor, shift, run, two blasts of horn (effect obtained by same means as cuts 1, 2 and 3 of 1009). (44 sec.) 2. Start motor, shift, 1 long and 2 short blasts of horn (same effect). (46 sec.) 3. Shut door, start motor, shift gears, run 1 long and short blasts of horn (same effect). (45 sec.)

AUTOMOBILE 1008 B—(6 cylinder) Continuous running at even speed (with sound of exhaust predominant). (2 min. 40 sec.)

Masque Records

M 201 A—AUTOMOBILE

Continuous running on highway. (2 min. 35 sec.)
Sound recorded inside latest model car.

B—AUTOMOBILE

Various sound sequences.

1. Starter, motor starts and idles. (32 sec.)
2. Repeats on starter, motor starts and idles. (35 sec.)
3. Start and pull away. (28 sec.)
4. Repeats on starter, start and pull away. (20 sec.)

M 203 A—AUTOMOBILE

Starter, motor starts, three-speed sequence with gear shifts, running on highway and stop. (2 min. 55 sec.)

B—AUTOMOBILE

1. Approaching at high speed, down brakes and stop. (9 sec.)
2. Approaching at high speed, down brakes and stop. (9 sec.)
3. Cars passing at moderate speed. (20 sec.)
4. Car passing at high speed. (15 sec.)
5. Car passing at high speed. (15 sec.)

M 207 A—AUTOMOBILE CLOSE-UP

Recorded for mechanical definition.

1. Starter only. (20 sec.)
2. Starter and slow idle. (1 min. 43 sec.)
3. Starter and fast idle. (40 sec.)

B—AUTOMOBILE CLOSE-UP

Sharp motor definition, continuous running, slow speed. (2 min. 55 sec.)

M 211 A—MODEL-A FORD

1. Starter only. (7 sec.)
2. Starter and start. (10 sec.)
3. Starter, start, and continuous idle. (1 min. 50 sec.)

B—MODEL-A FORD

Continuous running. (2 min. 50 sec.)

M 209 A—MODEL-T FORD

1. Starter only. (15 sec.)
2. Starter and idle. (2 min.)

M 210 A—MODEL-T FORD

Start, pull away, running. (2 min. 35 sec.)

M 206 A—AUTOMOBILE RACES

Racing cars approaching and passing at high speeds. (2 min. 50 sec.)

M 204 A—POLICE SQUAD CAR WITH SIREN

Starter, motor starts, three-speed sequence with gear shifts, running on highway, and stop. (2 min. 35 sec.)
Sound recorded inside squad car while in operation.

B—SAME AS A

1. Start and pull away. (25 sec.)
2. Approach, down brakes, stop. (15 sec.)
3. Passing at high speed. (17 sec.)
4. Passing at high speed. (18 sec.)
5. Siren only. (33 sec.)

Standard Records

27 A—AUTOMOBILE EFFECT

(Continuous 2 min. 40 sec.) Packard eight-cylinder. Door slam, pause, starter, through gears into high, and continuous running. Matches stop, skid, and accessory cuts on 28 A.

26 B—AIR HAMMERS AND TIRE SKIDS (3 cuts)

1. Air Hammers-Generator in background. (1 min.)
2. Single Air Hammer—Cont. (45 sec.)
3. Tire skid (continuous). (30 sec.)

Masque Records

M 212 A—TRACTOR

Continuous running. (2 min. 55 sec.)

B—SEVEN-TON TRUCK

Motor starts, shifts through gears to high; then continuous running and stop. (2 min. 40 sec.)

M 213 A—SEVEN-TON TRUCK

1. Starts, runs on level, climbs steep grade with gear shifts, stops at top of hill. (1 min. 32 sec.)
2. Approach, pass, down brakes, and stop. (13 sec.)
3. Approach, down brakes, and stop. (20 sec.)

B—TRUCK

1. Fast idle (continuous). (2 min.)
2. Slow idle and clashing gears. (55 sec.)

M 208 B—AUTOMOBILE HORNS

Three types electric horns.
9 cuts, three for each type.
Cuts 1, 4, 7, long blasts.
Cuts 2, 5, 8, short blasts.
Cuts 3, 6, 9, impatient signals.

M 209 B—AUTOMOBILE HORNS

Musical Sparton, 4 cuts.

1. Chord blend.
2. Four-note melody.
3. Melody repeat.
4. Melody and chord combined.

Moo-Horn, 3 cuts.

5. Long blast.
6. Impatient.
7. Continuous.

M 210 B—AUTOMOBILE HORNS

Eight Cuts.

1, 2, 3, & 4. Various French bulb horns.
5. Hand Klaxon.
6, 7, 8. Electric Klaxon—long, short, and impatient blasts.

M 206 B—CRASHES

Six Cuts

1, 2, 3. Airplane falls, crashes. (Each 25 sec.)

4, 5, 6. Auto approach, skid, crash. (Each 13 sec.)

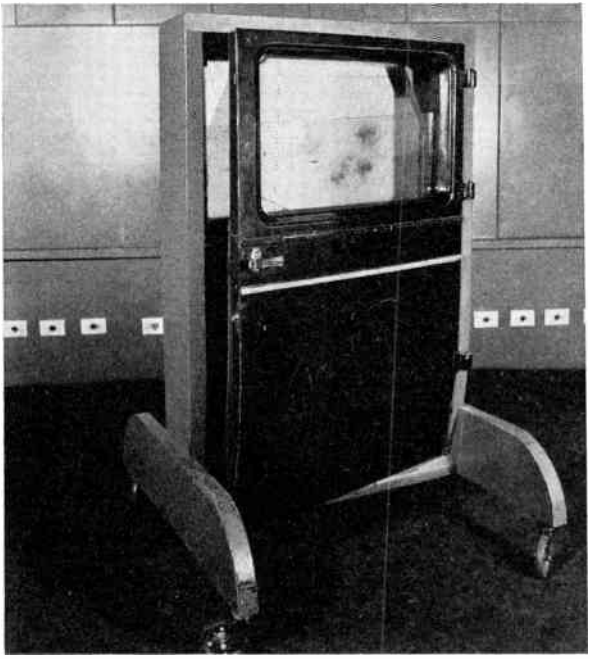


Figure 38. Auto door.

Auto Door

A very effective auto door effect can be built by securing an old sedan door and mounting it in a hardwood frame, using the original hinges and striking plate. When space is a factor, just the lock, handle, and striking plate may be mounted on a small solid wooden door built of heavy material. Some types of refrigerator door locks may be substituted for the auto door lock.

Bells and Chimes

Old second-hand bells of all sizes are readily obtainable. Auto brake drums can be mounted or hung so as to be free to vibrate. Tuned to the desired notes, these make very realistic bell effects. Large tubular studio chimes are also useful.

To make deep-toned bell effects sound large in size and give a full,

rounded perspective, a microphone should be placed close to the effect and the output of the microphone then amplified and fed through a loud speaker in the studio.

Bell records can often be used to a better advantage than mechanical effects.

Columbia Record

YB 13—Big Ben Clock Chimes.

Gennett Records

CHURCH BELLS—1106 A Exterior (continuous). (3 min. 40 sec.) Joyous bells, festivities, etc.

CHURCH BELLS—1106 B Exterior, 2 cuts.

1. Joyous bells, festivities, etc. (1 min. 33 sec.)
2. (1 min. 55 sec.)

Masque Records

M 1007 A—SHIP'S BELLS

1. Ship's clock, 1 to 8 bells.
2. Deck bell, 1 to 8 bells.

B—HOUSE CLOCK

Strikes all hours, one to twelve.

M 1006 A—CHINESE GONGS

1 & 2. Five-foot temple gong.
Struck once. Struck three times.
3 & 4. Three-foot gong.
5 & 6. One and one-half foot gong.

M 1006 B—SHIP'S BELLS

1. Large bell, forward deck.
2. Small bell, bridge.

Boat Effects

(Including harbor noises and whistles.)

Recordings are the best source for these effects. The following are commonly used:

Masque Records

M 251 A—Dinghy with outboard Motor.

1. Start, run, and stop. (2 min. 10 sec.)
2. Sound of wave slap and water washing around running boat. (35 sec.)

B—LARGE MOTORBOAT

Start, running at cruising speed, and stop. (2 min. 50 sec.) Sound recorded in boat during actual sequence.

M 252 A—MOTORBOAT

Large speedboat, start, idle, running at slow speed, speeding up, running at high speed, and stop. (2 min. 48 sec.)

B—TUGBOAT

1. Diesel tug, constant running. (1 min. 48 sec.)
2. Long blast of whistle on passing ferry boat and three blasts of whistle from tugboat. (27 sec.)

M 253 A—HARBOR SOUNDS

Continuous. (2 min. 47 sec.)

B—BOAT WHISTLES

1 & 2. Destroyer. (30 sec. & 17 sec.)
3 & 4. Steamship. (17 sec. & 10 sec.)
5. Tugboat. (17 sec.)
6. Ferryboat. (30 sec.)

Speedy Q Record

7841 A—FOG HORN, TUGBOAT WHISTLE

B—BELLBUOY, BOAT WHISTLES

Wooden boat whistles with different tones are obtainable from musical instrument supply houses. These may be used, but do not equal recorded whistles.

Brush and Bush Crackling

A small bundle of uncut broom corn worked in the hands close to the microphone or covering a small section of the floor with the corn and walking on it proves effective.

Communication Effects

(Radio and telegraph code, teletype.)

A telegraph sounder and key are usually to be found in every broadcasting station. Keying a variable-tone audio oscillator or high frequency buzzer may be used for radio code.

Recordings of these effects are very good, help to simplify the setup, and give authentic code keying.

Figure 39. Broom corn.

Masque Records

M 607 A—RADIO CODE TRANSMISSION

Three frequencies

1. At transmitter with sound of monitoring oscillator. (50 sec.)
2. At receiver. (55 sec.)
3. At receiver. (1 min. 5 sec.)

B—RADIO CODE TRANSMISSION

1. Old Navy-type spark transmitter. (50 sec.)
2. Telegraph sounder. (1 min. 45 sec.)

M 605 A—TELETYPE

1. One machine operating. (1 min. 50 sec.)
2. Several machines. (40 sec.)

B—TUNING RADIO RECEIVER

1. Broadcast receiver. (52 sec.)
2. Short-wave code. (55 sec.)
3. Static. (55 sec.)

Construction Noises

Sawing, hammering, filing, and all types of light construction noises are best produced by the actual operations in the studio. Perspective of pick-up on these effects is very important.

Heavy construction sounds such as riveting, air hammers, drills, anvils, and steam shovels are best from records.

Masque Records

M 604 A—CONSTRUCTION SOUNDS

1. Riveting steel girders, distance 10 ft. (48 sec.)
2. Riveting steel girders, distance 30 ft. (50 sec.)
3. Riveting steel girders, distance 75 ft. (49 sec.)

B—GENERAL CONSTRUCTION NOISES

Variety of machines at work in a single location on excavation and building construction. (2 min. 50 sec.)

M 603 B—EXCAVATION AND CONSTRUCTION MACHINES

1. Hoist engine. (22 sec.)
2. Hoist engine. (20 sec.)
3. Compressed-air drill. (1 min. 8 sec.)
4. High-speed pile driver. (42 sec.)

M 606 A—SHOP AND MACHINE SOUNDS

1. One man at anvil. (40 sec.)
2. Two men at anvil. (40 sec.)
3. Several men at anvil. (30 sec.)
4. Hand lawn mower. (30 sec.)

B—MACHINES

1. Steam shovel. (1 min. 25 sec.)
2. Power lawn mower. (55 sec.)
3. Power lawn mower, start, idle, and stop. (28 sec.)

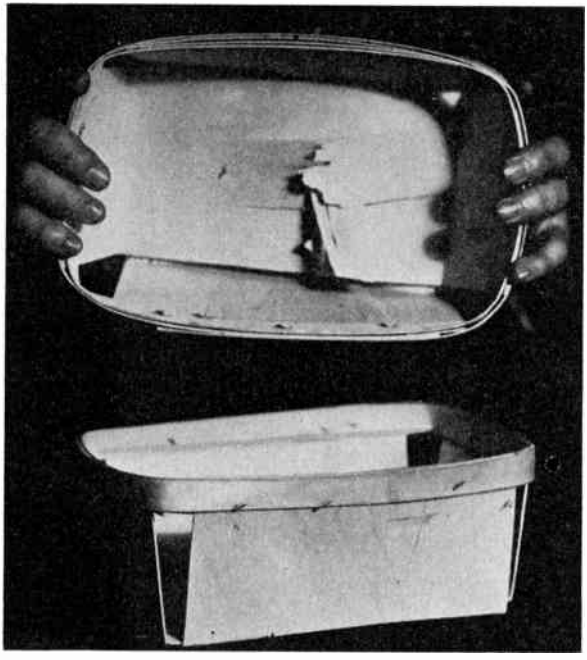


Figure 40. Crash.

Crashes

Recorded crashes are easier to handle than the old box filled with scrap metal and wood. The best glass crash effect is still to break small panes of glass. Pieces of 8 by 12 inch glass are inexpensive when purchased in boxes of 50 or 100.

Berry boxes and light-weight plywood are best for splintering wood. Chipped or cracked dishes are always available for china crashes.

In using recorded crashes it must be remembered that although the

record when played at 78 r.p.m. may not sound right, it may become realistic if slowed down and filtered as needed.

Heavy crashes are improved by backing them up with tympani, thunder drum, or the well-known basketball bladder filled with BB shot.

Doors

These most often used radio effects should be carefully built of hardwood frames. They may vary in size. Small, light doors may be

Figure 41. Door.

used where several different doors are required in the script to provide wide variation in sound.

I have found that the door which meets most universal requirements is 45 inches high, 20 inches wide. The frame is built of $1\frac{1}{2}$ by 7-inch kiln-dried oak, dovetail constructed to hold its shape. The door itself is a $1\frac{3}{4}$-inch standard-panel house door hung with heavy hinges and fitted with a heavy brass lock and striking plate.

On the opposite side of the frame, a screen door can be hung with

removable pin hinges when needed. Between the screen door and the panel door, a two-section baffle of 1-inch Celotex is mounted so that the upper panel may be slid up or down like a window. This provides a variable means of changing the quality of the door effect.

Rubber-tired casters are used for quiet portability about the studio.

Echo Effects

When space and funds are not available to build echo chambers, as described earlier in this book, an effect simulating echo can be substituted.

A microphone is placed face down over one of the holes in the sounding board of a grand piano. The dampening pedal is held down, allowing the strings to be free. With the top of the piano half open, voice or effects are directed into the piano.

A cardboard tube 5 to 6 inches in diameter may be used to direct the sound over the piano strings.

The strings of the piano vibrate with the sound and continue for a short period afterward, thus providing us with a simulation of echo.

Explosions

Recorded explosions are superior to mechanical ones for most situations.

Standard Records

26 A—EXPLOSIONS (4 cuts)

1. Three Heavy Explosions. (16 sec.)
2. One Heavy Explosion. (9 sec.)
3. One Heavy Explosion. (12 sec.)
4. Series of explosions. (45 sec.)

Masque Records

M 599 B—UNDERGROUND EXPLOSIONS (4 cuts)

1. 10 sec. 2. 12 sec. 3. 8 sec. 4. 7 sec. Underground rumbles with sound of heavy drafts. (1 min. 30 sec.)

Slowing down a record of a very sharp thunder crash will produce an excellent explosion with prolonged rumble.

Masque Records

M 555 A—THUNDER

1. One heavy thunder bolt. (19 sec.)
2. Four heavy thunder bolts and rumbles. (1 min.)

3. Six heavy thunder bolts. (1 min. 30 sec.)
Recorded during summer electric storm in the mountains.

A stem-type basketball bladder with 15 BB shot inside is blown up to normal size. Holding this within 3 inches of the microphone and giving it a sudden upward jerk and then holding as close as possible to the microphone, will give a fairly good explosion.

Fire

Cellophane is one of the old stand-bys for fire effects known. I do not believe that it is as convincing as crunching the heavy end of a small bundle of uncut broom corn.

Recorded fire has occasionally proved useful where its perspective suits the dramatic script.

Gennett Record

1057 A—CAMP FIRE

Close up, exterior, continuous. (2 min. 55 sec.) (With rush of flames and crackle of resinous twigs burning.)

1057 B—CAMP FIRE (Close up, exterior)

1. Crackle of resinous twigs burning. (1 min. 45 sec.)
2. Extinguishing with water from bucket. (50 sec.) Incidental sound from bucket handle.

Fire-Department Trucks

Records are recommended. The following are good.

Masque Records

M 270 A—FIRE ENGINE

1. Idle. (1 min. 48 sec.)
2. Engine pump. (38 sec.)

B—FIRE ENGINE

1. With siren. (58 sec.)
2. With siren and bell. (58 sec.)
3. Bell only. (43 sec.)

M 271 A—FIRE APPARATUS PASSING

Continuous running and stop. (2 min. 35 sec.)

B—METROPOLITAN FIRE DEPT.

Continuous approach and passing of apparatus. Coming to stop at fire. (2 min. 28 sec.)

Footsteps

Shoes with leather heels should always be used for footsteps effects. Actual stairs should be built, of hardwood maple, with treads mounted on a heavy frame of 2 by 4's. Usually three or four steps with 5-inch risers will be adequate.

A flat platform of 1-inch wood 6 feet long by 2 inches wide is fine for steps on a solid wooden floor. If a more resonant sound is desired, the platform should be placed on blocks of 2 by 4's.

Slabs of 1-inch thick composition stone several feet square provide a good sidewalk effect.

A tray 2 feet wide, 3 feet long, and 6 inches deep, lined with old carpeting, can be half-filled with sand, stone, or gravel for each of these respective effects.

Steps in snow are produced by covering a box of cornstarch with tape and rhythmically kneading this close to the microphone.

Microphone placement for a steps effect is critical and depends upon the accoustical qualities of the studio. It is a case of trying several pick-ups until the best one is found.

Horses

One of the best methods of getting good horse effects is by using

Figure 42. Footsteps.

halves of coconut shells equipped with finger straps in a small tray filled with dirt or sand. Often a few stones in the tray will add to the color of the sound. The different gaits of horses must be carefully

Figure 43. Horse's hoofs.

studied and the coconut shells "stomped" in the tray according to the gait required.

When the horse effects are continuous in action, records are satisfactory.

Masque Records

M 301 A—HORSES

1. Six horses walking on dirt road. (1 min. 18 sec.)
2. Six horses trotting on dirt road. (1 min. 20 sec.)

B—HORSES

1. One horse walking on dirt road. (1 min. 18 sec.)
2. Two horses walking on dirt road. (1 min. 18 sec.)

Machinery

Records of many types of machinery are available and offer the best choice for effects.

Gennett Records

1082 A—NEWSPAPER PRINTING PRESS

Running full speed; close up; continuous. (3 min. 5 sec.) Metropolitan Duplex Press.
Courtesy Palladium-Item Publishing Corp.

1127 A—STEAM ENGINE (Corliss)

Off mike; interior. 2 cuts. 1. (1 min. 40 sec.) 2. (1 min. 25 sec.)

B—STEAM ENGINE (Small steam stoker engine)

Off mike interior. 2 cuts. 1. Slow. (1 min. 40 sec.) 2. Fast. (1 min. 30 sec.)

Masque Records

M 601 A—WOOD-WORKING MACHINERY

Various saws and planers in operation. (2 min. 35 sec.)

B—WOOD-WORKING MACHINERY

1. Rip saw. (40 sec.)
2. Band saw. (40 sec.)
3. Cross-cut saw. (32 sec.)
4. Planer. (44 Sec.)

M 603 A—EXCAVATION AND CONSTRUCTION MACHINES

1. Four-cylinder gasoline work engine. (1 min. 2 sec.)
2. Double-action drain pump at work. Sounds of water. (1 min. 20 sec.)

Marching Feet

The most commonly used effect consists of 36 square 1-inch hardwood pegs 6 inches long. These are suspended by heavy round gut in a frame 20 inches square. This assembly is rubbed back and forth at marching cadence on a platform covered with emory paper. It may also be used in a tray of dirt or gravel.

Fair recordings of marching feet have been made by all the sound-effects record manufacturers.

Rain

Recordings of rain provide the easiest way to produce this effect. The following is frequently used.

Masque Record

M 552 A—STEADY RAIN

Continuous. (2 min. 50 sec.)

Figure 44. Marching feet.

A mechanical rain machine may be built which pours bird seed from a hopper over different types of parchment, paper, or light-weight tin, depending upon the character of rainfall to be produced. By regulating the flow from the hopper, the effect may be varied from a drizzle to a downpour. (See figure 45, on page 320.)

Squeaks

A sure-fire squeak which can be varied in tone is made with a hardwood dowel twisted in a tight fitting hole bored through a 2 by 2 by 10-inch piece of maple. A slot is cut in the maple 2 by 2 inches from the hole to the end of the piece, and a bolt is placed through the slot, which permits the tightening or loosening of the block pressure on the dowel, thus varying the tone.

Rusty pulleys and hinges are useful sources of squeaks to have on hand.

Turntable Equipment for Sound Effects

Most stations do not realize the fullest possible benefit from their sound-record resources. Sound-effects records are often better when used in combinations. We are able to build up unusual effects by the simultaneous use of three, four, and five records at one time, being careful, by experiment, to get the proper balance between each.

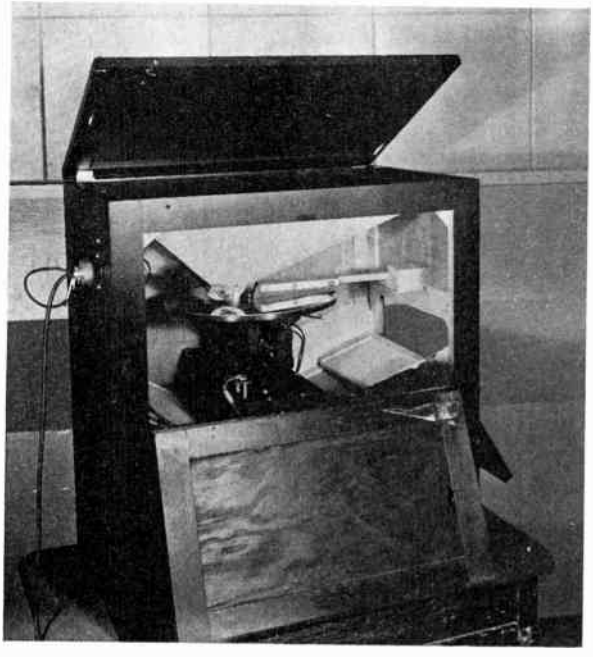


Figure 45. Rain machine.

By using a turntable of variable speed, one record may be made to produce several effects. Such a turntable, combined with variable high- and low-frequency pass filters, will help you get effects you did not dream existed on the records.

In building sound-effects turntable speaker combinations, several points should be kept in mind:

1. A good amplifier-speaker combination should be used. It should have ample gain and output without overload and distortion.
2. It should have good pick-up arms which are properly balanced in order to reduce wear on records and give a minimum of surface

Figure 46. Turntable-speaker combination (*bottom*). Close-up of turntables (*top*).

noise. The pick-up arms should be mounted so that they may be used on adjacent turntables. This will make possible the cross-fading from one pick-up to another to be used on the same record, in order that short cuts on a record may be utilized for longer sequences.

3. Use a variable-speed turntable—not just 78 to $33\frac{1}{3}$ revolutions per minute, but one which can be varied from at least 15 to 85 revolutions

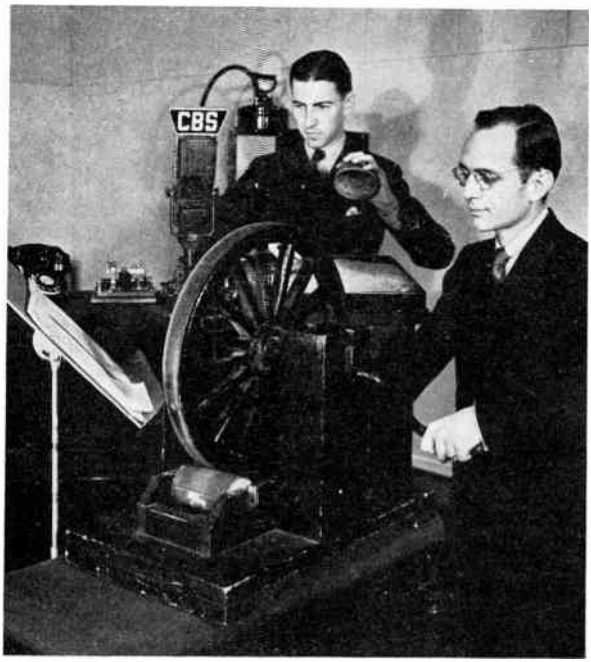


Figure 47. Horse and wagon.

per minute while in operation. Inexpensive turntables may be purchased which, with several slight adjustments to the speed-control governor, will supply this speed range.

4. Most consoles consist of two or three turntables, the number depending on the actual sound-effect requirements. The console should be so constructed that additional turntables or audio-frequency effects may be plugged into the system as needed. Turntables may be each mounted in separate portable carrying cases or grouped in console cabinets.

5. Tone control is absolutely essential. The high- and low-frequency by-pass system is most effective. One of this type is at present being made expressly for sound effects.

6. Do not mount the speaker in the turntable cabinet. Doing so results in a lack of flexibility, which is so essential in placing the speaker at various perspectives in the studio for different types of effects. Install the speaker in a separate cabinet on rubber-tired casters in order to get full benefit of this system.

Care in design and construction of this type of sound-effect equipment cannot be overemphasized if a good, dependable unit is desired.

Wagon

A small wagon wheel approximately 24 inches in diameter is mounted on a shaft with a handle for rotating and supported between two wooden uprights. The rim of the wheel is rotated at whatever speed is desired. Bumps are simulated by small upward jerks of the shaft.

Different types of rollers are used to give the effect of a wagon on dirt, street, stone, and so on.

Warfare and Shots

War scenes are best produced from records. The following have been found satisfactory.

Masque Records

M 801 A—WARFARE

Historic battle scene re-enactment. Old-time cannon and rifles only. Continuous. (3 min. 4 sec.)

B—WARFARE

Modern battle scene using artillery, machine guns, and rifles. Screaming and bursting shells. Continuous. (3 min. 10 sec.)

M 802 A—WARFARE

1. Screaming and bursting shells. (1 min. 20 sec.)
2. Ricocheting bullets. (55 sec.)
3. Screaming and bursting shells in different pattern. (50 sec.)

M 802 B—MACHINE-GUN FIRE ONLY

1. Continuous. (1 min. 40 sec.)
2. Long and short bursts. (1 min. 20 sec.)

M 803 A—RIFLE AND PISTOL SHOTS

Sound of bolt action.

1. Single rifle. (47 sec.)
2. Two rifles. (52 sec.)
3. Evenly spaced pistol shots. (35 sec.)
4. Mixed firing near and distant perspective. (35 sec.)

B—COLUMN OF INFANTRY MARCHING

Continuous. (3 min.)

Gennett Record

1006 B—MACHINE-GUN FIRE

Six cuts.

1. Gun firing close up, exterior. (7 sec.)
2. (8 sec.)
3. Two guns firing. (10 sec.)
4. (7 sec.)
5. (7 sec.)
6. (15 sec.)

Courtesy Indiana National Guard.

Figure 48. Splash tank for water effects.

Additional heavy rumble may be added to a war scene with tympani, thunder drum, or thunder screen.

A good anti-aircraft gun effect is produced by slowing down the pistol shot cut of the Masque Record M 803 A.

Revolver and rifle shots are very good when produced with the newly

developed gun and ammunition described at length in Chapter 14.

If no other means of making shots are available, slap a leather seat pad with a flat ruler, or hit the side of a corrugated cardboard box with a rattan switch.

Water Effects

A splash tank 18 inches square and 15 inches deep of heavy copper is lined with heavy waterproof canvas. The lining is necessary to keep the water from hitting the metal, which does not give unconfined water effects. A square wash tub may be used where the cost of the copper tank is prohibitive.

A paddle wheel with four- to six-inch metal blades on a shaft is suspended so that it can be rotated. The shaft is held in a bearing secured to a 2 by 6-inch piece of wood clamped across the top of the tank. The bottom of the blades should clear the bottom of the tub by $1\frac{1}{2}$ inches.

Fill the tub to the top of the blades with water. Various manipulations of this machine may be used for many types of water effects.

Records are available for river rapids, surf, and other large bodies of water.

Masque Records

M 552 B—THE LAP AND WASH OF WATER
(2 min. 42 sec.)

M 551 A—SURF
Sound of waves and backwash on sandy beach. (2 min. 20 sec.)
B—HEAVY SURF ON ROCKY SHORE
(2 min. 15 sec.)

M 553 A—RAPIDS
Continuous. (2 min. 40 sec.)
B—WATERFALL
(1 min. 42 sec.)
Wading and fording the stream. (1 min. 32 sec.)

Gennett Record

1028 A-B—RAPIDS
Small river rapids. Close up exterior, with ripple and rush of water over stones in rapids.
A—(2 min. 52 sec.)
B—(2 min. 48 sec.)

Window

The best window effect is produced by the use of a regular window such as used in the construction of frame houses. These may be purchased in various sizes, complete with frame, sash weights, and glass. The window should be mounted in a suitable pine frame and fitted with customary blinds and hardware.

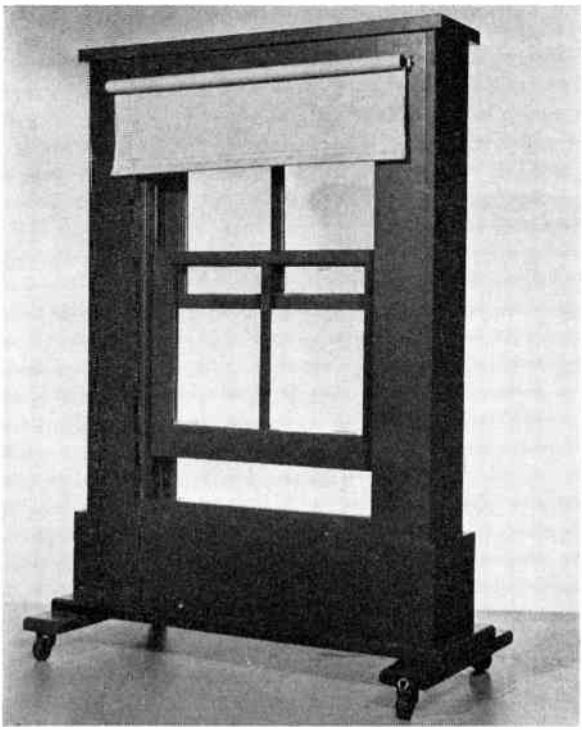


Figure 49. Window.

Thunder

Thunder may be effectively produced in several different ways. The simplest means is with a recent recording release.

Standard Record

7 A—THUNDER CRASHES (4 Cuts)

1. Single crash with rumble. (10 sec.)
2. Single crash with rumble. (10 sec.)
3. Continuous. (1 min.)
4. Continuous. (45 sec.)

Masque Records

M 555 A—THUNDER

Three cuts.

1. One heavy bolt.
2. Four heavy bolts.
3. Six heavy bolts.

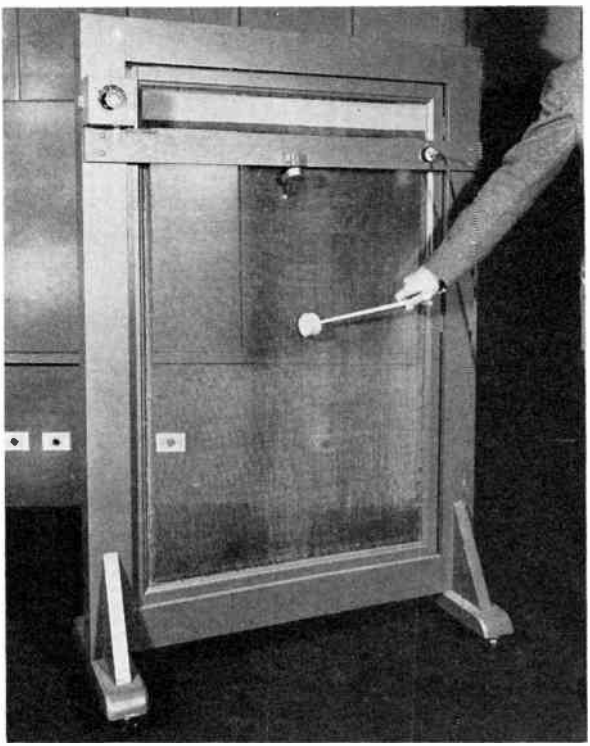


Figure 50. Thunder screen.

Thunder drums built of heavy oak frames upon which a large steer hide is stretched are the oldest type of thunder effects. The basketball bladder with BB shot described under "Crashes" may be used as a thunder effect.

A very unique thunder effect is produced from a piece of copper window screening, 3 feet by 4 feet, stretched tightly on a wooden frame. A magnetic phonograph pick-up head is rigidly mounted several inches above the screening. A piece of wire spring is soldered

to the screen, and the other end of the wire is inserted into the needle hole of the pick-up head.

Striking the screen with a padded tympani stick causes the screen to vibrate. These vibrations are transmitted through the spring to the pick-up. Output of the pick-up is amplified and fed into a loud speaker in the studio.

Trains

All train effects are produced from records. These are often used in combinations of several records to synchronize the effects to script action.

Many mechanical train effects have been tried, but none has compared with the recorded effects.

Masque Records

M 405 A—PASSENGER TRAIN

Start, run, and stop. (2 min. 50 sec.)
Sound recorded from observation platform.

B—PASSENGER TRAIN

Continuous. (3 min.)
Sound recorded between coaches.

M 402 A—FAST PASSENGER TRAIN

1. Approaching and passing, with crossing bell. (1 min. 25 sec.)
2. Approaching and passing without crossing bell. (1 min. 30 sec.)

B—FAST FREIGHT TRAIN

1. Approaching and passing, with crossing bell. (1 min.)
2. Approaching and passing without crossing bell. (1 min. 25 sec.)

M 406 A—PASSENGER TRAIN

Start, run, and stop. (2 min. 45 sec.)
Sound recorded in vestibule between coaches.

B—PASSENGER TRAIN

Continuous inside coach perspective. (2 min. 50 sec.)

M 403 A—LOCAL PASSENGER TRAIN

Start, run, and stop, with whistles and air signals. (3 min.)
Entire sequence recorded in cab of locomotive. Courtesy Central R. R. of N. J.

B—RAILROAD SOUNDS

1. Train coming into station; stop and pull out. (1 min. and 8 sec.)
2. Engine at station; bell and escaping steam. (18 sec.)
3. Crossing bell. (25 sec.)

M 401 A—RAILROAD TERMINAL

Entire sequence recorded during arrival and departure of both local commuting and through trains. (2 min. 30 sec.)
Courtesy B. & O. R. R.

B—RAILROAD STATION SOUNDS

1. Train in station with air-pump and bell. (1 min. 30 sec.)
2. Train in station with air-pump only. (55 sec.)

M 407 A—RAILROAD FREIGHT TERMINAL

Switch engines operating in yards. Shifting, shunting, throwing, and coupling cars. (2 min. 50 sec.)

B—TRAIN WHISTLES

1. 2 long, 2 short. (3 times, 32 sec.)
2. Alarm whistles. (3 times, 15 sec.)
3. Crossing whistles. (2 times, 20 sec.)
4. High-ball whistles. (5 times, 40 sec.)

Gennett Records

1005 A—PASSENGER TRAIN

Starts and leaves station, 2 cuts.
1. Heavy exhaust as train starts and recedes. (40 sec.)
2. 2 short blasts of whistle; engine bell; sound of exhaust as train starts and recedes. (1 min. 15 sec.)
Courtesy Penna. R. R. Co.

1305 A—WHISTLING FOR CROSSING, PASSING, RECEDING

Three Cuts.
1. (1 min.)
2. (55 sec.)
3. (25 sec.)

B—PASSENGER TRAIN

Whistling for crossing, passing, receding.
Five Cuts.
1. (40 sec.)
2. (30 Sec.)
3. (25 sec.)

4. (23 sec.)
5. (27 sec.)
Courtesy Union Pacific R. R.

1304 A—PASSENGER TRAIN

1. Entering station at night. (1 min. 30 sec.) Bell ringing, sound of exhaust, standing.
2. Passenger train entering station in daytime. (1 min. 13 sec.) Bell ringing, sound of exhaust. Courtesy Chicago & Northwestern Lines.

B—PASSENGER TRAIN

Union Pacific Streamliner "City of Denver" (Diesel).
1. Approach and pass through Central City, Ia. Almost continuous blasts of horn. (1 min.)
2. Same "City of Los Angeles." (1 min.)
3. Same "City of Denver." (1 min.)
Courtesy Union Pacific R. R.

Speedy Q Records

7810 A—TRAIN NO. 1

Continuous, the Santa Fe Super Chief (Diesel engine).
Whistle, enter station, stand, leave station, with crossing warning bell and train whistle.

B—TRAIN NO. 2

Two cuts.
Santa Fe passenger train (steam engine).
Whistle, enter station, stop, start, leave station.

7811 A—TRAIN NO. 3

Two cuts
The Santa Fe Chief (steam engine).
Whistle, enter station, stop.
Start, leave station.

B—TRAIN NO. 4

Four cuts.
The Santa Fe Super Chief (Diesel engine) and three other Santa Fe passenger trains approach, whistle, pass, recede.

Voices

Recordings of various types of background voices are extensively used in radio drama. A representative library of these should always be kept on hand.

Masque Records

M 507 A—CONFUSION OF VOICES

Mixed men and women, small group, continuous. (2 min. 50 sec.)

B—CONFUSION OF VOICES

Mixed men and women, large assembly, continuous. (2 min. 55 sec.)

M 503 A—CONFUSION

Large crowd at sports event, continuous. (2 min. 4 sec.)

B—CONFUSION

Large crowd at sports event.

1. Cheering crowd. (55 sec.)
2. Crowd reactions, heavy bursts of cheering. (2 min. 20 sec.)

M 508 A—ANGRY MOB

Continuous. (2 min. 42 sec.)

B—APPLAUSE NO. 2

(Special record for definition)

1. Small group. (15 sec.)
2. Large audience. (1 min. 25 sec.)
3. Boos and jeers. (45 sec.)

Gennett Records

1069 A—CHILDREN

Laughing, playing, clapping (4 cuts), close-up interior; 32 boys and girls about 10 years old.

1. Handclapping and voices. (45 sec.)
2. Handclapping, voices, laughter. (18 sec.)
3. Excited voices. (43 sec.)
4. Excited voices. (47 sec.)

Standard Record

27 B—BABY CRIES

Three cuts.

1. Slight cry. (10 sec.)
2. Slight cry. (12 sec.)
3. Mad cry continuous. (1 min. 30 sec.)

Wind

Numerous types of mechanical wind effects have been built, using high-speed motors which rotate rattans or electric blowers that blow

tuned whistles. These are fairly good effects, but not as realistic as recordings. Varying speed and tone controls are material aids with wind recordings.

Masque Records

M 554 A—WINDSTORM

Continuous. (3 min. 7 sec.)

M 599 A—A GALE O' WIND

Continuous. (3 min. 10 sec.)
Sound recorded at Montauk Point when wind reached 65 m.p.h. maximum velocity.

Gennett Record

1163 A—WIND

Howling, continuous. (3 min. 50 sec.) Around old house or barn. This is an actual recording of a crying wind blowing through the cracks of an old building.

A List of Sound-Effects Record Manufacturers

1. American Record Corporation, 1776 Broadway, New York City. Manufacturers of Columbia Phonograph sound effects.
2. Masque Sound & Recording Corporation, 130 West 56th Street, New York City. Manufacturers of Silver Masque sound-effects records.
3. Standard Radio, 180 North Michigan Avenue, Chicago, Illinois.

   Standard Radio (Pacific Division), 6404 Hollywood Boulevard, Hollywood, California.
4. Star Piano Company, Richmond, Indiana. Manufacturers of Gennett records.
5. Speedy Q Record Company, 1344 South Flower Street, Los Angeles, California.
6. Victor Recording Laboratory, 153 East 24th Street, New York City.

Microphones in General Use

To every craftsman, to every student of a craft, a knowledge of his tools is important—a familiarity with his tools from their simplest form to their latest development. So to a student of radio production, a knowledge of the microphone, from its early form to the present highly sensitive instrument, is of great value.

Five types of microphones have been devised for broadcasting. The carbon, condenser, and the dynamic microphones have had widespread use but have been replaced almost entirely by the velocity transmitter. Recently, engineers have experimented with a microphone which combines the best features of the first group and of the velocity microphone.

The *carbon* microphone was the first type to be generally used. On each side of the center of a thin, stretched metal diaphragm are "buttons" containing fine carbon granules. Variations of the small electric current, which are made to flow through these "buttons," caused when sound waves are impinged on the diaphragm, after being amplified are transmitted.

The carbon "mike" does not have a wide frequency range. It generates a good portion of harmonic distortion. Loud sounds cause blasting, often resulting in injury to the instrument, and the current flowing through the buttons causes a slight hiss. The sound source must be close to the live face, and it is necessary to place the broadcasting group within an agle of 30 degrees at either side of the microphone axis. Despite the fact that it is frequently in need of repair, its portability and ease of installation, and the fact that it requires little or no shielding, is responsible for is frequent use at remote points.

The *condenser* microphone consists of a thin, stretched diaphragm

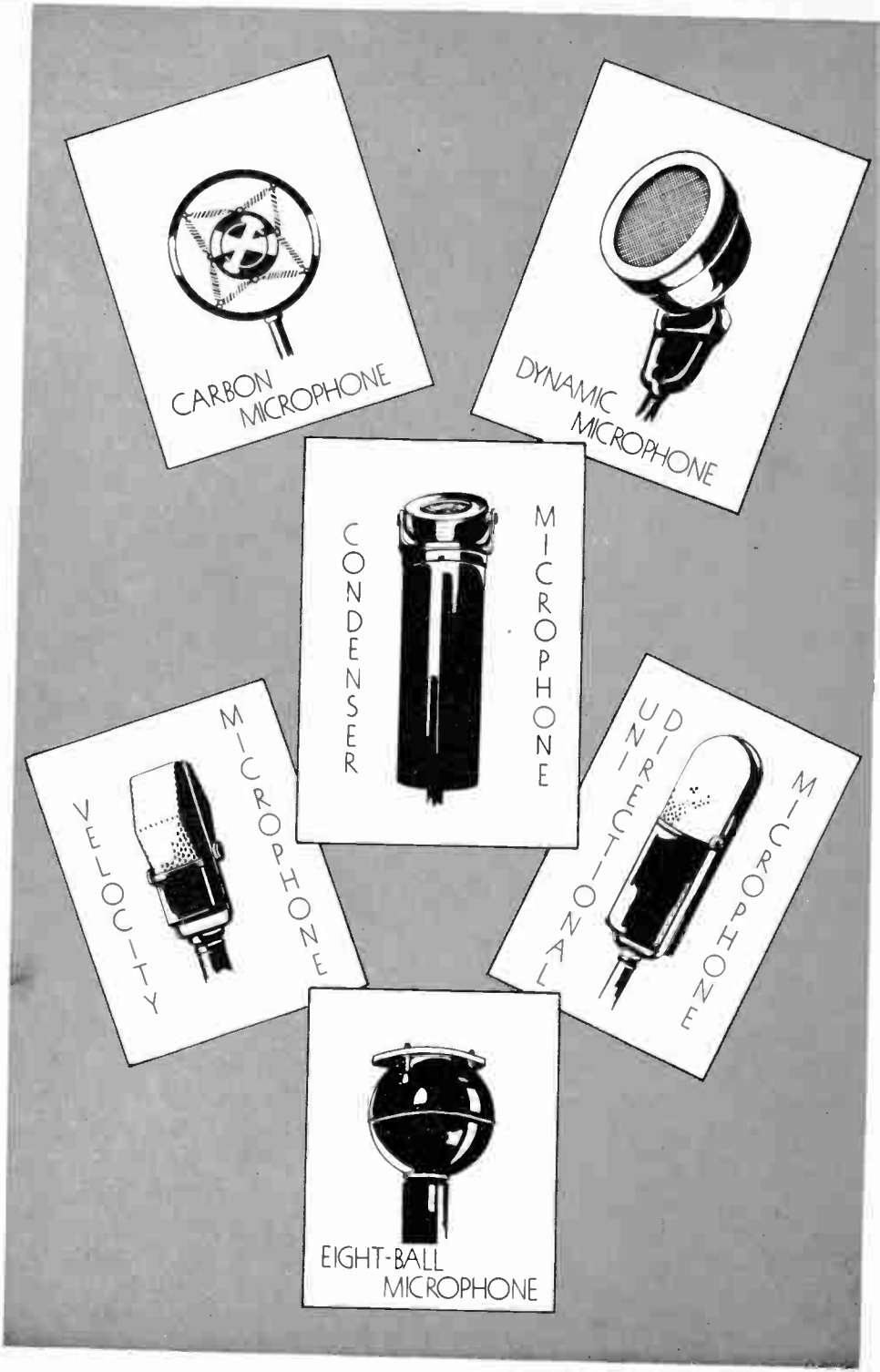


Figure 51. Microphones.

placed 1/1000 of an inch from a solid metal plate and subjected to a potential of 180 volts. The diaphragm and plate together constitute a condenser whose capacity changes when sound is impressed on it. The resulting electrical variations are then amplified.

The improvement of the condenser over the carbon microphone lies in that it reproduces sounds within a wider frequency range and with a greater degree of fidelity. Also, the hiss of the carbon mike is eliminated. As in the case of its predecessor, the broadcasting group must be placed within an angle of 30 degrees at either side of the microphone axis. It is most effective when the sound source is placed very close, as near as eight or ten inches.

The condenser microphone is a very unwieldy instrument in that the amplifier must be built very close to or into the instrument itself. Weather conditions, such as humidity and barometric pressure, affect its response. These reasons, plus the high voltage used in its operation, tend to make it a microphone better suited to studio rather than to remote broadcasting.

The *dynamic* microphone consists of a diaphragm on which is mounted a coil of fine wire. This combination, vibrating in the field of a strong magnet, generates minute electric currents proportional to the velocity of the diaphragm and, hence, proportional to the incoming sound impulses.

Like the carbon and condenser mikes, the dynamic, in one of its forms, is "unidirectional": that is, sensitive on only one side. It has a high-grade pick-up throughout a range of from 40 to 10,000 cycles. Higher frequencies are not reproduced with perfect fidelity, tending to peak. Likewise, a lack of definition is found in this type of transmitter, a group of frequencies often producing a muddled effect. It excels, however, in the faithful response to low frequencies and in the reproduction of single effects, such as the human voice. The dynamic is outstanding in its ability to reproduce the tone of "intimacy" in the voice. It is also rugged and dependable, and it enjoys freedom from temperature, barometric, and humidity effects. As in the case of the condenser mike, it requires additional amplification. This amplification, however, may be placed at a considerable distance (up to several hundred feet) from the instrument itself. All the latter characteristics make the dynamic microphone adapted to broadcasting from remote points.

A sturdy and less expensive form of dynamic microphone is the "salt-shaker." Its name is derived from its shape. It is non-directional.

Another variation of this type is the so-called *eight-ball* microphone. This transmitter, deriving its name from its resemblance to a billiard ball, has all the basic characteristics of the dynamic instrument. Its frequency response, however, is independent of the angle of sound incidence: pick-up is made without regard to the direction of sound approach. For these reasons, plus the fact that it may be placed far from the sound source, the eight-ball is used extensively for remote broadcasts and night-club pick-ups.

The *velocity* microphone is sometimes called the "ribbon mike" because its operation depends on the vibration of a narrow duraluminum ribbon suspended between the poles of a strong magnet. When the ribbon is set in motion by sound vibrations, small electric currents are developed which are then amplified. As in the case of the dynamic, the amplifier may be placed at a considerable distance from the microphone.

The frequency operating range of this type extends from 40 to 15,000 cycles. Low-frequency response is increased when the sound source is brought closer than two feet from the instrument. Beyond a four-foot operating distance, the response is unaltered by changes in the distance of the sound source. Nor is it essentially changed by the direction of the incident sound.

The development of the velocity microphone marked the first use of a bidirectional instrument. It has two live faces: that is, sound waves are picked up and reproduced from both the front and the back of the transmitter. Sound waves approaching on the same plane as the ribbon have no effect, while sound waves from either front or back on a plane perpendicular to the plane of the ribbon have a maximum effect. This "aiming" quality makes apparent the possibility of securing better balance, clarity, and selectivity in sound pick-up. The small effect of extraneous sounds approaching the mike from its sides increases by comparison the quality of the direct sounds reproduced. Owing to the velocity's bidirectional characteristic, speakers, instruments, or players may be placed on either or on both sides of the transmitter with equal effect.

Pick-up from either front or rear may be eliminated by placing a shield of some heavy sound-absorbing material, such as felt, at a distance of three or four feet from the instrument. This confines the pick-up area to the side of the microphone not shielded.

This arrangement theoretically describes the unidirectional velocity mike. The above-mentioned shield is built into the instrument itself in the form of a baffle around one of the live faces. The ribbon is

placed further front than in the bidirectional velocity, affording a pick-up field of 60 degrees at either side of the mike axis. This unidirectional transmitter is very effective in playhouse or concert-hall broadcasts where undesired audience noises are present.

The latest type of microphone to be developed is a unidirectional instrument which resembles in appearance and construction the velocity transmitter. It combines, however, the principles of both the velocity and diaphragm microphones.

It contains a thin metallic ribbon suspended between the poles of a strong magnet. The ribbon, however, is clamped at top, center, and bottom. The bottom half of the instrument is left open front and back and is operated as a regular velocity mike. An accoustic impedance in the form of a labyrinth filled with sound-absorbing material is placed behind the upper half of the ribbon with the result that this part of the ribbon operates as a "pressure" operated microphone.

This microphone retains the good characteristics of both the velocity and dynamic types of instrument and minimizes their disadvantages. The resultant microphone is one whose chief characteristics are fidelity, sensitivity to a wide frequency range (both high and low), and an "aiming" quality that permits definition of tone.

Building a Studio

By CLARENCE R. JACOBS, *Manager of Construction Operations, Columbia Broadcasting System, Inc.*

A GOOD BROADCAST is practically impossible without proper studio facilities.

Many problems and a great deal of responsibility, therefore, confront the station owner who is getting ready to build a new plant. A brief outline of some of these problems, together with a few solutions evolved out of long experience with many types of studios, should be useful.

The first thing to be considered in planning a new broadcasting station is the location. The building should have proper ceiling heights and column spacings, and it must not be near railroad tracks or street-car lines. In a large city like New York or Chicago, it is often difficult to find a site near enough to artists, clients, and agencies, and at the same time far enough away from street-car or subway lines. But the owner of a small plant in a city of average size should have no trouble finding a number of buildings which are free from vibration.

The plant should not be located in a building where any manufacturing takes place, or where such equipment as printing presses, sewing machines, and paper-cutting machines are located. The vibrations caused by such machinery are predominantly of low frequency, and we find the commercially available materials still lacking in low-frequency attenuation. So it is necessary to select a building free from manufacturing jars. If possible, it is best to buy a piece of land and erect one's own building on it to insure a maximum of sound control. Station WWJ in Detroit, for example, which is owned by a newspaper, originally wished to build studios in its own newspaper building.

Upon being convinced that the vibrations of the printing presses on the first floor would interfere with the programs in the studios on the upper floors, the newspaper bought a plot across the street. Its building is off the lot line, so that the vibrations in a future building on the adjacent lot will not be annoying.

Erecting one's own building has its advantages with regard to ceiling heights and column spacings. The proportions of a standard broadcasting studio shoud be in the order of 2, 3, and 5. A typical example would be a studio 20 feet high, 30 feet wide, and 50 feet long. In some cases, when width is more desirable than length, the proportions are in the order of 2, 3, and 4. The ceiling height required for a studio of this size is equal to two floors in a normal office building. Seldom is a floor space found in an ordinary building with column centers such that a studio of this size can be constructed. Usually columns must be removed and girder beams above reinforced. It is thus often cheaper to build a studio building than to undergo the trouble, delay, and heavy cost of remodeling an old building.

The general plan of the plant of course depends upon the requirements and personal tastes of the individual station owner. However, it is remarkable how much can be done with a limited space, provided the needs of the station are intelligently analyzed. Station WKBN, in Youngstown, Ohio, is a typical example. I would like to digress for a few paragraphs, and explain the details of what was done to remodel it.

Before remodeling, WKBN, located in the Youngstown Y. M. C. A. building, had only two studios at its disposal: one 20 feet by 24 feet, and the other 13 feet by 20 feet. It also had a master control room and a "milling space" for musicians and the public, with a desk in one corner for the program director. Business offices occupied the rest of the third floor. A large hall was available on the second floor for use when larger programs were put on.

The president, W. P. Williamson, Jr., was dissatisfied with this set-up as it stood. He felt he needed four studios, instead of two. He wanted a clients' room. There was also, under the existing conditions, no closet or storage space for folding chairs, miscellaneous instruments, and sound-effects equipment. There was no public telephone booth, and not enough seats for the convenience of the musicians and the guests. The program director's desk was crowded and inconvenient. He was also dissatisfied with the set-up of the master

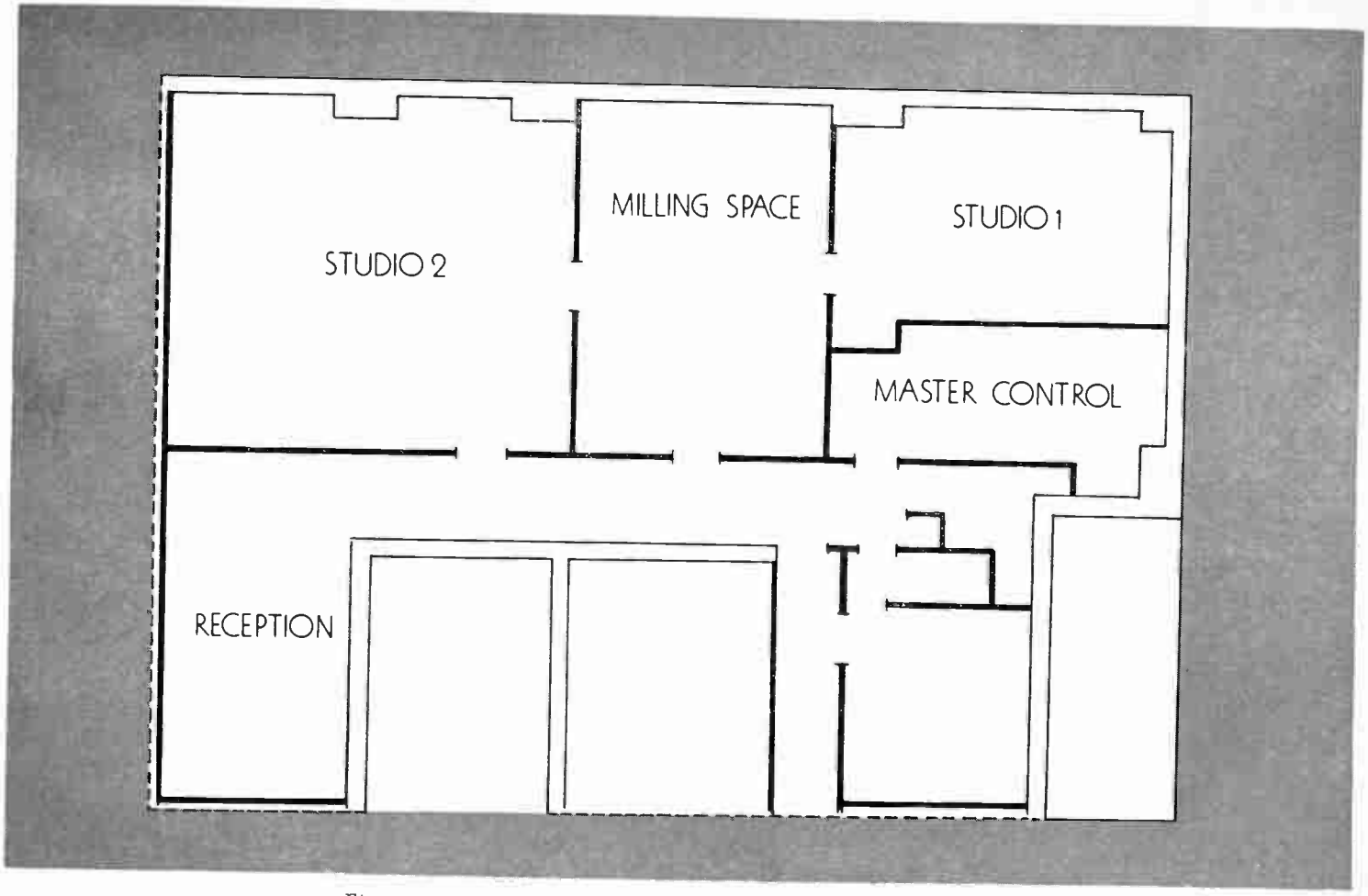


Figure 52. Studios of WKBN, Youngstown, before reconstruction.

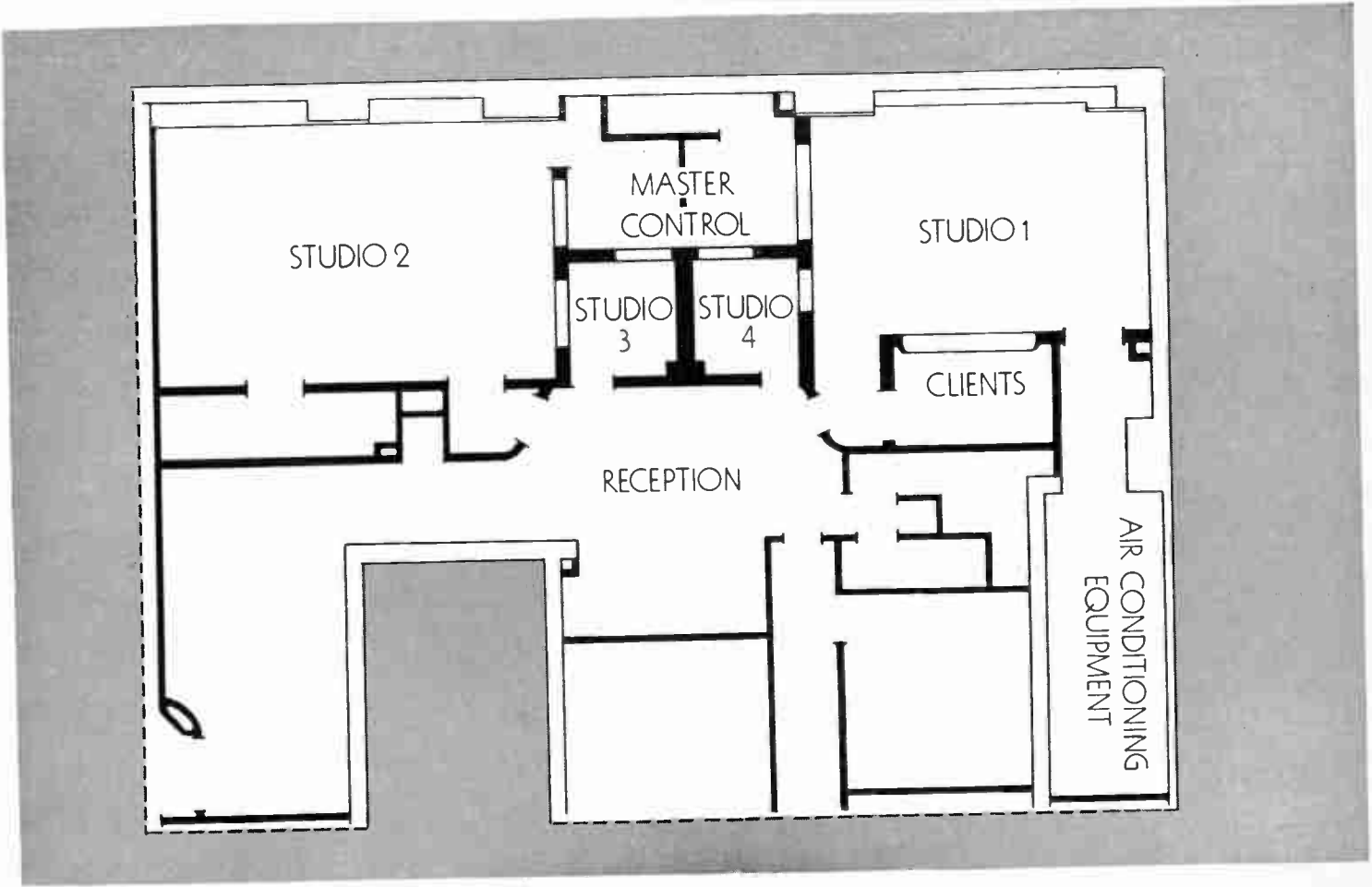


Figure 53. Studios of WKBN after reconstruction.

control room. It was so placed that the engineers monitoring the programs had to work "blind" without seeing the show. Besides, it was easily accessible to visitors and to friends of the engineers who had formed the habit of dropping in to visit them. This visiting, Mr. Williamson felt, might eventually cause a break in the broadcast.

Comparing the two floor plans here illustrated will show what was done to remedy all these defects. Figure 52 shows WKBN as it looked before we went to work. Figure 53 shows it as it is now. Note first that the master control room has been completely re-located. It is in the center of the four studios, into all of which the engineer can see through the observation windows. The engineer sits in a swivel chair in the center of the control room, his monitoring desk directly in front of him. On his left, below the window, are the turntables for the transcriptions which play an important part in WKBN's programs. Merely by turning his chair, he can operate this transcription equipment, or do such patching on the main panels behind him as is necessary in his operation. The main panel boxes are a few steps away. The reader can readily see that this plan eliminates the accessibility of visitors.

The diagrams show the transformation of the original two studios into the four that Mr. Williamson needed. In remodeling these studios, we kept the word *flexibility* always before us. Thus a window was installed in the wall separating Studios 1 and 4, so that the announcer need not necessarily be in Studio 1, but can tie-in his announcements by sight as well as sound. Thus Studio 4 can be used as an announcer's studio alone, or for sound effects in case Studio 1 is not able to accommodate the equipment because of set-up. If necessary, it can even be used as a control room for Studio 1. Conduits were installed between it and the master control room, so that the wires can easily be installed and equipment placed for the purpose. Studio 3 has been given similar conduits, so that it can be used as a control room for Studio 2, which it adjoins. Besides being used as a control room or an announcer's room, either Studio 3 or Studio 4 can be used as a clients' or observation room for the studio it adjoins. Thus Mr. Williamson's various studio needs were solved.

On examining the second diagram further, we find the problem of extra seats for the musicians and guests taken care of by a built-in seat with a loud speaker above it in the studio reception room. This speaker also permits the program director, who sits directly in front of it, to follow the programs in detail. Sound locks for Studios 1 and

2 create a more efficient sound barrier between the studio reception and the studios than the most expensive commercial sound-retarding door could possibly give. Storage rooms have been provided for the two larger studios. A public telephone booth has been constructed directly off the corridor leading from the public reception space. Room formerly occupied by an office is now assigned to the program director.

In passing, note also that the outside windows of the plant have been closed. The windows were left intact with the Venetian blinds drawn, so that the appearance of the building from the outside might not be affected. On the inside, masonry closes off the windows, and thus forms a barrier to outside interfering sound.

The studios of a broadcasting station are the scene of its most important operations; greatest care must be taken to insure their perfection. The enclosing walls of a studio should be of masonry construction, preferably of cinder concrete blocks. These should be at least six inches thick and should extend from the floors to the underside of the ceiling slabs above. The block should be laid up in a full bed of mortar, rather than the edge-bedding which is prevalent. Prior to the application of the isolation system, all cracks and openings should be carefully pointed. Care should be taken to caulk carefully around all ducts, conduits, and so on. Steel lintels should be installed for all door and window openings. Wood, even where permitted, is undesirable owing to the possibility of shrinkage and the opening of cracks after the construction is thoroughly dry. The rough bucks for the windows as they are installed should be securely fastened to the masonry construction. The rough bucks for the doors should be of at least three-inch stock, so that the heavy, sound-retarding doors can be secured properly.

The control room is an integral part of any broadcasting studio, and should be taken into consideration from the beginning of its construction. It should be of sufficient size, and preferably 18 or 27 inches above the studio floor. The control window should be about 30 inches high, with the sill 30 inches above the control-room floor. The entrance to the control room should be through a sound lock. In the larger plants it is desirable to enter the control rooms from a rear or service corridor, so that the traffic of the engineering staff does not interfere with the free movement of the artists and musicians in the public corridor. It is also desirable to have storage rooms directly off the studios, in which may be stored folding chairs, sound-effects

equipment, and musical instruments, together with all the miscellaneous paraphernalia that accumulates in the average studio.

Sound isolation, that is, the prevention of sound travelling from one space to another, deserves very serious attention. Seldom is it possible to plan a studio group in such a manner that the installation of a good commercial isolation system is not required. There are two isolation systems on the market, which are mostly used in broadcasting studio isolation: the Johns-Manville system, which uses felt as an isolating medium, and the U. S. Gypsum system, which uses steel springs. The station owner, with his consultant, should choose either type only after carefully scrutinizing the details of both.

1. Will the system selected result in the sound attenuation required?
2. Are the details of the system such that the system can be so installed as to affect the contours desired economically?
3. Are window and door details satisfactory as well as the proposed methods of isolating ducts, light boxes, pull boxes, and so on?
4. The efficiency of the system depends upon the care exercised during its installation. What type of supervision will the station owner have?
5. Lastly, delivery, price, and experience of the contractor.

When installing the system, all ducts and conduits entering through the masonry enclosure should be brought to the finished faces of the isolation treatment by means of flexible connections; for when the isolation treatment within the studio is complete, it forms a room within a room, not connected by any rigid means with the enclosing masonry shell. It is free to vibrate, but the vibration should be separated from the masonry construction by the shock-absorbing action of the isolation treatment.

Probably the most difficult isolation job ever done for a broadcasting studio was created for the Columbia Radio Theatre No. 3 in New York City. Theatre No. 3, at 1697 Broadway, is ideal for the broadcasting of programs with a large studio audience because of its accessibility to artists, clients, and guests. However, its stage backs up against a power house, the Sixth Avenue "L" ran along its left-hand side, and the Eighth Avenue subway runs underneath it. Our method of isolating it from these vibrations and noises was, briefly, as follows.

We put a very efficient acoustical treatment on all the available wall and ceiling areas of exit vestibules to reduce the elevated and street noises entering the theatre. When we studied the building, we found that the already existing cyclorama, composed of metal lath and plas-

ter, responded to the vibrations in the building caused by the subway and the power house. We applied additional plaster to this cyclorama in uneven surfaces, to change its natural frequency, and we also cut the solid steel connections supporting its top from the structure of the building and inserted felt vibration isolators between the top of the cyclorama and the roof of the building. A double-floated floor was constructed over the entire stage area to reduce the vibrations from the subway in the stage floor. We lined the entire plenum chamber underneath the theatre with a two-inch thick wire-enclosed rock wool blanket, to eliminate the noise coming into the theatre through the mushrooms, for we had found that the noise from the subway was being amplified in this chamber. We built secondary lath and plaster walls on either side of the proscenium opening for low-frequency isolation from those columns whose footings were near the subway. These secondary walls served not only as an isolation medium, but also as a decoration. Finally, we hung draped monk's cloth in the dome of the theatre to eliminate "slaps" from the ceiling.

When considering the acoustical treatment inside the studio, three things are of equal importance:

1. The selection of an acoustical treatment, or combination of treatments, with the proper sound-absorbing characteristics.
2. The proper quantity of treatment.
3. The proper placing of the treatment.

Let us consider first the selection of our acoustical treatment. In the early days of radio, there were no special materials on the market for the acoustical treatment of studios. Drapes were hung on the walls of the room from which the broadcast emanated. Heavy carpets covered the floor. These materials had absorption at the middle register, which was out of proportion at the high and low ends of the scale. A few years later, a commercial type of acoustical material then used for office quieting was used on the studio walls and ceilings. But these materials too, had a peak in their absorption curves at 500 and 1000 cycles. It was found that in order to get a reasonable amount of absorption at the high and low ends of the frequency range, the absorptive material had to be increased in thickness. Thus two-inch thicknesses of cattle-hair felt were sometimes used. Rock wool with a perforated metal facing first came into use as an acoustical treatment, I believe, in the old NBC studios at 711 Fifth Avenue, New York. Shortly afterwards, the old Judson studios were also treated with an acoustical element of four inches of loose rock wool with a per-

forated metal facing. These treatments were superior to the commercial office quieting materials, but they were still uncertain, for it was impossible to control the density to which the rock wool was packed. Finally in 1929, the writer was instrumental in having rock wool blankets made, similar to the way hair-insul was made at that time, for use in isolation constructions. Rock wool blankets were later made with a muslin facing for acoustical purposes. Perforated asbestos sheets also came into use about this time.

Today rock wool blankets covered with perforated asbestos board are in use as acoustical treatment for the studios of Radio City in New York, for WABC, Columbia's key station in New York, for KDKA in Pittsburgh, for WWJ in Detroit, and for many others.

Even more ideal, however, is a still newer type of acoustical treatment which has recently been developed. Instead of 2-inch, 4-inch, or 6-inch rock wool blankets, this consists of rock wool in the form of a rigid element. It is used in 2-inch thicknesses, with a covering of perforated transite (asbestos board), and shows a very desirable absorption curve over the frequency range. Its absorption coefficients from 64 to 6000 cycles are approximately as follows:

Cycles:	64	128	256	512	1024	2048	4096	6000
Absorption:	.35	.40	.55	.66	.78	.72	.55	.35

I believe the first installation of this type of material in studios was made in the WDRC studios in Hartford, Connecticut. The second installation was made in the auxiliary studios of WABC at 799 Seventh Avenue, New York. Installations have also been made in studios at WKRC in Cincinnati, WBBM in Chicago, and the new Hollywood studios at KNX in Los Angeles.

Still another type of acoustical treatment has been developed by a commercial laboratory. It is not yet on the market. It is a diaphragmatic treatment, made of a special membrane, and is ideal for absorbing an excess of low frequencies in a studio. It has a high absorption characteristic at 128 cycles, dropping off sharply at 1000 cycles. I first had it installed at WBNS in Columbus, Ohio, when the station owner complained of an excess of low-frequency reverberation or "boominess" in the studios there. There it is now combined with perforated and unperforated Sanacoustic panels, and a 2-inch rigid rock wool element covered with perforated asbestos board. The absorption coefficients of this treatment are approximately as follows:

Cycles:	64	128	256	512	1024	2048	4096	6000
Absorption:	.40	.70	.55	.40	.35	.40	.30	.25

The amount of acoustical treatment necessary should be in proportion to the reverberation period desired in the studio. The size and volume of the studio and the types of programs to be produced are the determining factors in establishing the average period of reverberation. This figure should be worked out by the chief engineer and the production manager. It has been customary to take the average of the six periods of reverberation from 128 to 4096 cycles, inclusive. The acoustical treatment should be placed in panels not only on the walls but also on the ceiling of the studio. The rest of the walls and ceiling may be covered with ordinary hard plaster. Care must be taken not to have wide reflecting areas directly opposite each other. Remember that even a correct quantity of acoustical treatment of satisfactory characteristics must be correctly placed to make the studio a good one.

It is important that the acoustical characteristics of the control room be similar to the characteristics of the acoustical treatment in the studio. To monitor the program well, the engineer should not be required to make a mental adjustment between what he hears over his loud speaker and what is being broadcast.

When painting the studio, the paint must not be applied too thickly. Otherwise it will clog up the perforated materials used in the acoustical treatment and destroy or change their sound-absorption characteristics. There is no such thing as "acoustical" paint as far as broadcasting studios are concerned, in spite of the fact that some are advertised as having "acoustical" value.

Sound-retarding windows must be constructed with split bucks and jambs. One rough buck should be placed in the masonry wall and the second in the "floating" or isolated wall. Solid connections must not occur. The finished jambs are then installed, with the wedging space between them and the rough bucks tightly caulked with cattle-hair felt. The window is then glazed with $\frac{3}{8}$-inch and $\frac{1}{4}$-inch polished plate glass. The $\frac{3}{8}$-inch thickness of glass should be placed in the masonry jamb and the $\frac{1}{4}$-inch thickness in the "floating" jamb. When practical, the studio side light should be tilted back to prevent sound reflections into the microphone area. Do not tilt the glass forward unless a very thorough study of conditions has been made.

The construction of the so-called dead-end live-end type of studio

is more the problem of large stations than of small plants. Although excellent results on certain programs are obtained with such studios, they are not recommended for the man who has only a few studios at his disposal. They are not flexible enough for every type of show.

Wood is an ideal material for adding brilliance to music, and we often use it to line the live-end portion of a dead-end live-end studio. Wood not only makes musical tones more resonant, but gives them a more natural sound. It adds to the brilliance and character without adding to the reverberation. A typical example is Columbia's Liederkranz studio, made almost entirely of wood. It is the old ballroom at Liederkranz Hall, in New York, and is constructed of wood beams, wood floors, and old lime plaster over wood lath. This wood has been seasoned over a period of more than 50 years, and is as mellow as the inside of an old cello. The ballroom was used many times for recordings by the Victor Company, and is now used for such programs as "Everybody's Music," the "Columbia Concert Hall," and "Exploring Music."

It is well to avoid the use of curtains whenever possible. Those that must be used should be of a heavy velour, lined and interlined, and should be hung on a suitable curtain track 10 or 12 inches from the wall, so that a flatter absorption curve may result. Heavy curtains hung in this manner still do not supply the desirable absorption treatment, for their efficiency lies between 250 and 3000 cycles, and they have a tendency to accentuate or even create "boominess" in the studio.

The illumination installed in the studio must meet several requirements. The level of illumination must be such that music and script can be read easily and rapidly on the working plane. It is recommended that it have a uniform value, to within three feet of the walls, of 20 foot-candles, on a plane three feet above the floor. The lighting should be without glare and should produce no definite shadows. In selecting the lighting fixtures, a recessed type with a minimum of heat reflection is recommended. The air-conditioning system will have to combat the heat from these lights. A tube which will produce a cold light, now being developed, will soon be on the market. This will make air-condition-systems of smaller capacity feasible.

The decorative scheme should be developed as the studio is designed. The acoustical materials required have a perforated surface, which limits the decorator. It is therefore necessary to create the atmosphere by means of color and furniture appointments rather than by wall textures. Interesting color schemes can be created in the

studios with wall and floor color, and by means of designs for music stands, chairs, and so on. In the reception rooms, lounges, and offices, the decorator of course may have a free hand. Color harmony is most important in creating a pleasing atmosphere for the artists and others using the studios.

Rubber is an ideal material for studio floors, because of its appearance, its quiet manner of deadening footfalls, and its low maintenance cost. At CBS, rubber tile usually $\frac{3}{16}$ of an inch thick is used. It wears better than linoleum. Musical instruments set down on linoleum have a tendency to cut into it, leaving deep holes. Linoleum needs replacement within three or four years. Rubber tile seems to last indefinitely.

An air-conditioning system is necessary to keep the temperatures and the humidity in the studios uniform, not only for the comfort of the artists and producers, but to keep up the good condition of the musical instruments as well. Indeed, a good part of the cost of the air-conditioning equipment proper might well be charged to the maintenance and tuning of musical instruments, for instruments need repairing and tuning less frequently in studios which are air-conditioned than in studios which are not. The difference is often more than 50 per cent. The temperature should be held at approximately 72 degrees, with the humidity in summer not exceeding 50 per cent.

Thought must also be given to the location of the air-conditioning equipment room, for often it adds materially to the background of noise in the studio. I have been in studios where the air-conditioning or ventilating system had to be turned off during the air show. For best results, the moving equipment should be placed on suitable vibration-absorbing materials. The supply and exhaust ducts should be lined with an absorbent material which has a comparatively good absorption characteristic at the lower frequencies. It is imperative that this material be of an inorganic substance, and that it be vermin-, moisture-, and fire-proof. Both supply and return ducts should be lined. Often the air-conditioning engineer specifies that only the return ducts be lined, his reason for not lining the supply ducts being that the air comes into the studios at a rate of speed which prevents the sound from travelling back through the duct system. A moment's thought will quickly indicate how wrong this viewpoint is. The problem is to prevent sound in the studio from leaking out into another studio. The air should be supplied at a rate of not more than 800 feet per minute. Sound travels approximately 1150 feet per second. One can easily see to what a small degree the sound is retarded. The

grills or registers in the studios and control rooms should be of such area and design as to prevent whistling or other noises associated with the rush of air through the grills.

There is no reason why a small station or a large one should have an inefficient plant today if the requirements of the station are studied, and the facts then used by a qualified individual. He must be acquainted with the construction details and the requirements of radio at the moment. He must have the vision and the imagination to build for the future so that, instead of the studios becoming obsolete within a few years, they will continue to accommodate radio in its forward strides.

Questions and Projects

WHAT ARE the four basic forms of sound for which present-day radio is the medium?

In terms of experimentation now being made, can you name other forms of expression for which radio may become an adequate medium?

From the broadcaster's point of view, what is the difference between the sustaining and the commercial program? What is the difference from the listener's point of view?

Name what you consider to be an outstanding commercial and sustaining program now on the air. Point out the comparative merits of each, and show the advantage each program enjoys by being either commercial or sustaining.

What is the most important element in radio programming?

What, in your opinion, is the best program idea now on the air? Discuss the manner in which the idea has been developed. If it can be improved, how would you do it?

In planning a radio show, what are the many elements that must be considered?

Projects

Select a committee from the class to act as the various department heads in the radio-program division, and develop three broadcast ideas: a morning show, an afternoon program, and an evening show for any day other than Sunday. Do the same for three like periods on Sunday.

Draw an organization diagram showing the central place of the

program and production executives and their personnel. Let the chart describe the relationship between other departments (Sales, Engineering, Publicity, and general station management) and show how they are related to this central one.

Make a town or neighborhood survey to ascertain the types of programs preferred by a majority of the people. Scan the program schedules of radio stations heard in the neighborhood and make reports on the extent to which each is meeting community preferences.

By extensive inquiries made throughout the community, make a survey of listening habits. How early do most of the people rise each day? Who listens between 9:00 A.M. and 5:00 P.M.? What are their occupations or other recreations during these hours? Estimate the percentage who listen to the radio at night. What forms of entertainment compete with radio? Divide the day into periods corresponding to the working, eating, and sleeping habits of the majority. Assume the class is about to start broadcasting for this community. Establish general rules governing types of programs appropriate for each period in the day to conform to the general facts on listening habits discovered in the survey. Let groups of students be selected to assume responsibility for more detailed outlines of programs for each general period.

Questions

Name the various instruments of the orchestra and point out the peculiar qualities of each.

Why is the studio (or auditorium) called the master instrument? Has there ever been a time in your experience when you were conscious of this fact? Elaborate.

Name some hall or auditorium with which you are familiar that has had to be treated acoustically, or should be treated in order better to fulfill its original purpose.

What is meant by "live" and "dead" as applied to the acoustic properties of a room? How may these qualities be achieved in a room?

What broadcasts have you heard recently that seem to have originated from an "unbalanced" studio? What were the obvious defects?

Projects

Take your classroom and indicate how you would better or change its acoustical properties. Do the same for your school or community auditorium.

———— .. ————

In a previous exercise you named the various instruments of the orchestra and the properties of each. Now assemble these instruments into groups that will form the nucleus for a symphonic group, a salon or chamber ensemble, a "sweet" and a "hot" dance band arrangement, and a concert band.

———— .. ————

Draw to scale the studio from which you propose to broadcast these various groups, indicating the acoustic properties of the studio. Make a diagram of the set-up or placement of the instruments of the group as well as the microphone placement.

———— .. ————

The efficient play director has his prompt-book indicating every move or line spoken on the stage. The director or producer should have a similar guide to the music he is to broadcast. Listen to a recording of Toscanini and the Philharmonic-Symphony playing Rossini's overture to "The Barber of Seville." If possible, follow the musical score as you listen. On a sheet of paper indicate all of the things of which you must be aware, such as fortissimos, pianissimos, instrumental solo spots, and so on, in order to broadcast this particular selection properly. Choose other selections that fall in the other types of music, and make similar "prompt" sheets.

———— .. ————

Set up a studio for the broadcast of a string quartette; for a string quartette with flute soloist; for a string quartette with vocal soloist.

———— .. ————

Discuss the problems, and their solution, of broadcasting the vocal quartet; a mixed chorus; a vocal soloist with piano accompaniment; a piano solo broadcast; any of the more popular instrumental solo broadcasts with piano or orchestra accompaniment.

———— .. ————

Listen to a small, selected list of musical programs. Write careful criticisms of each. Answer such questions as: Is it well performed? Has it unity? Has it also variety? Are the numbers well chosen? Is

it well directed? Criticize the written and spoken continuity in the program. Is there proper instrumental balance? Can you tell, by listening, any of the characteristics of the studio or auditorium from which the program is broadcast? Suggest changes in form, presentation, or musical selections which would improve the program.

Questions

What are the desired qualifications of the radio director?

How does each of these qualifications contribute to the success of the radio director?

What are the duties of the musical director? Of the dramatic director?

What is your interpretation of the word "showmanship"? Point up your interpretation with an actual example of your idea of showmanship.

Project

Secure a copy of a radio continuity. Study the program carefully. Then suppose yourself to be the director of this particular show. Outline your course of action in preparing the show for its performance on the air.

Question

How does the work of the production man differ from that of the director? What qualifications should they share?

Projects

Read carefully the instructions on production operations in Chapter 10. Assign each of the subdivisions to a member of the class. With the instructor acting as chairman, conduct a round-table discussion of these items. Remember that the discussion will gain by the use of the students' own ideas and observations and not by entirely limiting the discussion to the boundaries contained in the printed instructions.

Examine the production logs on pages 356 and 357. Fill one out for several different types of programs.

Questions

What part does the engineer play in the broadcast?

How should the engineer work with the director or production man?

Projects

Arrange, if possible, with the local station for a visit to the control room. Perhaps the engineer will explain to the class the "workings" of his control board.

———— .. ————

After careful study of the fundamental principles of radio speech contained in these chapters, prepare a radio speech of your own on some topic of interest not only to you but to the radio public as well. Read it over a microphone and have the rest of the class act as radio listeners. Their comments and criticisms should be of great value. Here are some suggested questions to answer in making criticisms:

1. Was the subject matter of sufficient general interest to hold the radio audience?

2. Did the speaker seem genuinely interested in the subject himself?

3. Was the speech given in good, straightforward language?

4. Was the speaker's voice and diction pleasant to hear?

5. Did the speaker, although unseen by you and you unseen by him, create any audience contact? How was this achieved, or in what manner did he fail?

Questions

What are the basic qualifications for an announcer on the major networks?

Why are these requirements sound?

Discuss the work of several of the outstanding announcers on the air today. Can you justify their popularity?

Compare the announcers heard on local programs with those associated with network broadcasts.

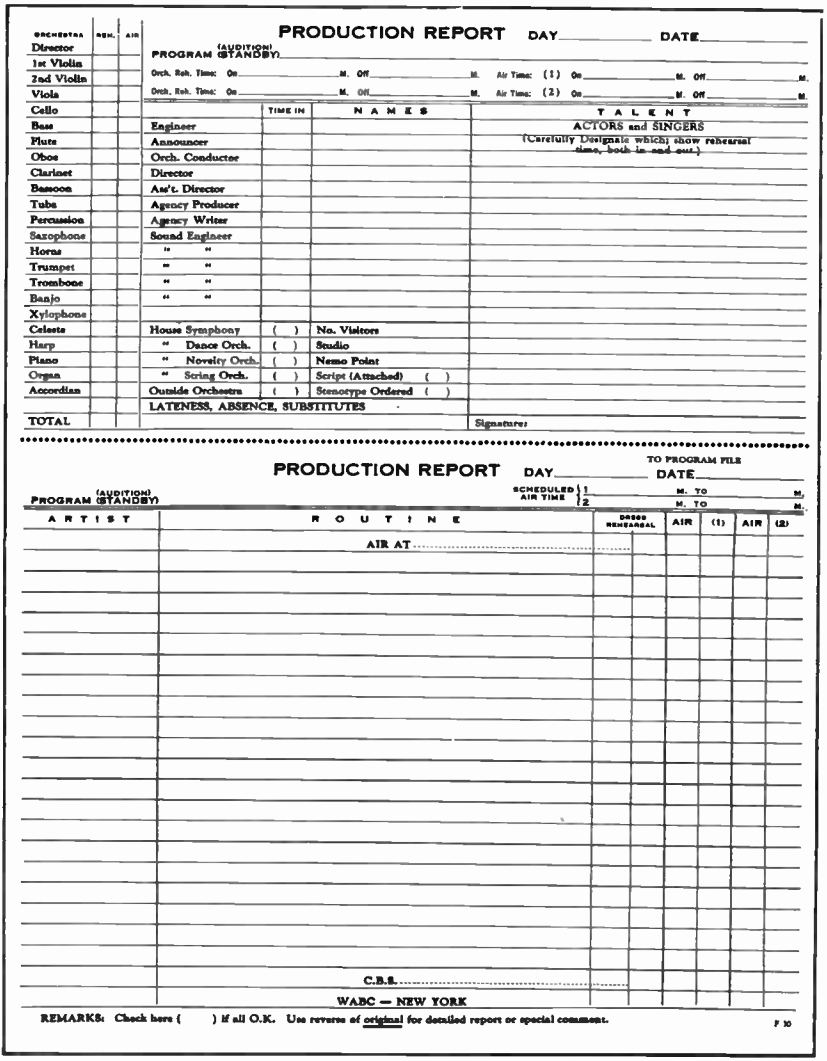
Projects

Study the announcer's audition test and see how well you can acquit yourself.

———— .. ————

Suppose you are an announcer and it becomes necessary for you to ad lib for about five minutes. The instructor will supply the hypothetical situation and you will govern your ad libs accordingly.

Write the G. & C. Merriam Company, 10 Broadway, Springfield, Massachusetts, publishers of Webster's New International Dictionary, for copies of a pronunciation test called "The Americanization of Carver." Make it the basis of a class reading and pronunciation bee.



PRODUCTION REPORT DAY_____ DATE_____

ORCHESTRA	REH.	AIR
Director		
1st Violin		
2nd Violin		
Viola		
Cello		
Bass		
Flute		
Oboe		
Clarinet		
Bassoon		
Tuba		
Percussion		
Saxophone		
Horns		
Trumpet		
Trombone		
Banjo		
Xylophone		
Celeste		
Harp		
Piano		
Organ		
Accordian		
TOTAL		

PROGRAM (AUDITION) (STANDBY)_____

Orch. Reh. Time: On_____ M. Off_____ M. Air Time: (1) On_____ M. Off_____ M.

Orch. Reh. Time: On_____ M. Off_____ M. Air Time: (2) On_____ M. Off_____ M.

	TIME IN	NAMES
Engineer		
Announcer		
Orch. Conductor		
Director		
Ass't. Director		
Agency Producer		
Agency Writer		
Sound Engineer		
" "		
" "		
" "		
" "		
House Symphony	( )	No. Visitors
" Dance Orch.	( )	Studio
" Novelty Orch.	( )	Nemo Point
" String Orch.	( )	Script (Attached) ( )
Outside Orchestra	( )	Stenotype Ordered ( )
LATENESS, ABSENCE, SUBSTITUTES		

TALENT

ACTORS and SINGERS

(Carefully Designate which; show rehearsal time, both in and out.)

Signatures:

PRODUCTION REPORT DAY_____ DATE_____ TO PROGRAM FILE

PROGRAM (AUDITION) (STANDBY)_____ SCHEDULED AIR TIME 1 M. TO M. 2 M. TO M.

ARTIST	ROUTINE	DRESS REHEARSAL	AIR	(1)	AIR	(2)
	AIR AT.....					
	C.B.S.....					
	WABC — NEW YORK					

REMARKS: Check here ( ) if all O.K. Use reverse of original for detailed report or special comment. F 10

Figure 54. Radio time log.

Questions

Who are the five collaborators in the production of a play in the theatre?

In transplanting the play to radio, what changes take place?

PRODUCTION REPORT

NATIONAL BROADCASTING COMPANY, INC. — PROGRAM DEPARTMENT PRODUCTIVE DIV.

Feature ..... Station .....

Date ..... Program Time .....

Studio ..... Rehearsal Time ..... Number Hours Rehearsal .....

Announcer ..... Studio Engineer .....

Type of Orchestra ..... Director .....

Number Called for ..... Present Rehearsal ..... Bdst. .....

Program Personnel .....

.....

.....

.....

Who Represented Client ..... NBC Com'l Rep. .....

No. Guests in Studio ..... Signed On ..... Signed Off .....

Present in Monitor Room .....

.....

Received Continuity .....

No. Extra Hours Needed .....

Orchestra Ready on Time Scheduled .....

Other Talent Ready on Time Scheduled .....

Was Engineer Set Up and Ready at Time Scheduled .....

Remarks: .....

.....

.....

.....

.....

Figure 55. Radio time log.

Discuss the problems of the writer or adapter, whose work must be heard and not seen.

Can you point out instances of radio scripts being weakened or spoiled because the visual appeal was more necessary than the auditory appeal?

Discuss the duties of the director for the script show.

Can you name some dramatic shows on the air today that are examples of excellent radio drama? Can you name some which, in your estimation, fail to be good radio drama? Give the reasons for your statements.

Projects

Write to the Script Departments of the Columbia Broadcasting System, 485 Madison Avenue, New York City, to the National Broadcasting Company, RCA Building, New York City, and to the Mutual Broadcasting System, 1440 Broadway, New York City, for sample manuscripts of well-written and well-organized dramatic programs.

———— .. ————

Produce one of these radio plays as a class, selecting the cast, assigning responsibility for sound effects, incidental music, and choosing assistants within the class membership.

If microphones and a public address system are available, produce the show in a separate room from that in which it will be heard. If no technical facilities are obtainable, let a curtain separate performers and listeners during the presentation.

———— .. ————

Divide the class into two groups. Let each group prepare to write and produce a five-minute act. Plan to present each act in three different ways:

1. On a dark stage but with action and lines handled exactly as if the stage were lighted. (Strive to have plenty of action in the scene, with rather long gaps between some lines of dialogue. The action will be difficult to comprehend on the darkened stage.)

2. On an illuminated stage where all will be seen and understood.

3. Present the play behind a curtain or over a public address system after it has been rewritten and adapted for a radio audience.

———— .. ————

Listen to selected radio dramatic shows. Write careful criticisms

of them based upon the writing, direction, and production. Make suggestions as to ways in which these programs might be improved.

If your local station has a sound-effects laboratory or a library of recorded sounds, try to arrange for a visit to this department of your station.

You must hear many sound effects on various radio shows that impress you as being unreal or, if a slang expression may be used, "phoney." Point out such effects and give reasons for your criticisms.

In your own school laboratory, try your hand at creating sound effects. Since many of the best "manual" effects now in use are the products of experimentation, there is no reason to suppose you may be less ingenious than others in developing good effects of your own.

A Glossary of Radio Production Terms

Words and phrases in common use in the production of radio programs.

A

Abie—Anyone who is sure fire.

Ace—Anyone who is at the top in ability among directors, assistant directors, producers, and announcers.

Across-mike—Projection of voice or musical sounds almost parallel with face of the microphone. Also "cross-mike."

Ad lib—To extemporize lines not written in the script, or in music to play parts not in the score, entirely at the announcer's or musician's discretion. Music or lines so delivered.

Adenoid—Any vocalist with a voice that is "tight."

Arsenic—Synonym for "poison." A disagreeable or boresome program.

ASCAP—American Society of Composers, Authors and Publishers, which licenses public performances of the music of its members.

Audio—The electric circuits—microphones, cables, lines, and amplifiers—used in radio transmission. Differentiates the actual sound circuit from the power circuits and from the radio frequency circuits used in reception. Also refers to a range of audible frequencies.

Audition—A trial of artists or musicians under actual broadcasting conditions.

B

Background—A sound effect, musical or otherwise, designed for use behind dialogue or other program elements.

Balance—The arrangement of musicians in a studio so as to produce a transmission of equal volume from all instruments or voices and so as to effect the most artistic relationship between instrumentalists and vocalists.

Bays—Upright supports of varying height on which are placed pieces of apparatus called "units."

Beam—

(a) The direct line running perpendicularly from the face of the microphone or the loud speaker.

(b) The small angle with the face of the microphone or loud speaker within which that instrument functions at its greatest efficiency.

Beards—Errors made in obvious fashion during the course of a program. See "fluffs."

Belcher—Any performer having a "frog" in his throat.

Bending the needle—Projecting an unexpected volume of sound into the microphone so that the needle on the volume indicator is moved violently against the stop.

Birdie—Sound resembling a bird's "tweet-tweet." Sometimes heard on transmitting or receiving equipment.

Bit—A small part in a dramatic program. The performer who plays a "bit" part is referred to as a "bit player."

Bite it off—Cut the music abruptly.

Blasting—Piling more volume into the microphone or other transmitting equipment than it can take, distortion being the result.

Blinker—

(a) The signal light used to call the attention of the conductor or artist. Operated from the control room.

(b) Term used to denote the program executive responsible for scheduling sustaining programs.

(c) A talent agent.

Blue gag—An off-color comedy line.

Blurb—A statement handed out for publicity purposes.

Board—The engineer's control panel connected with the studio.

Board fade—The manual and electrical fading out of a program on the studio control board.

Breaks—Interruptions in radio program transmission.

Bridge—Music or sound effects used by the director in dramatic shows to indicate scene transitions.

Bring it up—Increase the volume.

Bugs—Cause of trouble in equipment which is working imperfectly.

Burps—Onomatopoetic word describing noises frequently heard on transmitting or receiving circuits.

Button-puncher—An announcer whose responsibility consists in switching a studio to the proper circuit.

C

Canaries—Vocalists (used chiefly with reference to coloratura sopranos).

Cans—Headphones.

Carbon—A carbon microphone. Earliest type used by radio broadcasters.

Character—A casting term, meaning a dramatic part requiring characterization.

Chimes—Musical notes used on some stations or networks for identification, and for reversals by the telephone company.

Circuit—A complete electrical channel used for telephone or transmission purposes.

Clambake—A program for which preparations are filled with uncertainties, and rehearsals filled with errors, with changes and failures, and which is likely to result in a bad performance.

Clamaroo—See "clambake."

Clean it up—To make changes in a program during rehearsals so as to assure a satisfactory performance.

Clear a number—To obtain permission from official sources to make use of a certain musical selection.

Close the rights—Check the musical and literary copyrights.

Clientitis—Pain suffered as a result of sponsor interference.

Cliff-hangover—A radio serial thriller.

Coaches—Vocal and dramatic instructors.

Cold—Describes the opening of a radio program which begins without theme or musical introduction or background.

Cold dramatics—A dramatic sketch without music.

Coming-up—The ten-second warning cue before going on the air.

Commercial—A program sponsored by an advertiser—also the sales talk on a radio program.

Commercial credits—Specific mention of the client or his product.

Condenser—A type of microphone employing a diaphragm with directional characteristics. The same as all other diaphragm types but more quiet.

Conflict—The condition created for a performer by two assignments scheduled for the same time.

Corn—Unsophisticated show treatment. Simple and obvious musical or dialogue arrangement.

Corny—Unsophisticated.

Corn-fed—Lacking cultural background (said of an artist).

Cornfield—A studio set-up employing a number of standing microphones.

Corn-on-the-cob—A harmonica.

Continuity—Prepared copy for programs.

Control room—Housing for the monitoring equipment from which the show is both directed and controlled.

Crawk—An animal imitator.

Credits—The commercial copy mentioning the advertiser or his product. Acknowledgment of sources and ownership of program material.

Credit writer—One who composes the advertising copy.

Creeper—A performer who creeps toward the microphone during the broadcast.

Cross-fade—To fade in one sound from one source while sound from another is faded out.

Cross-fire—Interfering telegraph transmission.

Cross-talk—Interfering conversation originating at a point other than that of program origin.

Cross-tone—Any tone that interferes with clear reception.

Crowd noises—The sound of a crowd, produced by an effect record or by a number of people in the broadcasting studio.

Cue—

(a) The closing words of an actor's speech as a signal for another actor to enter.

(b) A sound, musical or otherwise, or a manual signal calling for action or proceeding.

(c) A phrase designating the transfer of the point of program origin; or, as in the case of network identification, a line such as, "This is the Columbia Broadcasting System," "This is the National Broadcasting Company," "This is the Mutual Broadcasting System," as a signal to radio and telephone operators for the switching of channels.

Cue sheet—An orderly tabulation of program routine containing all cues.

Cushion—A portion of the program near its end, composed of a musical number or sequence of sound or an announcement which can be lengthened or shortened according to time requirements.

Cut—

(a) To stop transmission or any part of the program abruptly, either by stopping performers or by use of an electrical switch on the control board.

(b) The deletion of program material to fit a prescribed period of time.

CVC—The chorus, verse, and chorus of a musical selection.

D

Dampen the studio—To aid acoustication through the use of portable sound absorbance, such as rugs, screens, drapes, people, and so on. Sound-absorbing surfaces on walls, floor, or ceiling.

Dawn patrol—Engineers and announcers who open the studio and put on the early morning programs.

Dead book—The file of continuity and program material which has been used on the air.

Dead mike—A microphone not connected or out of order.

Definition—Clean-cut transmission and reception, making possible the complete identification of the various musical units in an orchestra, in chorus, and sounds from the effects table.

Director—

(a) The responsible departmental executive.

(b) Sometimes the managing executive for a station.

(c) Program director. Same as the director in a play or a theatre or sound pictures. The actual authority responsible for the presentation of a program, whose business it is to cast and select all associated artists, edit continuity and scripts, and supervise the rehearsals.

(d) Assistant director: Functions as a studio manager in much the same fashion as the stage manager in the theatre and the assistant director in sound pictures. He is responsible to the director and program department heads for orchestral and vocal set-ups and balance, sound-effects personnel and equipment and variable acoustic conditions, and studio discipline. He is responsible also for program timing and keeping of the log.

Discrepancies—Mistakes made in the studio and recorded in the station log.

Dog—A passé or mediocre musical number, or a hackneyed piece of writing.

Dog-house, in the—

(a) To be in bad favor with the departmental chief.

(b) To have one's schedule loaded down with unimportant and routine assignments.

Down in the mud—Low in volume or in clarity.

Dress—The final complete rehearsal.

Dressing the program—Adding the finishing touches to a radio program.

Drool—Unimportant talk.

Drop and ring—Drop the channels and ring chimes.

Dubbing—Transposing recorded material to a new record.

Dynamic—A type of microphone designed as an improvement on the condenser microphone and having a higher degree of efficiency.

E

Echo chamber—A reverberant room used to add hollow effects and actual echoes (that is, the repetition of sounds). These effects may be produced both mechanically and electrically.

Eight ball—An astatic microphone characterized by non-directional pick-ups and having a 360-degree beam.

Eighty-eight—A piano.

Engineer—A technician who designs, operates, or controls the electrical equipment.

Ethritus—Hardening and inflammation of the ear drums due to continued listening to the loud speaker running at a high level.

F

Fade—A diminution of volume.

Fader—The device for electrically diminishing volume.

Fades—Same as "board fades."

Fade-out—The manual and electric diminution of volume to zero.

Fairy godfather—Easy-going sponsor.

Fairy godmother—Unimaginative musical director.

Fake—Ad lib.

Feed—To transmit a program over telephone lines to stations or groups of stations or to any listening point.

Feed-back—The coupling of input to output of amplifiers either electrically or acoustically, resulting in squeal or howl.

Fighting the Music—A singer's struggles with vocal production.

Fill—

(a) The transmission of a stand-by program to meet the requirements of an unused portion of an assigned program period.

(b) To add program material to complete an assigned period.

Fill for—A program designed especially for regional or sectional broadcasts and such regional or sectional networks designated.

Fill-in—One who stands by to perform in case a program change has to be made immediately. See "stand-by."

Filter—An electrical device used to change tone characteristics by eliminating frequencies.

Fish bowl—The clients' studio observation booth.

Flesh peddler—An agent who sells talent.

Fluff—Missing a cue, or muffing a gag.

Free lance—Personnel not regularly employed but given special assignments.

From hunger—Anything that spells trouble.

Frying—Hissing sound caused by defective microphones or amplifiers.

Fuzzy—Lacking clarity and definition. Said of vocal or instrumental music.

G

Gag—Generally a highly noticeable twist of comedy. A two-line gag is a cue with a gag rejoinder.

Gain—

(a) Control of volume used in transmission.

(b) "The gain" is the monitoring equipment used in this control.

Gelatine—A tenor with a thin, quavering voice.

Get hot—To ad lib an instrumental arrangement of popular music. The equivalent of "Jazz it up."

Giving credits—Crediting the source or ownership of material used on the program.

Godbox—An organ.

Goose-neck—A gallows-shaped microphone stand or one with a flexible neck. Also a saxophone.

Grasshopper—Young supernumerary of an advertising agency.

Grief—Program trouble.
Groan box—An accordion.
Guide sheet—A schedule to establish the program routine.

H

Ham it—To overact for emphasis—to bluster.
Hambone—Unconvincing blackface dialectician.
Ham-fest—A gathering of participating actors to discuss a broadcast.
Hash session—Meeting of production director and talent after dress rehearsal and before broadcast to discuss changes in program.
Haywire—Temporary equipment, or equipment in poor condition.
Heartbreaker—Commercial audition on speculation.
Hog-calling contest—A strenuous commercial audition for announcers.
Hold it down—An order for the studio engineer to reduce the volume.
Hop—Volume.
Hot mike—A microphone in which the current is flowing. Also called a "live mike."
Hot switch—A rapid program transfer from one originating point to another.

I

In the beam—Within effective directional range of microphone or loudspeaker.
In the mud—Having too little tonal volume; lacking clear definition.
Ingenue—A female performer with a youthfully pleasant voice.
Interpolation—A musical phrase or chorus added in a selection for purposes of contrast or the elaboration of a theme.

J

Jam session—Spirited ad lib renditions of standard popular tunes.
Juvenile—A performer whose voice is indicative of youthful age.

K

Kill—
(a) To stop the rehearsal or broadcast pending instructions from the director or to omit portions of the program entirely.
(b) To cancel a scheduled program.
Kill the mike—To turn off the electric current feeding a microphone channel.

L

Lady Macbeth—Superannuated tragedienne.
Lay an egg—To fail completely. Said of the performance of a program or part of a program.
Lead—The most important male or female role in a dramatic program.

Leaving here O. K.—An engineering phrase indicating proper transmission at a certain point. Used in checking technical difficulties.

Leg—A branch of a radio network feeding stations in a region not served by the main lines.

Let—A designation of a local electrical transcription program.

Level—The amount of volume audibly noted or electrically measured.

Lick—An ad lib solo passage which deviates from the written music. Usually "hot."

Light and shade—Variations from quietness to tenseness, softness to shouting, which have a tendency to save a production from dull sameness.

Listening audience inheritance—Holding an audience, which has been listening to a program broadcast immediately before it, into the succeeding program.

Live mike—A microphone in which the current is flowing. See "hot mike."

Live studio—One which is acoustically reverberant.

Lockjaw—The affliction ascribed to a tired or lifeless singer.

Log—A record of every minute of broadcasting, including all errors. An accurate journal required by law.

Loop—Two-way circuit or line.

M

Madame Cadenza—A flighty female vocalist.

Make system—To announce the network by name for cue to the telephone company.

Make the local—To identify the local station by broadcasting its call letters.

MC—Master of ceremonies.

Master control—Technical direction center.

Middle breaks—Station identification in or near the middle of a program.

Mike hog—One of a group of performers using a microphone who elbows the others away. Analogous to an up-stage player in the theatre.

Mike mugger—An artist who insists on working too close to the microphone.

Mike technique—The performer's ability to control his or her position in relation to the microphone in order to secure the most effective results.

Mike-wise—Having an understanding of microphone technique.

Mix—To combine the input of two or more microphones to effect a complete balance.

Monitor—

(Noun) Studio engineer who adjusts volume control to make it suitable for long-line transmission.

(Verb) To check the program by means of audio equipment.

Mixer—A panel for controlling and blending the sounds picked up by microphone.

Mixing—Blending sound.

Mob scene—A group of performers serving as a crowd background.
MPPA—Music Publishers Protective Association.
Mushy—Describes the poor musical definition of an orchestral pick-up.

N

N. E.—New England Network.
Nemo—A corruption of "remote." Any program originating outside of the broadcasting studio or requiring portable equipment.
Neutral—Theme music used to back up announcements.
Noodling—The tuning up of musical instruments with practice runs, trills, scales, and so on.

O

O. Henry—A closing line of dialogue with an unusually dramatic or humorous emphasis.
Off—Direction of sound away from microphone.
Off mike—A performer's position away from the microphone.
Offside—An off-color comedy line. A "blue gag."
Old cow-hand—Experienced staff member called upon to escort important guests about the studios.
Old sexton—A bass soloist with dark vocal quality.
On the beach—Unemployed.
On the button—Ending exactly on time. Same as "on the nose."
On the cuff—A service for which artists receive no compensation.
On the head—Describes the starting of a program on schedule time, made possible by the proper timing of the preceding broadcast.
On the log—An entry in the studio record, complimentary or otherwise.
On the nose—Describes the ending of a program exactly on the second.
One and one—Instructions given to an orchestra to play one verse and one chorus of a song.
One and two—A term instructing the orchestra or soloists to play or sing one verse and two choruses of a number.
One shot—A single program, not one of a series.
One-timer—See "one shot."
Out in the alley—Out of the microphone range.
On—Said of sound directed toward the microphone.
Overboard—Said of a program when it is too long for the time allotted to it.

P

P. A.—Public address or talk-back system.
Pancake turner—Any technician controlling the playing of double-faced records.
Panel—The control board of one or more units.
Patch—A temporary and removable studio-equipment connection.
Patch it in—To connect or plug in more apparatus to a circuit.

Peak—Maximum amplitude of sound in electrical energy formed while flying through a circuit. The maximum point of the needle swing on a volume indicator "kick."

Peaks—The distortions resulting when the amplitude is too great for the apparatus. Sometimes applied to performers whose uneven voice control causes peaks.

Pests—Radio fans seeking autographs of performers.

Pick-up—

(a) Location of microphones in relation to program elements.
(b) Acoustical value of program.
(c) The origination point of a broadcast.
(d) A device containing an electro-mechanical member which vibrates when in contact with a moving phonograph record; a modulated electric current for the purpose of making the record audible from a loudspeaker.
(e) Colloquially, the process of gathering material for broadcasting a particular event, other than the actual radio transmission thereof.
(f) Primary apparatus used to convert sound to electrical energy.

Pick it up—A term used in instructing a musician or actor to speed up his delivery.

Pick up a cue—Be prompt in speaking lines immediately after the preceding speaker has concluded.

Pipe—To distribute a radio program from one point to another.

Piped program—A program transmitted via wires.

Piping the show—The act of sending a program over wires.

P. L.—A private line.

Plantmen—Maintenance men in a radio station or a network.

Playback—The playing of a recording for audition purposes immediately after it is made.

Play ons—Brief music used to support the introduction of the radio performers.

Plops—The sound of a speaker whose pronunciation of the letters B and P results in distortion because of too forcible emphasis on these letters.

Poison—A disagreeable or boresome program or person.

Producer—

(a) One who originates and brings a program or presentation.
(b) The individual or the broadcasting company who offers a program for observation or consideration, or who brings a performance before the public.

Production—The building, organization, and presentation of a radio program.

Production director—Individual in charge of a radio studio program.

Production logs—Records kept by assistant directors or production men assigned to radio programs.

Program balance—

(a) The arrangement of musical and dramatic units in a program so as to secure a maximum of entertainment values.

(b) The similar arrangement of programs during a scheduled period of broadcasting.

Program monitor—A loud speaker or radio set over which the quality and the character of the program may be checked.

Projecting—Taking the audible foreground while enacting a dramatic role.

Provisional cut—A cut in a program planned conditionally in case of emergency. An attempt to facilitate the timing of a program in case the time allotted to it is reduced at short notice. See "cushion."

Punch the mike—To press the switch controlling the microphone.

Putty blower—A trombone.

R

Racked up—Placed permanently on racks; said of radio equipment.

Racks—See "bays."

Rebroadcast—See "repeat." Also a trans-Atlantic pick-up.

Repeat—A term denoting the second presentation of a regular studio program for those stations not served by the original broadcast owing to time differences.

Repeater—An amplifying station used to boost the volume on long lines.

Ribbon—A velocity microphone.

Ride gain—To control the volume range of a program electrically in order to transmit it over lines and equipment within proper limits.

Ride it—Swing instrumental ad lib.

Round robin—A wire loop going from one point through various other points and returning. It can be broken at any point and programs sent either way for various program originations or for split network purposes.

Rover Boy—An advertising agency junior executive.

Runovers—Occasions when the program overruns its allotted time.

S

Schmalz—Super-sentimental rendition of a musical number.

Scoop—To outwit a rival network or station in the broadcasting of a special event or public interest program.

Scooper—A vocalist with ascending slur attacks.

Scoutmaster—An advertising agency executive.

Scratches—Noises caused by faulty equipment.

Segué—The transition from one musical number to another without a break or announcements.

Service the script—To cast, rehearse, and present material in the manuscript.

Set-up—Arrangement of musicians, performers, and sound effects in a studio to achieve the most favorable acoustical effect.

Short—Describing a show lacking sufficient material to fill the allotted time.
Short voice—A voice with a limited range.
Show—
(a) A radio program or broadcast.
(b) A conceited performer.
Signature—The musical number or sound effect which regularly identifies a program.
Slap bass—To play a bass violin by slapping the strings.
Sneak in—To bring music in softly and swell it to full behind dialogue.
Sock—The tag line of a gag.
Song plugger—A music publisher's representative who promotes his firm's songs.
Sound effects—Various devices or recordings used to produce life-like sound imitations.
Sound man—Studio technician who produces, either manually or by recordings, the desired sound effects.
Sound table—Movable table for small sound-effect properties.
Sound track—A graphic record of sound produced on film or on sensitized paper for reproduction.
Sound panel—Movable panels of rock wool for sound absorption, or hard surfaces for reflection.
Sour—An off-pitch voice or instrument.
Specialty—A musical selection presented by a vocal group with piano accompaniment.
Spiel—The commercial or advertising copy.
Spieler—A radio commentator; also an announcer.
Split channel—Two or more network sections working simultaneously with different programs.
Split networks—Networks divided for the simultaneous transmission of two or more programs for the service of selected stations.
Spreader—A performer consuming a longer period of time on the actual broadcast than has been allowed in dress rehearsals.
Stand-by—
(a) A substitute program ready to go on the air in any emergency.
(b) A warning to performers to get ready to take the air.
Stand-by group—The performers engaged to take part in a stand-by program, if necessary.
Squeak-stick—A clarinet.
Step it up—Increase the volume.
Stick waver—An orchestra leader.
Straight reading—Reading material without undue emphasis or characterization.
Stretch—Slow up the reading or musical numbers so that the show will finish exactly on time.

Studio mothers—Mothers of performers, usually juvenile performers. Like stage mothers, only worse.

Sync (*Sink*) (*Synchronize*)—The synchronizing of two or more radio stations on a wave length. In another sense, simultaneous terminating of respective programs on two networks, so that network legs may be switched from one to the other or to a common program.

T

Tag line—The climax of a dramatic sequence. See "O. Henry."

Take it away—The cue from studio engineer to the engineer of the succeeding program.

Taking a balance—Preliminary testing to determine the sound quality of a certain program.

Taking it cold—See "Cold."

Talking down—Condescension on the part of a radio speaker. Considered an unpardonable sin in good broadcasting.

Talking in his beard—Speaking in a muffled voice.

Tear jerker—A radio script with a sad or pathetic appeal.

Theme—See "signature."

Thick—When the individual instruments in a group selection are not distinguishable.

Throw it away—Dramatic direction to performers or engineers to fade dialogue regardless of script.

Time check—Synchronizing the time-pieces of all concerned in a broadcast.

Tight show—A program timed accurately to fit its allotted period. Also a program which, in rehearsal, times a few seconds over the allotted time and should either be cut or played rapidly, if the material permits a rapid treatment.

Town crier—A vocalist who sings too loud.

Transition—The change from one dramatic scene to another. The music, sound, or silence that is used to suggest this change.

Transmission—A program; an "hour"; any modulations by a radio transmitter.

Two-in-hand—Radio sketch composed chiefly of two characters, like "Amos 'n' Andy."

Turkey—A flop or failure.

Turn over—Relinquishment of control at the close of one program and its assumption by engineers on succeeding program.

Tying-in—Coming into a chain program which may already be in progress.

U

Under—Said of a program that is too short.

Unilateral—A velocity microphone sensitive only on one side.

Unit—A piece of electrical apparatus devoted to one specific function.

V

V.I.—Volume indicator.
Velocity—A ribbon type of microphone.
Visual show—A radio program which is also being presented before a studio audience.

W

Web—A network.
West of Denver—Signifying engineering difficulties which can't be explained.
White meat—An actress.
Whodunit—A mystery script.
Wood pile—A xylophone.
Woodchopper—A xylophonist.
Wood shed—A severe rehearsal.
Woof—A word-sound used by engineers to check "peaks." Also used for time checks.

Acoustical Research Organizations

THE FOLLOWING LIST is divided into a university group and a commercial one, although these overlap to some extent. Many university departments do commercial work, and many of the commercial organizations do research work that has no particular application to commercial projects.

It must not be taken for granted that this list, although a long one, is complete. It may be that excellent work is being done in a number of other places.

Those laboratories marked with an asterisk (*) have expressed willingness to answer inquiries of serious students and accredited institutions and to direct students to such general report material as may be available.

University Research Laboratories in Acoustics

**Harvard University, Cambridge, Mass.*

Prof. F. A. Saunders has done outstanding work in analysis of violin tones by modern electric equipment.

Dr. Frederick V. Hunt has developed a number of new and valuable instruments for this and similar researches.

Prof. G. W. Pierce is an outstanding worker in the field of super-sonics (sound waves too high in frequency to be heard).

Prof. S. S. Stevens has made fundamental contributions to the psychology of hearing and related problems in physiological acoustics.

It was at Harvard that the first modern work on room acoustics, the basis of all present work in this field, was done by the late Professor Wallace C. Sabine.

**University of Michigan, Ann Arbor*

Prof. F. A. Firestone has done important work in measurement of machine noise; measurement, analysis, and prevention of vibration; noise reduction in the automotive industry; new theories of mechanical vibration and sound.

**University of California at Los Angeles*

Prof. Vern O. Knudsen is an authority in architectural acoustics including the characteristics of acoustic materials, the design of auditoriums and studios, etc. His laboratory also is noted for theoretical investigations concerning the speed of sound in air and in other gases under different conditions.

**Massachusetts Institute of Technology, Cambridge, Mass.*

Prof. Philip M. Morse is an authority on vibration and has done theoretical work in this field.

Wesleyan University, Middletown, Connecticut

Prof. W. G. Cady has done work in piezo-electricity (involving crystal pick-up devices, etc.).

University of Illinois, Urbana

Prof. F. R. Watson has been, for many years, an expert in room and architectural acoustics, continuing the pioneer work of Prof. Sabine mentioned above. He will answer inquiries concerning published articles.

**The State University of Iowa, Iowa City*

Prof. G. W. Stewart and his associates have done original work in the theory of mechanical "filters" (systems of weights, springs, etc., which pass certain frequencies and do not pass other frequencies).

Prof. Carl E. Seashore is a leader in the field of study of speech, the analysis of speech sounds, etc.

**University of Pennsylvania, Philadelphia*

Prof. G. G. Chambers has done work in the applications of super-sonic waves to chemical problems, the problems of killing germs, sterilizing milk, etc.

The Ohio State University, Columbus

Prof. G. Oscar Russell has carried on investigations of the anatomy of the throat with reference to singing, the production of speech sounds, etc.

**Smith College, Northampton, Mass.*

Prof. A. T. Jones is a specialist on certain problems of musical acoustics, especially the analysis and description of the sounds of bells.

Columbia University, New York City

Dr. A. T. Poffenberger also has done work on the psychological effects of noise and other sounds.

A New York acoustical consultant, Mr. V. A. Schlenker, also now is connected with Columbia but so far as we know is not doing any important amount of original research.

**Brigham Young University, Provo, Utah*

Dean Carl F. Eyring has contributed theoretical studies to the problems of reverberation time and other problems of room acoustics.

Northwestern University, Evanston, Illinois

Prof. Robert H. Gault has been working for years on the abilities of people to perceive sounds, rhythm, etc., from the finger tips or other nerves of touch. His work has proved to be useful in instructing blind and deaf children.

**University of Arkansas, Fayetteville*

Prof. Lloyd B. Ham has been working for some time on the loudness of different kinds of sounds, as affected by frequency composition and other characteristics.

Leading Commercial Organizations

Bell Telephone Laboratories, 463 West Street, New York City

Recognized as the leader in modern acoustic investigations made possible by the development of new electric and other instruments for purposes of exact measurement. While the chief interest of the Bell Laboratories naturally has been in the analysis of speech, music, and other sounds for transmission over telephone lines, they have had to do with virtually every modern acoustical field. Foremost acoustical worker in the Bell Laboratories is Dr. Harvey Fletcher. Probably at least a score of others would deserve notice in a comprehensive list. Aside from commercial activities the Bell Laboratories also have carried on much pure research in acoustical and other fields.

Associated with the telephone industry are also the Western Electric Company and Electrical Research Products, Inc. Activities of the former in the acoustical field are confined largely to manufacture of sound meters and other equipment. The latter has done, in addition to work with these instruments, important work in room acoustics and many other fields.

**RCA Manufacturing Co., Inc., Camden, N. J.*

Representative, in the acoustical field, of both the Radio Corporation of America and the Victor Talking Machine Co., their work in many fields of acoustics is probably second in importance only to that of the Bell Telephone Laboratories. Although primarily concerned with phonographic and similar equipment, this work has contributed to nearly every acoustical field.

E. E. Free Laboratories, 175 Fifth Avenue, New York City

This organization, under personal direction of Dr. E. E. Free, comprises

a group of general physical consultants. Its work has involved the development of methods of noise surveys and the making of many such surveys with the use of those methods; also the development of special noise meters and other sound-measuring equipment. Although not confined to the acoustic field, these laboratories have done much work in architectural acoustics and have assisted in the research of piano manufacturers. Chief acoustic engineer is Mr. C. A. Johnson.

**Riverbank Laboratories, Geneva, Illinois*

Set up a number of years ago by the late Colonel George Fabyan as a combined research and commercial consulting organization in the general acoustic field. Chief acoustical expert is Dr. Paul E. Sabine, a nephew of the Wallace C. Sabine of Harvard who began modern work in this field. The Laboratories under Dr. Sabine have tested and developed architectural acoustical products, as well as standard tuning forks and various other instruments.

**General Radio Company, 30 State Street, Cambridge, Mass.*

Known chiefly as manufacturers of excellent electrical measuring equipment, especially in the radio field, this organization also has developed various kinds of acoustical equipment, including a popular variety of sound meter.

Submarine Signal Co., 160 State Street, Boston, Mass.

Has specialized for many years in acoustic signaling apparatus for use at sea, including submarine detectors, acoustic depth measuring devices, etc.

Dictaphone Corporation, Bridgeport, Connecticut

Has done some research in the development of phonographic equipment, especially for office use (dictation phonographs, and the like).

**Sperry Gyroscope Company, Inc., Manhattan Bridge Plaza, Brooklyn, N. Y.*

Has done important work in the field of noise reduction, especially in airplanes. The company also has developed, and manufactures, various kinds of listening equipment for detection of airplanes in war and similar purposes. Chief acoustic expert is Mr. Stephen J. Zand.

**C. G. Conn, Ltd., Elkhart, Indiana*

Has done acoustical research for the development and improvement of musical instruments. Recently the company has developed a musical tuning device, based on the principle of the stroboscope, which can be used for tuning musical instruments of any kind.

**The Brush Development Company, Cleveland, Ohio*

This organization specializes in the development and production of crystal microphones and other devices using crystals, including crystal pick-ups for musical purposes.

Allen B. Dumont Laboratories, Inc., Passaic, N. J.

The specialty of this organization is the production of cathode-ray oscilloscopes, similar to the wave-form indicators much used in radio. The company recently has applied these devices to the production of instruments for musical tuning. Another specialty is a television receiver.

**Johns-Manville Corporation, 22 East 40th Street, New York City*

Acoustical interests lie primarily in building materials, and the like. At an excellent acoustical research laboratory at Manville, N. J., work has been done on methods and instruments for the measurement of vibration and of sound, on methods for measuring the sound-absorbing characteristics of different materials, and in other fields. Chief acoustical research man is Mr. John S. Parkinson.

**The Celotex Corporation, 919 No. Michigan Avenue, Chicago*

Maintains a research laboratory for measuring acoustic materials to determine the sound-absorbing characteristics of products for building construction and room surfacing. Chief acoustics expert is Mr. Wallace Waterfall.

**General Electric Company, Schenectady, N. Y.*

In addition to much research for its own purposes in the reduction of noise and vibration in fans, turbines, and other equipment, the G. E. also has developed sound meters and similar devices. (Acoustical work constitutes only a minor part of the G. E.'s work or of its Research Laboratories.) Leading men in acoustics are Mr. P. L. Alger and Dr. A. L. Kimball.

**Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa.*

Like the General Electric Company, this company is interested in certain noise and vibration problems in connection with its other work. Chief Westinghouse man in this field is Mr. C. R. Hanna.

Maxim Silencer Company, 410 Asylum Street, Hartford, Connecticut

Successor in interest of the inventions of Hiram Percy Maxim, in connection with silencers. While Maxim silencers for guns have had most publicity, most important are silencers for internal combustion engines. The organization has done a great deal of development work in connection with silencer problems. Chief acoustical engineer is Mr. R. B. Bourne.

Barss, Knobel & Young, Inc., Kendall Square Building, Cambridge, Mass.

An organization of general physical consultants. They have done quite important measurement work in the acoustical field and some original research, but mostly original commercial work for clients.

**Physicists' Research Company, Ann Arbor, Michigan*

Headed by Dr. E. J. Abbott, formerly with Professor Firestone at the University of Michigan, this organization does general physical consulting work, specializes in problems of noise and vibration.

**John V. L. Hogan, 730 Fifth Avenue, New York City*

Probably the outstanding independent radio engineer in the country. While most of his work has been in connection with strictly radio problems, he and his associates have done a substantial amount of work in acoustics also. He is chief owner of Station WQXR.

**Steinway & Sons, Ditmars Boulevard & 45th Street, Steinway, L. I. City, N. Y.*

The Steinway company has carried on research for years in connection with the improvement of the piano. One result has been the development of the new small grand piano and of the still newer Steinway upright, in which the tone of the former large pianos has been largely preserved although the dimensions have been much decreased. In charge of most of this research and development work is Mr. Paul H. Bilhuber.

Miessner Inventions, Inc., 18 Main Street, Millburn, N. J.

Mr. Benjamin F. Miessner, known as a radio engineer and inventor, has devoted much time in recent years to the development of electronic musical instruments, the so-called "electronic pianos."

Hammond Research Corp., Gloucester, Mass.

Dr. John Hays Hammond, Jr., has worked on improved pianos and other musical instruments along much the same lines as Mr. Miessner.

**The Hammond Instrument Company, 2915 North Western Avenue, Chicago*

An outstanding acoustic job has been the development of their tone generators as used in the Hammond electric organ. Aside from use in the organ, these generators are valuable in the general acoustic field, for the purpose of producing known and controllable musical tones.

The Baldwin Piano Company, Cincinnati, Ohio

Like the Steinway company this organization has carried out in past years a program of research on the characteristics of pianos and their improvement.

Mr. Louis Simmions, 210 Fifth Avenue, New York City

A practicing music teacher who has devoted his time for many years to the possible use of modern acoustic instruments in evaluating voices and in voice improvement.

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In addition to the above, of course, numerous Governmental institutions are doing valuable work in the field of acoustics. The leader is, unquestionably, the National Bureau of Standards, Washington, D. C., where many acoustical investigations of importance have been carried out by Mr. V. L. Chrisler, Mr. Wilbert F. Snyder, and other

associates. The chief function of this organization is, of course, to provide standards for the measurement of sound absorption, for microphones, and so on.

The Navy Department has several organizations interested in acoustics and doing valuable research work, notably the Naval Research Laboratory at Anacostia, Washington, D. C. The Naval Engineering Experiment Station at Annapolis, Maryland, is another.

The Army also has special interests and is doing important work. Naturally, much of the Army and Navy work is confidential.

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