Here is TELEVISION

by

THOMAS HUTCHINSON

$4.00

HERE IS TELEVISION

Your Window to the World

COMPLETELY REVISED EDITION

By

THOMAS H. HUTCHINSON

HERE IS TELEVISION is a comprehensive account of television as it exists today with a forecast of the developments we may expect in the future. Written in non-technical language, it takes the reader from the first entrance into the studio through all the steps that lead up to a finished production and its reception in the home.

The emphasis is on program and production technique but, in addition, an over-all picture of the industry is presented and the problems that the industry will face are approached from a commonsense point of view. There is a thorough discussion of the physical tools of television, a complete outline of the possible types of programs, and an analysis of station and network technique and operation. The book concludes with a survey of "Jobs in Television," a sample television script, and a glossary of television terms.

HERE IS TELEVISION will be of value to all those who are professionally interested in television — broadcasters, advertisers, producers, actors, entertainers, and writers — as well as to the lay reader who wants an easily understood guide to the background and possibilities of this newest of the entertainment and communications industries.

HASTINGS HOUSE

Publishers New York, 22

HERE IS TELEVISION

Artist's sketch of the multiple-use television tower on the Empire State Building.

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WITH
NINETY-FOUR
ILLUSTRATIONS

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PREFACE

The author of this book has helped to shape the beginnings of television, the newest of the instruments available to those in the future who seek to inform the minds of men, or to win their sympathy and understanding. It takes imagination and daring to leave the security of a known medium, to explore, through trial and error, with tools which are often anachronisms as soon as used, a new medium which has a limited audience, no traditions, no certainties of technique. It was in part this same imagination which led the author to teach what was perhaps the first University class in Television Programming. Offered by the Washington Square Writing Center of New York University in the fall of 1940, this course has been conducted each semester since that time, with the exception of a brief period during the war, and this volume is an expansion of these lectures, discussions, and demonstrations.

It is of special interest that this book grows out of teaching and will be widely purchased and used as a textbook. With television admittedly in its infancy as an industry and as an art form, why, it may be asked, should we presume to teach the techniques of television programming?

The answer is that we have a tradition of demanding that our best doctors, artists, and scientists shall teach us who seek to follow in their steps. Happily, most creative people are genuinely interested in helping us to share whatever secrets of technique or knowledge they possess. Moreover, the wisest of them realize that teaching benefits both him who learns and him who teaches. The task of communicating what one knows or has done is in itself clarifying. We do not have knowledge in its fullest realization until we have attempted to express it, to communicate it to others. Thus it is fortunate that when we as students seek to benefit from what pioneers in any field have learned, knowledge itself is perfected in the very process of teaching.

Although in this analysis of past and present problems and dilemmas of television the author continually makes reference to the improved methods and equipment to be expected in the near future, we as readers already believe in the technical marvels of tomorrow. There are few who would not agree that soon we shall have full color, big screen television in our theaters and in our homes. We need no persuasion that we shall actually be witnessing the Red Army parade in the Red Square as it is happening, and hear the shouts of the crowds; we shall see the blue windows at Chartres, the mourning crowds at the funeral train, the circus parade, the ninth inning rally. "You see the action the very second it happens," writes Mr. Hutchinson, "and probably from a more advantageous point of view than you would have if you were there in person. You *are* there, to all intents and purposes."

We agree. We know this is to be true. We are even willing to wait some years until future scientific discoveries shall have been made. We know they will be. But the phrase "to all intents and purposes" sticks in the mind. We are "there," we agree. But with what "intent?" To what "purpose?" Such a question must surely tease us out of all mere complacency with our scientific triumph. We know, now, the structure of the atom, "to all intents and purposes." But what is the intent and what the purpose?

In television we have an instrument which can make possible our identification with our fellow men over the face of the earth. We shall hear them speak to us and see them clearly in their appeal for understanding. They will see and hear us, and we must make them know our purposes. This has been possible through the newsreel, but television will make the immediacy of relationship beyond escape.

To what "intent?" Let it be our intent, in the words of Joseph Conrad, that

> ". . . one may perchance attain to such clearness of sincerity that at last the presented vision of regret or pity, or terror or mirth, shall awaken in the hearts of the beholders that feeling of unavoidable solidarity; of the solidarity in mysterious origin, in toil, in joy, in hope, in uncertain fate, which binds men to each other, and all mankind to the visible world."

Characteristically, our schools are concerned with the advancement of "science," not with the uses of its manifold practical applications. Through our colleges of engineering we have long since made provision for the study of radio, electronics, and vacuum tube theory, thus ensuring constant improvement in electronic and television equipment. But nowhere in our colleges and universities is there exhibited enough concern with the responsible use of radio and television, or any systematic interest in the professional training of those who will make careers in such fields. There are professional schools of law, of medicine, of dentistry, of accounting. Even of retailing. But there is, as yet, no School of Communications.

Boys and girls seeking preparation for living in today's world have forced colleges to offer training in the techniques of radio programming. And so it will be with television. If there are few courses now, it is certain there will be more in the near future, when colleges assume, as they must, some of the responsibility for the use of the inventions which their graduates in science have produced. Then, too, we shall perhaps have a degree awarded, not only in the sphere of technical achievements, but also in the sphere of how-to-use these achievements. The day is near at hand when training in the use and employment of scientific discoveries will be considered as important as the discoveries themselves. A volume such as this is a stepping stone towards this future in education, and as such is a distinct contribution.

Those who work in magazines, in books, in radio, in motion pictures, in television, hold our tomorrow in their hands. In this tomorrow the most talented and fair-minded among us must be trained to use the several media of communications which science has placed at our disposal. As one of the first textbooks for this training, the present volume deserves the gratitude of all who believe tomorrow is worth working for.

PAUL A. MCGHEE, *Dean,*
Division of General Education,
New York University

INTRODUCTION

It was only a little over one hundred years ago, on May 26, 1844, to be exact, that the first successful test of electronic communication was made. On that date a telegraphic message was sent from Washington to Baltimore and our great present day means of communication was born. No one realized then that the development to come in less than a century would make the now famous message, "What God hath wrought," tapped out on that crude telegraph instrument, seem meager and primitive. Telegraphic communication, crude as it was, proved that messages could be sent by means of electric impulses. And with this knowledge came experiments and improvements that brought the telephone, wireless telegraphy, and radio. As early as the year 1847 experiments were suggested for sending a visual as well as an oral message by means of electricity. These experiments were conducted with varying success for almost fifty years. Then, in 1923, Vladimir Zworykin filed his first patent on the television iconoscope and seeing as well as hearing through electronic means became a reality.

Today we stand poised on the threshold of a future for television that no one can begin to comprehend fully. We are aware of some of its possibilities, but we are a long, long, way from knowing what eventually may be done. We do know, however, that the outside world can be brought into the home and thus one of mankind's long-standing ambitions has been achieved.

When we stop and realize how new inventions have changed the thinking and living habits of the peoples of the world we get an inkling of what television may accomplish. The steam engine, the motor car, the telephone, and the radio all changed our ways of life. Who can say where television will lead us?

For one thing it will undoubtedly change the face of the entertainment world. Motion pictures and radio have broadened the entertainment horizons that used to be limited by the foot-

lights of the theater. In television a whole new future lies before us. Television will take everything that has been learned from the theater, from radio, and from pictures and will develop a technique of its own until a new means of entertainment is born.

Today the television horizons are limited; but we know that in the not too far distant future London, Paris, Moscow, and Washington will be next door and all the peoples of the world near neighbors. To make this dream come true everyone interested in television is faced with the problem of developing this new industry.

In this book the author will attempt to present television as it exists today, and to hint at its future possibilities with the hope that it may help young men and women find their place in this new field.

What Is Television?

To many people Television is still an unknown development of the future. To some it is as vague as the cyclotron smashing atoms in Berkeley, California. To others it is a practical every day visual means of communication and it is only a question of time before it will become just that to millions of Americans.

Television actually is a window looking out on the world. Radio brought sound to the home—television adds the visual image.

The average viewer will purchase a receiving set—there are now many different makes and types available—and have it installed in his home. The size of the picture will depend entirely on how much he pays for the receiver. Picture sizes vary from about six by eight inches on up to three by four feet. The popular choice will probably be for receivers that deliver pictures ranging between twelve by nine inches up to twenty-four by eighteen. Sets reproducing pictures of this size cost very little more than the early models of good console radios. The receivers are very simple to operate and any child can properly adjust them.

You, in your home will see events of national importance just as they happen. Personalities that we only heard yesterday will be seen as well as heard tomorrow. Sporting events of all kinds will be there for you to see with a twist of a dial. Drama, news, music —every known type of entertainment will be waiting at your finger tips. Television programs on film as well as live studio pro-

ductions will present the finest talent and material. For some time television program schedules may be limited to only part of the time now being used by radio; but as set sales increase so will the hours of programs.

Television isn't radio and cannot be treated as such. To get the most out of a television program you must give it your undivided attention. This means that television programs must be above the entertainment average that radio has set. And they will be.

The impetus that it has received from the broadcasts of World Series baseball, championship boxing bouts, the President and Congress of the United States, and the general caliber of programs have raised the sale of receivers far above early predictions. Program service is available every night in the week in the principal cities of the eastern part of this country; it is only a matter of time before it will be available to the majority of homes all over America and eventually to the world. Canada, Mexico, England, Belgium, and Russia are all planning extensive television operations.

Television means the world in your home and in the homes of all the people of the world. It is the greatest means of communication ever developed by the mind of man. It should do more to develop friendly neighbors, and to bring understanding and peace on earth, than any other single material force in the world today.

Throughout the book the editorial "we" refers to me or to those television pioneers who have labored with me in an endeavor to find out what television was all about. In many cases, where production problems are discussed, I have directed or supervised the programs referred to and in all cases I have seen the program or discussed the problems involved with their producers. While the opinions expressed are my own, they are based on my personal experiences in New York while Television Program Manager for the National Broadcasting Company, Supervisor of Television Programs for Ruthrauff and Ryan, Production Manager for the RKO Television Corporation, and director of some of today's foremost commercial programs.

I would like to express my gratitude to the Allen B. Du Mont Television Laboratories, The General Electric Company, The Columbia Broadcasting System, Lever Brothers, The National

Broadcasting Company, The RKO Television Corporation, Ruthrauff and Ryan, Empire State, Inc., WPIX and Television Productions, Inc. for the use of photographs and drawings included in this book; also to acknowledge with sincere appreciation the suggestions and guidance I have received from Thomas H. Belviso, Dr. Alfred N. Goldsmith and Olga Lee.

THOMAS H. HUTCHINSON

Larchmont, N. Y.

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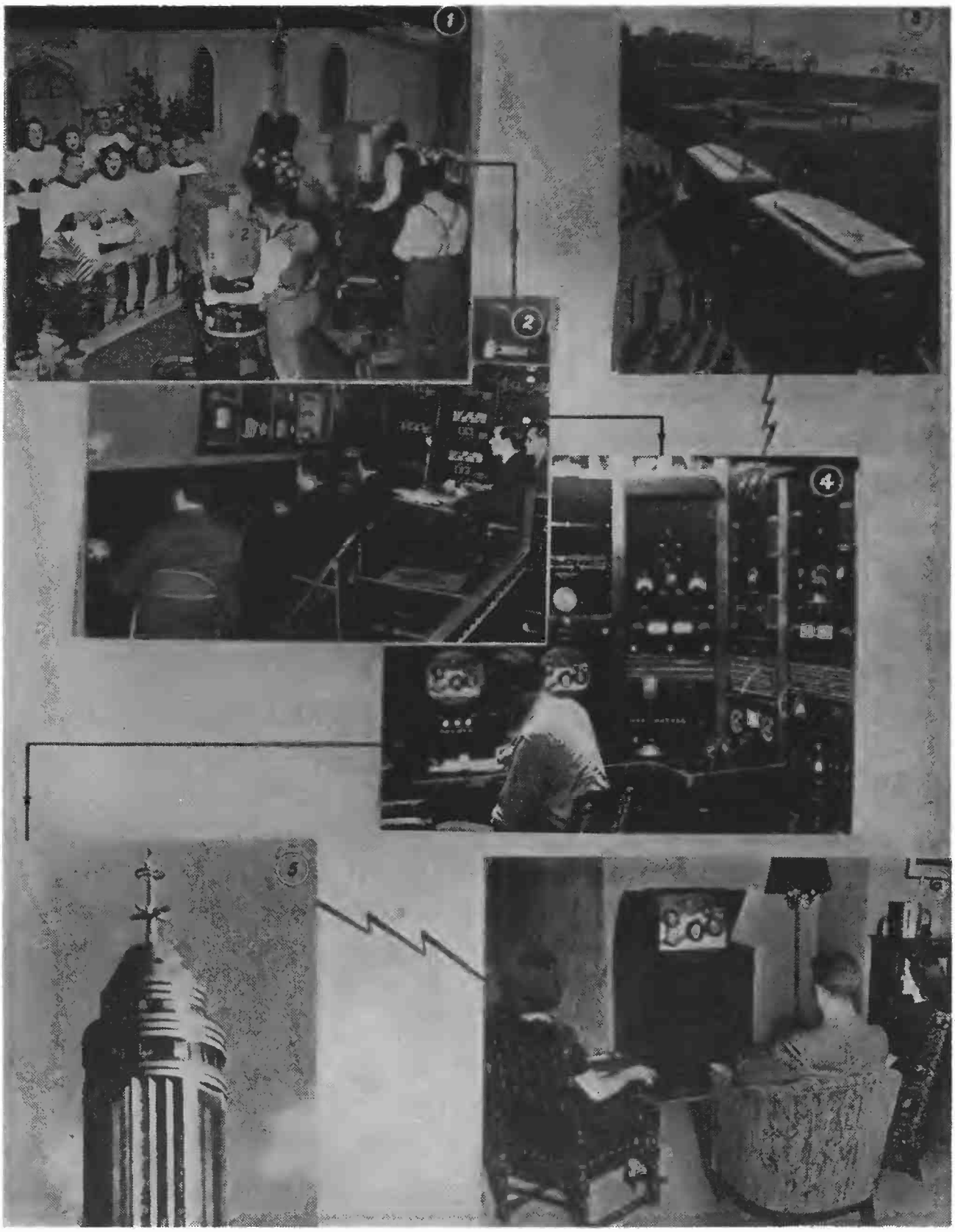
Part One

THE TOOLS OF TELEVISION



1—A studio scene. 2—The control room. 3—The mobile unit. 4—Master control. 5—The broadcasting antenna. 6—The picture in the home.

1

THE TELEVISION STUDIO

A visit to a modern television studio in operation usually impresses the mind of the inexperienced with a picture of finished operational simplicity or complete bedlam, depending entirely on how the visitor views this wonder of transporting pictures through the ether to the millions of homes throughout America. But, regardless of how it first affects one, the answer is that it is a bedlam resolved to minute simplicity of operation. The television cameraman's movement of his camera to a desirable position for the picture he is about to pick up, is in itself a very simple operation; but behind that act stands hours and perhaps days of preparation. The pickup of an involved live television program represents the ultimate in the theatrical world in the coordination of personnel and equipment.

In television, unlike motion pictures, there are no retakes, the job must be done correctly the first time with actors, cameramen, sound men, stage hands, electricians, stage managers, engineers, and directors all doing their part in the right way and at the right moment.

In this book, among other things, we will attempt to break down the operational picture and to present each man's job in its simplest form.

Physical Aspects

A television studio may vary greatly in size and shape. In most cases dimensions are governed by the location of the studio itself. In New York they range from a floor space of approximately one hundred feet by a hundred for large productions to those only about thirty by forty feet which were planned for intimate presentations. These small studios have proved to have a very definite value as each program must be thoroughly rehearsed and it is too expensive to have small cast units monopolizing thousands of feet of floor space. But regardless of its size, a television studio is first a soundproof room, with coaxial outlets through

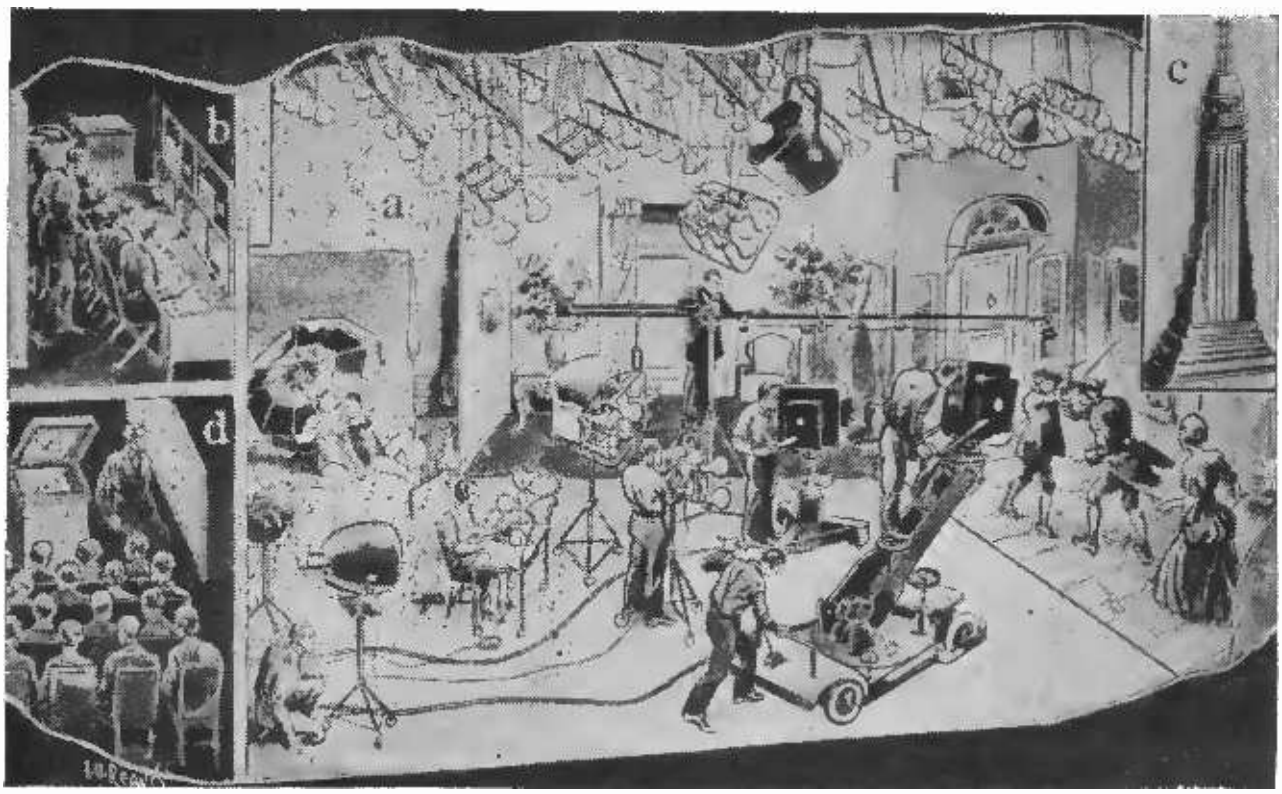
which the electronic pictures originating in the room may be sent to the transmitter. In addition, there must be sound equipment, proper lighting facilities, ventilating systems, and space enough for scenery to be placed so that actors may walk through their parts and be picked up by the television camera and the sound microphone. It must be of sufficient height to allow for scenery well above the heads of the actors and provide for lights and microphone pickup without ceiling interference. It must be

Three sets in operation at WRGB. Scene at left is on the air; announcer at extreme right. The remotely controlled lights are seen at the top of picture.

adjacent to dressing rooms for the artists, scene docks for scenery, and storage space for properties and should allow for the entrance of all the large objects needed, be they automobiles, pianos, or elephants.

The studio should be readily available to talent and the program staff; but so far there is a wide range in the location of television studios. In New York all of the main television studios are in the heart of Manhattan. For the most part they are in office buildings served by elevators with no direct door to the street. This is a serious handicap to program operations as many desirable properties can not be brought into the studios. In England before the war, the BBC studios were in Alexandra Palace some distance from the heart of London. General Electric's stu-

dios in Schenectady have proved to be in many respects the best located for all around programming. In a one story building, surrounded with spacious grounds easily available to everyone, it offers the program builder facilities not found in other cities. In Chicago we find a television studio atop a large office building, while in Los Angeles one is on a motion picture lot and another on top of a mountain.



The four main phases of television: (a) The studio; (b) The control room; (c) The transmitting antenna; (d) The receiver.

The studio need not of necessity be adjacent to the transmitter. We find some studios in the same building and some several miles away. As the picture may be carried to the transmitter by coaxial cable or radio relay distance is not a serious problem.

Let us examine our television studio a little further. In one wall we will see a large glass panel and behind it we will find the television control room. Here behind a soundproof wall, sit the men who supervise the picture originating in the studio and who pass it along, after it is styled to their liking, to the television audience. We will discuss the control room and its functions in a later chapter, but we must know that the control room is the "seat of the mighty" in television.

Setting the Scene

Let us assume that we are about to produce a live television program and we begin to assemble the physical properties necessary for its production. The first step is to a great extent similar to that followed for a stage or moving picture production. If the action is in a home the carpet usually goes down first. This is laid on the studio floor for picture values and for its sound deadening effect. Most studios today are floored with heavy linoleum. In radio studios this was usually on the dark side, but the value of reflected light from the floor will influence the color selected in television studios of the future. Either the floor itself will be light or light ground cloths will be used. Then comes the scenery. This has been designed by the scenic designer for the production, built in the carpenter shop, and painted by the scenic department. It must be of the proper height and weight to facilitate moving and yet make a practical setting for the production. So far most television scenery has been built along stage lines rather than to Hollywood specifications. One television production cannot tie up studio space for any longer than is absolutely necessary. The scenery must be easily handled and, because of this, very few attempts have been made to build the semi-permanent sets we see in the movies. Much remains to be done in building television scenery. Cracks or joints are unforgivable but how to get the effect of a solid wall and still be able to take the set out of the studio quickly and easily is a problem that requires careful planning and construction.

With the scenery properly set, the stage properties come in. Furniture, curtains, dressing and hand properties. Then electrical fixtures such as chandeliers, floor lamps, and other home equipment. Once the set is complete, we are ready to begin our investigation of how to turn the picture of this scenery in the studio into electronic impulses that will be broadcast to television receiving sets and again reformed into visual pictures on the home viewing screen.

Lighting

The first job is to properly light the set that we have assem-

bled, and in this connection television presents a different problem to that encountered on the stage or in the movies. In the theater the main objective of lighting is to create an overall picture that is pleasing to the audience and to accentuate the principal actors with sufficient light to point up their personality or bring attention to various parts of the stage. This is done for the most part with footlights, borders, and floodlights augmented with specially placed spotlights, from the front of the house, from off stage, or from above. In general, theater lights are in a fixed position although individual spots may be swung or turned to follow a performer.

There is no limitation either in brightness or lack of light that is essential to the success of a theatrical performance. Early stage productions were lighted with candles and tapers; then came gas and finally electricity; but as long as there was sufficient illumination for the audience to see the actors, the show could go on. Today many scenes are played in low level blue lights and in some cases action is carried on in complete darkness.

Lighting the motion picture set

In motion picture lighting, some of the freedom of the stage is lost due to the fact that photographic film will not register a scene unless there is sufficient light on a subject to affect the sensitivity of the emulsion. The film in use today, however, will react to a very low level lighting and motion picture directors have taken advantage of this fact to produce artistically beautiful effects. In a motion picture production the lights are usually so arranged that they may be diffused or concentrated on any given area. The lights are installed on a heavy platform, built around and just outside of the set, and each lamp is controlled by electricians who work the lamps from the catwalk. They must be out of the line of vision of the cameras and in the big studios lamps are located far up in the ceiling. These basic sources of illumination are augmented by floor lamps and spotlights.

Once all the lighting equipment is installed, and its placement varies with each production, each light is focused on a particular part of the set. Motion picture procedure, of photographing short scenes and then stopping, allows for perfect placement of

light. There will be special spots to cover any location or artist and to highlight his face or hair. We find special facilities for back lighting and all of the lights on the picture set may be shifted for each scene so that illumination always comes from the most advantageous position for proper photography.

Television lighting

Television presents a problem which in many ways combines the lighting techniques of both the stage and the motion picture studio plus some demands peculiar only to itself. First and most important is the fact that there must be a definite amount of light, evenly spread all over the set to be picked up by the television camera; or the pickup tube in the camera, will not respond to the images focused upon it. Photographic light levels, that is, the amount of light in each square foot of space to be photographed, are measured in "foot candles." Roughly speaking, some one thousand foot candles of light were required, spread fairly evenly all over the set, to get a readable response from the pre-war iconoscope. But today in general, good motion picture lighting is the standard in television, with especial emphasis placed on the average results obtained as performers move about the set. Early lighting requirements are a thing of the past. Improved pick-up tubes in the cameras have dropped the required light level down to below three hundred foot candles. Still television presents a lighting problem peculiar only to itself in that every light must be so placed that the overall picture results are good no matter from what angle the scene is "shot." In an opening scene the camera may be directly center but the next "take" may be made from the left or right of the set and in some cases from a camera position on the set itself. This means that motion picture technique "per se" can not always be followed. Every television lighting engineer constantly strives to obtain highlights on the actors wherever possible—to heighten the beauty of a woman's hair, to get natural shadows as the characters in the play move about the set, and above all to give naturalness to everyone who is to be picked up by the camera. He must avoid dark shadows under the eyes and especially under the chin. This requirement is in itself a problem. Low lights on the floor of the

studio (footlights as they are called in the theatre) are virtually impossible to place properly as cameras are mobile. The studio floor between the actors and the cameras must be clear to allow the cameras to move in closely when necessary.

Once a live television program starts there is no possibility of stopping the action as in the movies, and the theatrical approach, the sustained performance, demands that lights must be so placed that the best over-all results may be obtained. Television lighting equipment is for the most part hung from the ceiling or from permanent catwalks built over and around the studio. It is impractical to attach the large number of light units required to the top of the set as is done in Hollywood because of the lightness of the set and the quick change requirements on television scen-

An overall studio operation at WCBW—New York. The newsbay is at the left. The golf program at right is on the air. The studio audience in the background are ready for the program that is to follow.

ery. Various types of lights are used in commercial studios depending entirely on the physical aspects to be met. One station may use banks of fluorescent lights suspended overhead for their "overall" or (as it is known in television) "key lighting." Then

various limited areas where important scenes are to be played are highlighted by means of spotlights with lamps of varying degrees of brightness. Unless a special effect is desired these spotlights are equipped with lenses that diffuse the light to some extent so that the edge of the lighted area melds into the overall light pattern. Standard lighting equipment provides a wide range of possibilities including baby spots with low wattage lamps to large spots with incandescent lamps that will handle two or three thousand watt bulbs or even more. All these spots are adjustable and may be mounted on movable floor standards or hung from overhead pipes.

Another studio may prefer to provide the key lighting by using large incandescent bulbs in big reflector mounts. "Scoops" as they are commonly called. These units can also be adjusted to throw light as required. It is also possible, where overhead fixtures are impractical, to mount sufficient lighting units on two heavy upright stands, one lamp above the other, and then move these stanchions to any position desired. Mercury vapor lamps have also been used successfully in T V operations. In some studios lamps have been attached to the camera itself which turn with the camera and thus always illuminate the object directly in front of the lens. But however it is accomplished every set must be so lighted that at no time is light ever thrown into the lens of the camera.

The high light level of the prewar days meant in many cases that lighting engineers catered to the sensitivity of the iconoscope and artistic lighting suffered. The heat generated in a studio was intense. Actors suffered extremely in spite of very efficient air conditioning systems. But today, with the improvements made in pickup tubes, most of the apparently imponderable problems in lighting have been solved. Present day pickup tubes are so sensitive that acceptable pictures have been picked up by the light of one candle. It is standard practice to light dancers or singers—if so desired—with only a strong spot light. Shadow effects and night scenes that were impossible once, are now every day procedure.

But to go on with the production of our program. We instruct the electrician to "light up" the set. The overhead lights are

swung, turned and tilted to cast an even distribution of light over the entire area that is to be shown. Spotlights and banks of directional flood lamps are moved into position. The overall key light level is checked and approved and we are ready to examine our pickup equipment, the television camera.

2

THE CAMERA

From outside appearances the television camera today is a metal box with a lens at one end and a viewing system at the other which enables the cameraman to see what he is picking up. There are several makes of cameras on the market but in general they operate in much the same way. Actually the camera consists of two separate and independent pieces of equipment. The lower two-thirds houses the pickup tube and the necessary electronic mechanism to resolve the picture subject matter on which the lens is focused into electrical impulses, while the upper one-third is an independent television receiver. The kinescope or picture tube in this viewing equipment is small as compared to the size of receivers in the home as the camera man only sees a picture about three by four inches in size but he sees clearly the subject matter he is picking up and manipulates his controls accordingly. The electronic viewing screen came into standard commercial operation after World War II. Prior to that time, in the early iconoscope cameras, the picture being picked up was seen on a ground glass, through an eye-piece by the cameraman. This system had the disadvantage of showing the scene in color, and a cameraman was sometimes misled in picture composition due to the contrasting colors in the studio that did not give the same picture values in monochrome. It was an expensive installation as the scene on the ground glass appeared upside down unless inverting mirrors were included and an automatic gear-driven arrangement was necessary to show the exact outside edges of the picture on the glass as the focus of the camera was changed. An-

other method consisted of a rifle sight attached to the side of the camera. The cameraman gauged his field of vision by lining the picture up through this metal frame.

These early arrangements were practical but they failed to give the results attainable today. The cameraman sees in his view-finder, the picture the audience at home is seeing, when his camera is on the air and consequently there is no question as to proper "framing" and "composition." The electronic view finder has the added advantage sometimes in low light operation of showing more detail than the cameraman might see even with the naked eye.

A modern television camera.

Cameras Must Move

The box that houses the camera has a handle that turns the camera on its base, that is pivots it in a circle (which in motion picture parlance is known as "panning" from the word panorama). Another handle tilts it up or down and still another control allows the cameraman to keep the picture constantly in focus. This whole arrangement of camera and controls is mounted on a movable base. It may be a pedestal on wheels or castors, or a motion-picture dolly. The last mentioned equipment is the better as it enables the camera, in addition to being raised or lowered, to be dollied (moved in or out) closer to the object to be picked up for a close-up, or back for a long shot, without switching to another camera. These motion picture-dollies, however, are expensive, they take up room in the studio for their manipulation, and they

A close-up of a camera.

require an extra man to move them as the cameraman rides the dolly. Several types have been tried out. But one camera on a dolly of some kind is virtually "a must" in every television studio for smooth flowing program production.

In using the simplified and cheaper type of pedestal, the cameraman stands on the floor and moves his camera to a desired position by pushing the camera on its movable base. He should have controls for elevating or lowering the camera as well as for panning to right or left but he must get set in a given position before the output of the camera is picked up. Equipment of this kind limits the use of the camera as it must not be dollied while it is on the air, due to the physical inability of a cameraman to center his picture properly and keep it in focus while he is trying to change the basic position of the camera. The first duty of a cameraman is to keep the picture correct from an artistic point of view and, at the same time, constantly in focus. Television cameras today cannot be carried around nor may they be used while the cameraman is holding them, as they are far too heavy for that kind of operation.

Another choice in camera bases is simply a heavy duty tripod equipped with a panning head. These are used chiefly in outdoor pickups where the camera can be set in a fixed position and need not be moved. However they have been used advantageously on movable mounts—a triangular base on castors—in many studios where outside equipment has been brought in for temporary operations.

The Camera Cable

In addition to its weight and the heavy dollies, the studio television camera is definitely limited in where it can go and how it can be used, for (according to present practice) it is tied forever to the studio wall by its coaxial cable. This coaxial cable is a specially constructed electrical line capable of carrying the electrical impulses, which constitute the picture, from the camera in the studio to the control room. It also has additional circuits for communication, that is, telephone lines between the control room and the camera. The picture being picked up flows through this co-ax in the form of minute electrical impulses, and thus it can

be readily seen that these coaxial cables are a necessary evil if we are to send our studio picture on to the television audience. The mobility of the cameras is limited to the physical length of the cable. Cameras may be moved at will in the studio but only as far as the coaxial cables will allow them to go. There are further restrictions in the use of cameras in a studio due to the fact that one camera may not physically cross the coaxial cable feeding another camera. The present day cable is about one inch in diameter and any shots that are planned must take into consideration the physical factor of these picture output cables. Each camera at all times must "stay in its own alley." So we must plan the placement of cameras with relation to each other in every program we propose to televise. In normal operation we have two or three television cameras in the studio capable of being moved to various positions, panned, and focussed; and it is the proper use of these that makes a flowing television program possible.

The Picture Tube

Inside the metal box of the camera is the electronic pickup tube that makes television possible. The first one, the iconoscope, invented by Dr. V. K. Zworykin of R.C.A., has been called the heart of the television camera. It really is the heart, brain, and eyes of the television system; until this tube was perfected, electronic television as we know it today was non-existent. The industry has progressed a long way in the development of this tube and the results attainable today are beyond even those hoped for during pre-war broadcasting. We will discuss later the operation of the pickup tube but for now we need to know only that if the televisions system is working properly, and we focus the camera on a scene, the picture tube is capable of breaking down the picture into millions of electronic impulses which are reassembled as points of light on a viewing screen, forming a reproduction of the scene before the camera.

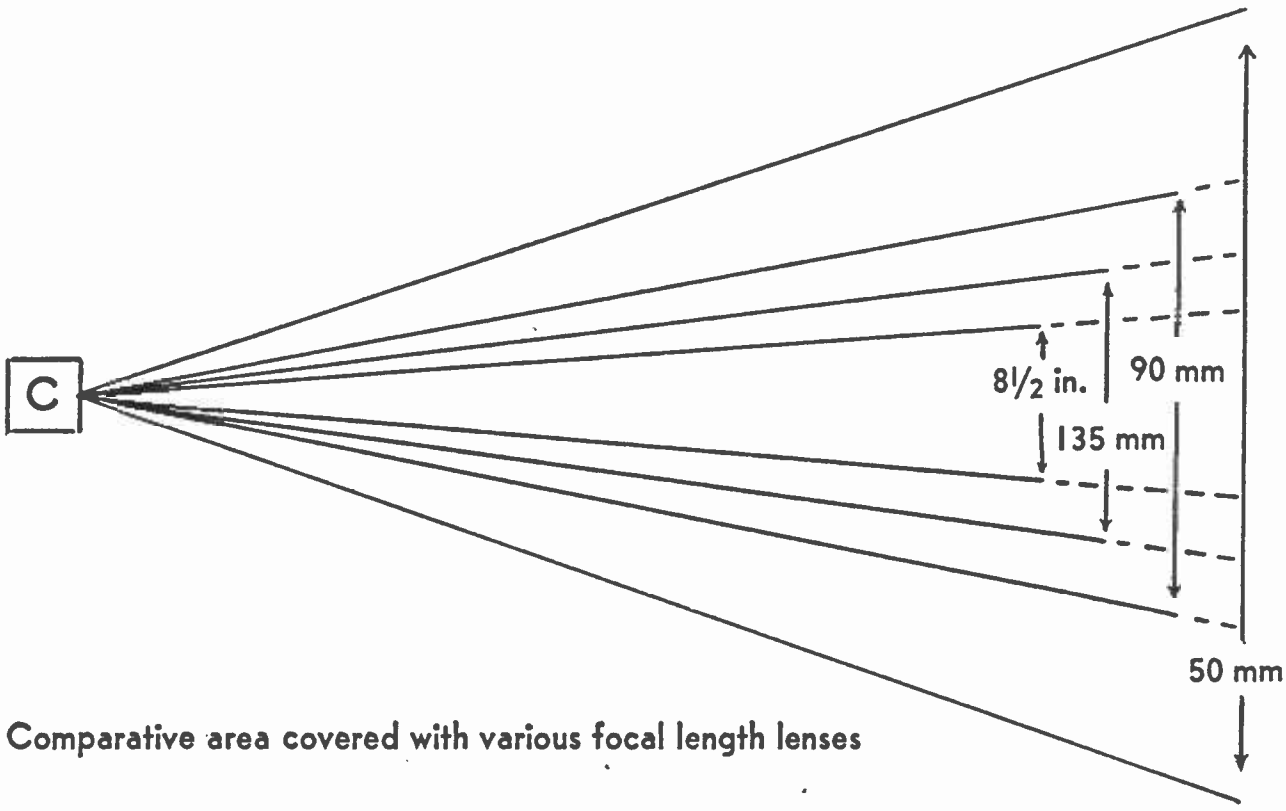
Lenses

It takes lenses to focus the scene in front of the camera on to the mosaic, the pickup plate in the picture tube, and their action is the same in a television camera as it is in a movie or still cam-

era. In the early days of television cameras were usually equipped with lenses of different focal length and thus varying results were obtained both in the area covered and in focal depth, depending on the distance of the camera from the object to be picked up. In three camera studio operations, camera number one might be equipped with a wide angle lens while considerably narrower angle lenses would be used on the other two. If a full shot of an artist was wanted, the picture would be picked up on camera number one, while a close up of the same scene might come from camera two or three. The lenses used in television cameras were considerably larger than those used in motion picture work as they had to throw a picture large enough to cover the mosaic. In the iconoscope the mosaic was roughly some three by four inches in size. But with the advancement in the development of the camera tube, the size of the mosaic was reduced to a photo-electric plate about one inch by an inch and a quarter.

This important change made possible the use of more than one lens on each camera. Four lenses are mounted in a turret head. They are interchangeable and thus the four lenses most valuable to the particular program to be picked up are inserted in the head. It is controlled by a handle in the back of the camera and the cameraman can rotate his turret to any desired photolength lens at will.

There is a comparatively wide range in the selection of lenses that may be used. In studio productions the choice will probably include a wide angle lens (35 or 50 mm), a 90 mm lens for medium shots and two close up lenses. A 135 mm or an 8½ or 13 inch lens is usually selected for this work depending on the shots required and the position of the camera at the time the shot is needed. Each lens covers a different amount of floor space at a given distance from the object to be picked up. For example. A 35 mm lens will cover a space approximately ten feet wide when the camera is ten feet away from the object to be televised. At the same distance away a 50 mm lens will cover about seven feet of floor space. The 90 mm lens at ten feet reduces the area to about four feet. The 135 mm pulls the coverage in to about two and one half feet. At the same distance the 8½ inch lens and other close up lenses reduce the area still further until we find



Comparative area covered with various focal length lenses

that with a 25 inch lens we have less than one foot of coverage. Thus it will be seen that by using various sized lenses, the cameras can work at unequal distances from the object to be televised, which helps in physical operation. Let's put it another way. To get a picture covering approximately ten feet of studio space the 35 mm lens would place the camera ten feet away from the subject but with a 90 mm lens the camera would be back about twenty-six feet to cover the same area while a 13 inch lens would place the camera almost ninety feet away.

Focal depth is another factor to be considered in the operation of cameras. A wide-angle lens, 50 mm or less in focal length, gives more depth of focus at the same distance from the subject than you would get if you used a 90 mm or 135 mm lens. The further away from the subject, with all lenses, the greater the depth of focus. If a camera with a wide-angle lens is well back from a subject, the focal depth is practically infinity, but as the camera is brought closer to the object the focal depth is markedly diminished. For practical purposes we may say that the depth of focus diminishes from nearly infinity, when the camera is well back from a subject, to an inch or two when it is in close. This focal problem is one that television has in common with motion pictures. Out-of-focus backgrounds can often be seen in motion picture

close-ups but they become more pronounced in television. This happens because the relatively small size of the viewing screen demands more close-up work.

Stopping Down the Lens

In every lens is an iris type shutter that governs the amount of light passing through the lens. In an ordinary camera the larger the aperture, the shorter the exposure necessary to get a sharp picture. This is true as a larger opening (wider stop) allows more light on the photographic film. In television we have no film in the camera, but to get a picture on the mosaic of sufficient detail to allow it to be reproduced there is a limit below which we cannot go. If the image in the camera is too faint, the picture in the home will be grainy, uneven, and unpleasant. Naturally, the best picture possible is the objective of all television producers; so with a given number of foot candles of light in the studio, the lens is stopped down as far as possible in order to obtain the greatest possible depth of focus. If the light is increased the stop may be further reduced; this means greater depth of focus, while less light means that the lens stop must be opened with resulting loss of detail.

In the early days almost every new picture tube was slightly more sensitive than the one in use before it. Engineers would tell the actors of this and they would anxiously ask: "That means you can use less light and get just as good a picture with the new tube as you are getting now?" "That's right," the engineer would reply and they would plunge happily into the next production. While the statement was true the actors never "got the breaks," for instead of reducing the amount of light the engineers stopped down the lenses and the lights were just as hot as they ever were. While we might have obtained the same picture that we had before with less light, we got a better picture by stopping down the camera lens and keeping the same amount of light in the studio. Our sympathies were with the actors, but better pictures were the important thing.

The Cameraman

Everything that the television audience sees is the result of

what is picked up by the cameraman. It is his work that contributes vastly to the success or failure of a smooth flowing television production. He must think fast, know the operation of his machine, and have a sense of artistic picture values. The duties of a television cameraman however differ greatly from those of a still-picture photographer or motion-picture cameraman. In still photography the "cameraman" poses his subject, checks the light, and arranges the over all subject matter. The success of the photograph depends on his artistic and photographic ability. His decisions are final. In making a motion picture the chief cinematographer is responsible to the director for the pictures that are taken. His decisions are vital in camera angles, lighting, and subject matter. His cameramen and assistants are the men who photograph the picture and it is their knowledge and experience in coordination with the director that gives us the results that we see in the motion-picture theaters of today. But in television, the cameraman loses a great deal of his executive functions. Because of the very nature of a television program, namely, the continuous flow of a program, the television cameraman has no opportunity to pose his people before each shot is made. Neither can he arrange lights just to his liking for each particular shot. He is limited in angles by the size of the studio, the type of dolly his camera is mounted on, the nearness of other cameras, sound booms, and floor lighting arrangements in the studio. In general, it is his duty to deliver to the television director specified shots where and when they are wanted, just as they were set at rehearsal. All his actions are relayed to him from the control room by means of a telephonic communication system. The cameraman wears a telephone head set and he is instructed in detail as to camera angles and just when and where he is to move for the picture desired. We will go further into camera operation in our chapter on the control room, as the cameraman's operations in the studio are at present continuously tied to the guiding voice on his telephone head set.

Color Response of the Camera Tube

Each individual picture tube has to a certain extent characteristics applicable to itself alone. There is nearly always a variation

in the response of each tube due to the difficulties encountered in its manufacture. This is particularly true in the color response. Some tubes may be high in the red response while others tend to give better results under bluer light. The objective of the manufacturer is to develop a tube with true color response and as far as possible eliminate variations between tubes. Usual procedure by a broadcaster is to check results produced by new tubes and those with similar reactions are used together. In monochrome television, colors will often give a different result in the gray scale than one would expect. Two objects that appear to be exactly the same color to the human eye may vary a great deal in the shade of gray that they produce on the viewing screen. In general, however, reds all tend to appear light in a television picture and most of the light pinks, blues, yellows, and greens all appear as a light gray while the browns, purples, and dark colors fall into a darker range. Pastels will fall into the lighter gray scale but in view of the surprises one often finds in camera tube response it is often advisable to disregard color entirely in television scenery and paint everything in shades of gray.

My first experience with this problem in scenery came with the delivery of a soft blue set for one scene and a beautiful pink for another. They were perfect in the studio but through the television system the two sets appeared identical. By painting all television scenery in shades of gray, variations can be worked out by the designer and scenic artist that give admirable results. Improvement in pickup tubes will some day result in a definite color response but until then the idiosyncrasy of each tube must be catered to.

This improvement is already seen in results obtained in make-up. At first it was necessary for artists to appear before the camera in gruesome make-ups of blue-black and white. In fact, only a comparatively few years ago the black-and-white make-up was still necessary; but today a heavy street make-up on a panchromatic base does a perfectly acceptable job.

One interesting fact that the television camera discloses is that dyed "red heads" haven't a chance of fooling their audience. Do not cast a dyed titian haired beauty for the part of a brunette for she will turn out to be a blonde. Her dyed red hair may look real

in the studio but not to the television camera. Only a real red head will be a brunette.

3

TELEVISION SOUND

Almost all the publicity that has been given television, particularly along basic promotion lines, has stressed the point that television adds sight to sound. But in an actual television production the problem is how to best pick up the sound that must *accompany* the television picture. The answer is not a simple one.

In radio the microphone is king. Everything in a radio studio pivots around this electronic ear. Streamline studios, soundproofing, acoustics, everything that radio engineers have learned has been utilized to make the sound pickup in a radio studio perfect. And then along comes a television camera and a new king of the studio is crowned. And what happens to our microphone? We no longer find it down stage center in the spotlight. It is out of the picture doing its job but shorn of its glamor; and as if resenting its fall from eminence—the microphone becomes one of the most troublesome appurtenances of a television studio.

In the first place, we must admit that it is most important but it can very easily ruin a good picture if it suddenly sails into view of the camera. The microphone must be so placed as to pick up all the sounds emanating from the television studio but at all times it must remain unseen. This is accomplished in most productions by hanging the "mike" over head suspended on a movable boom. Television has borrowed the sound boom from Hollywood. It is a heavy duty tripod on castors that can be moved about the studio; from this tripod extends a long arm. This arm can be extended or shortened by means of a hand operated crank which is geared to the movable arm. The whole apparatus can be raised or lowered on its base. The microphone is fastened to the end of the long movable arm and can be easily swung into any position with relation to actors or cameras. But our microphone now demands an attendant—a man to keep the

microphone constantly in such a position that the spoken lines can be heard readily but at no time should the mike appear in the picture. This means constant coordination between the "boom man," his sound engineer in the control room, the cameramen, and the director.

Most of our present day microphones give best results when they are close to the speaker. This means that if the picture at any given moment is on a close up—filling the television viewing screen with the head of an artist—the mike should be just above the head of the speaker. Now if the next shot is to be a longer one, such as a three quarter shot, or the area is to be widened to take in two or more people, the microphone must be elevated so as not to appear in the next picture. This is accomplished by telephonic communication and practice. The boom man is equipped with a pair of earphones, just as the cameramen are and he also receives his instructions from the control room. Practice with his equipment in rehearsal usually makes it fairly simple for the boom man to judge just where his mike should be. He quickly learns the approximate distance he must be above the heads of the actors through a knowledge of the field of the cameras from any given distance. If he should guess wrong, he will immediately be told from the control room to raise or lower his microphone as it will appear on the preview monitor screen. It is his responsibility to have the mike just above the actor or actress who is speaking at the moment. If an artist crosses from one part of the stage to another the mike must follow. If for any reason a scene is rehearsed with two actors seated at a distance from each other—the boom man must swing his mike back and forth between them to get the best possible pick up. This is bad production technique. A scene staged in this fashion should be avoided if possible although sometimes it is necessary. At all times the boom man is one of the busiest men in a television studio and one of the most important.

Sound Perspective

Sound perspective has long been an objective in pictures, and television will certainly iron out some of the phases in this process. So far it has been impossible to accomplish much along

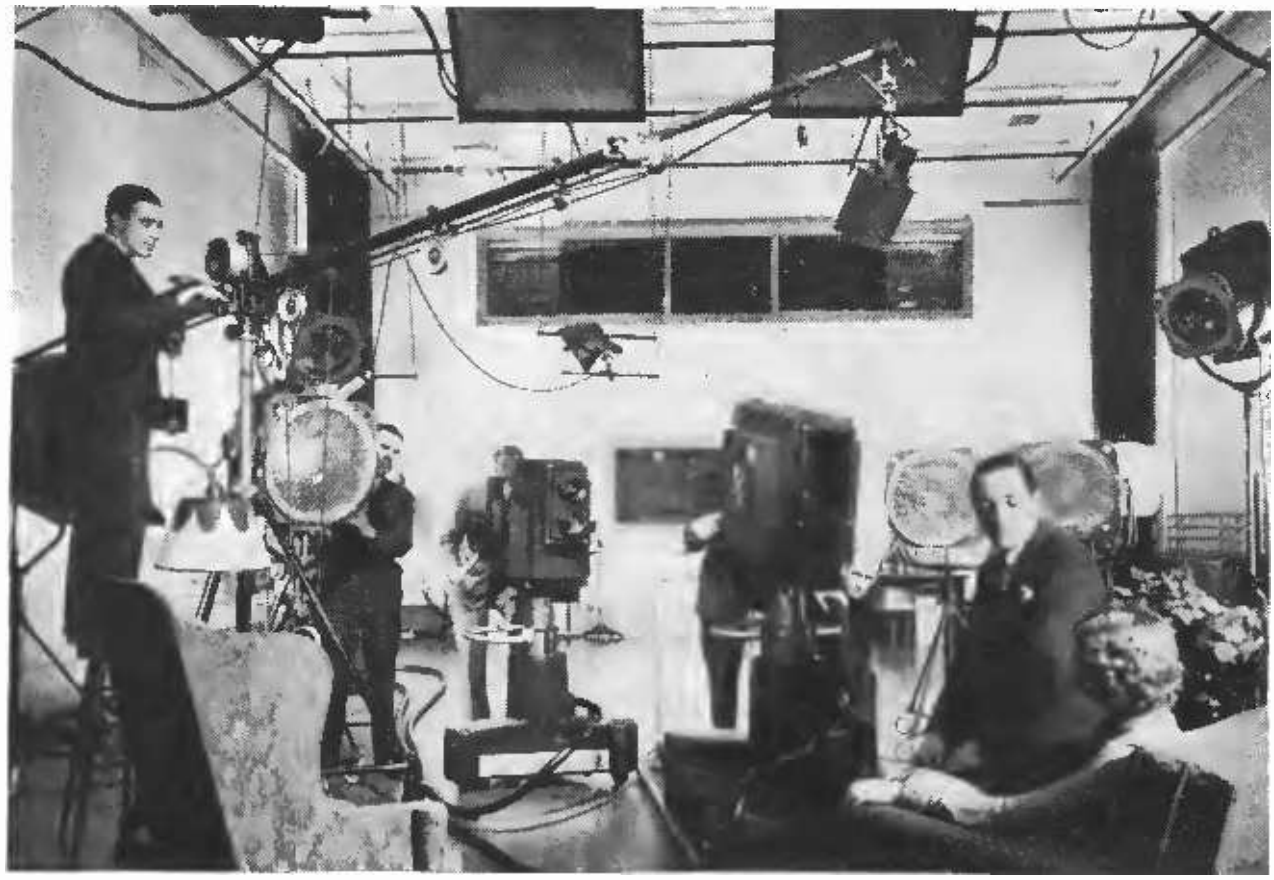
these lines, that is, to have the sound intimate and near in a close up but seem further away in a long shot. This seems easy on paper but in the studio we find that as we move the mike away from a speaker we must raise the "gain," the amplification of the sound picked up by the mike, to make the distant speaker audible and we lose the perspective we would like to have. Just as the camera must have a definite amount of light on a subject before a television picture becomes visible just so a given amount of sound signal must be picked up before the voice becomes audible.

It is obviously quite possible to lower the sound level but we must constantly watch the ratio of "noise" or unwanted sound pick-up, to voice. If we drop the over-all level in an effort to obtain the effect of distance, the listeners in their homes usually turn up the gain on their receivers and the effect is lost. As yet neither Hollywood nor T V have been able to successfully solve the sound perspective problem.

Another difficulty in television sound pick up is the scenery. In radio our sound studios are tested and "sound treated" so that exact results may be attained and, to accomplish the same purpose, television studios are also equipped with sound absorbent walls. Then in comes the scenery which acts as a perfect sounding board. It immediately changes a good sound studio into one that is so "live" that good quality sound becomes a constant problem. A soft material used as a back drop will help but we can't play all our television dramas in front of a couple of curtains.

Studio Operation

In the production of a program the boom is always right where you want something else to be. Usually when planning camera shots before he goes into the studio, a director forgets all about the sound boom. He will map out a beautiful camera routine, making allowances for his coaxial cables, lights, and dollies, and arrange his shots to cover every angle. Then he walks into the studio and there is the sound boom. And the base of this invention of the devil is something that cannot be dismissed lightly. A thirty foot boom has a base requiring about fifteen feet of floor space and there are wires to carry the sound from the microphone to the control room. In some studios these wires are suspended



An early studio picture from the set. The boom operator is at left controlling the microphone above the actors. The control room windows are seen in the background.

from the ceiling but always the boom must be in the most favored floor position because of the necessity of reaching all parts of the studio; usually the sound boom is in the way of all the cameras and all your picture shots must be replanned around it.

Television studios of the future will probably be equipped with sound booms extending out from balconies or hung from the ceiling which will free the studio floor for camera operation.

Special Microphones

It is some times possible to place special mikes in hidden locations on the set, and this is standard policy wherever possible. If a master of ceremonies is seated in a program involving other people, it is very good practice to place a microphone directly in front of him on the table and mask it from the camera with a few books. This enables the boom man to follow the other actors and results in a smoother flowing sound pick up than would result if the boom had to be swung back to the master of ceremonies each time he spoke. If a scene in a dramatic program is played across

a table or desk, a hidden microphone might be used to advantage. If this is done, care must be taken to avoid any sudden physical contact with the table or this unwanted noise will be heard "on the line."

When a scene is played by one or two people and they stand in one position for its duration a "mike" may be suspended above their heads just out of the picture. This is often done when a demonstrator is working at a table during a commercial. It is obvious that the actor must favor the microphone in this operation as it can not be moved. In large studio productions two booms are often used but this means another operator and space in the studio. When a program is being picked up in a theatre, two or three microphones are usually suspended on pulleys down stage. These can be lowered as desired to the top edge of the picture and proper manipulation eliminates the need of a boom.

In general, good television actors keep their eye on the microphone and they should not speak until it is within easy range, particularly if the speech ahead of theirs is delivered by some one some distance away. Correct usage of the boom mike is a godsend in many ways to a television director. If he finds himself restricted in camera shots, due to lack of space in a studio, he can have an actor move over to a new set "off camera," while the camera is on something else—a still picture, a long shot of an opening scene or a printed receipt—without interrupting the speech the actor is reading; in this way the flow of the story is held and new camera positions are opened up. In one production an actor changed his clothes—off camera—while reading a long speech and the visual interest was held by watching the reactions of the actor to whom the speech was addressed.

Sound Effects

Television, by its very nature, changes the whole picture of sound effects as they are used today in radio. No longer will the script writer fall back on the sound of marching feet or diving aeroplanes when his story begins to drag. Our first job is to try and make the "effects" we see, sound the way they normally would in real life. In television you don't make a house burn down with crinkled cellophane nor crack skulls by dropping

watermelons off step ladders. The day of the sound effects man's efforts to simulate normal noises with mechanical contraptions is over. Obviously, if a television actor closes a door, we see as well as hear him. If we need to suggest movement, we see the actors move instead of hearing weird noises that are supposed to be footsteps. When one thinks of the thousands of supposedly well-to-do homes in radio programs that have apparently never had carpets on the floors, it almost always brings a twinge of embarrassment for the limitation of the medium. Just how successful radio sound effects have been, however, was proven very realistically in an early television program. An actor seated at a desk was to crumple a piece of writing paper and put it in a drawer of the desk. He did so and a visitor, who wasn't looking at the picture asked: "What is the fire and the door slam for?" And that is just what it sounded like. Sounds created by the handling of paper, the opening and closing of drawers, footsteps, etc., all give a much more blatant pickup than the human voice and consequently everything of this nature must be arranged to blend in properly in its natural level in television. Aeroplanes, automobiles, trains, and the thousand and one things that have been so important in radio must be seen in television and necessitate the use of film or elaborate "Video" effects which we will discuss in a later chapter.

4

THE CONTROL ROOM

The Control Room of a television studio combines some of the factors of the control room of a radio station, the shooting stage of a motion picture lot, the film cutting room, the preview room,

The General Electric control in Schenectady. Director, switching engineer, and sound engineer in foreground. Multiple viewing panel with video engineers in front of them. Fourth screen from left is line monitor. Studio is seen through window in upper left of picture.

Line Monitor (A)

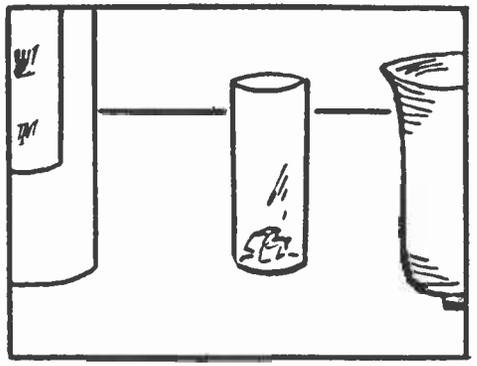
① ② ❸ ④ ⑤

Camera #3

The two screen viewing system

Preview Monitor (B)

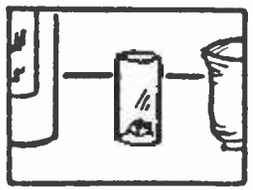
❶ ② ③ ④ ⑤



Camera #1

Line Monitor

Preview Monitors



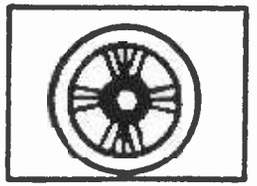
Camera #1

Camera #2

Camera #3

Preview Monitors

Camera #4



Camera #5

Camera #6

The multiple screen viewing system

and the first night at a Broadway opening. Every live television performance is a first night, and in the control room the program that the television audience is to see is cut, edited, directed, and produced. Here the final decisions that govern the picture quality of the program are made and executed.

All television control rooms are built along similar lines with only slight variations in physical placement of equipment. In general, they contain the necessary amplifiers, shading controls, viewing screens, and other electrical apparatus that make it possible to choose the particular picture wanted in the studio and pass it along, together with the sound, to the transmitters. The control room in all cases is adjacent to the studio and in most of them in operation today an unobstructed view of the studio is to be had.

Looking through control room to studio at WCBW.

Directly in front of the director's desk is the viewing screen that reproduces the picture the audience is to see. In addition to this line monitor are the preview monitors "kinescopes" that show the output of each camera in the studio. There are two basic arrangements used in television control room monitoring systems. The first requires only two screens, one being the line monitor and the other the preview of the shots available on all the studio cameras. This is accomplished by switching the output of any camera, at will, to the preview screen or to the line monitor. It can best be explained by a concrete example. In the control room we have the line monitor A and the preview screen B.

In the studio we have three cameras: #1, #2, and #3. By pressing a button we first preview the output of camera #1 on preview screen B. If the picture is satisfactory we press another button and the picture from camera #1 disappears and on the same screen we see the output of camera #2. The picture on camera #3 is previewed in the same manner and now, since we have seen the output of all three cameras, these previewed pictures may be put on the line by merely pressing the button that controls the camera wanted. Above each screen, numbers that identify the camera in use, appear as we switch. This system has both advantages and disadvantages. Its advantage lies in the fact that it requires a minimum of electronic equipment and with only two screens to look at, the line monitor A and the preview screen B, it is easier for the director. Its disadvantage is that it might require another operator, if many cameras were in use; for after a program starts and the output of camera #1 is put on the air, cameras #2 and #3 must be previewed on this one preview monitor. Obviously when #2 is switched to the line, then #1 and #3 must be previewed, and this operation continues throughout the program, constantly keeping the picture to follow on the preview viewing screen.

The other system is one in which separate preview kinescopes are provided for each camera. The output of camera #1 is seen on preview screen #1, camera #2 on screen #2 and so on for each camera used in the production. Each preview screen is numbered to correspond to the camera picking up the picture, as the direc-

tor must be able to identify the camera that is on the line at all times. In addition to the preview screens there is, of course, the line monitor and, as in the previously described system, the output of any camera can be switched to this monitor and thus put on the air. This arrangement is used generally; its chief advantage lies in the fact that the director can see, at all times, what every camera is picking up. More equipment is needed, however, as there is a kinescope and necessary wiring and switching facilities for each camera, but the possible need of a special operator for preview switching is eliminated. In a control panel of this type the line monitor should be slightly larger than the individual viewing screens, as it is very easy for a director to become confused during a performance. Actually it requires extreme concentration to avoid looking at the wrong picture. A director must look at a preview screen, then watch it on the line monitor, and again concentrate on the preview of the next picture coming up. With three or four pictures to look at, he is in trouble if he looks at the wrong one at the wrong time. Almost unconsciously he may become interested in camera movement on a preview screen and forget to watch what the audience is seeing. Many a director has found himself in a dither over a fault in a picture that the audience did not see, not realizing that he was looking at a preview monitor and not at the line. Only experience can teach the director how to overcome this error. He must make sure that he looks at the correct preview screen before he switches it to the lines but, once this system is mastered, the director can work all his shots and angles out well in advance and it lends itself to a more finished performance. The number of preview screens a director must watch depends of course on the number of cameras he is using. In normal commercial operation, five cameras are about all that will be needed. Before the war in Germany, there was a control room under construction in Berlin which included seven viewing screens: a large size line monitor and six preview camera screens.

One might ask the reason for so many viewing screens, as so far we have only mentioned the pictures coming from the cameras in the studio; but the pickup of all cameras used in the program must be visible in the control room if the program is to "flow."

If slides or motion pictures are to be used in conjunction with the live studio, then they must be previewed by the director. If the program is to use a mobile unit pickup from outside the building, then he must see that also. This means that every camera involved in the program must be so wired that the picture it is picking up may be seen in the control room, and a preview monitor for each one is needed. If facilities are limited a single monitor could be so arranged that it could be used for all the cameras as described previously, but separate monitors are preferable.

The Video Engineer

The output of each camera is viewed not only by the director, for its artistic and theatrical value, but by the video engineer for its electronic picture quality. He is the man whose sole responsibility is to deliver to the audience the finest electronic picture possible with the equipment at hand. The picture delivered by each camera is controlled electrically for adjustments in brightness, contrast, electrical focus, and all the delicate shading variations that are needed to produce a perfect television picture. The video engineer checks each picture before it goes "on the line." Varying amounts of black, white, or gray in a camera shot, that is, in each individual picture, as the camera is swung from one actor to another, means that the video engineer must constantly equalize these values before the picture can be put on the air. A preponderance of dark color in one scene will require a complete change in electronic shading if it follows a scene that is basically on the light side, and vice versa. In commercial operation the video engineer is a highly competent electrical master artist, for with his dials he paints a picture by adjusting the output of the camera, so that the artistic effects planned by the director and executed by the cameraman reach the audience with the finest precision possible. Today the video engineer is able to deliver pictures ready for the air just as rapidly as the director wants them, but in the early days of television operation the output of a camera was never available to a director until the video engineer was completely satisfied with the shading of the electronic picture from the camera. If it took him five minutes to adjust it

to his satisfaction the director and the audience waited before switching to another camera; but today there is no delay. The video engineer knows his job and does it quickly and efficiently.

The Switching Engineer

So far in our control room we have properly shaded pictures which are being picked up by the cameras in the studio, visible on our monitor and preview screen. Now let us see how we manipulate them. This operation is handled by the switching control room engineer. In some studios this job was done by the assistant director, but in the majority of stations it is handled by the engineer in charge of studio operations. On the desk in front of this operator are video faders and push buttons that control the switching of the output of the cameras. His duty is to deliver the snap switches, fades, lap dissolves, or super impositions required by the director.

Let us look for a moment at a typical television script and see its operation as it applies to the switching engineer.

CAMERA #1—Opening title	The output of camera #1, which has been previewed, is switched to the line monitor by pressing a button which controls the output of the camera.
Camera #2—Ready on clock	The output of camera #2 is now on the preview screen.
CAMERA #2	
Lap dissolve to clock face	The output of Camera #1 is faded down as the output of #2 is faded in.
Camera #1—Ready on opening scene	The picture on Camera #1 is previewed.
FADE OUT #2	Camera #2 is slowly faded out. When the screen is completely blank,

FADE IN #1 Camera #1 is faded in.

This operation, which calls for complete coordination between cameramen, director, video shading engineers, and switching engineer is repeated time after time through the program. Thus the correct pictures are sent to the transmitter.

Means of Switching

Just as in motion pictures, various types of switching from one picture to another may be desired by the director, and almost anything he wants along these lines can be accomplished. Back in the 1930's, almost all switching was done by fading one camera out and, when the screen was empty—"black" is the colloquial term used—fading the other camera in. In television a black screen isn't always black, for without a well lighted picture the viewing screen has a tendency to take on a grayish white flare. This system of switching was considered adequate by engineers in the laboratory, but when the equipment was delivered to the program builders in a studio for regular operation, they demanded and got additional equipment. Today, instead of the slow fade-out before bringing the other picture in, you may, if you desire, lap dissolve from one camera to another, as one picture fades out the other picture fades in over it and replaces it. Snap switching, that is, instantaneous cuts from one camera to another, was also made available to the director and as in motion pictures it is the basic switching technique today. Superimposition is also possible; that is, a figure being picked up on camera #1 may be made to appear in the picture coming from camera #2. This is done by feeding the output of both cameras into the line at the same time. In most cases a ghostly effect is thus created but, if the subject matter to be picked up on camera #1 is properly lighted and a suitable background is used, the pickup from camera #1 can be made a part of the pickup of camera #2, so that a well outlined picture may be delivered. "Wipes" either vertical, horizontal, or fan, by which the picture is wiped off and replaced by another, are possible through electronic controls of the video signal. They require special circuits but give a very valuable program effect.

A "split screen," where two actors in different locations can be made to appear in the same picture is also possible.

The Sound Engineer

Let's forget the visual aspect for a moment and check our sound. This is monitored from the television control room just as it is in radio. In fact the facilities provided in a radio control room are all in its television counterpart under the supervision of the sound engineer. Through his controls come all the sound originating in the studio and this is broadcast simultaneously with the video signal. As already mentioned in chapter three, the main sound pickup is from the boom in the studio. It is possible of course that additional mikes may be used and music may be fed into the system from an orchestra from another studio or from a remote part of the main studio. In some early English productions, to gain floor space in the studio, the orchestra was installed on a high platform that was open underneath so that cameras and personnel could work under it. In short, television sound may come from the studio, from a remote pickup point, from film sound track, or from records; but everything is handled as in radio from the control room.

Sound Effects

In some television control rooms you will find facilities for feeding the turntable sound effects or other recorded parts of the program into the system. This is handled by an operator whose sole responsibility is to see that everything originating from records is available and comes in as wanted.

Today, in radio operations we find the sound man with his turntables and records in the studio itself. He must follow the instructions indicated in the script as they are cued in by the wild gesticulations of the radio director, in an effort to try and deliver the sound effects as they should be heard. The majority of sound men do a good job in this way and there obviously isn't space in a radio control room for the paraphernalia that is required for "live" sound effects in a modern radio program. But with the addition of sight the sound man must see the picture to properly synchronize the sound effects of moving objects. So, we find him with his sound effects records in the control room, or in some

cases, just as in radio, he is ensconced in some corner of the studio. Now however he has a viewing screen alongside of his microphone and thus feeds into the program line the door bells, telephones, wind, thunder, aeroplane and automobile motors and all the other effects needed. These may be picked up from radio sound effects records, from transcriptions or perhaps from motion picture film. Normal studio sounds are picked up from the studio as the actors go through their lines.

Video Effects

Television has brought a new entity into the broadcasting picture in the "video effects man." He is responsible for all the visual effects and his work is an important cog in the machinery of a television program. Every presentation will need some sort of visual identification. In radio the announcer orally gave the name of the program and the sponsor who presented it. In the theater we have the printed program. In the movies we have the lengthy credit titles and so in television we have the visual opening, under the supervision of the visual effects director. This opening may be a facsimile of the product or the product itself. It may be an elaborate moving title or a simple card telling the name of the program. Eventually many of these openings will probably be on film, for as already stated we can switch to film and back to the studio at will and film eliminates the possibility of errors. Miniatures and motion picture backgrounds, process shots, as they are called in Hollywood, will take an important place in all programs. These visual effects will test the brains and ingenuity of many directors. We will go further into this interesting branch of television programming in a later chapter. For the present we know that the visual effects must be in the hands of a capable man in the studio ready to deliver to the director the effects he wants, where they are called for.

The Operating Crew

The man in charge of program operations in the control room is of course the director. He and he alone makes the decisions regarding the camera shots to be used. To get these shots he is in communication with the studio crew by means of telephones.

Each camera man, the boom operator, the studio floor manager and any other key program operator, such as the studio sound man or the musical director, has a telephone head set adjusted so as to leave his hands free to manipulate equipment or any other task he has to do. Each man is told just what is required of him and he executes the orders as requested. Additional telephonic equipment tie in the film projection booth, master control and any other outside point of program origin. These outside lines are usually manned by the technical director or "T D" as he is known in some studios.

As in everything else in life there is more than one way of doing things and television is no exception to this rule. It is obvious that telephone lines may be arranged in any way that is desired and in some studios the director does not speak directly to the cameramen. If we are to assume, as in radio, that the

Left—The operating crew in the NBC control room. In foreground is sound engineer; behind him, the director. Standing is the assistant director. Switching engineer is seated at right of director with video shading engineer in background. Microphone leads to loud-speaker in studio while breast phones connect with operating crew in studio. Shades are drawn over studio windows at left. The picture monitors are in upper left of picture.
Right—Studio view from the control room at the Television Production Studio in Hollywood. The images the cameras are picking up are seen on the monitor screens at the top of the picture.

sound engineer in the control room is responsible to the program director for the sound emanating from the studio then he should be held responsible for the operation of the boom and should be in telephonic communication with the boom man. If the switching engineer is held responsible for the pictures the director gets, then he should talk to the cameramen, and preview the pictures to be used. This system is in effect in some studios. The director tells the switching engineer, the "T D," just what shots he wants and holds him responsible for their delivery.

In other studios the director and his assistant talk directly to the cameramen. Usually the assistant director, working from a script marked exactly the same as the director's, sets up the camera shots, watching them on the preview screen to see that they are correct, thus they are ready for the director to take when he wants them. When the first system is used the technical director really functions as an assistant director and with so much to be done the director is in a position to get better results if he is not tied down with any manual operation. A lot depends on the abilities and personalities of the individual men involved. Actually everyone on a show must work together as a team, and this is particularly true of the men in the control room.

The physical operation between control room and the studio is this. From a script with camera shots predetermined at rehearsal the assistant director or technical director advises the cameramen of the shots wanted. Instructions to them may include panning from right to left or tilting up and down for good picture composition. While a camera man is responsible for focus and good composition he cannot see what the other cameras are picking up, so he must abide by the decisions reached in the control room. They will also receive instructions as to the size of the subject matter in the picture. They may be asked to dolly in for a close-up or pull back for a longer shot. Usually the complement of lenses in the turret head enables a cameraman to deliver the picture requested by simply changing lenses. It is seldom necessary to move his camera any great distance. When the preview shots are correct on the viewing screen the director calls for his switches, fades or lap dissolves as he desires. As soon as he releases a camera his assistant sets the shot for the next take.

During rehearsal the director speaks to the actors in the studio over a loud speaker but once the program is on the air this system is dead and his only contact with the performers is through his studio floor manager. He is responsible, as is the stage manager in the theatre, for the placement of properties and he is the man who sees that actors, lights, costumes and everything that is necessary to the program is ready when and where it is needed.

5

PROGRAM OPERATION

With the basic personnel and studio facilities fresh in our mind let us pick up a television script and take it into our studio for production.

A television script, when first submitted to a director may be in almost any form. It may be a short story, a radio script, a stage play or even a motion picture scenario. But regardless of what it was originally it must be reworded, rearranged, and adapted for television. The first thought in the back of the adapter's mind must, of course, be the dramatic values of the story; but parallel to this thought is the constant problem of production. There are many things that offer no problems to a motion picture director that cannot be done successfully in a live studio television production. Everything in live television programming must in many ways follow stage production limitations. For instance, actors cannot be in two places at the same time nor can they appear in different costumes unless time is allowed for them to change. A sequence of scenes in a script under discussion called for a man and woman to meet in front of a house. She invites him in, he accepts, and they enter the front door as the picture fades. The next scene opens with both of them seated at the dinner table finishing their after dinner coffee. This could be accomplished only by interposing a close up of a clock, or some other means of denoting the passage of time, to allow the woman time to get her hat and coat off and for both of them to physically walk to the dining room set and sit at the table. A television

script adapter must constantly keep in mind the physical problems that any production presents. He must also consider the economic angle. He must bear in mind that his script will be judged on the number of sets to be used, the space in the studio, the use of film, and the size of the cast. It may be necessary to rewrite some scenes, if those in the original manuscript call for production facilities beyond the possibilities of the studio, but additions and embellishments must depend on the entertainment value gained in their relation to additional cost. It must be obvious that the extra money required by the script is warranted.

Regardless of the source of the original story, a more or less set script form is required for studio production. This is necessary because of production demands. A television director is called upon to do the almost impossible. He must watch his script, cue in music and effects, preview the shots to come, and if they are not right correct them; and while he is doing all this, he must watch the picture, the finished work, that the audience is seeing. It goes without saying that a television production calls for the highest efficiency not only on the part of the director but from each person, no matter how minor his part, who is in any way involved in the performance. The lowliest "bit actor" may spoil a program by walking in front of a camera and there have been many instances where this has happened. Usually it has been done by some one who knew better but who forgot for the moment. So, with the accumulation of problems involved, it becomes necessary to arrange a shooting script in its simplest form with all cues and camera shots worked out in a pattern comparatively easy to follow.

The Director

The television director faces a problem in concentration unknown to the stage director or motion picture director. In the theater the director must rehearse his actors, plan his production, and work out the effects he desires; then, after long weary hours of rehearsal, the day of the "dress" finally arrives. There he criticizes and corrects the imperfections before the opening performance, but on the first night he has only to sit in the audience and view the results of his labor. After the curtain is once up

there is little he can do to better that particular performance. But in television the director hasn't the opportunity to relax at the first performance. He must do in advance of that date everything the stage director is called upon to do and on the night of the broadcast he is as much involved in the production as anyone else in the studio. The success of the program rests in his hands for, regardless of the work involved in preparation, the execution must be perfect. If a big scene is played well but is improperly photographed, the effect is lost. If the output of the wrong camera is sent to the audience, the work of many hours of rehearsal may be wasted. It is not unusual for a director to find himself more nervous in a control room prior to a televsion broadcast, when he realizes the responsibilities that rest on his decisions, than he ever was in some other type of entertainment.

In motion picture work the director always has another chance. If a scene looks bad in the preview screening room he can always shoot it over. If his judgment was wrong or if actors depart from the way the scene was rehearsed, he can make a retake or cut it entirely; *but in television once the action starts the audience must see a continuous flowing performance and if mistakes are made they are seen by the audience.*

The Rough Draft of a Script

With these problems in mind let us examine what might be a typical script accepted for production. If it was originally a story or radio script the scenic requirements would have to be designated and stage positions considered. Let's take a concrete example. We will assume the original story has been worked over and is now in shape for scrutiny as a first draft of a rehearsable script. It might be something like this:

Destiny
A Television Comedy
By
Timothy Smith

The first scene takes place on the veranda of a Long Island country estate. On the stage right are French doors leading into the main part of the house. Running from up center to down

An effective terrace set.

left we see a porch railing. Back of the railing is a trellis that masks the view of the garden beyond. The veranda is hung with flowering plants and a suggestion of wisteria is given on the trellis above the porch. Down right center is a rustic table with three chairs. Up center a porch swing. The entrance to the left would lead off into the garden. On the table is a tray with ice, glasses, and a siphon of soda.

The time is late on a summer afternoon. As the action starts we see Harry Withers, who is dressed in a typical sports outfit, mixing himself a drink. He raises the glass to his lips and starts to drink as Grace Lyons, his hostess, who is dressed in a summer sheer, enters from the house through the French windows.

Grace: Hello Harry. Drinking again!

Harry: (Smiling) Well, you don't blame me—do you?

Grace: That all depends. (SHE CROSSES TO THE TABLE AND SITS)

Harry: On what I'm drinking?
Grace: Perhaps. (SHE PICKS UP A NEWSPAPER FROM THE TABLE AND GLANCES AT IT.)
Harry: (AS HE TASTES HIS DRINK) Apparently I am not as interesting as the news.
Grace: Who is? (EXCITEDLY) Harry—did you see this?
Harry: (LEANING OVER HER CHAIR) Interesting isn't it?
Aileen: (ENTERING FROM DOOR R.) Very. And you two make a very charming picture. (HARRY AND GRACE REACT TO AILEEN'S SUDDEN ENTRANCE.)

Now let us see how to best transpose the information contained in the first page of our potential television script into a working shooting script. For while we need all the information contained in the script above to design and build our set, once it is built—the properties secured and the actors rehearsed—the director is interested only in the necessary steps to visualize the story for the television audience. The style and layout of our shooting script is purely arbitrary. If a director preferred the camera and other cues on the right hand side of the page, there is nothing to prevent him having it laid out that way. But because we read from left to right and because everything indicated on the right half of the page has been already built and rehearsed, the director is interested mainly in the things that he must do and they are all tabulated on the left side so that he sees instantly the things he must handle.

A major problem, that hasn't been cleared up as yet, are stage directions in a television script. In the theater "stage right" was the right of the stage facing the audience, and naturally so, as that was to the actor's right. A stage director who faced the actors, as the audience would, quickly learned to adjust himself to saying right when he meant left. This is simple when only the director is involved and actors are rehearsing without cameras, but when they come into the studio and start to rehearse with cameras before the viewing screen the actors' right becomes the cameraman's left. So to get an actor to cross right and to have the camera pan with him, the director must tell the actor to cross right and the cameraman to pan left. It was and still is slightly confusing, to say the least.

The Shooting Script

But back to our television script. The first page or two of the script of "Destiny" worked out for actual studio production might appear like this.

CAMERA #3

START MUSIC

CUE TITLE TO ROLL

(Preview #1 on C.U. (*) of Glass)

(Preview #2 on Door R for Grace's entrance)

OPENING TITLE

MUSIC

The
Paragon Broadcasting
Company
Presents
"Destiny"
An original story by
Timothy Smith

Cast:

Harry Withers
Wendell Ayer

Grace Lyons
Jean Davis

Aileen Rankin
Kathryn Fleishman

(AS THE TITLE ENDS)

LAP DISSOLVE FROM #3 to #1

(Cue Harry to go ahead)

(#3 Ready on C.U. of Grace in chair at table)

A glass on table—we see a piece of ice dropped into it and some soda added then—

PAN UP WITH GLASS TO HIS FACE ON #1 AND DOLLY BACK TO C.U. OF HARRY

A man's hand raises glass to his lips—he starts to drink. He sees Grace in door R. He gulps the drink.

FADE MUSIC

SWITCH TO #2 ON C.U. OF GRACE

Grace enters and stops in doorway.

(*) C.U.—Close Up.

(#1 Holds on C.U. of Harry)

GRACE: Hello Harry—Drinking again!

SWITCH TO #1

(#2 Holds on Grace ready to pan with her as she X's to table.)

HARRY: (SMILING) Well, you don't blame me do you?

#2 PANS WITH GRACE TO TABLE AND INCLUDES HARRY

GRACE: That all depends (SHE X'S TO CHAIR AT R. OF TABLE.)

HARRY: (BEHIND TABLE) On what I'm drinking?

SWITCH TO #3 C.U. OF GRACE AS SHE SITS AND PICKS UP NEWSPAPER

GRACE: Perhaps. (SHE SITS AT THE TABLE, PICKS UP NEWSPAPER AND GLANCES AT IT.)

SWITCH TO #1 C. U. OF HARRY

(#2 Ready on door R)

(#3 Pulls back a little)

HARRY: TAKING ANOTHER LARGE SIP FROM HIS GLASS) Apparently I'm not as interesting as the news.

#1 DOLLIES BACK FOR M.S. (*) OF GRACE AND HARRY

GRACE: Who is? (READING PAPER EXCITEDLY) Harry did you see this?

SWITCH TO #3 GRACE

(#1 continues to dolly back)

(*) M.S.—Medium Shot.

SWITCH TO #1 GRACE AND HARRY

HARRY: (LEANING OVER HER CHAIR) Interesting isn't it?

SWITCH TO #2 ON AILEEN IN DOOR R.

AILEEN: (ENTERING FROM DOOR R.)

(#1 continues to dolly back)

Very. And you two make a very charming picture.

SWITCH TO #1 WHICH PULLS BACK TO COVER WHOLE SCENE.

(HARRY JUMPS BACK AND GRACE RISES.)

Operating Problems

Radio had its limitations but one of its advantages was that the audience painted its scenery to suit itself. A listener always visualized the scene as he would like to have it appear. But television is forced by the nature of the medium to deliver a veranda that will meet the requirements of the audience as well as the studio limitations. It must be economical, practical, and above all look well in a television picture. That is a problem for our scenic designer. We will assume that he has turned out a workable set and it is ready for shooting in the studio.

Now let us see what must be done by each member of our television production team to turn our shooting script into a visual performance. Our first direction reads: "Camera #3—Opening title." This requires that the camera picking up the title has been previewed, the title card adjusted as to distance from the camera, and the lighting checked. If it is animated in any way the device has been tested. The stage manager has seen that the hand properties for the entire performance are all in their right place and the actors are ready. Camera #1 is set and previewed on the glass with the camera in close.

Camera #2 is ready on the door. In a case of this kind when we plan to pick up an artist as she enters, it is necessary for the cameraman to focus his camera on the door frame or otherwise

approximate his focal range so that when the artist makes her entrance she will be in proper focus. With our preview shots set, on a "go ahead" from Master Control, we start our music and fade in picture and sound. As soon as our opening shot is well established we give the cue to roll the title and hold the shot until it is finished. As this ends we lap dissolve from the title to the close up of the glass on the table. Two principles are involved here. First, if the lap dissolve is done manually, care must be taken that camera #3 is faded out at the same speed as #1 is faded in. Eventually all lap dissolves will be done automatically, with the elapsed time desired to fade out Camera #1 and fade in the other camera preset on the controls. Obviously the length of time taken to make the dissolve depends on the mood of the scene and the subject matter involved. The other point is the focal depth of the #1 camera taking the glass on the table. As stated before, as the distance from the camera to the object being picked up is lessened, the focal depth decreases. In making a shot of just the glass care must be taken that the picture is understandable; that is, the audience must be able to see what it is and a "split" focus will probably be best. This is obtained by focusing on an imaginary line drawn through the center of the glass or perhaps the ice in the glass. In working too close the front and back edges of the glass may be slightly out of focus so a picture of this kind must be carefully previewed and the correct camera position determined.

At this point there are two operating cues to watch. We have released Camera #3. So through our telephone we tell cameraman #3 to get set for a close up of Grace after she sits in the chair to the right of the table. This may take a little time as the camera was in close on the title, the cameraman may have to move his camera some distance to get the right shot on Grace, and he must be prepared to do a quick focal job when she sits. In preparation he might use the back of the chair as a focal point. Also through our telephone, we tell our stage manager to give Harry the "go ahead" for putting the ice in the glass. One of the most inexcusable faults, and it is one that continually happens, is to be late in cuing actors before the cameras to go ahead. Most studios have a red or green light on the front of each

camera and this bulb lights the second the output of that camera goes on the air. Consequently, the actor can tell immediately which camera is picking him up and when the switch is made but, if a delayed cue is necessary, as in this case, the director must anticipate it and tell the stage manager to give the actor a "go ahead" just before the effect is needed. The director now has two more things to do at once. He must carefully watch his picture "on the line," that is the one the audience is seeing, and also preview the picture that is being readied on #3. If the angle is wrong he must tell that camera man to move in or out, pan right or left as the picture must be correct when it comes on the air. Here is a perfect case, where team work between the director and his assistant is important. With the director concentrating on the "air" shot the assistant might line up the shot on the third camera. This procedure may be worked out through the entire performance if desired. Our next move is to instruct the dolly man to move back. A shot of this kind should only be attempted with a good dolly on which the cameraman rides, as his whole attention must be on the focus of the glass, which of course will change as Harry raises the glass to his lips and the camera moves back. This means that the cameraman must correct these focal changes, while the camera is moving, to hold the picture constantly in focus.

You might ask why make it harder by dollying back at the same time that Harry raises the glass to his lips. The answer of course is that it must be done if we are to follow the glass to his lips as we are too close on our opening shot to get a picture of Harry's face, though we automatically take advantage of the distance between the glass on the table and Harry behind it, as his face is farther from the camera than the glass in his extended hand. Instead of moving the camera we might have Harry move but this is usually very bad practice for we lose contact with Harry the minute the program starts. Just as in the theater once the curtain rises the actor is pretty much "on his own." It is much simpler and we constantly control the situation by having Harry hold his position while we move the camera. The distance we dolly back is also important and it is something that cannot be determined until we see the picture at rehearsal.

We might stop here for a moment and discuss another way of opening this scene. The director may want to pull #1 back far

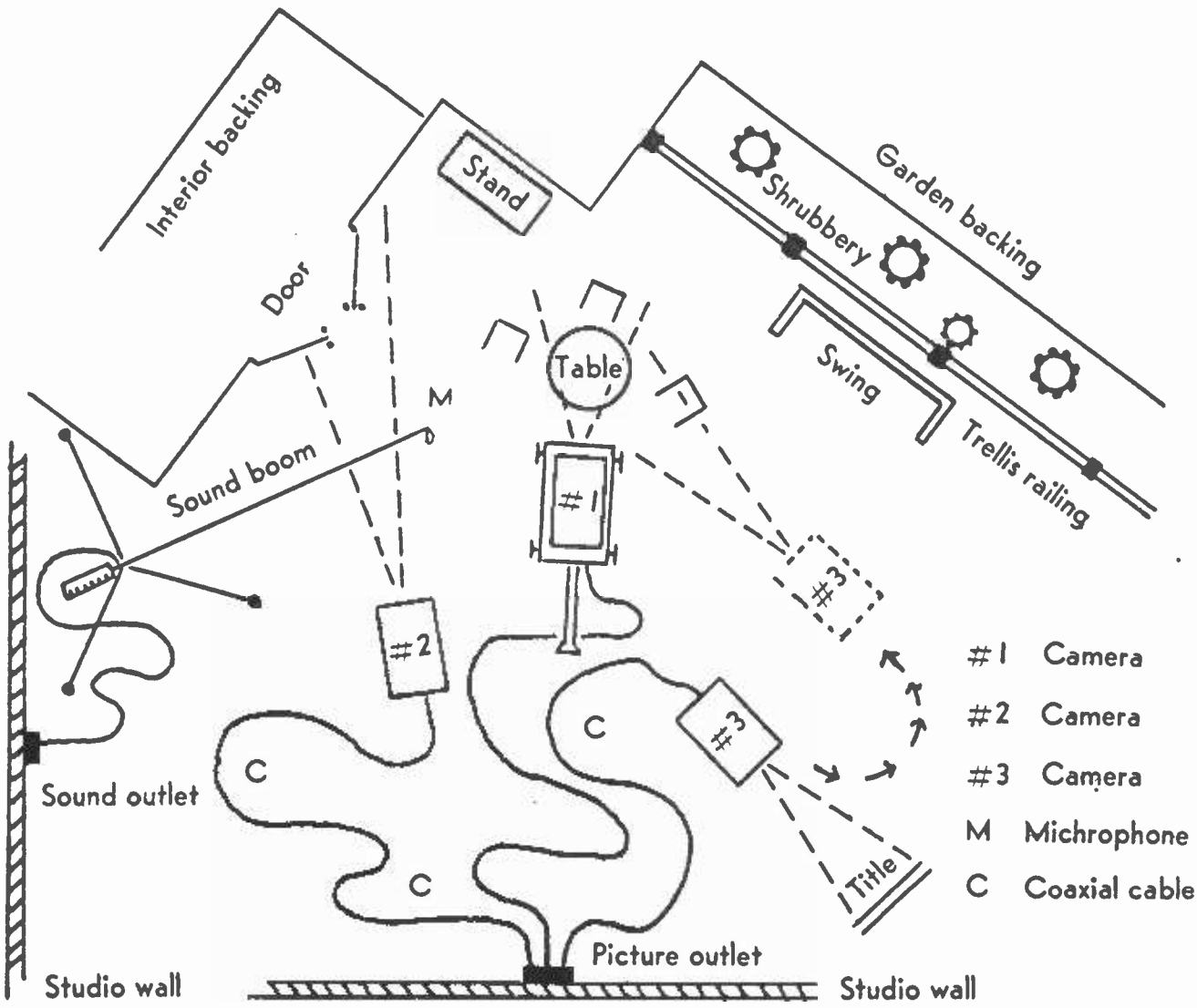


Diagram of camera positions in opening scene of "Destiny"

enough to disclose the whole scene; to establish at once in the minds of the audience, where the scene is taking place. If this is done, at the end of the movement Camera #1 will be too far back to get a good close up of Harry's face. If this procedure is decided on—Harry's business and the dolly back must be slowed down to give #3 time enough to get into position for a good C.U. of Harry. If this took too long, obviously camera directions could be changed and #2 could take the C.U. of Harry while #3 covered Grace. If it is decided to do this, it will at once become necessary to change all the following camera shots. While the shots may be the same, they will be picked up by a different camera and they must be set in advance as the operation of all cameras must flow right through the program and any change in routine on one camera may affect the others. It is usually best to indicate camera changes in the pre-rehearsal script but to delay actually designating the camera numbers until you get into a

camera rehearsal in the studio. The effect of the little opening scene might be heightened if we switched to Grace in the doorway before she spoke. This would let the audience in on the fact that Grace was watching Harry and on her line "Hello" we would cut back quickly to Harry on #1 who would react on Grace's "Hello" and then proceed as before. Were we to decide to do this we need not seriously upset our camera routine, as we are simply adding shots for #1 and #2. But let us continue with our original plan of operation.

The position of the #2 camera is important as it is our first glimpse of Grace and she immediately X's to the table and sits. We must have our camera in such a position with relation to the door and table that Grace will cross on a line parallel with the lens of the camera. Wherever we have action by actors it is advisable to pick them up with a camera that is so placed that they do not directly approach or recede from it. A direct approach to the camera can be used for special effects but in normal scenes it is desirable not to change focus, once we have switched to a camera, unless that camera is on a dolly as explained above. All movement wherever possible should be planned in the same focal plane. The moment Grace sits in the chair, #3 is focused for the C.U. it is to take. We now have Grace and Harry both in on #2's shot. All through this opening scene we have kept #1 in on a C.U. of Harry. We now prepare to take advantage of our dolly to show more of the entire scene. At this moment #3 is on a C.U. of Grace, #1 on a C.U. of Harry, and #2 includes both. This whole operation is really keyed to the original position of #2 for the cameraman has had no time to move the base of his camera and from his opening shot on Grace he must be able to merely pan as she X's to include Harry.

The suggested camera routine just discussed is predicated on the assumption that we have a wide angle lens on #1, a medium lens on #2 and a narrow angle lens on #3. Thus #3 could get a close shot of Grace even though the camera was further away from her than either #1 or #2. Camera #1 now moves back to include both Harry and Grace and #2 is released for Aileen in the door R. Camera #1's final position, that is, the distance it pulls back is of course a decision of the director.

Quite obviously there are many ways in which the scene just described could be televised. The lenses, wide, medium, and narrow would not have to be on the cameras indicated here. Lenses could be changed by merely rotating the turret head in the cameras and close-ups or long shots would be available without moving the cameras. A director might want to open the scene with a long shot to show the whole set especially the position of the door with relation to the table, and then dolly in to a C.U. But, regardless of what the camera routine is, every shot must be worked out at rehearsal and plainly marked in the script, so that when the time of broadcast rolls around every movement of every participant in the program is definitely set.

6

THE PROJECTION BOOTH

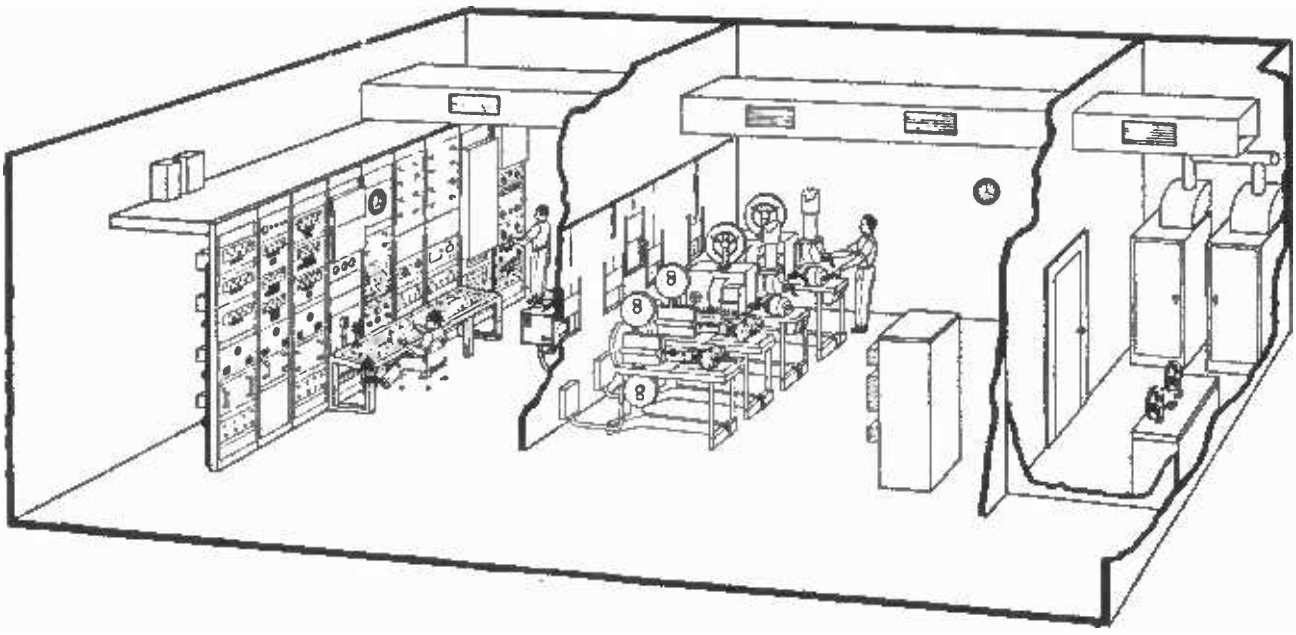
Motion picture film is one of the most important sources of program material in television. Many thousands of feet of film have already been broadcast over the now existing television transmitters throughout the world and transcribed television programs on film have already won a place second to none.

The television projection booth may physically be situated anywhere near the main operating studio. It need not be necessarily adjacent but it should be conveniently close to save wire installations and time involved in physically going from one studio to the other. But from a television operational standpoint it can be located anywhere in the main studio building. The equipment in this room will depend on the size of the station but, in general, it should contain at least two television camera chains. This means two pickup cameras so arranged that they may feed to the transmitter the pictures from 35 m.m. motion picture film, 16 m.m. motion picture film, and still pictures in the form of slides. And naturally it must contain the necessary motion picture and slide projectors. The television cameras will of course require the electronic controls, that are required in a "live" pickup studio. The personnel usually involves three men—the supervisor, the projectionist, and a video and sound engineer. The actual

personnel may vary depending on how the output of the studio is handled.

The Physical Arrangement

Motion pictures and still slides are projected into the television camera in the same manner that they are thrown on the screen of any theater. The only difference is the size of the picture projected. The television cameras in some stations are mounted on a track to enable them to be moved in a direction parallel with the lenses of the projectors so that one television camera may pick up the output of several projectors. But the cameras must be so arranged that they can be firmly locked in position directly in front of the projector in which the film is running.

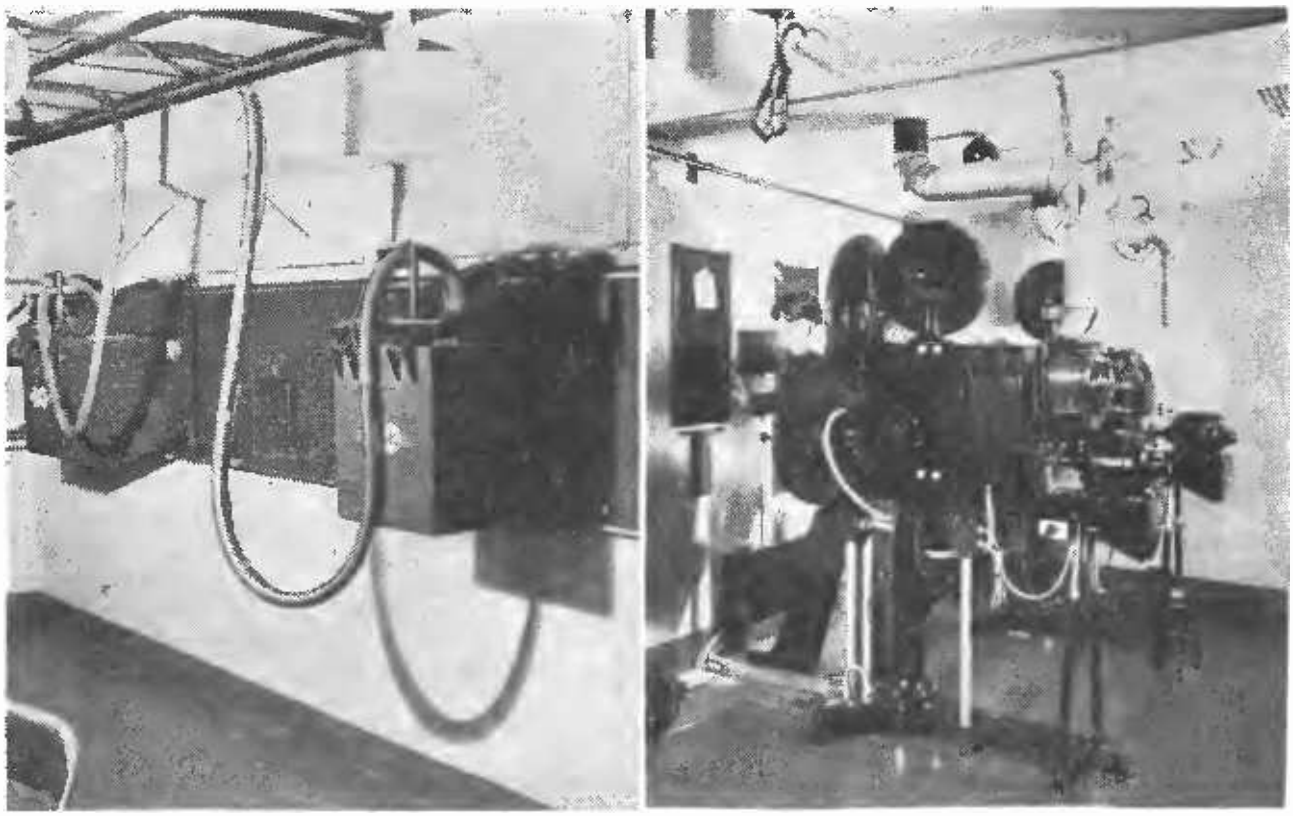


CUT-AWAY DRAWING OF THE TELEVISION PROJECTION BOOTH. CONTROL ROOM AND MONITOR SCREENS AT LEFT, THE FILM PROJECTORS CENTER AND CUTTING ROOM AT RIGHT

In a studio camera the object to be picked up is focused on the sensitive photo electric surface of the pickup tube, by means of lenses in the camera itself. In picking up motion pictures, the lenses in the television camera are removed and lenses in the projector are used to focus the picture on the plate. Thus, through proper adjustments, a picture the exact size wanted is thrown on to this plate and the picture is then scanned electronically as it is in an ordinary television camera.

Motion Picture Projection

While this description aptly describes the pick-up of a still picture, motion pictures are the same up to a certain point but they need another control. Thirty-five millimeter film is projected at the standard rate of ninety feet a minute of twenty-four frames per second. Television standards call for thirty frames per second. To synchronize the two a special shutter is attached to the motion picture projector. Standard motion picture projection is intermittent, that is, the pictures you see in a theater are not constant. What happens in the motion picture projector to pictures you see on the screen today is that a single frame of 35 m.m. film is thrown on the theater screen. Then a shutter, revolving at



Left—The film cameras on sliding rack in the motion picture viewing room. The film projectors are behind wall.
Right—The motion picture projectors in the projection booth. The television cameras are behind ports in wall.

a high speed spins in front of the film cutting it off for a fraction of a second. The shutter then opens a second time, again flashing the same picture briefly on the screen. Then the shutter closes for the second time. During the time the shutter covers the picture for the second time, the roll of film is jerked quickly one frame

ahead, the shutter opens and we see the next frame. This whole operation is sensible only because of a little quirk of nature known as persistence of vision. Our eyes hold the impression or image of the picture we have seen long enough for the shutter to close and the next frame to be pulled into place. Motion pictures prove the old phrase "seeing is believing" to be an utter fallacy, for half the time we spend in a moving picture theater we spend looking at an utterly black screen. But in a television motion picture projector, the shutter and the intervals at which the film is moved ahead are adjusted so that we see six of the 24 frames for an additional fraction of a second. The whole thing is really a mathematical trick but it works out so that the television camera sees the picture 30 times a second and we see the motion pictures on our home receivers.

As we mentioned before, the television camera is so mounted that it can slide from one film projector to another. This is particularly important in any installation, as it may govern the amount of equipment needed. Big T V stations will have probably two standard 35 m.m. projectors; two 16 m.m. projectors and two or three slide projectors. These might include a projector for 2 x 2 inch slides, 3¼ x 4 inch slides, and a Belloptican or some similar arrangement for picking up small still pictures. This means you may have seven or eight projectors of one type or another. By sliding the television cameras in front of each projector as it is to be used, the saving in electronic equipment is evident. Two 35 m.m. projectors are necessary, as the standard film container is not large enough to carry a full length motion picture. The ordinary projector can carry only about two reels of film. When the film has run out on the first projector, the second is started and the picture is shown without a break.

The problem of synchronization is an important one in all television program operations where film is used. Care must be exercised in all switches from film to film or from film to studio to avoid gaps of blank screen on the home television receiver. Dead air is one of the unforgivable errors of radio and it is just as necessary to avoid in television. Some television station operators used to think nothing of asking their audience to spend

many precious minutes looking at a blank screen while some one got a projector up to speed, changed a slide or simply made a mistake. When a switch is to be made from any live source of programs to film, the projector must be started before the switch is made and the director must see the picture on his preview monitor before he throws the output of the film projector on the line.

Audience Reactions

While operations of this kind require accurate judgment and experience they are simple if they are handled intelligently. And they are very effective. In one early studio dramatic program we had previously made a short motion picture sequence showing the actors in a hansom cab. As the first scene in the studio ended with the line "Come on, we'll go over right now"—we faded into film and saw the actors on their way. The audience viewing room at that time was separated from the television studio by a plate glass window covered by a shade. Before the show started the visitors were able to see the scenery, actors, and camera in the studio but just prior to the start we pulled the shade down and watched the program on a television receiver. All was normal during the first scene but shortly after we switched to the film sequence of the cab driving down the street, one of our female visitors rose from her seat and raised the shade in order to see into the studio. "What is it?" we asked. "Nothing," she replied, "I just wanted to see the horse."

Use of Film

Motion picture film will always play a big part in television programming and all of it need not be the standard theater size.

The use of 16 m.m. sound film is possible and lots of it has been used; in many stations it has eliminated 35 m.m. entirely. The synchronization problem is not a difficult one as sound 16 m.m. film uses the same number of frames per second as 35 m.m. While we still have the intermittent blank screen moments the same shutter procedure is used in a 16 m.m. projector as in a 35 m.m., so that when it is adjusted to conform to television requirements we get 30 frames a second for television scan-

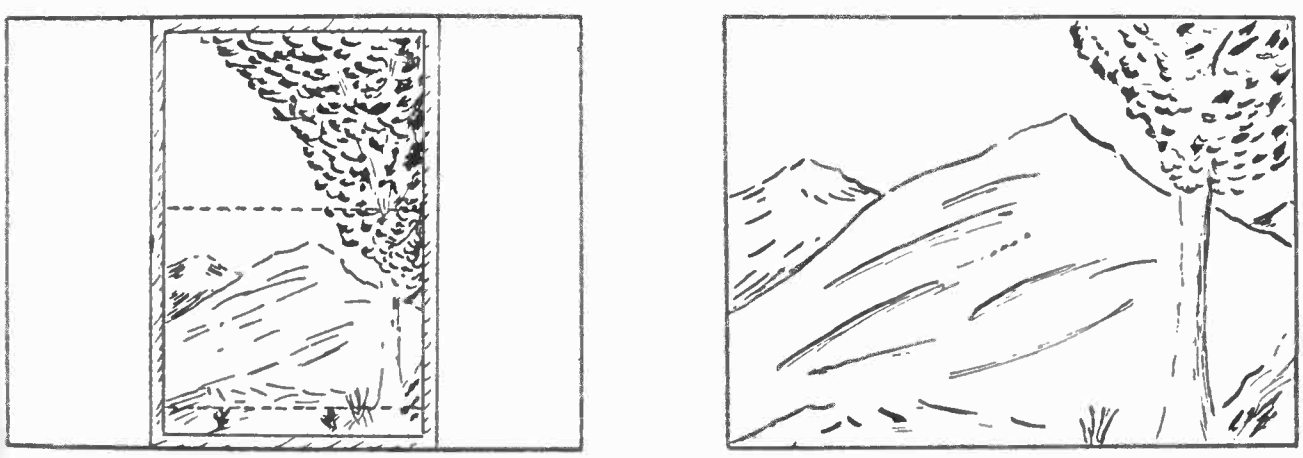
ning. If 16 m.m. silent film is to be used another projector with proper shutter adjustments will be necessary as 16 m.m. silent film runs at 16 frames per second. The two factors that are detrimental to the use of 16 m.m. film are, first, the quality of the sound is far below that delivered by 35 m.m. film. The equipment being used today reduces the brilliancy of the sound quality to a noticeable degree. Secondly, the visual quality suffers as well. This is caused by the fact that the picture on the 16 m.m film is so much smaller in size it is impossible to get as much light through it and consequently we fail to get as clear a picture projected on the pickup tube as that from the larger film. But the advantages gained by using 16 m.m. film more than outweigh any loss of picture quality. First, if 35 m.m. film is used it means that you must have a fireproof projection booth as it is highly inflammable. In the second place the film costs are considerably higher both as to raw stock and processing and projectors are very expensive. And lastly taking pictures with 35 m.m. cameras is a highly competitive commercial business but the thousands of 16 m.m. cameras all over the world are a valuable source of potential program material. In spite of the loss in quality, 16 m.m. film is used extensively.

Still Pictures

The still projectors (there must be two of them if we are to avoid seeing the slide pushed into the picture) are a very important adjunct to any television station. Any still picture or photograph that might be picked up from the studio may be made into a slide either 3½ x 4 inches or 2 x 2 inches and projected into the system just as motion pictures are. The sizes given are the slide sizes. The picture is matted down still further in each case. The use of this equipment is almost constant. Call letters, visual announcements, pictures of all kinds can be used very advantageously and better results can be obtained in most cases by using a projector than is possible in a direct studio pickup. By shooting a picture or card direct in the studio you eliminate one step of preparation—that of making a slide from the picture—but if it is subject matter that is to be used often, such as call letters or a standard announcement, then the space

The film monitor desk. The cameras are behind the operators.

saved in storage alone more than makes it worth while to reduce it to a slide. If this is done and the picture or card is reduced to film in a well equipped photographic studio, perfect lighting may be attained, and this is reflected in the resulting television picture. Another advantage is that all television pictures must be wider than they are high. Roughly this is in a 3 x 4 ratio. If we



Full picture

Camera should move in to properly frame picture

EXAMPLE OF POOR AND GOOD FRAMING OF A STILL PICTURE

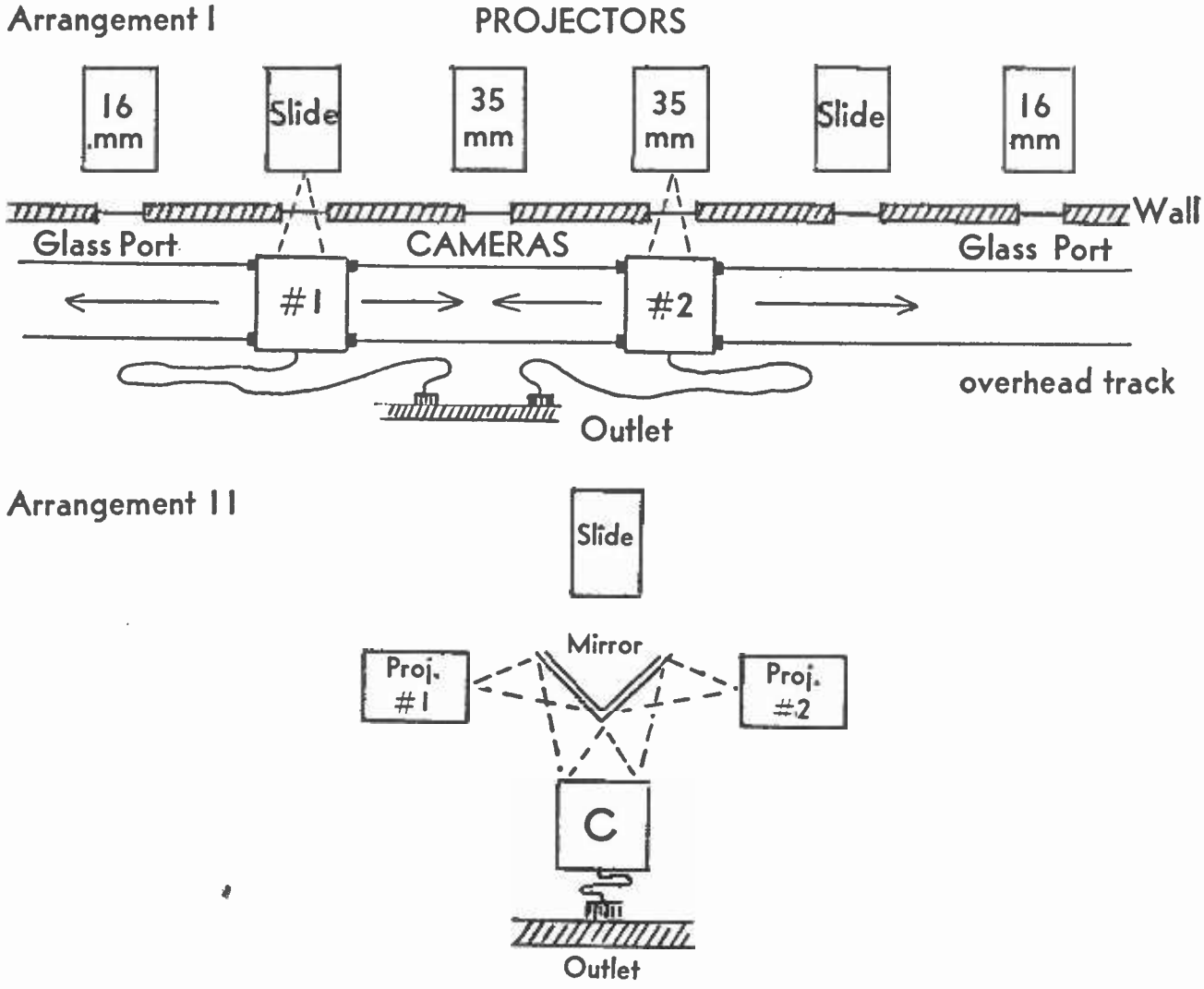
have a picture higher than it is wide then it must be properly "framed" to get the best results on television.

Of course this can be done in television studios but better results can be obtained if it is done by photography. In addition, every shot put on from the film projection booth frees a studio camera.

A projector that will pick up direct from post cards, small pictures, and printed matter will enable one to project them directly into the system and this equipment, while not a must, is a valuable addition to any television studio.

Importance of Proper Installation

In laying out the pickup equipment arrangement in the film studio, thought must be given as to how the projectors will normally be used. Once they are installed they cannot be moved



POSITION OF FILM PROJECTORS WITH RELATION TO THE TELEVISION CAMERAS IN THE PROJECTION ROOM

readily and if only two television cameras are to be used, then the position of the projectors with relation to the pickup equipment is very important.

The accompanying diagram gives an idea of how the equipment might be arranged.

This arrangement allows the most facility in normal procedure as it gives greater freedom of operation. We must be able to slide our cameras in front of the projector wanted without limiting our program demands.

We will constantly see new developments in T V equipment. One of these has added considerable flexibility to the use of cameras for picking up film. In fact it virtually makes one camera do the work of two. The device is simply a clever arrangement of mirrors. (See Arrangement II.) Two projectors are so installed that the output of both is thrown by means of mirrors directly into the camera. The picture from projector #1 strikes the mirror set at a forty-five degree angle to the camera and the reflected picture is thus thrown on to the plate of the pickup tube. The second projector is mounted to throw a picture from the other side. This means that no movement of the equipment is necessary. The light source in projector number one is dimmed as a reel finishes and the light in number two is turned on. Thus a continuous flow of program material is possible and the permanently mounted equipment is cheaper and simpler to operate. If a slide projector is installed above the mirrors in such a way that its projected picture strikes the camera plate from only a slight angle, three sources of pictures are made available for programs. Regardless of what equipment is used, thought should be given to all studio installations from a program point of view for, after all, the smooth operation of the station's output is the important thing and programs should not have to be limited by the placement of equipment if this can be avoided.

Various animated announcements may originate in the film studio. One ingenious arrangement throws a clock face with the correct time directly on to the pickup tube. Another contrivance projects a kaleidoscopic effect into the system with very favorable results. As said before, when cameras in the film studio are used, personnel and equipment are released in the main studio. Oper-

ative costs are, and will be, high; but careful working out of schedules will often make a big difference on the final cost sheet.

Aside from film projection equipment, the film studio will need turntables for picking up music and recorded effects. In the early days of the war motion pictures of the London bomb raids were shown. By supplementing the sound on the film with phonograph recordings of guns, aeroplanes, and bombs and by feeding both the film sound and the recorded sound into the system the overall effect was considerably heightened.

The Announce Booth

Somewhere in or adjacent to the projection studio, should be an announce booth. This operates practically the same as its counterpart in radio. It is designed to free other studios, when only a single voice is needed for any program operation, in con-

The announce booth. Announcer center reads narration to accompany picture seen on receiver left. Director cues him for proper synchronization.

junction with silent motion or still pictures. It is not arranged for a video pickup but its usefulness is obvious. It is equipped with a microphone, a picture line monitor, and turntables. The phonographic pickup equipment that is used in conjunction with the film studio may be located in the announce booth if it is so desired.

Station call letters must be given orally as well as visually. So to use the least equipment they are presented visually by a slide in the still projector and orally from the announce booth. In the operation of the booth the announcer merely follows picture operation on his monitor screen and opens his "mike" when he should come in. Comment on still pictures or silent movies is thus handled simply and efficiently. While it is not an absolute must, an announce booth will more than pay for itself in only a few months of broadcasting.

7

THE MOBILE UNIT

While every angle of television is full of interest and excitement, the one department that will probably transcend all others for romance and glamor is the mobile unit.

What the eventual television mobile pickup equipment will be cannot be definitely stated at this time. Already the heavy two truck unit is practically obsolete and the same must be said of the three truck unit in use in London before the war. Units have been put together with power supply, transmitter, and pickup equipment all in one light truck, and no one knows how far improvements and inventions will carry us in the future. But in this chapter we will discuss the mobile unit as it was before Pearl Harbor for no matter how the equipment is improved the same basic operational problems will remain.

Outside Pickup Equipment

Before the war the Mobile Unit mounted on two ten ton trucks consisted of a traveling control room and a television transmitter, capable of sending both sight and sound back to the main

transmitter. The control room unit was equipped with virtually everything found in the studio control room. This included generators, synchronizers, amplifiers, shading controls, viewing screens—in short—everything involved in picture and sound pick-up. The crew consisted of two camera men and a sound man outside the truck and a shading operator, a sound engineer, and a supervisor, who acted usually as a switching operator, inside. Just as in a studio pickup the output of the two cameras was seen on a preview screen as well as on a line monitor. The picture had to be electronically shaded and the sound monitored but from there on the similarity with studio procedure ended, if it ever began, for a mobile unit crew faced problems that never beset their fellow engineers in the studio. Their day started early

The mobile unit trucks in Rockefeller Plaza. The camera and parabolic microphone are being operated from the roof of the truck housing the control room. The antenna of the television relay transmitter on top of transmitter truck at right.

with the truck chauffeurs delivering the equipment at the point of pickup.

Let us follow through an ordinary broadcast of a horse race. First and most important the original survey had to be made, which meant approval for the broadcast by the proper authorities. A power check was necessary for no picture was possible without 3 phase 60 cycle alternating electric current available to the unit at a location close by the point of pickup. During an early demonstration in Washington, D.C. we found that a picture from the Capitol of these United States was impossible, for in 1939 there was no alternating electric current anywhere in the building. After suitable power leads were found the camera and microphone positions had to be decided on and a line of sight location picked for the antenna.

Let us look for a moment at the truck which housed the transmitter. On the roof was an adjustable antenna. This steel pole when raised to an upright position sent the pictures picked up by truck #1 back to a receiver at the main transmitter. Within this truck were generators, amplifiers, and all the electric power supply equipment necessary for operating picture and sound transmitters. This equipment was powerless, however, until a local source of electric power was hooked up with the equipment.

In England the three truck unit included in addition to the transmitter and control room, a mobile power supply, a generator motivated by a gasoline engine. This arrangement removed the limitation of finding adequate power at a broadcast location but our unit did not include this. All new models will probably include some arrangement for generating their own electricity so that the location of future sites will be broadened considerably.

A Typical Day's Work

At our race track location we have parked the trucks in a position where we can reach power, where we have line of sight transmission to our main transmitter, and where our microphone and camera leads will reach the pickup points decided on. It may well be that from where our trucks are parked it is impossible to send a picture back but from the roof of the grandstand

we have line of sight. This means that our transmitting antenna must be installed on the roof of the building and this may result in a lot of hard work, for all the equipment necessary must be taken up and assembled. Obviously, we must have at least one of our cameras on the roof, if we are to attempt to see across the track; so the camera and microphone with their wire leads are hauled to the top of the grandstand. Our second camera might be wherever we wanted it as long as we have sufficient camera cable. We found that by installing it near the paddock we had something of pictorial interest between races as we could see the horses and riders before they went to the post and from that position we could interview interesting personalities.

In early operations cameras differed from those used in the studio as far as focus and camera finders were concerned. In the studio the camera operator saw the picture he was picking up on a ground glass within the camera case, but in mobile unit operation this arrangement was far from practical. In the studio everything to be televised had been predetermined and the visual subject matter was relatively close to the camera; consequently a viewing screen, either on a ground glass or on a kinescope attached to the camera, was perfectly satisfactory for studio operations; but when we attempted to cover outside events neither the director or cameraman knew in advance what the next picture would be. At a football game, if a kick was blocked and the camera man had his eyes glued to a view finder, he would have to leave his finder, see where the play was going, and then swing his camera to cover it. This procedure was not suitable for practical operation, so a rifle sight was provided for our mobile unit cameras. This arrangement lacked the precision of a studio finder but allowed the cameraman to see what was going on outside the restricted field of vision of his camera. But the introduction of the electronic view finder and turret head lenses changed all this. Today a remote cameraman sees the picture that the audience is seeing on his viewing screen just as in a studio camera. He is of course in a fixed position. His camera doesn't move. But by using the multiple lenses available to him he may take long shots or close-ups as required. His problem always is to use the right lens at the right time on the right subject matter and the results that

are being attained today are excellent. We expect to see close-ups of an outfielder in baseball catching a long fly ball or a football forward receiving a pass and we do. The credit for this should go to the cameraman. He must gauge his shot—focus it and then keep the action centered on his viewing screen.

The Outside Camera Men

Telephone connections are of course established from the control room in the truck to the cameraman and the program man at the point of pickup, but in normal outside operations the studio procedure, where the director tells the cameraman what to shoot, is not used. This is our only choice, for the director in the truck can only see what appears on his viewing screen. He has no way of knowing what is going on unless the camera covers it. He still has the choice of cameras as he may switch from one to the other but he is extremely limited when it comes to making decisions on subject matter. Because of this the mobile unit cameraman must take the responsibility for what the audience sees. We have two way communication lines to the camera but cameramen can only talk back to the director when their cameras are well away from the announcer's microphone, for if he were near it any conversation from the camera end would be picked up by the mike and broadcast to the audience. Because of his restricted point of view the director becomes the voice of the television audience. If he fails to see something he wants to see, he makes it known to the cameraman and if he sees anything that isn't perfectly clear he asks the announcer "What and Why?" The announcer then clears up the point over the microphone which is heard by both the director and the television audience; but the success of an outdoor pickup depends for the most part, on the cameraman.

Remote Camera Control

In prewar broadcasting, outside cameras were equipped, for a while, with a remote focusing control. On the studio cameras each cameraman focused the picture he was seeing on his viewing screen, but on the mobile unit cameras, the cameraman had no means of seeing what he was picking up except by estimate through his rifle sight and, consequently, he had no means of

checking his focus. So a special device was installed in the truck and the camera was focused by remote control. By turning a small handle at the control board in the truck, a small motor on the camera was made to move the lens in or out. Actually there was considerable physical motion in the lens, and one of the pet jokes of the crew was to leave the camera standing alone; usually it was immediately surrounded by a group of small boys, and some not so small. Nearly always somebody would attempt to look into the camera from the front end; as he stuck his nose almost against the front lens the boys in the truck, who could see what was going on, on their monitor screen, would spin their focusing control and suddenly the lens would start forward right at the person in front of the camera. To say that it was surprising,

Remote control focusing device on mobile unit camera.

to the would-be investigator, was putting it mildly. He usually retired to a respectful distance after such an experience, for to see the inside of the camera suddenly coming right at him through no visually apparent means, was awe inspiring to say the least.

The remote control focusing device had both advantages and disadvantages. While it eliminated a job for the cameraman and allowed him to concentrate on keeping his camera on the center of action, it made the operation in the track much more involved. The man on the controls was faced with the problem of focusing the camera on what he saw and not always on what the cameraman wanted to show. In Washington, on an early demonstration out-of-doors, we had arranged for a blimp to fly over the camera. That afternoon, while we were picking up interviews, we got word that the blimp was in sight. We told the cameraman to go up and get it and he immediately tilted the camera up and our viewing screen showed an expanse of sky. But no blimp. We went through focus from end to end. Still no blimp. After about three minutes of empty sky we finally gave it up. This occurred of course because we went through the correct focus on the air ship without knowing it. We simply couldn't see it on our viewing screen because of its small size due to its height. But today the outside cameraman must deliver a properly focused picture.

At the Track

We have wandered a long way from our horse race so let us get back where we are set up and ready to go ahead. Both picture and sound pickups have been tested and we have made an air check with the main station. The picture is sent back from our truck transmitter to the receiving antenna near the main studio and is lead from there into the master control room where both the picture and the sound are checked. This arrangement, sending the picture through master control and not directly to the main transmitter, allows the mobile unit program to be handled in the same manner, as far as program traffic is concerned, as a program eminating from any of the studios. With everything OK, we relax until air time.

Some few minutes before the start of the first race we get our signal to go ahead. We open on our #2 camera at the paddock

where our announcer greets the audience, gives them the line-up of the day's racing, and interviews jockies, trainers, and prominent sport fans. Then, as the horses come into the paddock, we get a picture of the men and horses in the race. The horses leave for the track and we switch to our #1 camera on the roof of the grandstand where our racing commentator takes over the microphone.

Racing on television has its handicaps from a pictorial and entertainment point of view. In the movie newsreels, we almost always see only the last of the race—the home stretch and the finish—and always this is a good close-up. The elapsed showing time is measured in seconds. But in television we take a whole afternoon and any comparison in picture values must take into consideration that with our telephoto lens we see everyhing that a spectator at the race track would see—but no more, and we see it in the same elapsed time as he does. To a person who is not interested in horse racing a television afternoon of this sport might be extremely dull. Everything except the race itself seems to drag unmercifully, for we must remember that six races take less than ten minutes to run but the sport is so handled that it takes about three hours to see it done. At the track racing fans compensate for the long waits between races in many ways, but at home we do not have the same facilities. We see but we cannot participate. Another handicap is that the objects in the pictures are all too small. If the race starts on the other side of the track, we see tiny specks moving on our television screen. But in spite of these handicaps the real value is that what you are seeing is taking place at the moment you see it. *The moving picture version is a visual historical record—but on television we are seeing history being made.*

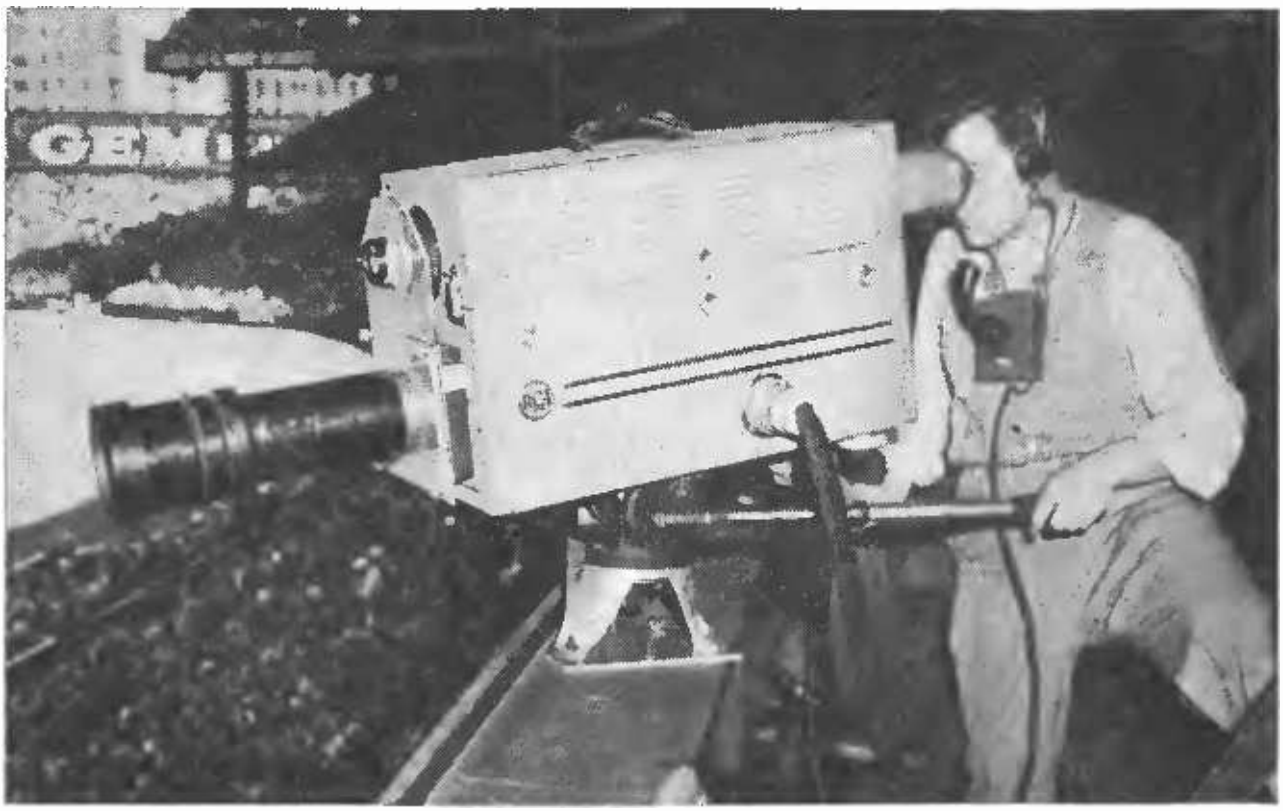
There was a rather amusing sidelight in connection with our racing programs. It seems that bets were being made in a back room somewhere in greater New York and the results of the race were phoned to the room after each race. As there was no hurry there was always some delay before the man at the track made the call. An enterprising better discovered a television set virtually next door to the bookmaker, so he would watch the finish of a

race and then walk next door and place his bet on the horse that he had seen win. When the telephone call came, he would collect his money. The racket didn't last long as the bookmaker bought a television set.

In the early days of television programming we used to swing the camera on the pari-mutual betting board and leave it there between races, but in the future we will probably cut back to the studio or develop something of interest at the track. On the whole, mobile unit race track pickups are not only feasible but good television fare.

The Orthicon Camera

Probably the most important pre-war addition to the mobile unit pickup equipment was the orthicon camera. This camera tube, a later development than the iconoscope, was not an improvement on the first tube but another way of doing the same



Size of lens used in early outdoor pickups.

job. The results varied tremendously. The orthicon was more sensitive than the "ike," but the resulting picture never gave the detail possible with the other tube. In a given scene, with good lighting, both pictures were satisfactory, but the results obtained

with the iconoscope were much the best as far as details were concerned. If both types of cameras were used to pick up an event on a clear day, with the sun shining brightly, both pictures were good but, as the sun began to go down, we saw startling things happen. As the light faded the orthicon picture began to far surpass the iconoscope. We had no more detail in the orthicon but we had far less in the iconoscope; and so by comparison, it shone like a jewel at low light levels.

Actually, a large part of the mobile unit pickups made in New York would never have been possible without the orthicon. On dark winter days it was indispensable. Football broadcasts have been successfully picked up in light so low that it was necessary to turn on the "night baseball" lighting equipment at the playing field to enable the players and spectators to see the ball. The orthicon camera enabled the television viewers to follow the game. This could not have been accomplished without it as the iconoscope picture had gone completely hours before.

Basketball and boxing pickups would never have been possible without the orthicon as only that camera would deliver a picture with the lights available. The telephoto lens was installed in the orthicon and all the outdoor close-ups were taken on that camera. It was designed with a ground glass viewing screen in the camera similar to the studio cameras and, because the cameraman was always interested in close-ups, this arrangement worked very well.

Camera positions were always important in outside pickup as well as truck locations. The trucks could never be further from the point of pickup than the coaxial cable lead, and there was a limit to the amount that could be carried. Naturally, the time of day and the sun decided most of our problems, at least to the extent of limiting the positions from which cameras would function. We have shot pictures from the third row at championship fights, from the rafters in westling arenas, from the tops of trucks, buildings, and second-story windows. For some time to come the man in charge of mobile unit pickups, when planning a program will have to consider where he can get the necessary power, where to place his equipment, and where to locate the antenna to get the picture back to the main transmitter. What will the weather be? If the sun is out, where will it be with relation to the shots

he wants to take and last, but most important of all, where will he put his cameras? Once all these problems are answered a very interesting television program is possible.

Sending the Picture Back

So far we have only considered the possibility of sending the television pictures to the main transmitter by means of a radio link. We are referring to the transmission of the picture signal from the mobile unit transmitter to a receiver at the main broadcasting studios, but it is possible, if the distance is not too great, to send the picture back from the point of pickup by wire.

Prize fights, hockey games, and basket ball games were picked up in Madison Square Garden in New York and sent to the studio by a balanced pair of ordinary telephone wires. This arrangement is limited at this time to inter-city operations but its use simplifies the problem when the event to be broadcast is relatively near or the relay transmitter cannot be placed so as to make the use of the radio link feasible.

Later Developments

As we pointed out at the beginning of this chapter, real changes have been made in remote pickup equipment. This has been possible by the continual development of the image orthicon camera, which we will discuss later. The gear necessary for a good picture has been improved, simplified, and refined. Today's trend seems to be toward what is called "suit-case" equipment. This means, in the main, that all the electronic paraphernalia that was formerly permanently installed in the trucks has been broken down into small portable units. The use of this equipment has altered the operation of the crew to some extent but, whether the necessary electrical equipment is in ten-ton trucks, station wagons, or is carried by hand, the basic problem remains the same.

In the "suit-case" operation the necessary camera control units, monitor and switching control units and the synchronizing generator are all contained in portable cases. These, together with the cameras, tripods, coaxial cable, and sound equipment, must be transported by automobile to the desired location and then by

hand to the actual point of pickup. Once there the various units are connected, the cameras and "mikes" set, and a lead is run to the terminal of the telephone wires or relay link which will carry the picture back to the master control room at the main studio.

While this type of equipment eliminates the necessity of finding a parking place for the trucks it adds a problem in that space suitable for a control room must be found near the point of pickup. There the equipment is set up, the output of the cameras and sound pickup is monitored, and the director handles the program just as he did from the truck.

The portable control equipment necessary at the point of pickup in addition to cameras when the truck is not used.

The value of this type of equipment is evident for semi-permanent pickups, especially if two or more broadcasts are to originate each week from any given location. Its portability

really adds studios to any broadcasting station. It may be installed in a light truck or an aeroplane and should broaden the scope of tomorrow's remote television programs, providing on the spot coverage of the news as it happens.

In normal operations the announcer sits in a position where he can see the action on the field but in front of him is a television monitor where he can see the picture that the home audience is seeing. Thus it is possible for the director to show by proper camera switching the event the announcer is describing or the announcer may explain a picture that the director puts on the line from any of his cameras. Team-work on the part of the cameramen, the announcer and the director is essential to a good program.

8

THE MASTER CONTROL ROOM

Now as we leave our studios and mobile unit, which are both program pickup points, we might take a look into the master control room. This is the traffic tower through which pass all the programs that the television audience eventually sees. It is the final check on pictures leaving the studios and the switching point for all operation. Its specific location will probably vary at each broadcasting station due to the physical setup of studios. Considerable latitude is possible as almost every station operating today handles the problems involved in a different way and from a different location, but somewhere at each station you will find a master control room or its equivalent. It is there that the programs, eminating from the live talent studio, the mobile unit, or the film studio, are finally assembled and sent out to the audience as an organized whole. It is the central contact point for all the elements of a flowing program schedule.

Facilities, of course, include all the necessary electronic equipment for sending the picture on its way and, most important from a program point of view, a preview screen that may be switched to any point of pickup, a line monitor where we see the

programs as they go out, and an off the air monitor where the pictures, as they are sent out by the transmitter and received on the average receiving set, may be seen and checked.

A Typical Operation

Let us look at a typical two-hour program schedule and see how the master control room would function. In normal operation today, each television broadcasting station is required under its license to give its frequency and power at the start of every broadcasting period. This "sign on" is usually followed by test pattern, for audience set adjustments. The test pattern may originate in the master control room itself, through the use of a special monoscope in which the test pattern is permanently etched on the mosaic. This is done to save personnel, as the test pattern can be sent directly on to the line without requiring a cameraman or attendant. It could come from the main studio.

Test pattern broadcast prior to regular program for receiver adjustments.

with the test pattern on a card—which necessitates lights, camera and operators in the studio, and a control engineer in the studio control room—or it might come from the film studio where the test pattern would be fed into the system from a still projector. The "sign on" requires an oral announcement as well as visual call letters. After this is made and while the test pattern is on the air, accompanying sound might be the radio programs being broadcast by the affiliated radio station at that time or simply a constant test tone.

Let us assume that we are going to follow our opening announcement with a test pattern, that the visual call letters and test pattern are to come from our film studio, that the oral announcement is to originate from the announce booth and that we are going to follow it with records. Normal procedure would be for master control to check with the film studio, where the call letters would be on one still projector and the test pattern on the other. Knowing that they were ready they would preview the output and check picture levels. Next they would check the announcer in his booth and make a sound test and then contact the point that was to originate the music to accompany the test pattern and test the pickup from there. Then they would line up controls to feed the picture and sound from these two pickup points to the transmitter. A final check with the transmitter to see that all was well there and then they are ready.

At the appointed hour—we will assume the time set is seven thirty—a switch is thrown and the output of the film studio is fed to the transmitter, the announcer is notified by telephone to go ahead, and the program is "on the air." At this point visual program controls go to the film studio, for at the conclusion of the opening announcement the operator in charge switches from camera #1 which is picking up call letters to camera #2 which is carrying test pattern. Master control would switch the sound lines to wherever the accompanying sound was to originate and would be free for a moment to check picture level, brightness, shading, pedestal, synchronizing generators, sound level, and the thousand and one things that must constantly be watched to keep the television picture at its best.

The Flow of Programs

At eight o'clock the record program would conclude. The operator in the film studio would switch back to camera #1 for call letters and master control would switch sound channels to wherever the oral station announcement was to originate. Usually this is done from the studio that is to originate the next program; if it is to come from outside the building, it would come, of course, from the announce booth.

Let us assume that the next half-hour program was to come from our main studio and the oral announcement preceding it was to originate there as well. While the test pattern was on, master control has tested the visual and oral signal from this studio and so, as the film studio switches their camera to the visual call letters, master control throws the sound channel to the main studio and gives them a "go ahead." The announcement ends, and the visual output from the film booth is switched to the main studio.

The director in the main studio now controls the output of the station—both sound and pictures. If film or still pictures are to be a part of the program, master control would throw switches that would make the output of the film studio available to the control room of the main studio, where film sequences and still pictures could be previewed at will and thrown onto the line.

Now let us assume that we are going, at eight thirty, to the mobile unit out somewhere on location, for an hour. At nine thirty we will go to film and at nine forty-five back to our main studio.

As soon as master control sees that the program from the main studio is flowing properly, they contact the mobile unit by telephone and preview their picture. Levels for sound and picture are set and they are ready for the next program.

At the conclusion of the program from the main studio, call letters, both aural and video would be given from there as there might be noise at the mobile unit point of pickup. Then controls are switched to the mobile unit. For an hour we feed the transmitter with the output of the mobile unit, with the film studio standing by, ready to go on the air if necessary.

At nine thirty we have two choices. We may go to the main studio for call letters, both sound and visual, or we may go to the film studio for visual call letters and put our announcer back in the announce booth to give the call letters orally from there.

It would probably be handled that way as our next fifteen minutes of program is to be on film and if we were to go to the main studio we would interrupt the rehearsal. So at the conclusion of the mobile unit program we switch the video output to the film studio and the sound to the announce booth. After the call letters the film studio takes the sound line and the sound motion picture rolls. Again master control contacts the main studio for previews and tests and at nine forty-five we return to the main studio for the final program. At its conclusion the station signs off, probably from the same studio, with call letters and frequency and power announcements.

While we have gone into considerable detail in the description of this operation, it graphically pictures the moves that must be considered from a purely operational angle; the final decisions as to what shall be done will of course depend on facilities and personnel. It can always be accomplished in several ways—the only question is, which way is the cheapest and best.

We have followed program operation from master control for two hours of television programs. You can readily see what detail will be necessary when a station is on the air eight or ten hours per day, seven days a week. More studios and equipment will make the problem more difficult. Every single piece of equipment from the largest tube in the transmitter to the smallest condenser in any circuit, and there will be hundreds of them, must function perfectly on demand. There can be no mistake. Switches from studio to studio, from film to mobile unit must flow with a machinelike precision. Radio operation has proven it can be done. It simply requires the necessary equipment, intelligent planning, and efficient operation by a trained crew of engineers to make it an accomplished fact in television.

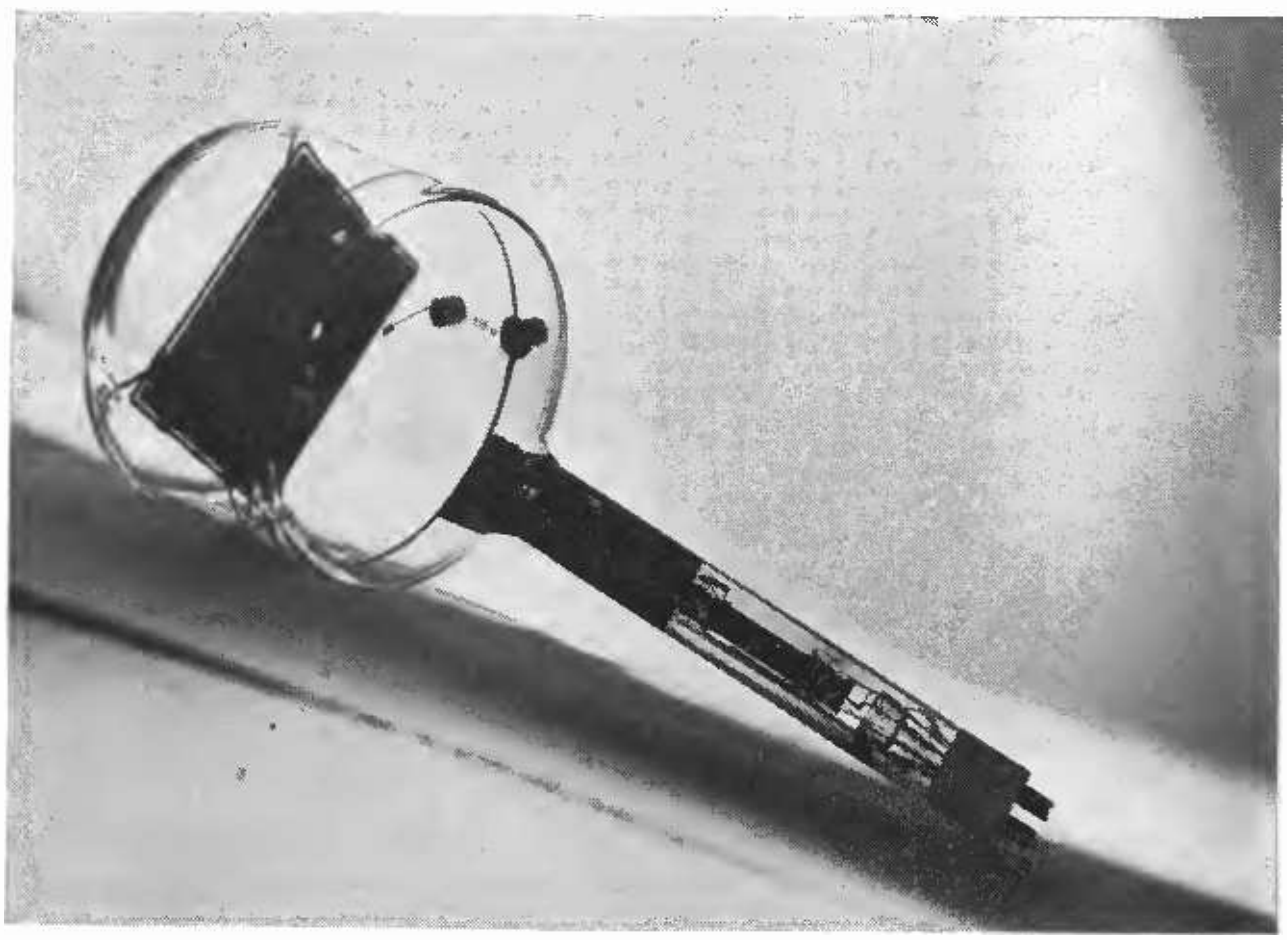
In the majority of stations, call letters, both visual and aural, are on motion picture film. This has proved to be the simplest method of handling this information as station identification

usually precedes or follows a film commercial spot and the whole operation can be handled quite simply from the film studio.

9

THE TELEVISION PICKUP TUBE

In the days to come the important thing regarding television will be what is seen on the receiver, but we cannot afford to ignore the means of accomplishing this and some knowledge of how our studio picture gets to the home receiver will be of interest to the program builder and the lay viewers alike. We will probably never need to know all the involved answers about how and why television works, as we can safely leave them to our electronic engineers, but we do need to know the first principles for we will find them with us always. We will look at our pickup tube from a layman's point of view and not from the practical



An early iconoscope. The mosaic is the dark rectangular plate in the tube.

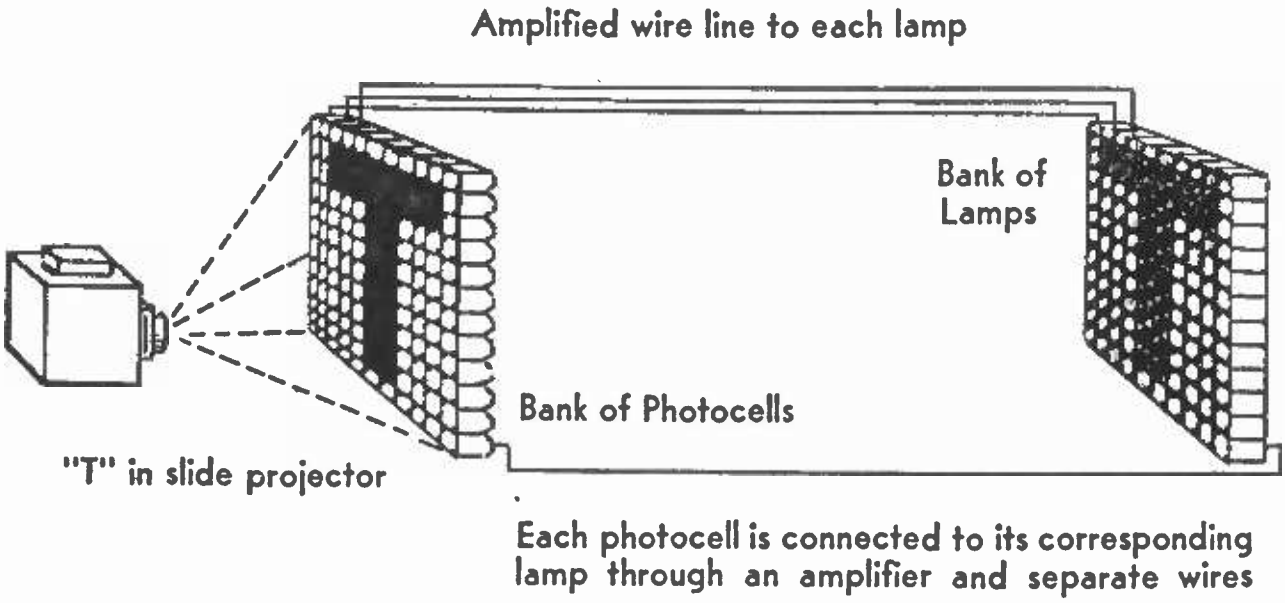
electronic standards. Potential electronic experts will need to know much more about the workings of an iconoscope than we shall attempt to describe here and many authoritative works are available. But every program builder should know how to get the best television picture possible with the equipment at hand and the fundamental operating principles will help him.

Television as we all know consists of picking up a picture in one location and making it visible in another. A simple comparison is the wired circuits controlled by photocells more commonly known as electric eyes. You have probably seen them used in elevators to prevent the doors from closing while passengers are getting in or out and to open and close doors in hotels, railroad stations, and other public buildings. Their operation is simple. A light is focused on a photocell and as long as the light shines on the cell nothing happens, but if anything comes between the light source and the cell, cutting off the beam of light shining on it, things begin to operate, for a circut is thus closed; we can thus make bells ring, doors open or shut, motors start, lights light, or do almost anything else we choose. The action of stopping the light shining on the photocell is just the same as though we turned on an electric switch in our home. Now let us see how we might use it to transmit a picture.

Let us say that we had a bank of photocells closely packed together to form a rectangle. Some distance away we had a bank of electric lights also closely assembled in the same general form with a lamp for each photocell. Let us assume that each individual photocell was connected by wires to its corresponding lamp. Now we throw a white light from a projector on the bank of photo cells. The light shining on the cells would activate them and close the circuit to the bank of lights, thus all the individual lamps in the bank would stay lighted as long as the photocells were illuminated.

If we place an opaque object, the letter T perhaps, in our projector, the dark area caused by the letter would fall across certain photocells in the bank. As soon as the light from the projector was cut off by the opaque T, those photocells in that area would break the circuit to the corresponding lamp bulbs and on our bank of lights we would see an unlighted number of lights

in the shape of a T corresponding exactly to the shape of the T in the projector. If we used a star or a circle in the projector, that shape would automatically appear in our bank of lights. This simple illustration is not present-day television but it does show that pictures may be carried from the slide in the projector



ELECTRICAL REPRODUCTION OF STILL PICTURE

to a lighted screen and reproduced there electrically. If we consider the mosaic in the television pickup tube as the bank of a tremendous number of extremely tiny photocells and the receiver in our home as the equivalent of the bank of lights, we begin to see how television works. But we still have a long way to go; so let us examine our television camera and see what is inside it.

The Mosaic

In the front of the metal television camera case we find a lens and behind this lens is an iconoscope, an orthicon, dissector tube, or whatever pickup tube you may be using. Let us assume that our tube is an iconoscope. This tube is a glass vacuum tube shaped roughly like a dipper. Within it we find first a light-sensitized plate called the mosaic. Comparatively speaking this plate is the bank of photocells we have been discussing.

Actually the mosaic in an iconoscope is a very thin sheet of mica covered with untold millions of caesium coated silver glob-

ules. While a mosaic looks to the naked eye like a solid sheet of material it actually is composed of an amazing number of tiny isolated pin points of caesium. If a bright light is thrown on any group of these tiny globules they will react to the light thrown on it by generating from their surfaces a tiny charge of electricity. This phenomenon takes place because of the physical properties of the caesium, and it is this action which makes electronic television possible. If the amount of light thrown on any individual globule is weakened it generates less electricity. Thus two tiny pin points (globules) on the mosaic will react—(generate electricity) entirely independently of each other, depending on the amount of light thrown on them. In our camera the iconoscope is so placed that by means of a lens in the front of the camera various degrees of light may be focused on the mosaic. We place an object (let us take our T) in front of the lens in the camera.

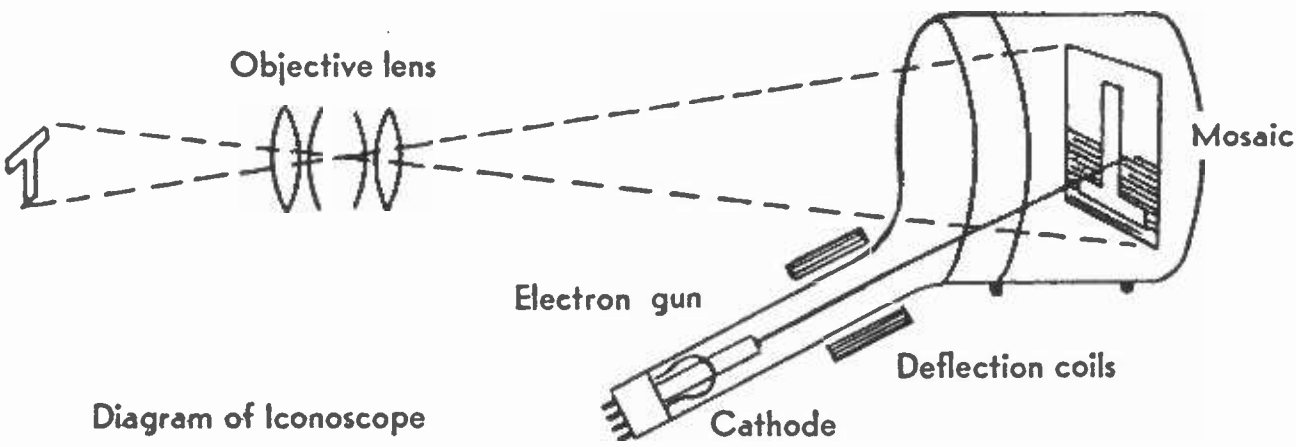


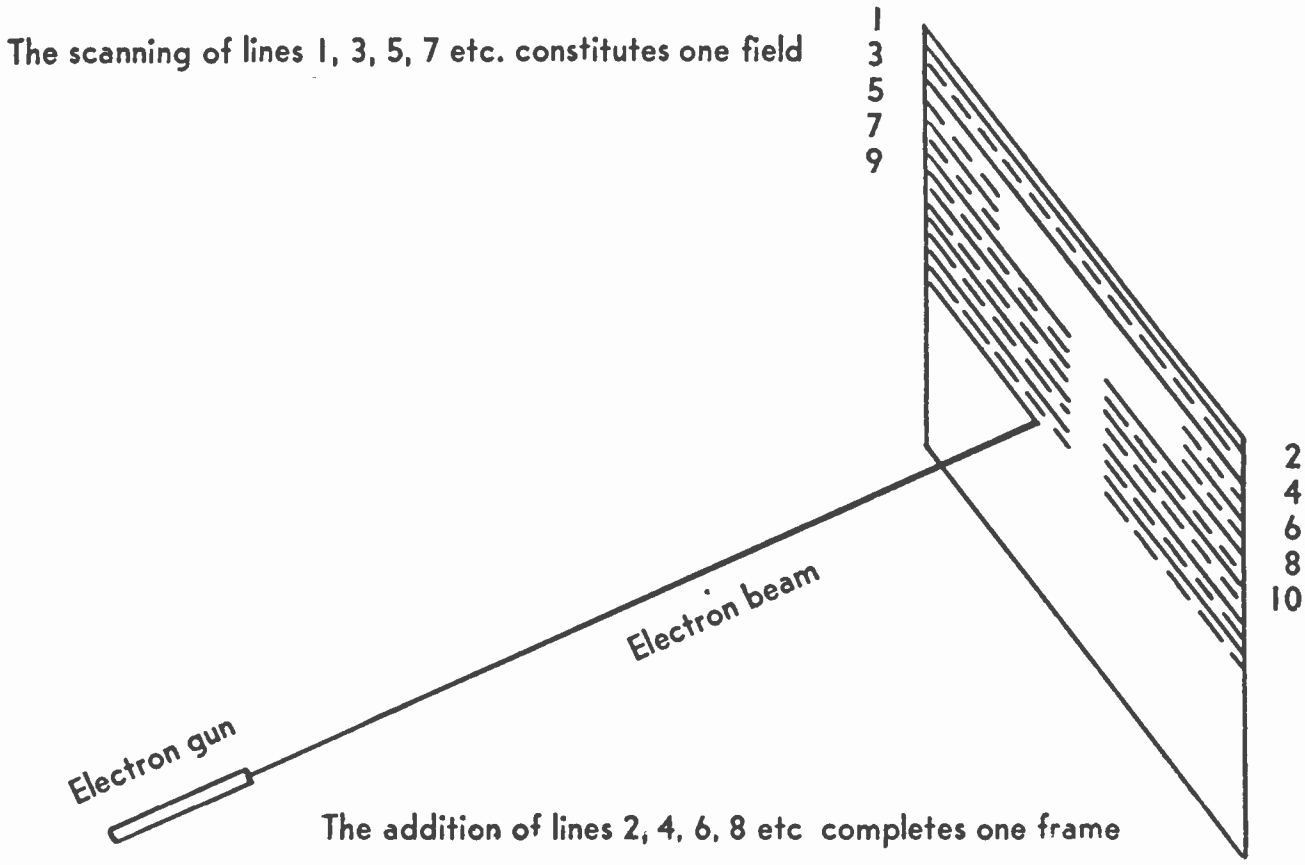
Diagram of Iconoscope

We paint it lighter than the wall in back of it and illuminate the T and the wall behind it brightly. The lens now throws a light T in a dark area on the mosaic in the iconoscope. Instantly the tiny globules that are covered by the light form of the T generate high charges of electricity while those outside that are receiving the low light from the background behind and around the T in the studio generate a smaller charge of electricity. So we have for a moment varying degrees of electrical charges trapped on our mosaic in the shape of a T. We now have the same result that we had when we focused our T on the photocells in the first experiment.

Scanning

Naturally, we cannot have individual sets of wires leading from each tiny globule; so the problem now is how to get the picture, which is nothing but electrical charges on the mosaic, changed into a visible image. To accomplish this we scan the mosaic with an electron gun. This unique piece of apparatus can best be understood if we visualize it as a nozzle on a garden hose. The electron gun will play a fine stream of electrons over any area desired if properly directed, much as one might direct a fine stream of water from a hose nozzle over a given area in a garden. So in the neck of our vacuum tube we install an electron gun which is pointed at the mosaic. The stream of electrons from the gun is as fine as is necessary for sharp receiver pictures, but the area which it covers embraces many of the individual globules on the mosaic. Now if we aim the gun at one tiny pin point, the stream of electrons from the gun hits the globules in a very small area and releases or neutralizes the amount of electricity that was generated or stored in these globules and this tiny electric impulse, thus released, is led off from the mosaic through a wire to the outside of the tube. But there are thousands of such groups of tiny globules, so we must swing our electron gun from side to side and from top to bottom if we are to release the electronic impulses stored in each tiny image point. Special controls are placed in the neck of the tube which enable us to swing the gun in a regular order from the top left-hand corner of the mosaic straight cross it to the right-hand corner. Thus we neutralize one complete line of image points, or rather the charges on their globules, and the electrical charges they contained are in effect led off, one after another, as the electron stream sweeps across them. It is obvious that we must sweep across or scan each line that composes our picture so we change our controls, move the gun back to the left-hand side, drop it to the third line of the picture, and again move it to the right. This procedure is continued until we have scanned every other line on the mosaic from the left-hand upper corner to the lower right corner. Now we swing the beam from the electron gun back to the upper left-hand corner and scan the second line from

left to right. Then we move it down and to the left to the fourth line and so on until all the lines in the picture have been scanned.



THE ACTION OF THE SCANNING BEAM

This system of scanning lines 1, 3, 5, 7, and returning to scan lines 2, 4, 6, 8, to complete the picture is known as the "odd-line interlacing system" and is standard in American television operations. The movement of the beam of electrons in the gun is directed by means of specially designed electromagnets forming a so-called "yoke" around the neck or stem of the tube. This yoke is the electronic hand that swings the stream of electrons from side to side and up and down. When we want the stream to move up or down we put power into the vertical unit or coils of the yoke and pull the beam up to the top, then the power in the horizontal units or coils of the yoke causes the beam to swing to the right. The "pulling power," so to speak, is a set of four electromagnets, one to the left, one to the right, and the other two above and below the stream of electrons. As stated, left- and right-hand magnets pull the stream back and forth to the left or

right as the lower and upper magnets pull it down two lines (for interlaced scanning). Thus, by supplying appropriate currents to the coils in the yoke, we may move the beam as we choose.

Naturally the oftener we swing our scanning beam back and forth in each picture, the narrower the picture lines and the more picture detail we receive. In early television pictures the beam scanned the mosaic 180 times per picture and produced our first 180-line picture. But detail was lacking. While 180 lines would reproduce our "T" very nicely, line structure as coarse as this failed to show the varying degrees of light and shade necessary for a commercial television picture. So the thickness of the electron beam was squeezed down until a stream of electrons fine enough to scan the mosaic 525 times was developed. This is the standard number of lines in television pictures in the United States today.

We now have our scanning beam swinging across each line of the picture and as it sweeps over each tiny group of globules the tiny electric charge stored within them are released. These released charges, minute electric impulses, pass off a conducting coating in the back of the mosaic and through the feed wire in exactly the same order in which they are released. Thus we have the electric impulses that were formed by the image of our T all in a single line flowing out of the iconoscope. Some of the impulses will be strong and some weak depending entirely on the amount of light that brought them into existence. Now we send this string of very low powered impulses into an amplifier which builds up each impulse until it can be utilized as a motivating force, but the amplification treats them all alike—they still retain their relative strength.

Reconstructing a Picture

These amplified impulses are carried through a coaxial cable to our control room, and here they are fed through additional equipment which makes it possible to control these impulses and to properly manipulate the overall result in such a manner as to make the resulting picture readable. We will make no attempt to explain the operation of all the electronic equipment that makes the finished picture what it is, but we might mention the

synchronizing generator for it is the regulator of the whole operation. It synchronizes the speed with which the electron gun in the camera iconoscope scans the picture to the same action in the receiver. Everything is necessarily interlocked. The picture we see can only be obtained by this interlocking system. In fact the timing of the scanning beam must be accurate to about one ten-millionth of a second. Another function of the "sync" generator is the blanking control. We have described the action of the electron gun in scanning a picture and mentioned that the scanning beam returned to the left-hand side of the mosaic as it finished one line to be in a position to scan the next line from left to right. Each of these left-hand swings or returns must be blanked out, for we must only see the result of the scanning beam from left to right. As it returns as many times as it swings to the right you can see that the blanking control must blank out the return line 525 times in each frame. There are actually 527 blanks in each complete scanning as the beam has to move from the bottom back to the top of the mosaic at the completion of each field or half picture.

The result of our scanning, synchronizing, and blanking is seen as an electronic picture on an oscillograph. On this small electronic vacuum tube the television signals appear as narrow bright green lines on a black field. The curious wave forms which they show are understandable in the main only by electronic engineers. As far as program builders are concerned, the oscillograph is the volume control of a radio control room and you can ignore it with impunity. You can also forget electronic positions, "front porches," contrast, keystoning, shading, sweep circuits, pedestals, and levels. Leave them to the engineers. All you are interested in is the finished picture which you will see in a moment, for now the amplified impulses which were discharged by the electron gun from the mosaic in the iconoscope are fed into another electron gun in the base of another vacuum tube known as the monitoring kinescope. This tube, which is funnel shaped, is covered on the inside of its face with a flourescent material which glows in proportion to the amount of electronic energy sprayed on to it from the electron gun in its base. This electron gun is controlled, moved up, across, down, and across line by line,

just as the electron gun in the iconoscope moved; so as the impulses strike this fluorescent material they activate it, make it brighter or darker, in exactly the same shape and degree of light and shade that was first established on the mosaic when the lens in the camera threw the picture of the T on to the iconoscope. Thus our stream of single line impulses are in effect shot on to the face of the kinescope by an electron gun in the base of the tube, line by line, and on our receiver we see the T that was picked up by the camera in the studio.

Speed of Operation

And now comes the really wonderful part of this whole operation—the speed with which it is accomplished. The scanning once of every other line on the mosaic is known as a field, and two fields, or the complete scanning of every line on the mosaic is called a frame. The electron guns in both the pickup tube and the receiver completely scan each frame in 1/30 of a second, so that during each second of a television program we see 30 complete reproductions of the picture before the lens of the camera. We see it as continual action of course, because of the persistence of our vision. Human eyes cannot see breaks in a picture that do not last for more than an approximate 1/18 of a second so with our 30 pictures per second we have plenty of margin. The speed of operation of most mechanical or electrical contrivances is measured in revolutions per minute but in the iconoscope our only measurement is in fractions of a second.

Actually the iconoscope operates so rapidly that it is almost impossible for the lay mind to comprehend it. The beam from the electron gun scans 525 lines 30 times a second. That is 15,750 lines per second. To scan each line takes three different movements of the beam—across, down and back. This means that the yoke coils act on the beam three times for each of the 15,750 lines which must be scanned each second. Thus we have over 47,000 electrical controls each second in a single television picture!

If the physical size of your receiver is an 8 x 10-inch picture you can figure the speed with which the beam swings across the face of the tube. It figures out somewhere around 300 miles per min-

ute, or some 18,000 miles per hour. It is thus very easy to see why mechanical television scanning was found impractical.

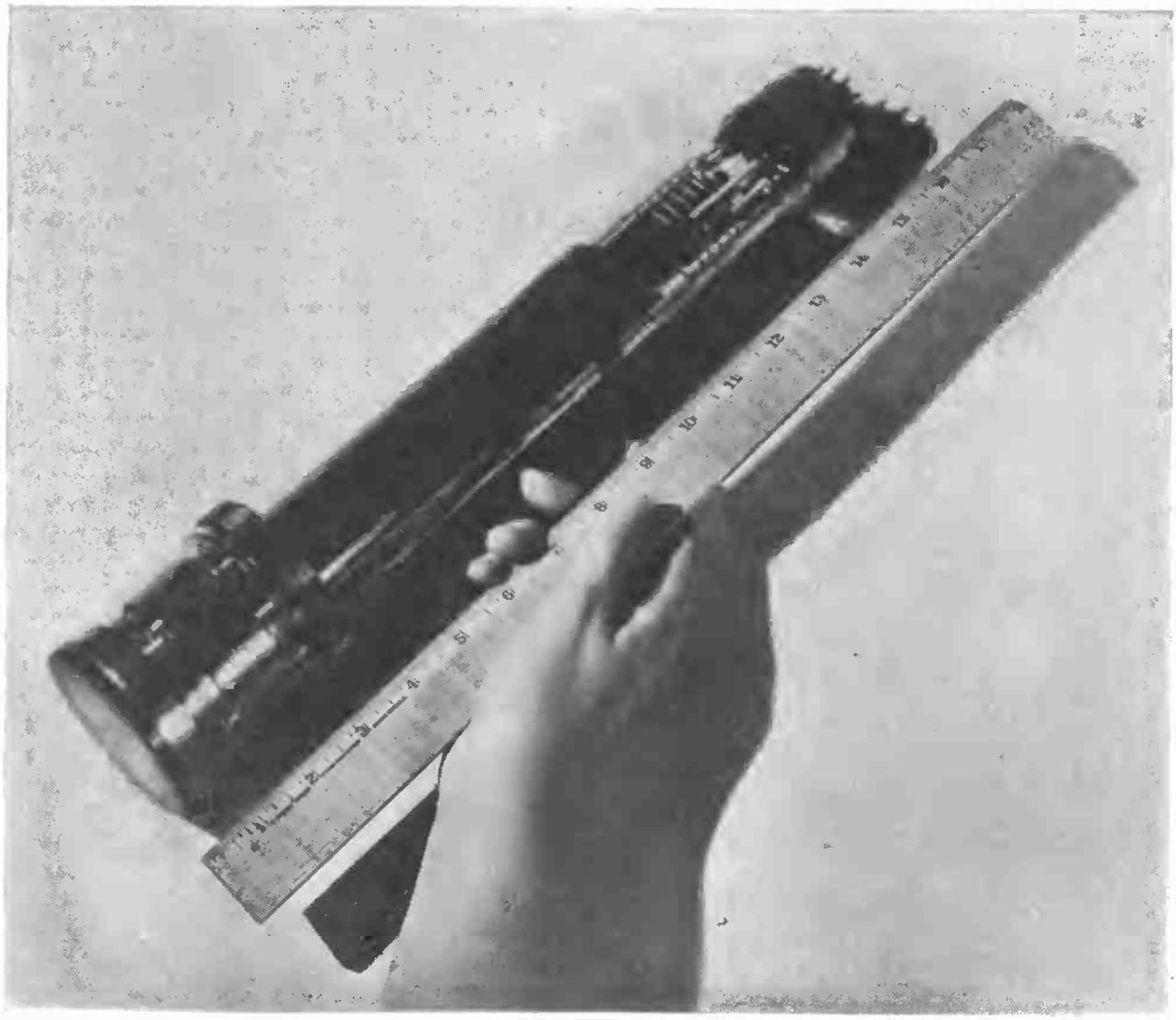
The Image Orthicon

So far our discussion has been only of the operation of the iconoscope. We have previously mentioned the orthicon tube and stressed its greater sensitivity, but this tube was but a step in the development of the pickup tube we have today. Present cam-

The new RCA image orthicon camera and control equipment.

era tubes are almost unbelievably sensitive to light and it would be foolish to attempt to foretell the advancements we will some day see. Some of this new equipment has finally arrived. During October, 1945 The Radio Corporation of America demonstrated the new "image orthicon" pickup tube. This camera tube is the result of experiments conducted during the war. It was this tube that was used by the Navy in the television bomb. The camera, installed in the nose of a robot plane, enabled the "pilot," who was in another plane far from the target, to see his objective and to send the flying bomb, by remote control on its

deadly mission. Commercially the use of this tube opened up vast new fields. The Navy Day dinner at the Waldorf Hotel in New York, the first public use of this camera, was picked up with only the normal room lighting. No spotlights nor auxiliary lighting of any kind was added.

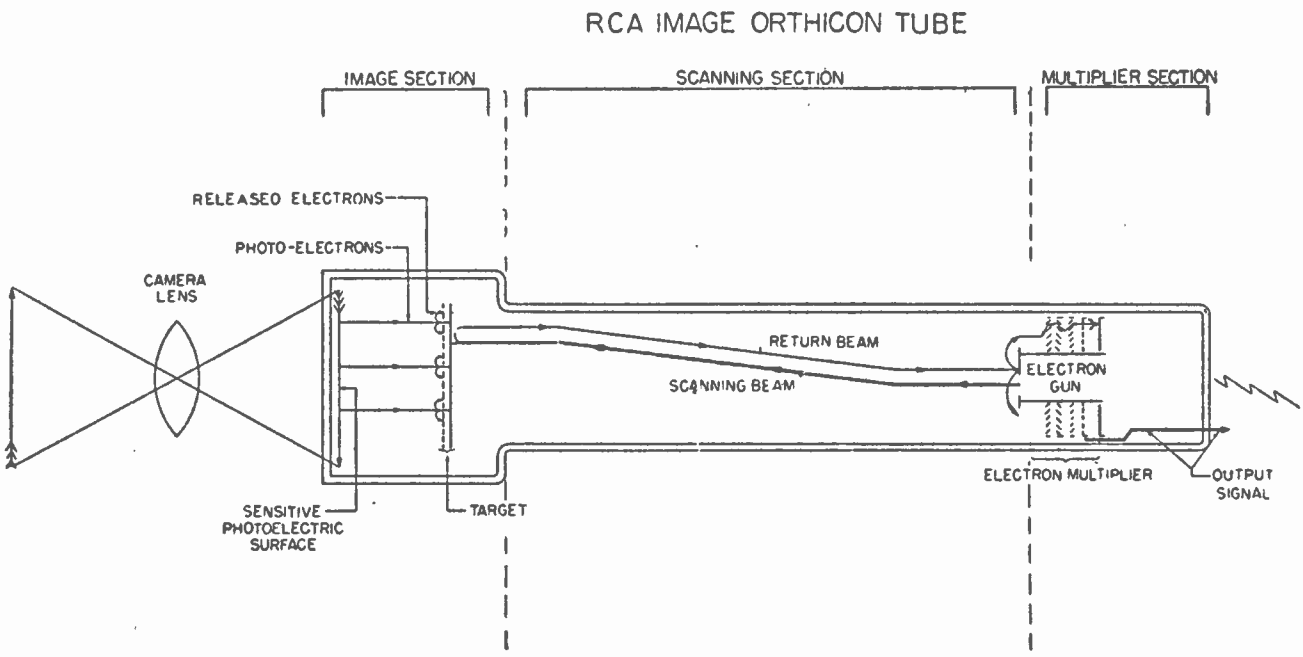


The pickup tube of RCA's image orthicon.

The greater sensitivity of this new development of the orthicon is achieved by increasing the picture signal electronically within the tube.

R.C.A. describes the new tube in this way. "A light image from the subject (arrow at extreme left) is picked up by the camera lens and focused on the light-sensitive face of the tube, releasing electrons from each of thousands of tiny cells in proportion to the intensity of the light striking it. These electrons are directed

on parallel courses from the back of the tube-face to the target, from which each striking electron liberates several more, leaving a pattern of proportionate positive charges on the front of the target. When the back of the target is scanned by the beam from the electron gun in the base of the tube, enough electrons are deposited at each point to neutralize the positive charges, the rest



of the beam returning, as indicated, to a series of "electron multiplier" stages or dynodes, surrounding the electron gun. After the returning "signal" beam has been multiplied many times, the signal is carried out of the tube to the television broadcast transmitter."

The results attained are remarkable. A picture can be seen from the light of one candle. The tube is said to be almost a hundred times more sensitive than those used earlier. This camera has changed many preconceived requirements for television operations. By one broadcast, it rendered all previously used field pickup cameras obsolete. Its potentialities for studio use were obvious. Over night, plans for future studios were altered. Originally it lacked the definition possible in the iconoscope, but through electronic improvements it will ultimately equal and surpass any results previously attained. Its low light sensitivity saves thousands of dollars in studio equipment, for the studio light level now drops from around 1200 foot candles

to about 300. It changes the basic operational requirements and makes artistically lighted pictures possible.

The small size of the tube allows for much lighter cameras. The target area in the tube is only about an inch and a quarter in diameter and this feature permits the use of turret lenses. Four different focal length lenses are mounted in a revolving turret or head and that gives a director the equivalent of four cameras, for a flip of the turret head brings a different focal length lens into operation. If necessary, this can be done while the camera is on the air. The greater sensitivity of the image orthicon allows lenses to be stopped way down, which results in much greater depth of focus. This camera is equipped with an electronic view finder.

New Lenses

Another new development particularly advantageous to outside operations is the Zoomar lens. This new camera accessory may add a great deal to the flexibility of both television and motion picture results. With it the camera can be made to apparently "zoom," that is, approach rapidly the subject matter being viewed. At a boxing match, an overall shot of the ring was used at the start of the program and then by manipulating the lens and without a break in the picture the camera apparently moved forward toward the ring until a sharp close-up of the contestants was given to the television audience. The advantages of a lens of this kind are obvious, and many costly installations for moving cameras while on the air are eliminated.

The Picture

Regardless of the nature of our camera the electronic impulses derived from it are handled in the same way between the point of pickup and the transmitter. So the picture elements flying through the coaxial cable are reassembled for a moment in the control room. There, visible on the monitor screen, they are properly shaded and adjusted electronically and then sent on to the master control room. From there they go to the transmitter where they are broadcast, together with the accompanying sound, to the television homes of America.

10

THE TRANSMITTER

The television transmitter and receiver have been called a "lock and key combination." The transmitter broadcasts the electronic impulses that make up the television picture and your home receiver picks them up and reproduces these impulses into a visual image. The "lock and key" reference is apparent when we realize that the transmitter and the receiver must be so adjusted that they operate in perfect synchronization and are therefore capable of working together exactly. The scanning beam in your receiver must flow across your viewing screen at the same instant the beam in the camera picks up the picture in the studio, for this instantaneous picture is received in your home—the moment it is picked up, and this necessitates perfect adjustment and similar electrical circuit operation in many steps.

In our last chapter we took our electronic signal from the studio through the control room and sent it on to the transmitter. Now comes the problem of broadcasting—spreading the picture from the antenna in such a manner that it may be received in your home. To understand this there are several basic points that we must cover.

Broadcasting Channels

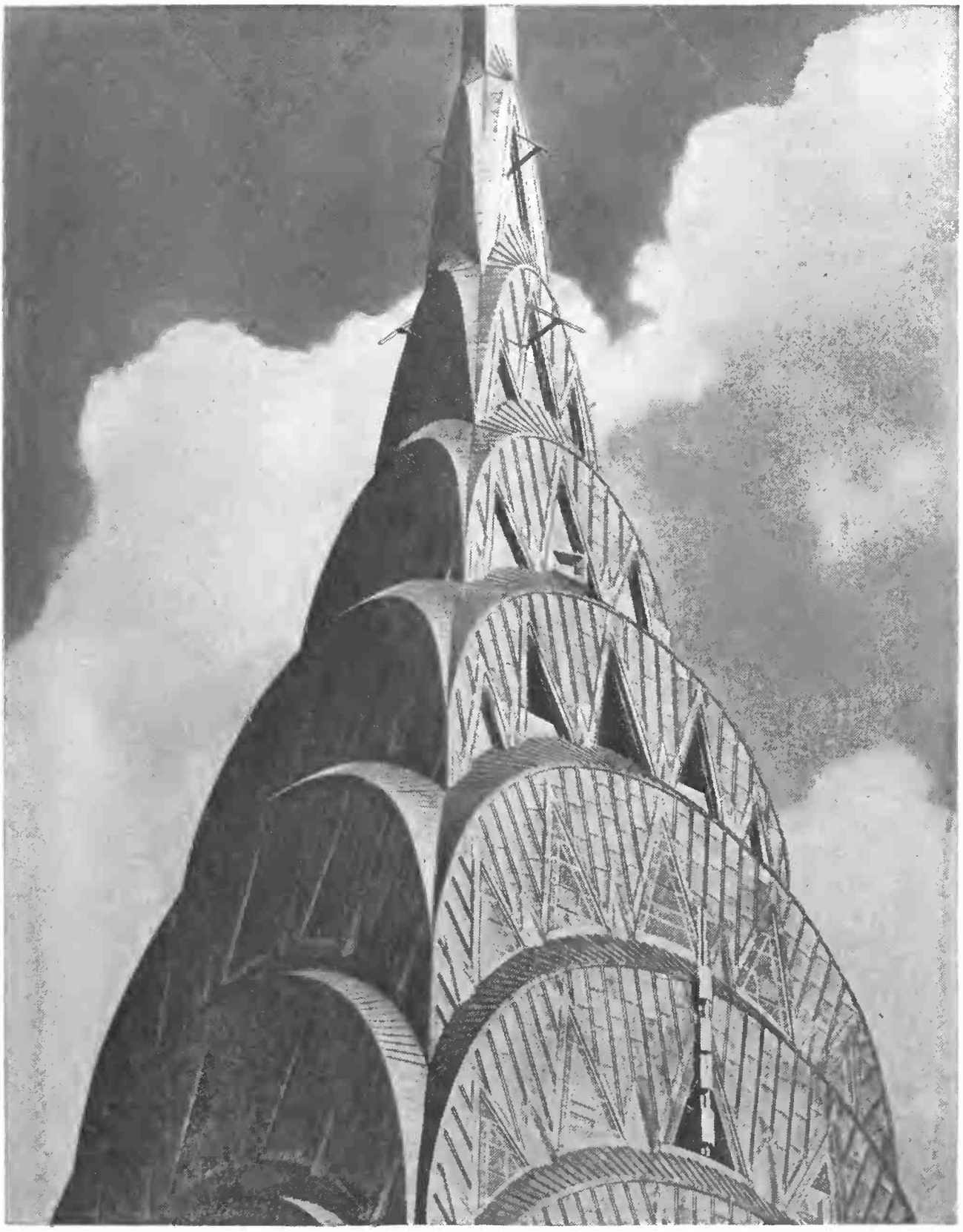
First, television is broadcast on very short wave lengths high in the radio spectrum. This radio spectrum is an unstretchable segment of usable space into which all radio, television, facsimile, radar, and kindred services must be crowded. More technically the radio spectrum is a mathematical scale of frequencies; that is the number of times a second an electromagnetic wave vibrates Starting at ten kilocycles, which means 10,000 vibrations a second the scale goes upward from the long waves to short waves, ultra

shorts, and microwaves. At its lower end we find the long-wave radio services: point to point, ship to shore, air route beacons, S.O.S., and the standard radio broadcast band. Above these services come the short-wave broadcasting systems, and in the ultra-short waves we find frequency modulation (F.M.) and television. The top of our radio spectrum contains the microwaves which eventually merge into infra-red light. That's all there is, there isn't any more. Radio will not function usefully below ten kilocycles, and so far commercial use of the microwaves is nil. This means that all types of radio services must be assigned operating space within a given segment of the spectrum. The hope of the future is that the millions of cycles in the very high frequencies will some day be utilized—there seems to be plenty of space for everything in the microwaves if electronic engineers can figure out a way to use them, but right now our workable spectrum is overcrowded.

In the medium wave standard broadcasting section of our spectrum all the stations in the United States are handled within 1050 kilocycles. Approximately nine hundred radio stations occupy about one million cycles. Television presents a new problem; *for each present-day television station requires six million cycles to get the pictures and their accompanying sound from the point of pickup to the receiver.* One television station requires roughly six times as much space in the spectrum as is occupied by all the standard broadcasting stations in the United States.

There have been hours upon hours of study by the best brains in the industry to determine just where in the spectrum television belonged. Today our thirteen television channels run from 44 to 88 and from 174 to 216 megacycles. Some day television will undoubtedly move on upward in the spectrum bringing us color and better definition, but today we are about as high as man has been able to make commercial television function. Experiments in the microwaves have been made but, regardless of the frequencies eventually used, we must produce the programs that are to be broadcast with cameras, lights, and people and while program facilities may improve the basic problem will remain constant.

Naturally every television receiver must be keyed or responsive to the wave frequency over which the picture is broadcast and to



The CBS antenna in the Chrysler Building for Station WCBW is seen at the top of the picture while in lower foreground the new ultra high frequency antenna is visible. This site was used prior to CBS's move to the Empire State Tower.

the correct number of lines and fields per second of the picture. Before the war, channel number one was from 44 to 50 megacycles and some seven thousand receiving sets were manufactured. Then all the television channels were moved up and channel number one went from 50 to 56 megacycles. That meant that every receiver had to be adjusted to correspond to the new frequency. Originally television sound was broadcast on an amplitude modulated wave—then it was changed to frequency modulation and all the receivers were correspondingly shifted. About this time the Radio Technical Planning Board was formed to recommend to the Federal Communications Commission just where in the spectrum television was to be, and to insure, among other things, receivers being sold that would pick up the programs as they were broadcast.

Today all that is behind us. Every good television receiver will be capable of receiving the picture signal sent out by every station in any given community. Our commercial television frequencies today are as follows:

	Frequency Band	
Channel #1	— 44- 50	Megacycles
" #2	— 54- 60	" "
" #3	— 60- 66	" "
" #4	— 66- 72	" "
" #5	— 76- 82	" "
" #6	— 82- 88	" "
" #7	— 174-180	" "
" #8	— 180-186	" "
" #9	— 186-192	" "
" #10	— 192-198	" "
" #11	— 198-204	" "
" #12	— 204-210	" "
" #13	— 210-216	" "

Far above these comparatively low frequencies the F.C.C. has assigned space for other channels for television experimentation. These upper channels are planned to be about 20 megacycles wide, that is, over three times as wide as our present 6 million-cycle channels. It is in these upper channels between 480 to 920

megacycles (or perhaps on still higher frequencies above 5000 megacycles) that we will some day have television in full color and perhaps in three dimensions. It is conceivably possible (though not particularly likely) that they may add the sense of smell. It has been suggested that program interest might be heightened if bottles of various scents were incorporated in our television receivers. When a forest scene was being transmitted—from our receiver would come the scent of pine trees. A meadow would bring us the smell of new-mown hay, a dank cellar more unpleasant odors—while each star would have her own individual perfume. It's possible, but we are dealing now with actualities, so we will leave conjecture out of our discussion.

Sending the Picture Out

Let us go back to our master control room at the studio and send our television picture, composed now of electronic currents, on to the transmitter. To accomplish this we may use coaxial cable or a radio relay.

In almost all of the television stations operating today we will find our transmitter and antenna for both sight and sound somewhere near our studios on the highest point available—be that the top of a skyscraper or a mountain. In New York City—the NBC transmitter is in the Empire State Building with the antenna on the very top of the structure 1300 feet above sea level. It is about a mile from the studios in Radio City. The CBS antenna was atop the Chrysler Building across the street from their studios in Grand Central Station. DuMont's transmitter and antenna were at 53rd Street some three or four miles from their Wanamaker studios. At all these stations the picture is carried from the studios to the transmitter by coaxial cable, but where the transmitter is situated some distance from the studio, as is the case at the General Electric station in Schenectady (where the studio is twelve and one half miles from the transmitter which is on a mountain top that overlooks the whole countryside), the signal is sent from the studio to the transmitter by radio link.

The coaxial cable previously mentioned is a specially developed wire carrier of electric impulses. It was extensively de-

veloped by the American Telephone and Telegraph Company and is capable of carrying the many segments that go to make up the television picture as well as the sound without objectionable loss of signal quality. It also provides a channel practically free from outside interference. Through this cable the amplified electric currents generated by the pickup tube in the studio camera flow at the frequency of about four million cycles per second and are delivered to the transmitter in the same sequences and relative strengths as they were sent out.

The other television carrier in wide use today that has been developed by the radio industry is the relay link. This actually is a low-powered transmitter which sends a directed signal to a receiver, tuned to the particular frequency in use, and physically aligned to receive directionally the output of the transmitter. The signal so sent cannot be picked up by ordinary receivers in the home as the frequency used is far removed from the one used in broadcasting the picture to the public. The development of point-to-point television transmission is the basis, either in conjunction with coaxial cable or by radio relay link for our television networks.

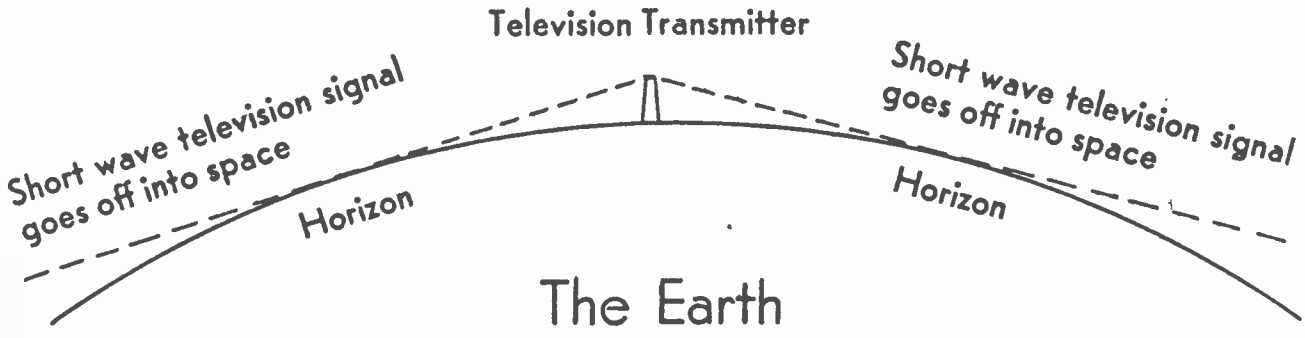
Once these signal currents from the studio master control room are received at the transmitter, they are again monitored, amplified and, together with the synchronizing impulses and accompanying sound, broadcast to the television audience.

Action of Short Waves

Because both our picture and sound are broadcast at very high frequencies, as compared to ordinary or standard A.M. sound broadcasting, they do not behave in transmission as ordinary long waves do. These high frequency waves, known as short waves, tend to take on some of the characteristics of light waves in that they travel in straight lines, and do not bend to any extent around obstacles in their paths. Our signals go out from the antenna as light rays would do if a high powered beacon light were installed on the top of the antenna tower.

In ordinary long wave broadcasting, the waves travel out into space in all directions from the transmitter, and some portions of them strike far overhead reflecting surfaces, known technically as

"the Kennelly-Heaviside" layer and then return to the earth. This action causes the waves emanating from a radio broadcasting transmitter to cover not only all the area in the immediately surrounding territory but also, under certain conditions, to bounce again from earth to sky to earth and to continue, if the signal is strong enough and conditions are favorable, for thousands of miles. This was proven when a highly directional short-wave signal was sent out from a given location and, after it had gone clear around the world, it was received again at the sending station.



ACTION OF ULTRA-SHORT WAVES

The ultra-short waves used in television, acting more as light waves do, fail to return to the earth by reflection as in longer-wave radio, but proceed onward in straight lines out into space. Consequently a television station's coverage is, for the most part, that area lying within the line of sight of the top of the antenna or as far as the horizon.

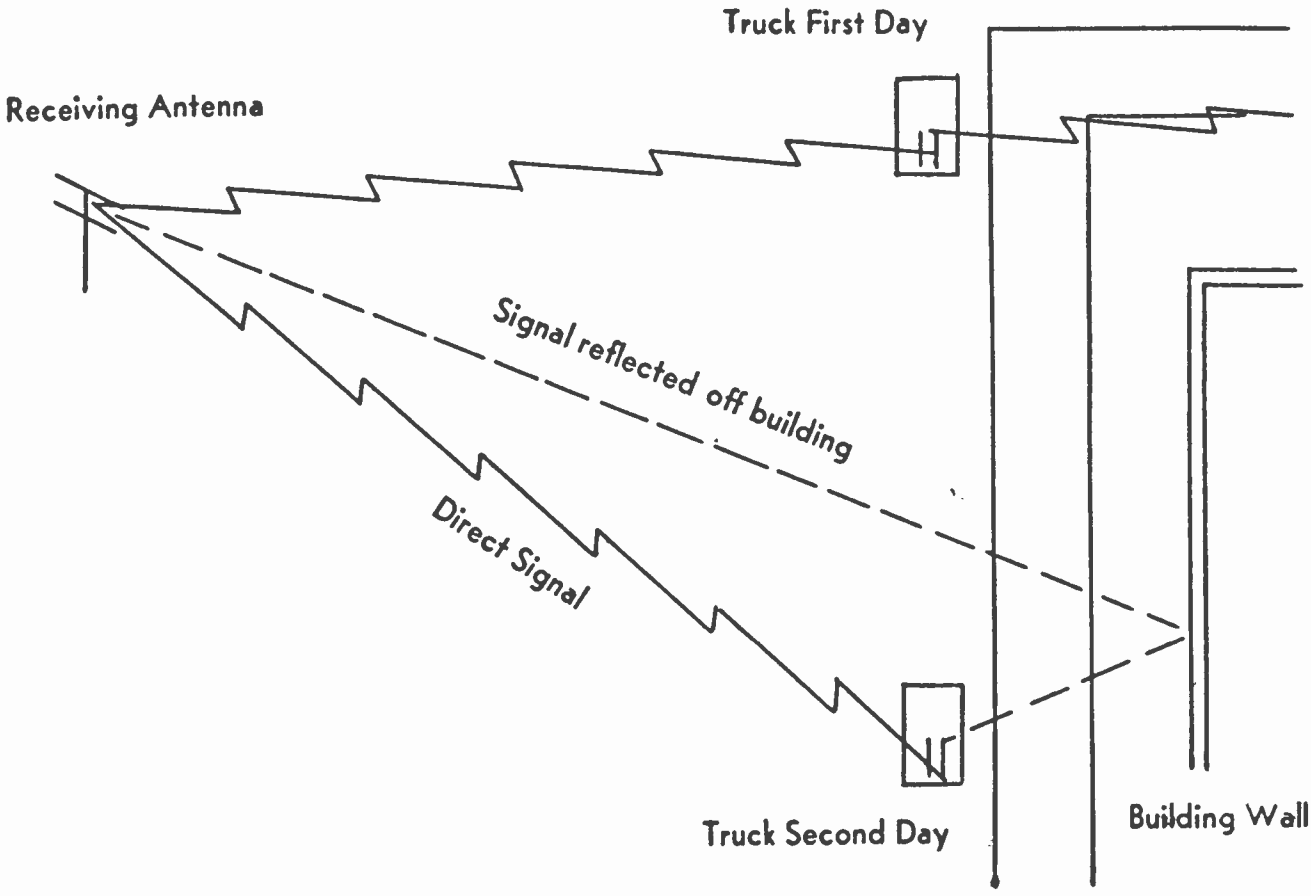
If we draw a circle on the earth's surface as seen on a clear day from an elevation one thousand feet high its radius at sea level would be roughly fifty miles. Thus a television station with a thousand-foot antenna would have as its primary coverage area all that territory within fifty miles of the transmitter. As can readily be seen, the higher the antenna, the greater the coverage, so that some day every hill or mountain top will probably be the site of a television transmitter. Already mountain tops are being reserved all over the country as possible locations, and the very interesting suggestion has been made that transmitters of the future be carried in planes flying high in the air. With a plane circling over a given area at 30,000 feet the estimated coverage by

this so-called "Stratovision" should be a circle somewhere around four hundred miles in diameter, that is, a radius of 200 miles from the plane.

Because our signals have a tendency to travel in straight lines similar to light it is not unusual to expect them to have other characteristics in common with these waves, and they do. They may be reflected. Just as a mirror or any other smooth surface reflects light, large solid areas will bounce or reflect our television signal. In an early demonstration in Washington, D.C. our mobile unit transmitter was installed at a street corner for a demonstration in the capital city. The test was OK and we were all set for the show but the next day when we turned on our receivers—there were two pictures where there should have been only one. The following few minutes were unhappy ones for everyone concerned. "What has happened?" was the question on everyone's lips. "It was all right yesterday." Then a phone call was made to the engineer in charge of the mobile unit transmitter. "Is your transmitter truck just where it was yesterday?" "Yeah—about." "About what?" "Oh, I guess we are twenty feet further from the cross street than we were yesterday." "Well—put the truck just as close to the spot you were in yesterday as you humanly can." "Woof," which is the radio-television engineer's equivalent of "OK—Will do—Goodbye." In a few minutes our picture cleared and everything was as it should be. What had happened was this—when the transmitter was twenty feet back of its original location, the picture signal came direct to the receiver and another signal from the side away from the receiver hit a building fifty feet away and reflected back to the receiver another almost perfect picture just out of line with the first. When the truck pulled up past the end of the building, the signal on the side away from the receiver went blissfully down the street and bothered us no more. In television one good picture signal is fine but two are awful.

This principle sometimes makes it possible to receive a good picture when the receiver is not in a line of sight relation with the transmitter. A receiver behind a hill for instance may still get a picture if there is a reflecting surface for the signal to hit. The signal travels from the transmitter to the reflector and

bounces back to the receiver. This same principal may cause reception trouble in large cities, for the signal may bounce off many buildings, and all of them may come flying into your receiver; but proper installation of your receiving antenna will overcome this. In outlying neighborhoods, the elimination of this "ghost



EXAMPLE OF REFLECTED PICTURE SIGNAL

image" is a much simpler problem and the suburban viewer may for the most part forget it. Diathermy machines, automobiles without ignition interference eliminators, and direction finding equipment from airplanes do not help the television picture, but they will all be controlled before our technical experts get through.

Unusual Results

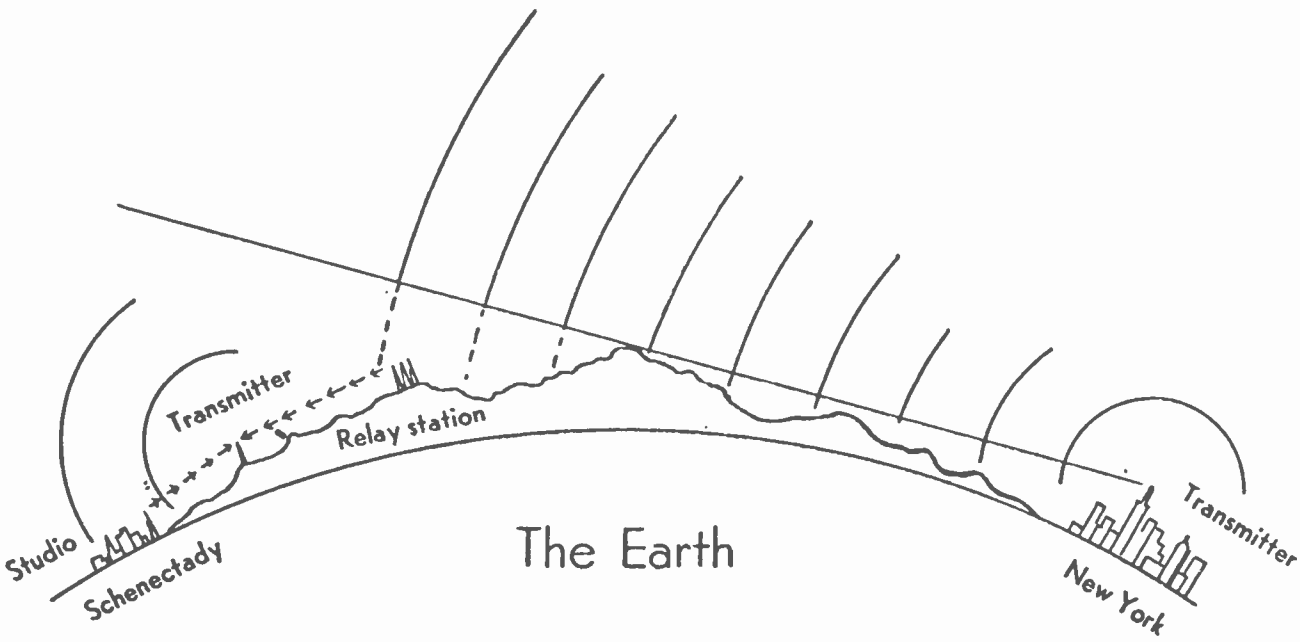
Now, while our television picture should go only to the horizon and then on out into space, some very interesting things actually happen. With the antenna one thousand feet high the average coverage is, as already mentioned, about fifty miles from the

transmitter, but in many instances good pictures have been received up to approximately one hundred miles. On rare occasions television signals have been seen from locations many times that distance. When the British Broadcasting Corporation first began television broadcasting from London, reports came out that the picture had been received in South Africa. In answer to the query "How could it?" a very competent engineer replied "It probably isn't true." Then one day, some time later it was announced that motion pictures, taken off a television receiver screen, of a broadcast in London received on Long Island, New York, would be shown. Again came the question "How could they get London in Long Island?" Again a cryptic, "They probably didn't." Tests made then in taking motion pictures of a television receiver screen had not been commercially practical—but readable visual records had been made and when the 16 m.m. projector started rolling—there was the BBC television picture. It was not good. The leading man and leading lady were indistinct and fuzzy but the British call letters were readable. Only recently, a New York television director asserted that he received a long distance telephone call from a televiewer in Indianapolis telling him how much he was enjoying the program. It was still going on and the set owner in Indiana described over the phone what he was seeing as it was being broadcast in New York at that moment.

All of this sums up to the fact that we do not begin to know yet what we may eventually accomplish in the way of long-distance television transmissions and very few men know why these freak receptions occur. They apparently only happen at infrequent intervals. We know that radio waves hit the overhead Kennelly-Heaviside and bounce back to the earth. Perhaps the television waves are hitting a higher or lower reflecting layer, the troposphere, the ionosphere, or maybe more fancifully the moon itself is reflecting our picture. Choose your own layer or planet; but somehow, under certain conditions, the occasional range of a television transmitter is far beyond anything we believe practical today.

And in the face of all the theoretical television knowledge and principles, we saw for quite a while a demonstration to prove

that we do not know the possibilities of this wonderful medium. Before the war General Electric was experimenting with a receiving station on the top of the Helderberg Mountains in New York State. The receiver was 129 miles from New York City and even though it was atop a high mountain it was far below the horizon with relation to the NBC transmitter in New York. But there was the NBC television picture—clear and true; so they relayed it on to their own transmitter just out of Schenectady and then rebroadcast it to the Albany, Schenectady, Troy area. Thus the first television network was born.



THE NEW YORK-SCHENECTADY RELAY LINK

11

THE TELEVISION RECEIVER

The one television instrument that the general public will be most familiar with is, of course, the receiver. This is the viewing screen that brings to our living room everything that takes place in the world about us; and it is only natural that we will want a good picture.

Through experiments over the past ten years it has been proven that good television pictures can be seen in the homes of America. These experiments have included work on the size of the picture, the line structure and the overall clarity. The final result is that we have a picture available in our home that is comparable in general to a 16 m.m. moving picture.

The detail we see in a television picture is dependent for the most part on the fineness of the line structure. The more lines we have, (that is, the more times the scanning beam swings across the mosaic per picture), the better definition we attain.

Early experiments were first seen on a 180-line picture. It was immediately evident that a television picture composed of so few lines did not contain enough detail to satisfy the viewing audience and experiments were immediately launched to increase the line structure. Another reason for increased lineage was the necessity of enlarging the early small receiving tubes that were only about eight inches in diameter in the early sets.

As we increase picture size the line structure composing it is spread and the lines become visible unless a sufficient number are used. This is plainly evident in ordinary photographic enlargements. The original negative must be of a very fine grain or as the size of the picture is increased we see the component parts. So from 180 lines in the early television pictures the number of lines was increased to 343 in 1936, then further to 441, and fi-

nally today it is held by the F.C.C. regulations at 525. When we consider the size of the picture seen on an average television receiver, the detail in picture structure is evident. The smaller the picture the more closely compressed are the lines and consequently picture detail. The 525-line composition allows for good pictures from as small as a manufacturer cares to go to a projected picture almost twenty-four inches in width, or even larger on special projection equipment.

Further developments may some day increase the line structure in a television picture, but that our present standards are adequate to start this new industry was demonstrated when a 441-line picture was projected on a motion-picture screen, in a theater television demonstration to a twenty by fifteen foot size, with more than satisfactory results.

The Receiving Antenna

In our previous chapter, we sent our television picture out into space, wave after wave, and now we must recapture it and reproduce the picture in our home. To do this we mount our receiving antenna on as high a location as we can find on or adjacent to our homes. Most early television antennas consisted of two metal rods mounted on either side and at right angles to a supporting mast. This type is known as a simple dipole antenna. The television signal is sent out on a so-called horizontally polarized wave and, consequently, it must be trapped with a receiving antenna parallel to the earth. Because the television signal is broadcast on a short wave length, the total antenna or dipole is not longer in physical length than ½ of the longest wave sent out by any television station. The length of each metal rod to bring in channel No. 1 is about 63 inches (about 1.6 meter). As all the other channels are shorter in wave length (higher in frequency) our 10½ foot (about 3.2 meter) dipole (true metal rods 68 inches long) will capture all of them fairly well. Our antenna, when first erected is rotated on its supporting mast until the maximum signal from all the stations in the area is received on our receiving set. If all the stations in a given locality are in the same general direction from your home there is no particular problem in "tuning," properly lining up, your

aerial, but if you are in between two or three stations you may have to install a different type antenna or a group of antennas, one for each station. The best picture is received when the dipole is at a right angle to the direction of the signal from the station.

Improper placement may result in ghost images for as already described, the signal can and will bounce. If you run into ghosts, you may be in for trouble. Reflector-type antennas will help, and special shielding devices can be and have been devised, but ghosts are not general unless you live downtown in a large city and are unable to get a line-of-sight location for your antenna. If this happens your fate rests in the hands of a good television installation engineer.

We will probably see multiple set antennas erected on apartment buildings and hotels in metropolitan areas. These specially built aerials and amplifiers will furnish the picture to all the receiving sets in the building.

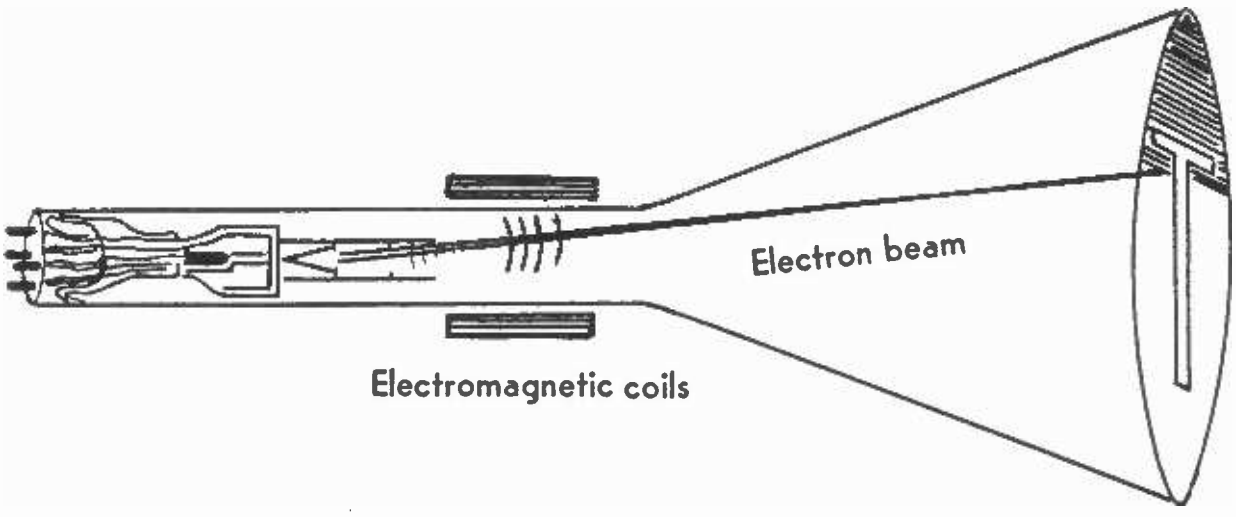
From the antenna our picture signals are led down to our receiver by means of a transmission line which is shielded from outside electronic interference. There has been considerable experimentation in various types of conductor wiring and any service man knows the answer to your particular problem. If the distance from the antenna to the receiver is of any considerable length the "lead in" wire should be properly shielded to prevent unwanted interference.

Types of Receivers

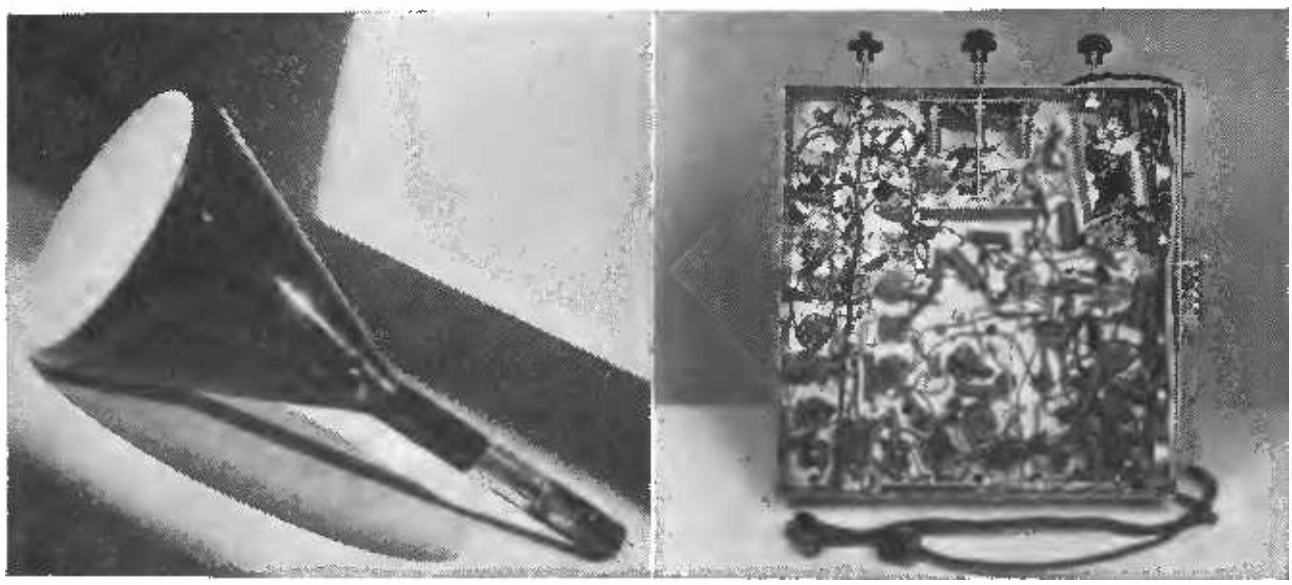
There are two basic types of television receivers, those in which the picture is seen on the end of a vacuum tube (direct-vision receivers) and the so-called projection-tube type, where the enlarged picture is projected on to a translucent screen.

The first type was developed and was in use long before any satisfactory projection type was found commercially practical. In receivers of this kind the size of the picture depends entirely on the size of the tube as the picture is seen on the end of the tube itself. This tube or "kinescope" as it is called is a funnel-shaped glass vacuum tube. It was described in our chapter on the pickup tube. In its operation in the control room it was fed by wire from the studio, but at home the action is just the same

except that now the electron gun is controlled by the synchronizing impulses sent out from the transmitter at the same time it sends the signals through the air. Thus the electron stream in the kinescope in the set at home moves right across the face of the tube, back and down and across again, line by line, at exactly the same moment the beam in the studio scans the picture miles away.



KINESCOPE TUBE USED TO REPRODUCE THE TELEVISION PICTURE



Left—An early RCA kinescope. The picture is seen on the face of the tube. *Right*—The electrical connections in the chassis of a television receiver.

The television audience will probably have many types of receivers to choose from, and the price will be in direct proportion to the size of the picture. We may have our choice from a small direct viewing tube with a five-inch picture to a projection type job with a picture somewhere around two by three feet.

The size of the picture is a subject that has been discussed at length, and obviously there are many opinions. Before the war the largest picture available commercially was about 12 x 16 inches and only a few of these sets were manufactured. The majority produced a picture about seven by ten inches. The vast majority of potential purchasers wanted a television picture as big as a 16-m.m. movie screen, but very few of those who demanded a picture of this size had sets in operation in their homes. Actually the size of the screen you should choose depends entirely on how you plan to use your receiver. Before the war we had no choice, but prospective purchasers now have their choice of pictures from 6 x 8 inches to 18 x 24, and even larger. If you are planning to install your receiver in a large room where it is to be viewed by a fairly good-sized group, obviously, you want a large picture. It was under condition such as these that the early criticisms of picture size originated. But it is a law of optics that the larger the size of a picture you are looking at—the further away you must be, to view it properly. There is always a best spot to view any picture—be it an illustration in a magazine or a painting in the Metropolitan Museum. A viewer should be at least five times the height of the picture from the viewing screen and could be ten times or more and still see well.

In the early days of television everyone wanted to see this new medium and sets were few. Hundreds crowded around a seven-by-ten inch receiver. The majority were disappointed. But in the home a picture of this size was adequate. One consistent viewer remarked, "Our receiver has been in a room about 10 x 12 feet in size—if we buy a receiver that delivers a larger-sized picture our set must move from the den to the living room. We are not so sure we want it there." Few wives are anxious to turn their living rooms into motion-picture theaters. But the choice will rest with the buying public—if they want large pictures, they will be available, but they will probably be relatively expensive. Good definition is possible in very small pictures and our arm-chair sets—designed for one person only—may be one answer to the low priced set.

A Vacuum and a Law of Physics

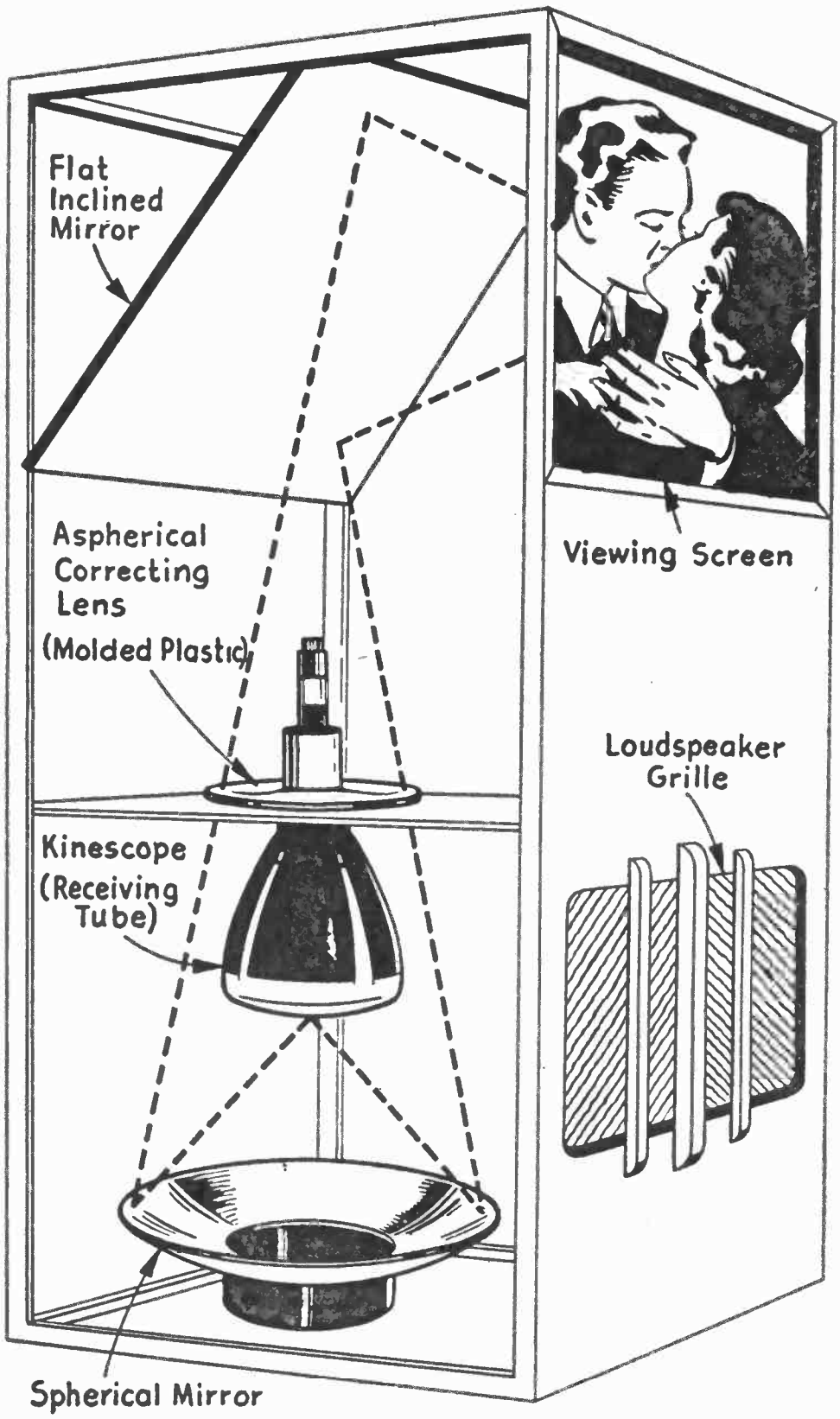
One of the limiting factors in picture size in the early experimental stage that still governs manufacture today is the law of physics, that a vacuum enclosure must resist a pressure of 14 lbs. to the square inch, which is the normal pressure at the air around us. This means that the bigger the receiving tube, which is a vacuum tube, the more force on the face of the tube from outside atmosphere or normal air pressure. In Germany they experimented with a vacuum tube 26 inches across the face. They said that they had made a dozen and the other eleven had collapsed. Also to resist the air pressure it was necessary in pre-war tubes to curve the face of the tube slightly and because of this curvature the picture was always fuzzy at the edges.

Today flat-faced tubes have been developed that produce a much better picture and the development of plastic lenses has made projection tube receivers possible. In a projection set, a small tube which functions exactly the same as the larger receiving tubes but which is high-powered for the picture brilliance throws its picture reflected from a spherical mirror and passing through a transparent corrector plate on to a translucent viewing screen.

The smaller sized tube, as compared to the large kinescopes and the development of a cheap practical plastic corrector plate have reduced the potential price of these sets immensely. In most of the sets that have been designed so far the viewing screen is attached to and is a part of the receiver; but sets have been designed where the tube and optical projection system would be used similarly to those in a motion-picture projector with the picture thrown on the wall or a detached screen.

Today on almost all television receivers you will find various sound and picture controls: a station selector that allows you to choose the station you want to see, a control for fine tuning, a brightness control which gives you a choice in the amount of picture signal you desire, a contrast control to vary the relative brightnesses of black and white in the picture, a sound volume control, and, on some sets, a focusing knob.

Other knobs allow you to control the vertical and horizontal



HOW LARGE-SCREEN TELEVISION WORKS

size of your picture and also to control its position on the face of the tube (but once these are set you can usually forget them). In spite of all the controls, sets are very simple to operate. We will probably find in many receivers television, frequency modulation, and broadwave radio combinations while other sets will contain only television receivers with no other service included. Naturally these will be the cheaper sets.

Dr. Zworkin with two types of direct viewing receivers.

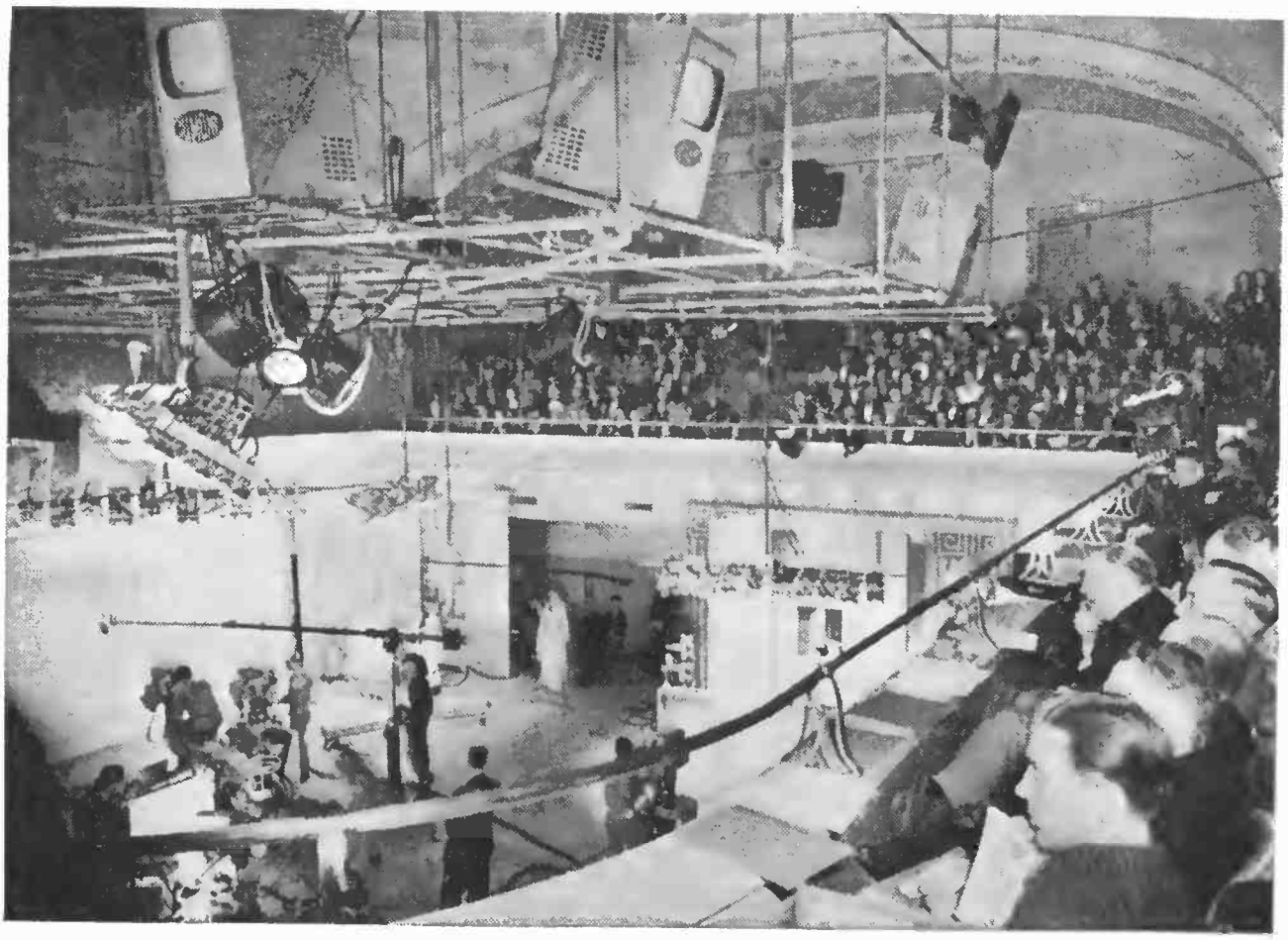
In all probability many new wonders will be incorporated into this medium but they are developments of the future. If a better picture can eventually be transmitted in the higher frequencies, stations will broadcast at very little additional cost on both the low and high channels. This means that anyone who buys a tele-

An early RCA projection receiver.

vision receiver today is certain to get his money's worth. Of course new and better models will be developed, but in the meantime the home viewer will have thousands of hours of enjoyable entertainment; and when color comes he can put the old receiver upstairs in the bedroom and install the new one in the living room. Many sets in operation today have been in use for almost ten years. We don't ask that of automobiles so we know we will get our investment out of our television receiver.

Part Two

TELEVISION PROGRAMS



Du Mont's Wanamaker studio from the gallery which is open to the public. The picture being broadcast is seen on the receivers in the upper part of the picture.

The new Du Mont Wanamaker studios from the rear of the control room. The five-screen viewing system is seen in the center of the picture with three studio sets in the background.

12

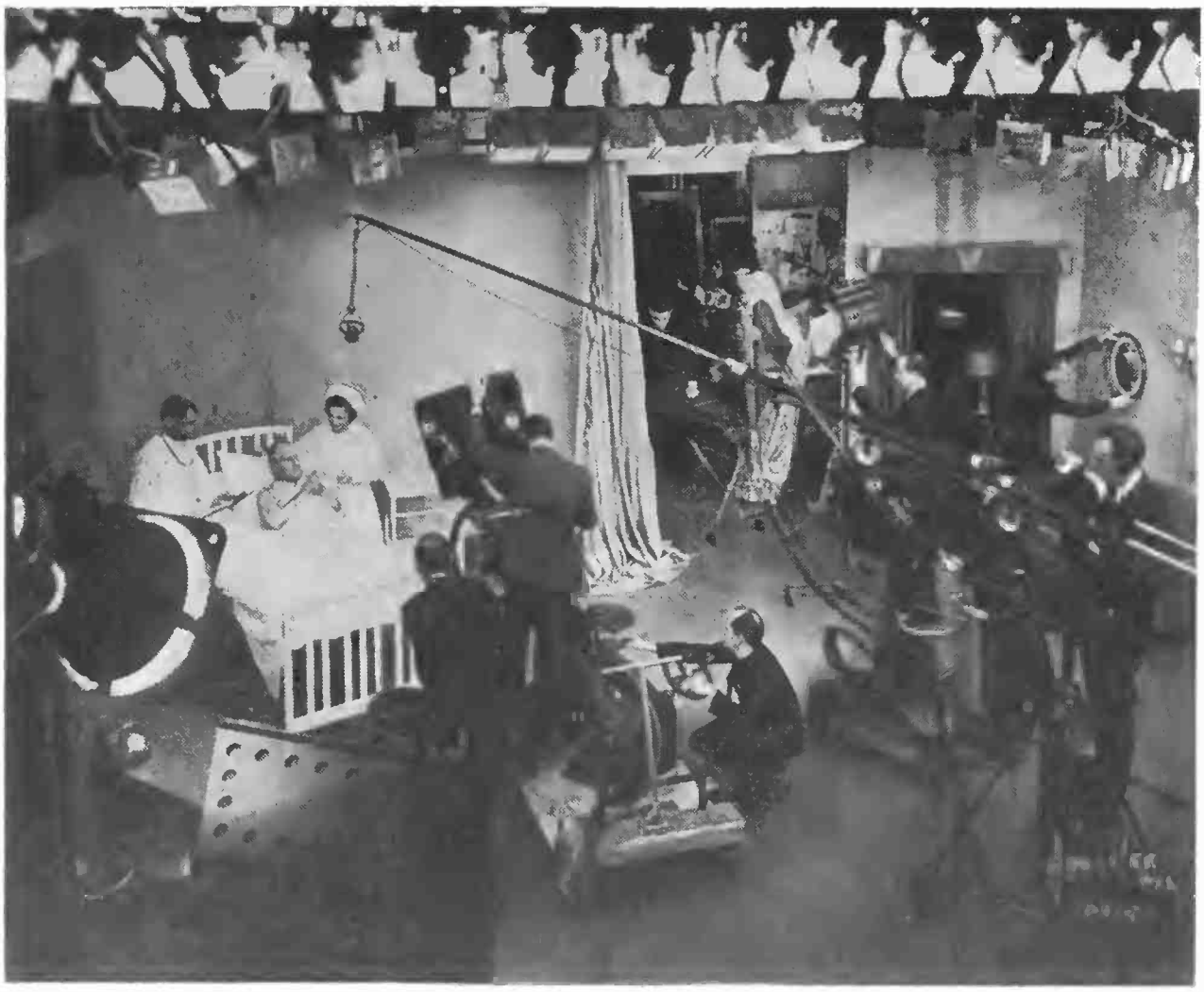
PROGRAMS IN GENERAL

So far we have been investigating the physical equipment that makes television possible, now let us turn our attention to the subject matter that we will put on our transmitter. It is obvious that when a would-be televiewer purchases a receiving set he is more interested in the programs he will see than he is in the set itself. The purchaser of a television receiver buys program service and the successful operation of a station will depend on a good electronic picture and the programs that emanate from that station.

Just what comprises a good television program is a formula that will probably be heatedly discussed for many years to come. The real answer is that probably everything under the sun has its place in a television program schedule if it is properly presented. There is nothing hidebound about this new medium. It takes in its stride entertainment from every existing source. It embraces the simplest parlor game to the peak of metropolitan theatrical production. The race track or the baseball diamond has no terrors for this new means of communication. Hollywood and its huge resources could only begin to supply a part of the vast number of hours of television program units that will be necessary to fill our schedules. With television we see and hear and thus we can intelligently transmit every single thought so far developed by the mind of man. While radio could talk, the old axiom "that a picture is worth ten thousand words," makes television infinitely more flexible.

But whether or not the television audience of the future looks and listens to the things we put on their receiving sets depends on what we include in our schedule and how we present it. In the early days of program experimentation no one knew what would or would not be good television fare. In our early quest for suitable program material the answer to the query "Do you think

this will be good television?" was always "Try it and see." We still are a long way from knowing the final answer. We have tested many hours of material. We have found the obvious things but we haven't begun to approach the ultimate that may yet be accomplished. So far only a comparative few have concentrated



Studio operations at NBC in 1937. The plain scenery and early lights are worthy of note.

on developing television programs. No one can know what will eventually be learned and probably ways and means will be devised to make possible the use of hundreds of ideas that today seem unsuitable. The ultimate success or failure of television is going to depend entirely on the program content available to the viewer in his home.

What Are We Going To See?

The wonder of television passes quickly. A new owner accepts

the medium from an electronic standpoint overnight and then sits back and demands to be entertained. This challenge is one that the television program builders must accept and it cannot be passed off lightly. While television has the tremendous advantage of bringing the world visually into a home, it is not going to be received by everyone with wholehearted approval; for it must meet immediately opposition that has been built up through the years and is an accepted part of our everyday life. Every television viewer will decide for himself just how he will spend his evenings. If television hopes to claim the major part of his spare time it must give him more pleasure than he can obtain in any other way. If we stop to analyze this we find it is a pretty big order.

Television in the home is in active competition with everything that goes to make up the happiness of the American family as we know it today. If television is to compete successfully with other forms of entertainment and information—and it will—the average man and woman must give up a certain amount of time formerly devoted to bridge, magazines, books, the radio, automobile rides, and the moving picture theater. No one today sits around home in the evening doing nothing. On the contrary every American today can have plenty of amusement every evening of every day; and now we suddenly offer a new form of communication which he can only find time to watch if he gives up something that he has been doing for a long time. Television can not find an audience and hold it unless the programs it offers are more interesting than anything else our televiewer may find to interest him.

Production Technique

This new medium offers another challenge to producers, for as yet no method of presentation has been evolved that is artistically new and unique. So far, everything that has been broadcast has already existed as entertainment subject matter in some other field. It has been seen in the legitimate theater, on the movie screen, or in the world of sports.

Television program procedure so far has been to adapt to tele-

vision a form of entertainment that was already enjoyed in some other medium. That, in itself, is fairly simple; but television holds pitfalls as well as advantages and while the basic dramatic values are the same in any medium how they can best be brought out on the television screen presents problems unknown to the stage or to Hollywood. While we are thinking along these lines we may find the answer in the reactions of the television audience. Can we present situations, facts, data over our television transmitter in a way that has not been tried in some other visual medium? Television has an intimate approach that nothing else we know of today possesses.

Audience Reactions

The biggest single factor in audience reactions is that television programs are seen in relatively small groups, usually by one or two people at a receiver in the home, at the most by ten or a dozen. Every other form of visual entertainment has been planned for consumption by a large audience, the bigger the better. It has been built to take advantage of the contagious reactions of the members of the audience. A man or woman laughs—other members of the audience catch his mood and the whole house is soon reacting not only to the actors but to the other members of the audience. Every actor knows that one or two people who are "with him" in the audience can do more to make him a success than all the clever lines in the world. Radio faced the same problem and quickly solved it by inviting big audiences to every broadcast, and in some cases television has done the same thing in an effort to put comedy across. If no one laughs at the comedians, the act is a failure; so we may see all our television comedy programs broadcast from large theaters with big audiences. But is that the answer? Perhaps—but in that case we are merely "looking in" at home while other people enjoy a live show. Such a procedure does not seem to be the solution. We must devise a way to produce intimate television productions for the family in the home or they may go out to the television theater or the movies.

None of these questions has been answered in the short time

that television has been trying to make itself seen—they can only be answered in the future. Perhaps television is only a new means of communication, a medium for seeing what the other fellow is doing, and if it is only that, it need make apologies to no one. In line with this thinking we might do well to consider that there are two basic schools of thought regarding all types of television programs. Should they be basically built for sound or picture values? Should the approach for afternoon programs differ from evening programs or should it depend entirely on the subject matter of the program?

In a motion picture theater if you were to close your eyes you would not be able to follow intelligently the story being told by the majority of the films shown today. Hollywood has resorted almost entirely to a presentation technique in which the picture must be seen to be understood. Almost all of the good television programs being produced today have followed this same line of production. But there are those who maintain that good television programs can be delivered by merely turning a camera on a radio show. They point out the great interest that people have in seeing present-day radio broadcasts and they maintain that elaborate visual productions are unnecessary. They also argue that the cost of a completely pictorial production, if made according to Hollywood standards is prohibitive. And then there is the all important question of how the American housewife can find time to drop everything else and look at television all day.

It seems thoroughly practical to assume that some leaning toward radio technique may be perfectly practical in television. Sound may justifiably become more important and may be used more extensively in television than in motion pictures, but there is a limit as to how far we can go. In one experiment a series of dramatic radio programs were presented. Complete radio procedure was adhered to. We saw the announcer and the cast huddled around a radio microphone with their scripts in their hands. We saw them all reading their various parts and the results were highly unfavorable. All the dramatic suspense of the program that would have been very effective if sound alone had been used, was completely destroyed by the visual presentation. People are anxious to see a radio program produced to see their

favorite stars in person and to see at first hand "what makes the wheels go round," but on a dramatic program in particular the emotional values reached in the home are never equaled in the studio.

On the other hand, if our radio daytime dramatic programs were presented by television in simple sets the story could be carried virtually by sound alone. Naturally the actors would have to learn their lines and dress the parts but a listener-viewer could follow the story just as they do today through the spoken word plus the opportunity of looking up at the television picture whenever they desired to see how new characters looked and again when visual values were built up. In this way the dramatic radio program would develop a new and larger audience and still not disrupt the lives of Mr. and Mrs. America any more than the radio does today. The more a producer relies on sound to carry his story—the more he can reduce his production costs and intelligent handling of sound may develop a very interesting, fairly economic television program. On the other hand, there are those who say that television is merely a new way of presenting a new kind of motion picture. But no matter how we theorize, *television is a visual medium.* Television pictures are "moving pictures," whether they originate in a studio, out of doors, or from film. The visual approach is the important thing to consider in every program we produce. Now we can see through the air and we must give our audience something to look at.

With this obligation in mind let us consider some of the program elements that we may choose for broadcasting on our television station. At this time the subject can not be completely developed. It probably will not be twenty years from now, for new developments in the world about us will profoundly influence the programs we transmit. Even so the basic fundamentals of television programs will remain constant, for the same objective that influenced the producers of the Greek Drama, helps directors today to make decisions in Hollywood. Tomorrow's programs will be better but they still must make their audience laugh and cry and above all they must make their television audience willing to give up some other amusement to watch the transient shadows on their television receiver.

13

INTERVIEWS

The simplest form of live television programs and those that have been seen the most are interviews. It is obviously the easiest type of program to produce, as two people are placed before a camera in a fixed position and the quality of entertainment depends entirely on what is said. This formula is pure radio. It is true that we see the people doing the talking but aside from that, the information that is conveyed to the audience could have been handled just as well by sound alone. We are naturally visually inquisitive, however, and because of this an interview type of program does have its place.

Interviews on television are good or bad depending entirely on three factors: first, the personality and appearance of the interviewers; second, the personality and appearance of the interviewee, and third, the subject matter of the interview. You need all three factors to make a perfect program and the attempt had better be stopped if you haven't at least two of them.

The main object of a program of this type is to bring out the personality of the person being interviewed, and this is accomplished for the most part by the questions asked and the general format of the interview. On early mobile unit programs we used to set up a camera on a street corner in New York City and select people out of a crowd at random. The results in general were very good for we put people on the air in this way who had never seen television, who were typical of the man on the street; and we were able to get their views on subjects that were in the public mind at that time. A good interviewer could bring out points that he felt might be interesting but he constantly faced the danger of having program interest drop. This could happen almost without his knowledge, as it is quite possible for a tele-

vision subject to be interesting in person and dull on the receiver. This was a responsibility of the director in the mobile unit control room. When a subject was exhausted or the person interviewed lost interest he immediately signaled the interviewer to discontinue the discussion. A good television interviewer used plenty of tact, among other things, and those being interviewed were always found to be cooperative.

An operation of this kind can be handled best if two interviewers work together on one program. Thus while one man is on the air—the other can be lining up the next interview. Two interviewers of course are only necessary on a fully unrehearsed program. When the people to be interviewed are lined up in advance of the broadcast one interviewer and a program man connected to the control room by telephone can do the job well. The production problems are simple. Necessary stage directions, if needed, can be given by the interviewer while they are on the air. References to microphone and camera are not out of line in an impromptu program if it is obvious to the audience that the person being interviewed has never before faced a television camera. This is especially true of the "vox pop" type of program on a street corner or other public place. In general, references to lights, cameras, and "mikes" are much better omitted. Much too much of this has been done. While the newness of television may overwhelm the novice, the constant reference to the mechanics of operation by experienced masters of ceremony is more than boring to an audience who has heard this far too many times. Many program builders believe that the main appeal of television is informality, but when we talk on a telephone we do not constantly refer to the receiver in our hand. Informality in television programs should come from the flow and apparent ease of presentation rather than from operational references.

Prepared Programs

Rehearsed interviews, or those taking place in a studio, immediately terminate many of the hazards of the outdoor pickup. First, the subject matter has been discussed in advance and the person being interviewed has had an opportunity to see the cameras and lights. Microphone movements and camera shots

can be planned at rehearsal, but even so the majority of interviews seem stilted and static. No one so far has taken advantage of the pictorial possibilities of television in handling interviews. Just how this can best be accomplished is a real problem—but two people sitting in one spot talking is not good television. It *is* good radio and in that medium it has to be done that way, for broadcasters are limited in their physical movements to a close proximity to the microphone. But on television we have freedom of movement and this can and should be utilized to increase the picture value of the program. Not that an interview would be improved by having the two parties running madly around the studio, but if normal movement fits in with the general scheme, it should be made.

Announcers

In all probability the majority of people who are to be interviewed on television will be questioned by the station announcer, and on this person falls a very heavy responsibility. The television announcer faces one of the hardest jobs that will ever develop in this new industry, for he must be welcomed in every home, not once but many, many times. If every time a television set is tuned on the audience sees a personality that they do not like, it is perfectly obvious that the viewer will turn to another station. The necessary requirements of a good announcer are many and who to select is a much more serious problem than one might think. First, should our announcer be a man or a woman? We will probably have both but in some respects the women have a decided advantage. For a long time to come we will want close ups in television. Regardless of the size our viewing screens eventually reach we will always have small ones (actually a very interesting television picture is possible as small as 3 x 4 inches in size) and we are going to have individual receivers on the arm of our chairs at home, on trains and in aeroplanes. Television is an intimate medium so of course we want to see the face of our announcer as well as we can and in general a pretty girl looks better in close up than a man. She has the advantage of presenting a pleasing picture to the audience while the majority of men are far more attractive in a medium shot than in close up. If

coupled with the fundamental requirements of a beautiful television picture a girl has poise, charm, and personality she has nine tenths of the jury in her favor. She cannot be "beautiful but dumb." The requirements of the job will demand correct decisions at a moment's notice, tact, good voice, diction, sound judgment, and plain ordinary television horse sense. The girl who gets the job must have enough of all these qualifications to make the majority of television viewers want to see her as many times as they will have to in the course of a week's broadcast. This means that some tested few will be very much in demand. The experienced television announcer of the future will find an attractive salary and a big audience waiting for her.

Now let's look at the male side of the picture. With all due respect to the abilities of the many successful radio announcers whose voices come into our homes today, the majority face a problem in television that they did not have to contend with in radio. They must be photogenic. Their physical appearance must be such that the majority of viewers will want to look at them. There is no implied suggestion that all television announcers must be prize winning beauties but they must be "good to look at." Their requirements from the point of view of ability are the same as the women: good personality, voice, and diction. In this respect the majority of men have a slight advantage over the women as a man's voice is usually more pleasing on radio. And now comes the all important question which will finally settle the sex of the announcer. Who are we playing to in television, the husband or the wife? Of course we are playing to both but it is doubtful that many men look at programs that their wives don't want to see and usually, in the long run, women would rather look at attractive men than at other women. So it doesn't seem that the girls are going to walk away with all the television announcing jobs. There will be plenty for the men. No one can say at this time what the future will bring to television announcers. So far there is no set rule as to how they will be used. Every station operating today has its own ideas on the subject and is acting accordingly.

The FCC regulations demand that station call letters be given visually and orally. Consequently we never see the announcer

when call letters are given. We see the station call letters on a slide and hear the same information given by an "off camera" voice. On some stations we never see the station announcer at any time. Program titles are presented visually, usually over music, as is done in moving pictures. If a voice is necessary, they again use the Hollywood technique where we hear but do not see him.

Stations have regular announcers on their staff, and some used attractive young women, who opened and closed every broadcasting session. This procedure has a value and was used by BBC in London before the war. The only criticism is the constant repetition. Other stations have used men as regular announcers while individual programs use men and women as announcers or masters of ceremonies. The chief fault is the over use of announcers. On one program the station announcer introduces the program announcer who in turn introduces the master of ceremony. Why stop there or do we need them at all? Operational experience will answer the question in the near future.

Television announcers, be they men or women, will be much more important to the audience than the radio announcer as we know him today. They will have a much more personal contact. A very interesting experience that proves this point was unconsciously enacted by a young lady who had seen a lot of television and suddenly came face to face with Ray Forrest. Ray had done an exceptionally fine job as a television announcer for NBC and had come into the young lady's home via television almost every night for a year. On seeing Ray in person she turned toward him impulsively and said "Why, Mr. Forrest, how are you?" Ray never having seen the lady before in his life turned to her with a polite but completely baffled expression. The lady gasped and said, "Oh please forgive me. I've seen you so close so many times I felt that I knew you. I just forgot that you didn't know me as well as I know you."

The Master of Ceremony

Everything that is important and true of a television announcer is just as vital in a television master of ceremonies. This field

is going to be one of the most difficult to cover. In any public gathering that is handled by a master of ceremonies or a mediator, that person, by the very nature of the proceedings, monopolizes more of the elapsed time of the meeting or program than any other one person present. He introduces each speaker and carriers the load of motivating the proceedings. In the flesh we may or may not look at the master of ceremonies while he is talking—at least we make the decision. If we don't like him we try and forget him and feast our eyes on something or someone more attractive. In television we face a different problem. It can be helped to a great extent by judicial use of the camera but it is only human and sensible to pick up the principal actor at the moment he is talking with the result that the master of ceremonies appears to be "hogging the camera," talking too much and otherwise monopolizing the spot light. Heaven help the master of ceremonies who gets to the place where the audience has had enough of him! A perfect television master of ceremonies should always be at his ease, always know the right answer, always be ready to pull a show out of the doldrums, and always make the audience want more of him as he builds up and gives way to the guest artists on his program. It is quite a tall order.

The best friend of the master of ceremonies will be the television director. He must know when the audience has had too much of a given personality and deliberately switch his cameras to other people or points of interest. In doing this he risks being accused of attempting to submerge the master of ceremonies or of simply doing a bad job of directing. To prevent this possible criticism of himself, the average director turns the cameras on the master of ceremonies every time he speaks, with the muttered imprecation—"You'd better be funny." In any event and with the best of camera work, the television master of ceremonies faces many tough problems. It may well be that "name" personalities, men and women who have qualified as stars on the stage, radio, and in pictures will, because of their very importance in their profession, take the television camera in their stride; but even they must realize that television is an intimate medium and unless they are visually interesting at close range, they too will face problems.

Many series of successful interviews have already found their place on television, but the popularity of these programs has depended entirely on the personality and visual interest of the individual. An interview spot on an afternoon program was interesting when famous names were brought before the television camera. Favorable results were achieved in England, with the same idea. The television audience was interested in "seeing" in their home personalities and celebrities with national reputations, but in many cases the interviews suffered from lack of "visual thinking" in planning the programs.

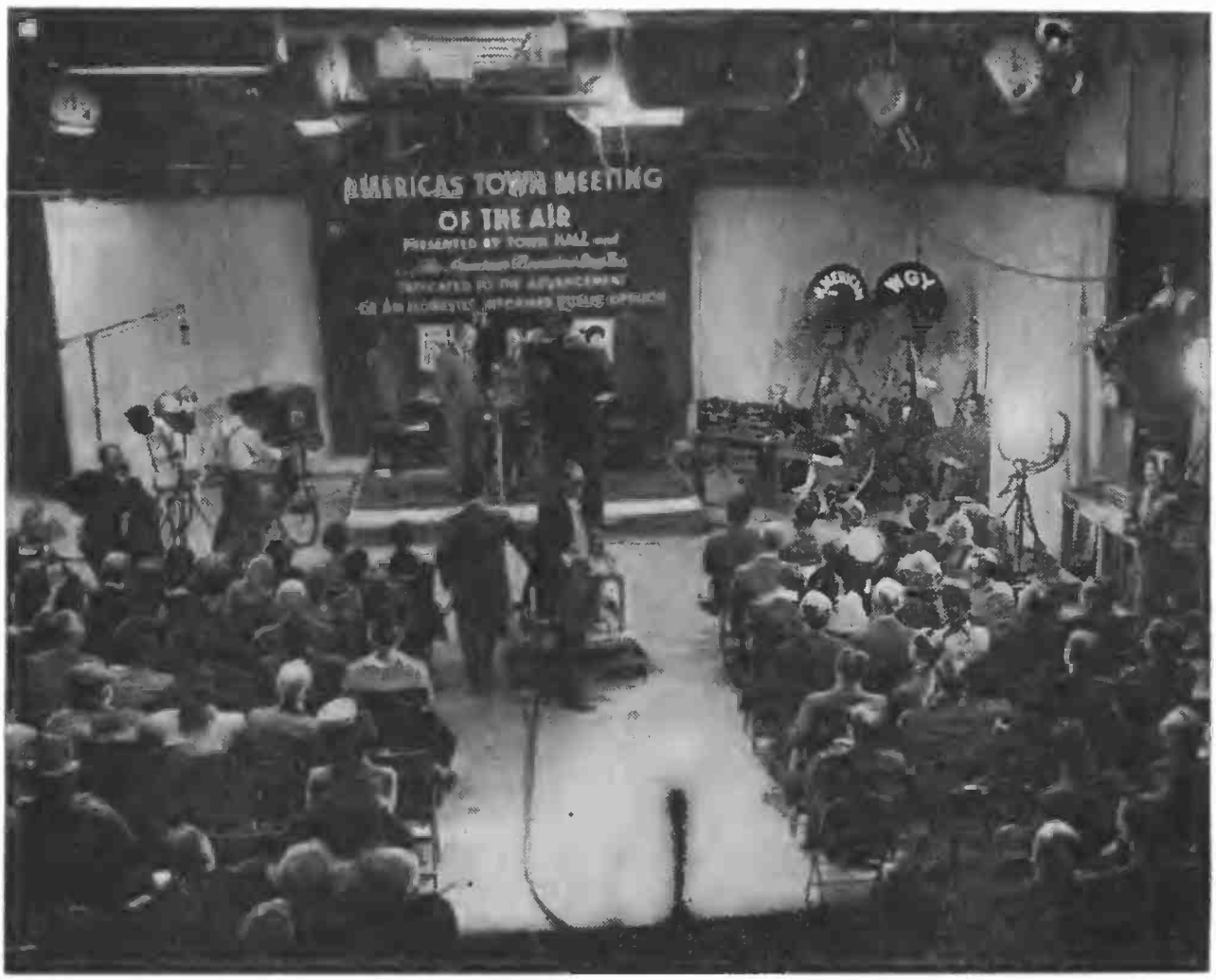
On a series of interviews of well-known women, interest was high as the program started. We saw the lady in person. Her dress and hat—the way she wore her hair; we saw her sniffle—the little mannerisms she had when she talked. What she said for the first few moments didn't matter. Then having satisfied our visual curiosity we wanted something to make us keep on looking. Interest dropped when she began telling about the teas she had attended. Actually the bottom fell out, as far as program interest was concerned, for it immediately took on the flavor of a radio program. When we interviewed Gypsy Rose Lee—everyone wanted her to do just one thing and she didn't. Care must be taken to prevent the visual possibilities built up in the minds of the audience from detracting from what they actually see. In radio this does not happen for everyone who tunes in knows that they will hear an interview—in television they expect to "see" one and they wanted to be shown. All this only proves that we should not attempt something that can't be done, neither should we forget that television makes demands on program builders that must be met, and that all interviews on television must be planned from the visual rather than the oral angle.

The visual interest has been worked out effectively in many interviews by showing the audience pictures of the subject being discussed. Obviously a perfect visual interview—if the man interviewed is an explorer or traveler—is accomplished by showing silent motion pictures of the places he visited—while he tells us of his travels. Obviously that is not an interview at all in a strict sense but it may mean that interviews on television will

cease to find an audience unless they are developed along similar visually interesting lines.

Experiments

In an attempt to find the answers to some of the problems we have mentioned, some very interesting approaches have been



The Town Meeting of the Air broadcast simultaneously by radio and television from the WRGB studios in Schenectady.

made. One of the earliest was the "debate" approach. The winners of two university debating teams were put on a program. While the boys were interesting personally, it was all talk. Their subject matter might have been worked out from a visual angle but in this case it was not. A debate can only be good television if the whole approach to the subject discussed can be made pictorially interesting.

Another program consisted of asking a group of high school

students their opinions on world affairs. This was better but again the visual interest depended entirely on the personality of the children.

Programs that include discussion of vital problems of the day (of interest to all of us) come close to making controversial subjects visually interesting. A subject for discussion is chosen and authorities on the subject argue the point. It is presented in a fictitious court room with judge, attorneys and court attendants. (The audience is the jury.) The experts are called as witnesses and their time for presentation of evidence, cross examination, and argument is limited. To see and hear important controversial questions discussed from both sides by recognized authorities and to witness their arguments and reactions is very interesting television. The program has movement and color and the right subject and personalities make it worth seeing.

One of radio's feature programs has been presented very successfully on television. The Town Meeting of the Air, a simon-pure discussion, was broadcast at the same time on radio and television from General Electric's Studio in Schenectady. The audience that regularly attends these radio broadcasts were invited to the studio. One television camera "down front" covered the speakers and the mediator, in close up, while the other was so placed that it could show a long shot of the stage and the individual members of the audience as they asked questions. Here was an example of television showing the viewer at home everything he would have seen if he had been there in person.

Political Candidates

What this medium will mean to future election campaigns can be estimated to some degree by what radio and the motion picture accomplished. It is true that we have seen all the candidates in the news reels but the shot is usually very short. If we show, and we will and have, a speaker throughout his whole speech, it may influence voters decisions. There is nothing so dull on television as a speaker reading a speech. That is radio. His only chance is to "put across" his personality so definitely and favorably that we want to *watch* him talk. Just as radio changed campaign methods, television may usher in a com-

pletely new order. While it will help some candidates it may prove to be a serious handicap to others. Television cameras are factual to an embarrassing degree. The "ike" portrays what it sees. This does not mean that all our future statesmen must be Adonises but they must have a personality that puts them in a favorable light with the majority of voters. Can you imagine anyone being elected to office today, if they did not sound as if they knew what they were talking about? In television they must not only sound but *look* convincing.

14

INFORMATIVE PROGRAMS

Educational or informative programs on television open vistas that virtually stagger the imagination. If there was ever any question concerning this, the Second World War proved the value of visual training for all time. The results that were attained in the armed forces through the use of motion pictures as a means of demonstration and training speak for themselves. There is nothing that can not be taught by means of sight and sound. True, we are only using two of our five senses but those two are adequate to teach the people of the world everything that they may be taught through personal contact with a teacher in a school room. It requires very little use of our imagination to foresee that pupils of the future may be taught collectively by the foremost teachers—experts in their respective lines—in every country school throughout the world. No longer will low paid educators teach the three R's to small boys and girls in rural school houses in isolated districts. Instead every country school in the world will have a large screen television receiver, in each classroom. Facing the camera will be the highest paid experts in the world, who will bring the knowledge they have gained through years of hard work and study, direct to the youth of America. Again let us repeat, there is nothing that cannot be taught by television. We will see the wonders of the world

through travel pictures. Planetariums, available now to a restricted few, will bring a clear picture of the universe to pupils in the backwoods counties of every clime. Visual demonstrations in physics, chemistry, algebra, geometry and languages will be brought home to youthful minds in detailed animation.

Probably the first concrete demonstration of the feasibility of teaching by means of television was carried out during an experimental program several years ago. The project was tested on a closed circuit to a viewing room which contained several receivers in Radio City. Substituting this viewing room for a classroom of the future, a class in electronics from New York University was brought there by their instructor, who was picked up by the cameras in the studio. Thus a practical approach was made. The professor delivered his lecture directly to the class and among the points covered was a demonstration of the electric eye. The class saw as well as heard just how this marvel of present day electronics operates. All of the highlights of the lecture were illustrated with practical demonstrations in the studio and it is obvious that the class could have been thousands of boys and girls in classrooms anywhere.

Music Lessons

While we are a long way as yet from the Utopia we hope to reach, a crude beginning has been made along many lines. Educational experiments of all kinds have been included in regular program schedules. One of the first tele-lessons was a music lesson. An accomplished pianist was seen seated at a piano. At his side was a little girl who had come for her first music lesson. We saw a close-up of the teacher's hands on the key board. We saw and heard him strike the notes of the scale, chords and arpeggios. We saw his little pupil start her first lesson. We saw and heard the mistakes she made and the corrections given her by the teacher. This one demonstration proved that television could do a job of this kind and almost immediately suggestions for improving our visual music lesson began to come in. One writer suggested the possibility of coordinating the printed musical notes to those on the piano, in the mind of the pupil, by electrically connecting the keys of the piano to a replica of the

printed page. When the note "A" was struck on the piano the "A" on the printed page would glow and so on for all the notes of the scale. While this suggestion was never carried out it was perfectly feasible and in this way the printed note would have easily become identified in the mind of the pupil with the note it represented on the piano. Hundreds of new ideas will be incorporated into programs of this kind. The fundamentals of every musical instrument can be taught by means of television. Heaven help us all when the saxophone class of the air starts!

Dancing Lessons

Dancing was another art that had an early experimental tryout. Competent dancing teachers appeared before the television cameras. Steps were charted, explained, and then demonstrated to the home audience. The final developments in teaching this art form may need additional work and special visual courses but the overall problem is fairly simple. Dancing of all kinds can be taught. While our early lessons were based on the popular steps in vogue at that time more recent experiments have included ballet, folk dances, and the latest of ballroom steps. Educational programs of all kinds can be made interesting even to those who are not particularly anxious to try the lessons themselves. Good dancers are easy to watch in any medium, regardless of the type of dance they are doing.

Some telecasts built around the dance required routines especially designed for television. This was particularly true of ballet. A long line of girls was a problem due to the size of the receiver but let us at least be fair in our demands of this new medium. When you go to the theater do you watch a "line of dancers" as a whole or do you single out a particular dancer? You cannot focus your attention on the alluring charm of an individual without losing the overall effect of the dance as a whole. Neither can the television camera. You may see the long shot of the whole group or the close-up of the individual. With proper camera work the dance can be used as an important subject in television programming and because radio could not handle this type of entertainment it will come into its own in this visual medium.

Exercises

Closely allied to the dance is the means of improving the female figure. Because women like to be slender and sylphlike there is a tremendous interest on the part of the fair sex as how best to accomplish this. They can be shown just how to go about it through television. And strange as it may seem the men always managed to be around when the demonstrator was in front of the cameras in the studio. The male interest in a women's program of this kind is high. Seriously though, television is the perfect means of showing both men and women how to properly stretch, bend, relax, and balance. A great deal will be accomplished along these lines. We will see how to walk, breathe and sit. Proper carriage, hair-styles, make-up and every sort of personal appearance will be realistically demonstrated.

The World We Live In

Let us think for a moment what can be done in an educational way regarding travel. Informative programs showing how people live in other parts of the world will be invaluable. We have perhaps forgotten the old illustrated lectures of the early nineteen hundreds and the travel books with their hundreds of illustrations of the far corners of the earth, but the travelogues we saw in the early days of the movies are still comparatively fresh in our minds. They were an attraction at every motion picture theater. With television we may look at the world without moving from our favorite chair. Already railroads, steamship lines, and air transport companies have seen the possibility of selling their wares by means of television. Trips of the future will be planned, photographed, and shown to prospective customers in advance, and if we are too lazy to get up and go we may use television as our magic carpet. We may travel anywhere from the poles to the tropics. Travel books of the future will be recorded on film and they will be visible on your receiver in your home.

Other Subjects

How simple it is going to be to teach languages! We will *see* lip movements, *see* the object the word signifies, *see* the printed

word while we are hearing it pronounced. History has already been brought home visually to some of our early televiewers. A series of dramatized incidents of famous American historical events has been filmed by a large eastern university. This series has been televised with very favorable results. The youngsters of tomorrow will see a reenactment of all of the great historical events. From the film libraries of the world will come the pictures of the happenings of this century. The wide use of film in World War II will make a visual record possible that will someday be seen by every school child in the world.

Every form of sport can be easily illustrated either by means of live broadcasts or film. We have had master golfers in the studio show us proper grips, swing, stance, and follow through; then by cutting to film we have seen these points demonstrated on the golf course. We have seen the fine points of fencing, the precision necessary in billiards, and champions in table tennis matches. Lessons in home decorating have been not only informative but intensely interesting. Cooking can be taught in every detail from the first steps in preparation of a dinner in the kitchen to the final serving at the table.

Everything that has been mentioned so far as well as hundreds of other subjects are obviously suited for good television production; but it is apparent that the manner of presentation is going to be most important. Many people have conceived ideas for television programs, but ideas in themselves do not interest television program managers. It is the detailed working out of an idea, its presentation in the studio, the way the script is written, and the manner in which it is photographed that make a program idea good or bad.

Televising Art

Let us take a typical idea, a program on art, designed to show painting and sculpture. The idea is sound. Television must include the finer things in its program schedule. So, where do we start? What makes a program of this kind good or bad? The first suggestion was to take the mobile unit cameras to a museum and actually show the originals as they hung in the gallery. Some day that may be done but we found that a good reproduction

gave us just as good results, if not better, than the original. We were also confronted with the problem of properly lighting the painting as it hung on the wall at the museum. We also faced the constant television picture ratio of three high by four wide. The source of power had to be considered. There was the necessity of hiring extra personnel on an overtime basis at the museum if we broadcast the program at night. We would have had to rope off that part of the building from which we were to broadcast and we soon saw the impossibility of a flowing program as the pictures we wanted to use were in various galleries which meant a complete shifting of equipment between each picture. On the other hand, if the broadcast was done from the studio, by getting the reproductions in advance, in an approximated ten by fourteen inch size, we could show them as rapidly as we desired. By mounting them on cards and placing them on an easel the pictures were in a fixed position and could be well lighted. So it was decided to use the studio. Then came one of the most important production problems. It is one that will confront television program producers in like situations for all time, for we found that the person who knew the most about the subject under discussion was not particularly "telegenic." Many times it is not a physically attractive person who spends his life delving into the minute points of interest regarding the whys and wherefores of a masterpiece or an Egyptian mummy. On the other hand actors in general may be attractive, handsome, and personable but they seldom know at first hand the intricate details of the subject to be explained. They can learn the lines and do a creditable job of "putting them over" but the knowledge, the facts, must be written out for them, worked out in detail by an expert on the subject who in many cases is both shy and reticent when it comes to personally appearing in public. Why, oh why, can't all the people who really know things be beautiful? Of course some of them are, but if they all were life would be simpler for television directors. But back to our program. It is conceivably possible that the man who had the original idea, who delivered the reproductions to you, who knows the facts behind the world's great art treasures, is a good talker and his personality is one that would make the television audi-

ence lose themselves in the pictures he is talking about. If not, the things he knows must be transcribed, learned, and delivered by some one with the personality to do a good job. Another problem is the right to use the reproductions it is planned to televise. However, all these details can be worked out and the person who knows his subject, who chooses interesting material and then gives a commentary that is not only educational but exciting will be the one who will make a success of a program of this kind. It is true that the audience is limited but it may be possible to make the program so interesting that many casual viewers stay and learn.

CBS accomplished this in their programs given in cooperation with the Metropolitan Museum of Art. For the most part these programs feature odd bits of sculpture and objects d'art from the collections in the museum. They were brought to the television studio and there one of the staff of the museum explained when and where they were found, how they came into the possession of the museum, the probable sculptor—in fact all the data pertinent to the subject under discussion. He knew his subject and proper presentation both visually and orally held an audience that might have been expected to switch to a program of a supposedly more entertaining nature.

Children's Programs

Many program experiments have been carried out with broadcasts designed to appeal to the youngsters. One in particular was on the air each Saturday afternoon and it was put together to show what the younger generation was thinking with regard to aeronautics. A boys' club, which helped boys build model aeroplanes, was the key to the program. This club participated in the broadcast and through the cooperation of airlines and aeroplane manufacturers we saw what was new in aerodynamics. We showed model planes and explained how to make them. Not only drawings of all the best planes were shown and discussed but parts of actual planes were also brought into the studio. The instrument board of a commercial plane was shown and explained in detail. All of the new inventions—jet and rocket planes, radar, etc.—can be described in detail to the

youngsters of tomorrow. If such a program is properly presented many adults will also find it interesting. During a broadcast in conjunction with a prewar automobile show in New York the special features of the new cars of that year were successfully demonstrated. We saw cut away motors in operation, the latest improvements in design, and the advantages of each new car. While the approach was commercial we must not lose sight of the educational value of programs of this kind. "There Ought To Be A Law" is another idea that was tried on CBS. On this program high school students from various schools in New York presented their ideas as to whether there should be a law preventing something that might or not be in the public interest. While it was basically an aural program the personalities of the students and the earnest expression of their opinion made the potential possibilities very interesting.

Bridge Lessons

Bridge is one of the few subjects that presents difficulties that must be worked out before it can be televised satisfactorily. Most of the trouble is caused by the size of the receiving screen. It is a fallacy to assume that all future receivers will deliver a picture two feet or more in size and with a small picture bridge lessons pose a real production problem. In other media bridge hands, when printed, are shown like this:

North
S A–K–J–10–5
H 8–7
D None
C 8–7–6–5–4–2

East
S Q–8–3–2
H Q–6–4
D K–9–7–3
C A–J

West
S 6–4
H A–J–10–3–2
D Q–J–8–6–4
C 10

South
S 9–7
H K–9–5
D A–10–5–2
C K–Q–9–3

How to put this information on a television screen stumped many enthusiasts who felt that bridge lessons would be interesting program material. Obviously it is impossible to reproduce all the above information on a small viewing screen. If you show one hand at a time you must constantly flash back to all the others to make your point clear. It is impossible to lay out fifty-two cards so that they may all be seen at the same time. Some day bridge lessons will become an accomplished fact, but at present this is one of the problems that remains to be worked out. In London the BBC had very interesting broadcasts of experts playing unusual hands. There we saw the cards they held from over their shoulder while an off screen commentator explained the problems involved. Some one will find the right way to put bridge lessons across on television before very long and the one who discovers the best way to do it will find the results more than worth while.

General Education

World's fairs have always featured the manner in which ordinary things of life are developed. Some of the chief exhibits have revealed to the layman the hidden secrets of many everyday facts. It was a real thrill to those of the television audience who attended the world's fair in New York in 1940 to calmly walk right by an exhibit that was holding the attention of hundreds of out-of-town visitors; for they had seen it all on television in their homes. One in particular was what is technically called a Micro-Vivarium demonstration, an investigation of the secrets of the minute animals that live and develop in a drop of liquid. To say that such a procedure is fascinating is a definite understatement. It is accomplished by placing a drop of liquid on a microscopic slide. This drop is then projected on a translucent screen and the television camera is merely focused on the projected image. No camera switches, no cues, no change of focus are necessary. Instead everyone loses themselves in the doings of the animals that live in a drop of swamp water. Through the enlargement of this single drop of water we see two of these animals meet, pass the time of day and lo and behold about five hundred little animals have suddenly come into existence. If

you'd like to know what goes on in a drop of vinegar just take a look at it through a microscopic enlargement on television. To put it mildly, there is plenty. Seriously, the amount of visual education that may be brought into the home and the school room by this method is almost unlimited.

Another interesting program that was suggested during a discussion of possible informative subjects was a rather unusual experiment that had been conducted in a univerersity class room. A wire maze was constructed with many false passages. One of these led to the center which contained a piece of cheese. Well fed white mice took quite some time to fathom the intricacies of the maze but "good and hungry" mice found their way to the cheese in no time at all. This experiment proved for all time that hungry mice are smarter than well fed characters and it could have been demonstrated effectively on television.

During a series of afternoon programs we attempted a garden class through the cooperation of a large agricultural college. We saw just how to handle plants, the proper way to cut when trimming the roots of various plants, how to thin and separate an over-developed plant, how to plant various bulbs, and how to care for them in winter. In fact, we saw all the things the amateur gardener wants to know and never does.

Floral arrangements were also demonstrated in a very interesting manner and programs of this nature can help aid the housewife in making her home attractive.

Another series of programs that showed great promise was carried out in conjunction with the New York Bureau of Missing Persons. Here photographs and descriptions of persons who had disappeared were given to the television audience and the possibility of a real service along these lines was clearly shown. The Weather Bureau is another branch of our civil government that can be demonstrated very well by means of television. Just how it functions, where weather information is obtained, etc., can all be shown comprehensively.

Clay Modeling

Clay modeling has been brought to the television audience by many sculptors and with various degrees of success. This is no

reflection on the ability of the sculptors who have appeared before the cameras but rather on the planning of the program before it was presented. The majority of television programs of this kind suffer from a lack of sufficient rehearsal or a lack of knowledge of the subject matter on the part of the director handling the program. It takes time to do a clay head. The movies have spoiled us by the speed with which things are accomplished on finished film. In television you are dealing with physical facts as they exist. After several bad trys we finally found that the best results were achieved, when working with clay, by having three heads of the same model all in various stages of completion. We would start with the raw clay and the sculptor would show the basic fundamentals involved in starting a head then we would lap dissolve to a head that was nearly completed to see the technique involved in that phase of the work and finally we would switch to the completed head. Proper television presentation of subjects of this kind is going to take serious study on the part of the sculptor as well as the television director to ascertain how they may best be presented.

On the General Electric station in Schenectady clay was the subject matter of a most interesting educational program. It consisted of a simple demonstration of a potter's wheel. To actually see a man take a lump of clay and fashion it into a vase was very interesting. Demonstrations of this kind should awaken the creative genius in all of us and help to make the world a better place to live in.

Making a Dry Point Etching

Another interesting informative program was a detailed description of how to make a dry point etching. The majority of people know nothing of this process and perhaps academically care less, but our television audience hung on the dials for a real job was done on this program. The credit goes almost entirely to the demonstrator. He knew his subject and was willing to give us all the rehearsal time necessary to bring to the audience the details of the operation.

We saw each step in the process from the drawing of the first picture to the finished etching as it came off the press. The suc-

cess of the program was mainly the time spent in rehearsal. The demonstrator had the patience to go over and over his lecture so that when he finally went on the air the right camera was on the right subject from the correct angle at the proper time. When we were through the results more than justified the time spent in preparation.

A good formula for an interesting informative program might well be: secure a man or woman who is a good talker, who looks well and who knows and can demonstrate an interesting subject, assign studio technicians to the program who are interested in putting out the best job possible, put the program in the hands of an experienced director who is familiar with or who has the time and energy to become thoroughly acquainted with the subject to be shown. Plan every shot in advance. Rehearse and rehearse and rehearse. The result will be a program that the television audience will find to be informative, interesting, and entertaining. What more can we ask of any medium?

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VARIETY PROGRAMS

In programming television the most obvious source of entertainment consists of individual artists doing what ever it is they do best—but doing it before a television camera. And this type of entertainment, taking in the whole gamut of songs, dances, dramatic readings, magic, etc., may be considered broadly under the heading of variety programs. Whether they are good or bad on television depends on two things: first, the ability of the artist and second, how they are presented.

The first television demonstration using the present all electronic system was given in New York on July 7, 1936, in the NBC studios in Radio City. The program included stars from various fields of entertainment but the production from a theat-

Eddie Green and George Wiltshire participating in the first demonstration of the present day electronic television system: NBC studios July 7, 1936.

rical point of view was a long way from being the finished product that we are seeing on television today. There were many limiting factors in this first television program. First, there was only one camera and consequently the artist simply stood before the camera and "did his act." The iconoscope was lacking in sensitivity. White make up and black lips were necessary to give a semblance of reality. The program was done in front of draped curtains. The lights were not right and the picture only had 343 lines. But this crude beginning proved that the possibilities of television program development were virtually unlimited and immediately a schedule of program experiments began that extended over a period of five years. Pearl Harbor put an end temporarily to active programming and it was the fall of 1943 before television experimentation again became active, but many things were learned in those years and they are basic fundamentals that we may take advantage of in future programs.

The Television Approach

In any television program that we plan we must remember that it is to be viewed in the home by a small group of people. We immediately lose the advantage of mass reactions. A singer in a night club may win the applause of the occupant of every chair in the café, where they see her in person, and that same entertainer may be a dismal failure on television. First the television camera has a heartless eye. It shows faults as well as perfection not only in ability but in appearance. In the night club our soloist will probably appear in soft mellow lights. The whole atmosphere of the place is subdued and we are in sympathy with the performer even before she begins. We came there to be entertained and probably went to this particular night spot to hear this particular singer. You may note, we go to a night club, the opera or a concert to "hear" a singer. The "seeing" we take for granted. But as yet on television we tune in to see and the hearing becomes of secondary importance for we could hear her on the radio. And even at the club we are not as close to the artist as we seem to be when we view her on our television screen. Some one has said "everything looks good if it is far enough away" and that is all too true in television. In this medium, especially in a small sized viewing screen, we want close-ups and our subject must be able to "come up smiling" under the most minute scrutiny. For our close-up lens brings us a picture that we would only see if we sat about six feet away from our night club performer and looked at her through opera glasses.

In general those are the conditions under which vaudeville artists, night club performers, and concert soloists must work. No more do they need to project to the last row of the gallery. They are always playing to the front row. And this one feature is going to result seriously for old vaudevillians. One team with an international reputation was suggested as television program material. Out of deference to their reputation, they were to be scheduled for an appearance without an audition. But "on advice of council" we asked them to run through their act. Thank Heaven we did, for they were both so used to projecting their material, to putting their personalities across the foot lights,

that their television personality was far from what it had been in the theater. We saw them "work." We saw "the wheels go round." They strove so hard to put the act "over" that they were totally unsuited for this new medium.

In spite of the lights, the boom microphone, and the cameras, artists must remember that they are really in a living room, only six to ten feet away from their audience and they must approach their television viewers from this point of view. And while this is too complete a change in technique for some of the "old timers," others take to television like a duck to water. Loud speaker systems have trained many, radio has helped others, and if a proven performer knows how to take advantage of the television system, as represented by the output of the television camera, he can do a job that will keep him working as long as he wants to. There are few people who wouldn't be thrilled if they could casually remark to their next door neighbor, "Come on over tonight, Bing Crosby is coming to our house, as our guest, and he's going to sing." Radio brought Bing's voice to our home, so did phonograph records. But television brings the man himself, his personality, and his charm. Some of the best television programs have been done by outstanding personalities but other artists not so well known, have been equally as good. The right performer with the right personality and the right material is a television natural.

Skaters

We have tried almost every type of variety program and, from a production point of view, trick roller skaters are among the best. They always perform on a hard wood mat not over twelve feet square, so if a director sets his camera to cover that amount of space he always has a good picture. If his camera is back far enough to take in a twelve-foot area it also has good depth of focus. With one camera set to cover the overall area the close-up camera can be readied to pick up interesting close-ups. We know that those close shots will always be within that twelve-foot area. So when the male skater spins the lady by her feet and just grazes the floor with her nose, we can always get a perfect close shot of the proceedings.

Legerdemain

Magicians are another television problem. Magic must develop a new technique before it can take its rightful place in this new medium. Magicians always guard their secrets carefully. They never explain their tricks and to protect them it behooves all magicians to be wary of television. It might be a kindness to say that a magician should never perform before a television camera unless his manager or personal representative, is in the television control room. As you know each camera has its corresponding viewing screen, and you also know, a magician succeeds in fooling the audience by prevailing on them to look *where he wants them to.* In slight-of-hand particularly he makes the audience look at his right hand while he executes the trick with his left, but he may lose this ability on television. If a television director sets his cameras in close-up, one on each hand of the magician, directs his cameraman to stay with that particular hand no matter what the magician does, and then watches not the hand he is supposed to watch but the other one, he can usually see how the trick is done. Of course the television audience does not, for during a program cameras are switched to heighten the surprise; but at rehearsal—magicians beware!

Seriously the main problem with legerdemain on television is that we yearn for detail and if we roll into a "close-up" we inevitably cut off a hand or two. And if we eliminate a hand from our television picture who knows what is going on "off camera?" It would be the simplest thing possible for a magician to hold both of his empty hands in close up before the camera, swing them out of sight for a minute (out of the range of the picture) and bring them back full of cabbages and kings or what have you. To show the versatility of a conjurer—you must keep both his hands in the picture at all times. This means that once a magician starts a trick you must keep one camera on him that will completely include him, at least to the knees, until the trick is completed. If he is doing a card trick the visual results are not good as the cards are so small they are unreadable. The red spots show very light and they are too small to recognize. Does all of this mean that the art of magic is no good for television? Of

course not; but it does mean that a director must know what to show and when to show it. He must never let the audience realize that they didn't see the magician's hands all the time. That itself is quite a trick—but it can be done. While magic is obviously suited for television it is a production problem that should not be dismissed lightly.

Animal Acts

Trained animal acts came in for their share of early experimentation. The boxing cats in their little ring were fine, trained canaries behaved well, but we came to grief with dogs. We arranged a simple setting that in the main duplicated a vaudeville stage. At the rehearsal everything was perfect. Towser and his pal performed like the troopers they were. We made chalk rings on the floor so the cameraman might make a rough focus of the spot until the dog came into it. The trainer saw our problems and everything was fine. We went out to dinner with high hearts. Then, some three hours later, the show went on the air. The first trick was just as rehearsed but from then on the performance took on all the characteristics of a good game of "hide and seek." The cameraman would cover the circle on the floor but no dog came into it. The director frantically called to the cameraman over his telephone line—"get the dog." The cameraman, knowing his camera was where it should be, was naturally unhappy but he reluctantly left the eye piece of his camera to gaze around the studio in a frantic search for the star. And there was our hero standing on his head as ordered but over in the corner completely out of range of our lights. Frantic signaling on the part of the stage manager finally induced the trainer to go bring the dog into the lights. But doggie had already stood on his head. That trick was over and he had no intention of repeating it. In the meantime his co-star had decided that he should investigate the television cameras. Again the director urged the cameraman to get on dog number two instead of on the trainer's feet but by that time, dog number two was out behind camera number one and furthermore he had decided about then that he didn't want to be televised and he wasn't. From that point on—neither camera ever again caught up with either dog—and we signed off with the

fervent vow—no more dogs. Undoubtedly we will have hundreds of dog acts on television. But under the conditions just related other things are easier.

Contests

Various types of indoor sports and games might roughly come under this category. Ping pong was an early program experiment and as yet it is not one of the best. First the players are so far apart due to the regulation size of the table that to see them both we must pull our camera way back and the resulting picture is lacking in detail. If we try close-ups, the action is so rapid that the viewer fails to properly comprehend just what is going on. Larger viewing screens will help but that isn't the final answer. This game needs more experimentation before we can hope to learn how to present it properly.

On the other hand, billiards is a perfect television game. We have a definite limit of action. Everything of interest happens on the table top. Beautiful close-ups of the balls in action are possible. We can show how to hold the cue correctly, how to hit the balls. We can see complete demonstrations of draw shots, follow shots, and just how to put "English" on a ball. Every program of this kind that has been tried was very good. Of course you need a good player but competitive games are a possibility in the smaller stations between local players. There is only one problem and that is the table. It is no simple task to install a billiard table weighing several tons in the studio and once it is placed in a position it must stay.

Fencing has also had its television baptism. It offers no particular production problem. Both close-ups and long shots can be presented effectually. All sorts of competitive matches are interesting if they are done well. Who knows, some day checkers and chess may be developed, as television contests.

Jugglers

Jugglers are, for the most part, easy to present visually and they provide interesting program material. Juggling naturally takes a good performer and it needs a certain amount of long-shot camera work to give the overall picture, but there are plenty

of opportunities for close-ups. Indian club jugglers once put on a great television act, as we put the camera in line with the man who was throwing the clubs and he threw them directly at the lens of the camera. His partner stood beside the front of the camera and reached out and caught the clubs just before they hit the camera. The effect was spectacular—but be sure the station owner doesn't watch rehearsals or he may cancel your camera shot. Of course, if the catcher ever misses just start looking for another job—but visually it's worth trying.

The perfect television act is the one where the juggler lies flat on his back and juggles men and articles with his feet. We were never able to find a good troupe who specialized in this, as the Japanese were the principle exponents of this type of balancing act, but it ought to be very easy to produce and it should be good entertainment. Tumblers need only to stay within a certain floor space to do a good job. Trapeze acts offer more problems particularly due to the equipment used. Our only venture in this type of entertainment meant cutting holes in a concrete floor to anchor the base of the trapeze and then we found that it was impossible to catch the performer at the top of his swing because of the studio lights. An act of this kind needs a high studio and special lighting.

Preparation

Rehearsals for nearly all variety acts are more of a work-out for the camera crew than for the artist. The performers know their routines. They have done them day after day, so for them to walk into a television studio and put on their performance is just part of a day's work. But while rehearsals are simple for the performer—the director and the cameramen must know at all times just where to focus the camera. There is always some high point of action in variety acts, other than straight singing acts, and if the act is to "go across" in television these high points must be brought to the attention of the audience by correct camera work. Whenever possible it is advisable for the director to see the act in a theater so that aside from knowing the routine in advance, he can plan his close-up shots, basing them on the high point in audience reaction in the theater. If advance viewing is

not possible, the acts must be rehearsed enough to definitely set every camera shot. Variety performers for the most part, resent going through their routine time and time again. This means that a television director handling this type of performance must be able to make up his mind in a hurry and work out a cue sheet that will make it possible to do a photographic job when they go on the air. He must also have a whole lot of luck. A good variety act can easily be ruined by poor camera work.

Many directors apparently fail to grasp the importance of having their program set and also to be prepared for any emergency. There have been broadcasts of cartoonists where the artist actually stood between the camera and the picture he was drawing. We'll say this was the result of a mistake either in camera positions or on the part of the artist, but there is a reasonable doubt, for the camera position wasn't changed for at least five minutes and we saw a very charming picture of the artist's back. This kind of television production is inexcusable. Barring accidents it can only be the result of lack of rehearsal or inexperience on the director's part. Many well-known artists appearing on television seem to feel that it is unnecessary for them to rehearse at all. While this gesture of importance on their part may inflate their ego it fails to make a good impression on the audience. If an artist walks out of a picture or if he moves to a spot that the director and cameramen do not anticipate, anything may happen. It is very easy for a performer to walk out of the lights and thus spoil the picture. If an artist cannot take the time to rehearse he would be far wiser to forego television altogether. He may not need the rehearsal but the cameramen and the director do, and the artist cannot do a good job without their help.

Usually a director can chart a routine of an act based on stage business or music and he then can know where his cameras should be at all times. Only in that way can perfect results be achieved.

There is one must for a good director. At any time in any performance he must be able to tell instantly the next shot on every camera he is using. This isn't easy but it can and must be done if a smoothly flowing program is to register on the viewer's receiver.

Drawing

We mentioned cartoons a moment ago. This type of program material is or should be good television, but it takes a fine artist and one who works fast. Very few artists can or want to carry on a running conversation while they are working and the drawing of a complicated picture is dull entertainment without sound of one sort or another. Again the program usually lacks action. If some kind of semi-animation could be worked out in combination with straight drawing, a very interesting program might result. For instance, if in a comic strip type of program all the printed matter in the "balloons" that the characters are supposed to say could drop into position or suddenly appear as soon as the characters were completed and the artist started his next picture while the audience was reading the one just finished it might help considerably. This could be accomplished very easily by having the completed drawing with the written conversation lined up on camera #2. The artist draws his cartoon on camera #1 and as soon as the picture is drawn a switch is made to camera #2 for the finished work. We haven't even begun as yet to program television properly, there is so much to be done and so many ideas to be worked out. Every set owner is going to see the medium develop as new men and women work out their ideas. But a word of caution to directors—don't try your ideas on the air until you have at least tested them on a closed circuit or you may find your audience tuning into another station. The television viewer is long suffering and very tolerant and easily pleased—but after all he is entitled to and will demand good entertainment. At least be eighty percent sure you are right before you go ahead.

At Home

So far we have discussed various types of acts that might be used in a television program. Now let's look at the program problem that is involved in putting variety acts into a unit hole —a smoothly running overall performance. So far in our television studios we have relied entirely on presentations as they might have been put together in some other medium. It still remains

for some imaginative director to build and present a television variety show within a framework that is new and perhaps only possible on television. Up to now we have seen variety presented in several basic forms: the "at home" type, straight vaudeville, burlesque (before the advent of the strip tease), and the modern night club approach. You might ask, "How else are you going to present variety?" That is a question we will not attempt to answer at this time. That is one of your television program problems.

Let's look for a moment at what has already been done. We fade in a title card reading "At Home with Esmerelda Brannon." and then a quick switch to Esmerelda's living room, where we see people grouped about the room listening to Esmerelda playing the piano. She finishes and everyone applauds and whispers "Wasn't that just too wonderful." Esmerelda tells everyone how glad she is to have them as her guests with a sly glance at the audience and then turns to Amelia who is leaning unhappily against the piano and says "Now Amelia, you sing a song." After some hesitation Amelia sings and everyone says it is "just wonderful." Then our hostess singles out Elmer who is sitting dejectedly with a guitar in his lap and says "Oh Elmer, can you play the guitar?" Yes, Elmer can, and does, and it is just "so wonderful." Then Esmerelda sees Gertie. Gertie has been there all the time but Esmerelda acts as though she had just dropped in through the transom, and tells all the guests what a wonderful dancer Gertie is. Gertie then proceeds to prove that she isn't and after everyone tells her how "wonderful" she was some one suggests that Esmerelda play again and all the other guests think that is a "wonderful" idea and Esmerelda starts the routine all over again.

Perhaps this criticism is overly severe but this type of presentation is as near the bottom of program planning as anything that may be attempted. There is no imagination, no sparkle. It has none of the spontaniety of a group having a good time among themselves in a living room. It actually "comes across" as a number of performers in a television studio pretending that they are in a home and for no reason on earth, except that the director told them to, they sing, play and dance. An honest approach

where an announcer says we have invited a group of entertainers into our studio to sing and dance for you is much more real and enjoyable.

Vaudeville

And a vaudeville show is really just that. You might set the scene in an old-time theater. You might look over the heads of the audience to the orchestra in the pit and above them, see the advertising "Opery House" curtain. You might have a short overture as the front curtain rises and the little lady in the pink opera length stockings puts the first identifying card on the easel at the side of the stage as the show starts. Many old-time vaudeville programs have been presented, for the most part, as is suggested above and their success has depended on the caliber of the acts that were included on the bill. There are hundreds of old vaudeville routines that are still very funny and television may bring back this type of entertainment. The amateur hour, with the right master of ceremonies, is also a good frame for presenting this type of program. Youngsters who are talented in any way are good television material but their amateur standing must be built up and once that is done the audience will take them to its heart.

The Good Old Days

Another formula that can be used in many ways is the "Gay Nineties" set. It may be in the "back room" in a small café, or in any of the hundred and one places where people used to get together in the days before automobiles and radio. It may be any gathering from a Church social to a picnic, from a pink tea to the tap room in Grogan's. Wherever the location, it gives a frame work for the presentation as a whole that aids the writers and helps to set the scene and mood of the program. Once the proper atmosphere is established it is easier for the performers to entertain their audience.

Practically all of the programs that we are seeing today are based on results that have been achieved through experimentation either in television or even in some other entertainment

medium. Our biggest variety programs were a very simple step from the revue type of theatrical entertainment. In fact television simply moved into the theatre. Comedians needed an audience and it was impossible to crowd a large number of people into a studio where scenery was spread out for effective T V camera work. So the cameras went to the auditorium.

The installation for television was fairly simple. Usually a ramp was built down the center aisle of the theatre at the same height as the stage. The camera, on a dolly, was then able to move in or out as the subject matter to be picked up dictated. Two other cameras were installed at stage right and left. They were either on the stage itself or on raised platforms in front of the boxes. While these cameras do not move the four lenses in the turret head give them a wide range in shots that may be made. By panning they can also pick up the audience when it is desired. Sometimes a fourth camera is installed in the front of

Dorothy McGuire and Tom Terris in an early television production.

the balcony for wide angle shots or close-up work with a narrow angle lens.

With this camera arrangement the master of ceremonies introduces each act and the audience at home and in the theatre have a complete picture of what takes place. The entertainment value rests with the M C and the performers selected but the whole gamut of theatrical personalities can be used.

A typical café setting as reproduced in the NBC studios.

The Night Club

One of the favorite frameworks for variety programs on television today is the night club. In a program of this type actual conditions as they exist in the Broadway night spots can be duplicated. The majority of the popular after-theater rendezvous are small. The performers are actually close to the audience and the formula of presentation is ideal for television. The whole studio can very easily and inexpensively be made to simulate a favorite location. The scenery is placed entirely around three sides of

the studio. A small stage is built for the orchestra. With a space for the dance floor with tables placed around it, an entrance for the artists, and a main entrance, if you want it, you are ready to go. You invite your friends to attend your television program. Their price of admission is an evening dress for the ladies and at least a "black tie" for the men. You seat them at your cabaret tables perhaps serve them some ginger ale, if the sponsor feels generous, and you are almost set. You need of course a hat check girl and a couple of waiters. You need a small orchestra, a master of ceremonies and as many "acts," artists if you prefer, as you think necessary to round out your allotted time. You need very little rehearsal for your artists all work in the cleared dance floor which need not be large. You do not require a great deal of camera movement. One camera should be placed for an overall establishing shot. Your opening might be a high shot of all the guests dancing. As the dance ends, the master of ceremonies steps out on the floor; you switch to a close up and the show is on. In a program of this kind you have many aces up your sleeve. Food, drinks, and clothes are there to be looked at and talked about. Audience reactions can be used to fill a gap, if perchance you have to move the piano. Every type of act is possible from Hawaiian dancing girls to acrobats. Intimate entertainers make the most of this almost perfect setting for a television variety program and to top it all the entertainers can play to the audience in the studio legitimately and the viewer in his home becomes one of them at a table next to the dance floor.

Looking in on Radio Programs

Many potential television sponsors were interested in simply turning the cameras on radio programs and some of them held an audience. While from a sound, rather than a visual approach to television, that is, where the television program is designed for listening and only casual viewing, they had a value, we must remember that a visual presentation shows up the faults of a program, especially where artists appear before a microphone with scripts in their hands and the announcer gives the audience cues as to when to applaud. Some of these have been used, however, and the quiz programs came the closest to doing a good television

job. Seeing the contestants had a tendency to heighten audience interest.

Television Quiz Programs

Several types of "quiz" programs have been tried on television and the results have varied considerably. There is no doubt that people are interested in problems, but what problems to use and how to present them has been the biggest question. To be a hundred percent successful the home audience must participate.

On some programs of this kind, higher than average contestants have been asked various and sundry questions. They have included the enactment of parlor games, from musical chairs to throwing marbles in a dish balanced on the contestants head. We have seen visual problems where the contestants are asked to draw as well as to identify pictures and drawings. One of the principal dangers in programs of this kind is a lack of interest on the part of the television audience, in the personalities of the contestants. They at least must have a favorite.

An old-fashioned spelling bee was a regularly scheduled program for some time. It reached its peak of audience interest when the contestants were such that the home audience sympathized with the loser and applauded the winner. It is difficult to include the audience in contests of this kind, and yet a way to accomplish this must be found. Aside from either knowing or not knowing the answer, if the viewer at home has no way of entering into the game he really is merely an observer. It is true that this same situation exists in radio, but television being visual should offer more.

It is comparatively simple to reset radio program procedure so that it will look well on camera. Early experiments proved that radio technique had to give way to visual demands. The problem was how best to accomplish this. We forget for the most part when attempting something of this kind, the organization needed to do a good job. We tried out a program for a while where the contestants were children on the theory that youngsters would be visually interesting. The first problem was to find the right youngsters and then to determine what questions to ask them. We wanted to get away from completely oral

questions in an endeavor to stress the visual. This meant that the television audience had to see the picture or object that the children were looking at, at virtually the same time they did. The audience also wanted to see the kids as they studied the picture. Frankly, this formula has yet to be worked out correctly. It sounds simple but the program attempts that have been made so far leave one with a sense of something lacking. Another common production fault and one that is very easy to fall into, is to stay too long on the quiz master. This must be avoided at all costs as the quiz master, while important to the program as a motivating force, is not the high point of interest to the viewer.

Visual Picture Quizzes

We also tried a completely visual type of contest. We took some part of a well known picture or subject and enlarged just that unit, such as the statue on top of a well known monument, a carving on the front of a building, a motto over a door, and then asked our contestants to identify the pictures. Development of ideas of this kind have plenty of possibilities, but it involves the gathering of the photographs, enlargements of the units to be shown and clearance on the use of the pictures. Making them into slides aids the operation of the program, as the audience may look at the slide while the contestant looks at the photograph.

Charades

One visual quiz program was tried out with more than ordinary success. It was simply a development of plain old fashioned charades. In the home, two teams are chosen. Names of books, songs, plays, or quotations are written on a piece of paper and the opposing team must guess the name written on the slip as enacted by the member of their team. The total elapsed time in guessing the answer is the deciding factor in determining which team won. On our television program we formed a team of "experts" who were challenged by any other team who cared to participate. Quotations were sent in by the audience and a prize was given for the ones selected with additional prizes if the ques-

tion remained unanswered. Cards bearing the quotation were prepared, and placed on an easel which was located so that the contestants in the studio could not see them although they were visible to the television audience. At the same time the audience saw the quotation or name it was handed to the person, who was to enact the sentence, on an ordinary slip of paper. The program called for ingenuity and intelligence, and it proved to be amusing and interesting. We included the audience from time to time by not showing them the quotation to be guessed so they were in the same position as the people in the studio who were trying to find the right answer.

Undoubtedly quiz programs have a value as subject matter for television programs and eventually we will find the best manner of presenting them. They offer possibilities not only as network features but also as local programs, for groups in a small community could compete with each other and interesting low-cost programs might very well be the result.

Further Experiments

Another type of audience participation program was Columbia's "The Missus Goes A-Shopping." This program was lifted bodily from radio. There was very little deviation on television from the radio routine. We were shown the assembled guests and then the master of ceremonies called his contestants up from the audience. The stunts they were asked to perform did not require much intelligence on the part of the doers and even less on the part of the viewing audience. We have seen men struggle into corsets—contestants guessing the number of pennies in a bowl, a girl being kissed three times by one man while she was led to believe it was done by three. We have seen eating races and other games that recall the first party we ever attended in our youth; but the station received an award for putting the program on the air—and so it goes. You have undoubtedly seen "Information, Please" in the movies. This is just a foretaste of what you will see some day on television. Quiz programs may need to be dressed up for television but our normal human inquisitiveness will always make us interested in puzzles and contests. This

means that all we have to do is to find the best way to present them and we can be sure that our audience will look in.

Another program that found a certain amount of public acceptance perhaps proves that some types of radio techniques will have a place in television. On this program we saw the master of ceremonies call a member of the television audience at his home. We waited while the recipient of the call answered the phone. Then we heard and saw the M C telling the party on the phone that he was going to show him a problem on his television receiver. Then we waited while the man at home came back to his set. The M C presented the visual problem and asked for the correct answer. Again we waited while Mr. Jones went back to the telephone. If his answer was correct we waited some more while he came back to the receiver to select the prize he had won and after another wait we were informed of his selection. While the program lacked visual interest it shows that all sorts of ideas have been tried out and from some of them have come practical television programs.

In the main, quiz programs are static—that is, there is little or no movement before the camera. The quiz master and the contestants sit in one position and answer questions. This means that the entire entertainment value rests on the personalities of the people before the camera. But just as radio used every possible approach to the quiz type of program, so too, will television and the proper combination of personalities, "gimmicks" and subject matter will eventually find its place in a program schedule.

16

DRAMA

Probably the most popular television programs will be basically dramatic. Taken altogether more experimentation has been done with this type of entertainment than with any other and with the most gratifying results. While a dramatic program is the most difficult kind to produce it also is one that challenges

the ingenuity of the director. It gives him an opportunity to express himself in many ways, to discover what to do and how to do it. Because of the place that drama had won for itself in Hollywood, it was a foregone conclusion that experiments must be made to learn how best to fit this form of entertainment into the new medium.

Early dramatic programs were simple, nothing involved was attempted, but as the success of this type of entertainment was proved the plays presented became longer, the casts larger, and the productions more pretentious.

The first experiments were nearly all short dramatic blackouts, from musical comedies, or one act stage plays. The casts were, for the most part, small and the action was restricted to one set. From virtually the first broadcast it was apparent that the material selected for presentation was as important, if not more so, than the way it was done. "The Play's the Thing" took on a new significance. The limitations imposed by facilities could not be ignored. Whether the play to be presented was an adaptation of some existing work or an original television story, the problem from a production point of view was the same.

Writing for Television

In some respects it is more difficult to write for television than it is for radio. During the past twenty years definite techniques have been developed for radio. Because we are only using the sense of hearing we must "picture the action" in our radio story by means of words or sound effects. Thus it takes many more words to convey a scene to an audience by means of radio than it does in television. In a dramatic scene it is necessary first to have the narrator describe the scene. This may take from thirty to forty seconds of broadcast time. In television the audience sees the scene and the forty seconds must be filled with additional plot development or good dialogue. If we want our radio audience to know that our leading lady is going upstairs to get a warmer wrap for the baby we hear "I'm afraid I'll have to get something warmer for little Alice." "She's a cute baby isn't she, but I do worry about her." "Oh dear, I'll have to go upstairs and get a warmer wrap. I won't be a minute." Then we hear

the supposed click of high-heeled shoes walking across a floor without any carpet and up an endless flight of steps, again carpetless, then the door handle turned and the door opened. All of these sound effects take time. In television we'd see the action and probably rule it out as uninteresting. This simple illustration shows how radio scripts differ from television plays. We must think in terms of visual presentation and, in general, it is more difficult to paint pictures that we can see than it is to set our scene with a word picture. In radio it is doubtful that any two listeners visualize a scene that is described in a radio story in the same way. We build the set mentally to suit our own imagination from the description we receive. "A dark paneled library" might appear one way in your mind's eye and entirely different to the man next door. But in television we lose the advantage of the listeners' mental picture. We must show the paneled library convincingly. It must be real enough to create in the mind of the viewer through the eye, the room he "saw" through the medium of sound alone.

If we eliminate altogether the difference in elapsed time between television dramatic productions and radio dramas, the author must still face a more difficult problem in writing, for the audience demands more from a visual performance. In listening to radio the audience is constantly trying to visualize the story and the people in it and consequently our plot development may move slower. We can take more time to relate the happenings of any given scene. We cannot take time out in television, as in radio and in fiction, to tell what the heroine of the story is thinking. We must write a play in which the actress is able to "put across" to the audience visually the things in her mind.

Radio has developed a tremendous reliance on sound effects. Many dramatic climaxes in radio rely entirely on effects. We successfully build to a high dramatic situation and top it with sound effects and music. We have proved the efficiency of a procedure of this kind in sound only but it is much more difficult to achieve the same effect visually. An automobile accident in radio is sound on a record. In television it means either hours of work on a miniature or a motion picture crew shooting a real accident.

In spite of the difficulties, writers will adapt themselves to this

new medium and the successful original dramatic programs we are seeing proves that it can be done. The majority of tomorrow's television writers may and probably will come from young people who are as yet unknown. The successful radio, theater, and motion picture writers were until recently not particularly interested in spending hours of their time in writing material to develop this new industry. Their sound economic reasoning was that until television could pay them what they get from their present job they would continue to write for other mediums. It is true of course that thousands of copyrighted short stories that have already been published will be produced on television, but every year brings a greater demand for good material. Fees comparable with and in some cases higher than radio are being paid. Writers in television should come in to their own because of the great demands that will be made for original programs.

Choice of Material

The television program director faces many serious problems when he sits down to decide which particular script he will recommend for television production. In its broader sense he has the whole world of literature to choose from. What shall he select from the myriad pages of written material for production on his station?

As television program schedules expand the choice of material selected will broaden, but in the early days of television the dramatic programs were restricted to easily produced playlets and sketches. This type of dramatic material is usually selected because of the limitations that exist in studio space, equipment, and personnel. There probably will never exist anywhere in the world a television studio with sufficient equipment to enable a director to forget his limitations in studio facilities when planning a production. So any material chosen must first and foremostly be considered from the point of view of "Can I physically do a first class job in the studio with this play?"

Nothing has been written that equals in intensity and theatrical values the old dramatic sketches of vaudeville. A short cast of characters set a scene, developed a situation, and reached a

dramatic climax in less than twenty minutes. The "blackouts" of English and American reviews took this same formula but they shortened it in elapsed time. The short-short stories of modern fiction carry out the same idea. In approaching the problem of what to select for presentation it is wise to bear in mind a program policy that has been generally successful. The theory of it is this. The radio (or television) audience welcomes your program, they give their time to listen to and look at your program. Regardless of its subject matter, be sure the audience doesn't resent the time spent, be sure they are glad they listened. And actually a director doesn't need much more than this formula tucked away in the back of his mind and a little theatrical horse sense to know what to select for television production.

As facilities expand and the operating crew becomes more facile in their studio operations, more ambitious programs may be attempted, but it is better to underplay your hand in television.

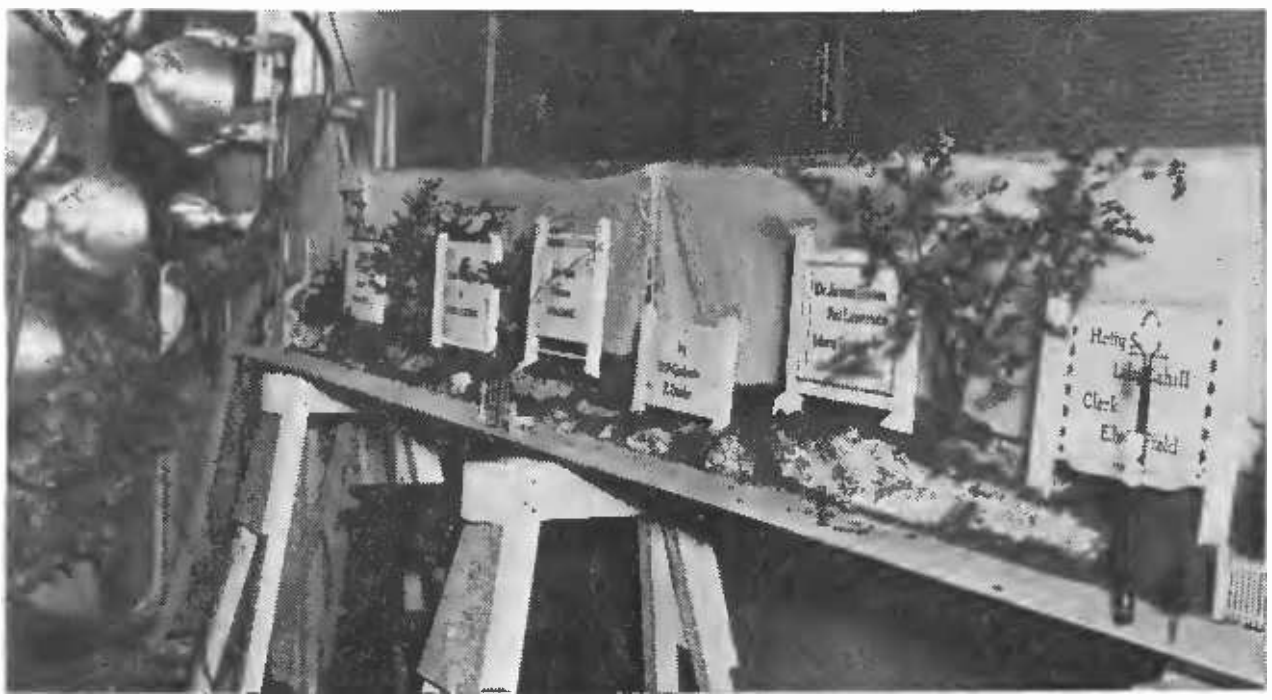
At first it seemed that hundreds of successful stage and screen vehicles were utterly beyond the studio facilities of television production but that is a thing of the past. Experience has proved that the job can be done and has established an operational formula for its accomplishment. Unfortunately too many television directors attempt productions far beyond their capabilities and the results are bad both for the director's reputation and television as a whole. Some young directors seem to think they are accomplishing wonders in the results they are achieving with the meager facilities at their disposal. It may be that they are, but why should a purchaser of a television receiver care what the production limitations are in the studio? All he sees is a bad production. It is much better for the director's reputation and the broadcasting station's audience reactions to have a good simple production well done than to attempt a major effort and have it fail because of physical limitations. A television director once made the statement that he only rehearsed a thirty minute program for eleven minutes. Unfortunately the program looked as though it had not been rehearsed at all. Programs of that caliber are not good television, are not good for television as an industry, and have no place on a station's schedule.

Production Problems

Now let us assume that we have selected material for a half-hour dramatic television program. We have chosen a story in fictional form, perhaps a short story that we have read. We will make this assumption because, if we select a one act play, half our problem is already licked. A one set, "one acter" written for the theater, is no problem on television unless you attempt to broaden it visually from a motion picture production point of view; if this is attempted you face the same problems that we will discuss in our adaptation of our fiction story.

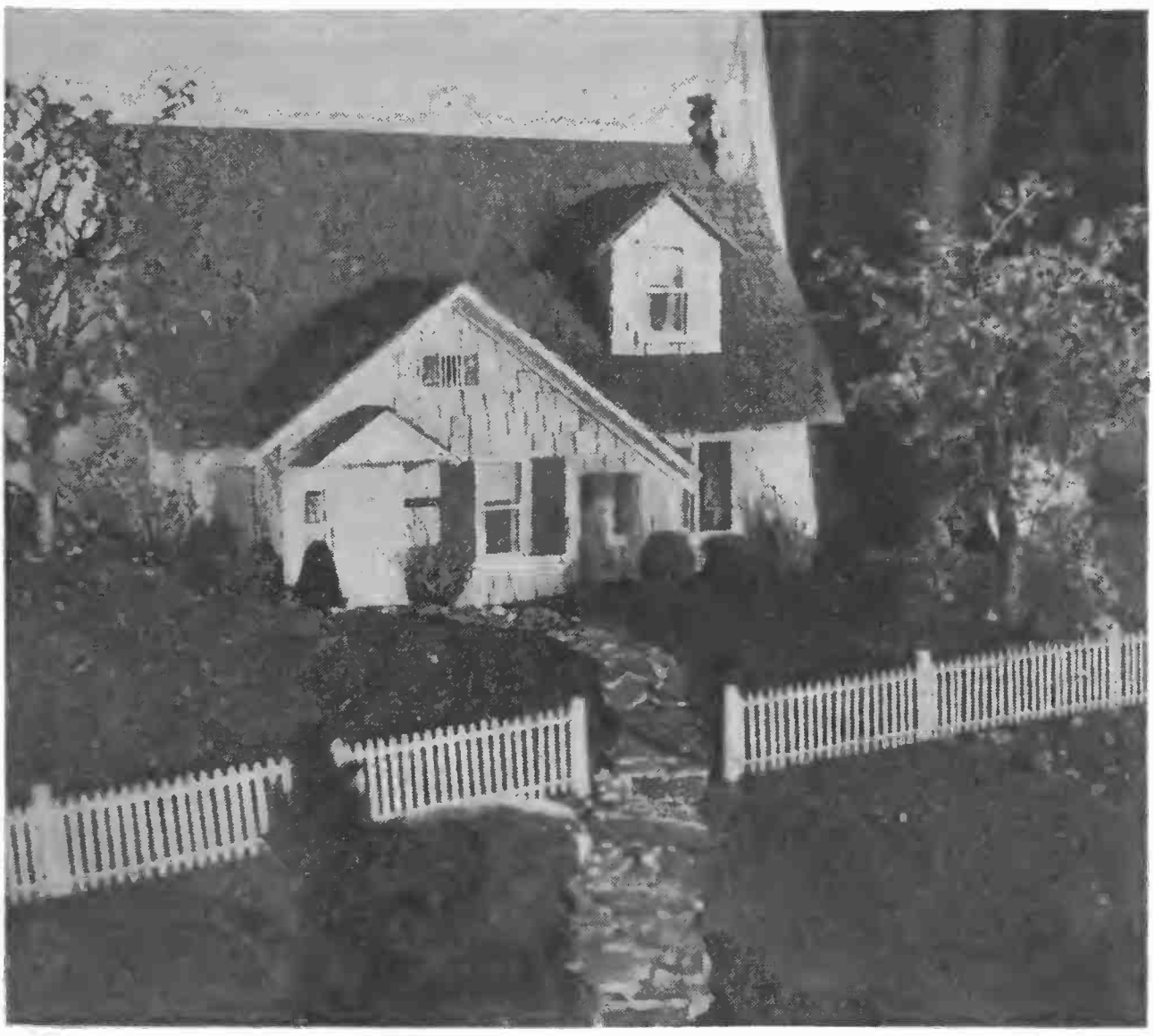
The first step is to break down the story you are going to adapt into playable dramatic scenes bearing in mind the number of sets you plan to use. The decision as to whether you will use three sets or twelve in telling your story will probably depend for a long time on the size of the studio and the production budget you have to work with. Anyone can produce a good television program if you give them enough time, money, and equipment. Those are your three limiting factors and a successful producer must use all of them wisely and well.

Many times directors have insisted on a complete set of scenery and additional actors to start a story when the idea might have been "put across" very well by simply using a narrator. The



Opening titles on miniature signboards. Camera trucks parallel to sidewalk.

narrator might be reading the story, or perhaps telling it. Again you may accomplish the same purpose through film or visual effects. In one short program that we presented we wanted to take the audience to a small suburban home. It might have been done in many ways, but we chose the hard one. We faded in on a miniature sidewalk backed by a picket fence. Our camera started to truck, moving parallel to the sidewalk. Behind the fence were miniature outdoor sign boards. On them were carried the name of the playlet, the author, the cast and other credits. We traveled past these sign boards and stopped at a miniature suburban cottage. Then we started to dolly in toward the front door. We had constructed the front door and porch roof of the cottage in full size exactly duplicating the miniature so as we



Miniature house at end of signboards. **The front door was duplicated in life-size studio set.**

dollied in on the miniature door with camera #1 we watched the preview on #2 that was focused on the real door. When the picture on #1 exactly duplicated the real door on #2, we switched to that camera as the lady of the house opened the door to get her morning mail. Now was that "good" television program planning? At the time we did it, we were trying to prove to ourselves that it could be done effectively. We did it but whether or not the expense involved would be warranted in a regularly scheduled program will be one that each director and program manager will have to decide for himself. It took time and money to build the miniature—it was only used once. Perhaps the time and money involved might have been used to better advantage somewhere else in the program.

Again you must decide how far you should go in production expense in developing a scene. We know that if a young husband were leaving his wife in New York for an extensive trip, that the departure might be heightened, the pictorial effect broadened and the dramatic values increased, if we saw them leave their apartment and take a taxi to the air port and witnessed their final goodbyes as he stepped aboard the plane, with the plane in the air as our final sequence. That's one way to do it. Could you still hold the visual and dramatic interest of your audience if you only show their goodbyes in the apartment, with the wife sobbing on the couch as the husband closed the door? Obviously the second treatment is more economical but we lose in visual interest.

Television Scenery

Now let us say that you have decided to use three sets in your thirty minute production: an exterior, a living room, and a bedroom. First let us approach our exterior. Exteriors are very difficult to make convincing in television. Beautiful clouds painted on a back drop are lovely perhaps in a long shot, but when you roll into a close-up and an irregular shaped cloud that somewhat resembles a cornucopia seems to emerge from the left ear of your leading lady, you realize that something is wrong. Scenic effects that look fine on a theater stage in soft lights just won't work on television. In close-up, a theatrical grass mat does not

give you the illusion of being a lawn, instead it looks exactly like what it is. We were having trouble trying to overcome this difficulty, so as an experiment, in a play that called for a woodland dell, we rented some twenty or thirty very real looking imitation trees. They were well made and to the human eye in the studio the scene was perfect. We had a bower of green that would have done credit to a Broadway production. Then we looked at it through the television camera and our beautiful

Left—An example of poor scenery design. The actors fade into the background behind them.

Right—Robert Lynn and Helen Lewis in a woodland dell.

deep bower flattened out like a poor pencil drawing. With the improvements we have now in camera tubes this might not happen today but we had to have so much front light that we were unable to pour enough light through the branches of the trees from the sides and rear to enable us to get any depth or realism out of the scene. If we lowered our front light our actors went into silhouette. One of the big problems in every television scene

is to make it look well from every position the camera is to take. It must be lighted and designed with this thought constantly in mind.

So television exteriors must be approached from a slightly different angle. Every scene must have something more or less solid to act as a background. This might be a high hedge, the outside of a building, a wall, anything that will look well both in close-up

Terri La Franconi singing in the WABD studios. Note use of photo mural as background.

and long shot. If an exterior drop must be used the more detail that is painted in, the better. Large photo murals seem to give the best results, but a low wall or balustrade should be set in front of the drop to prevent the actors from getting too close to the distant scene. Very good effects have been worked out for the porch of a house. In any event the director and scenic designer must plan their setting to give them the best visual results

An early experimental setting.

possible, allow for easy flow of movement of cameras and actors, and not lose perspective.

Interiors also cause troubles. There are many wrong ways to paint a television interior. One expert on the subject maintains that all sets should be painted from an architectural drawing point of view rather than from a stage scenic approach. Wall paper sets look fine in a long shot but big flower designs are not good in close-up. Paneled walls give good results. While the set must have individuality it still must not be so blatant that it overpowers the actors. The close up result must be considered

constantly. A flat gray wall gives the best background for the actor but an unadorned flat wall does not make a believable setting. Scenery should also be designed to allow for the proper placing of properties. Very effective results may be attained through proper use of curtains, drapes, and pictures. A general rule is that the more true to life your set is, the better it will reproduce. Placement of pictures is important for the edge of a pictured frame in a close-up is almost as bad as the aforementioned cloud.

An effective interior from "Ode to Liberty."

In planning your production you need to consider the relation of your sets to each other in the studio. If you move from set number one to number two, back to one and then to number three you must so place them that your cameras are in such relation to each other, and to the sets, that the operation can be made smoothly and efficiently. Remember that the camera coaxial output leads are permanently installed somewhere in the

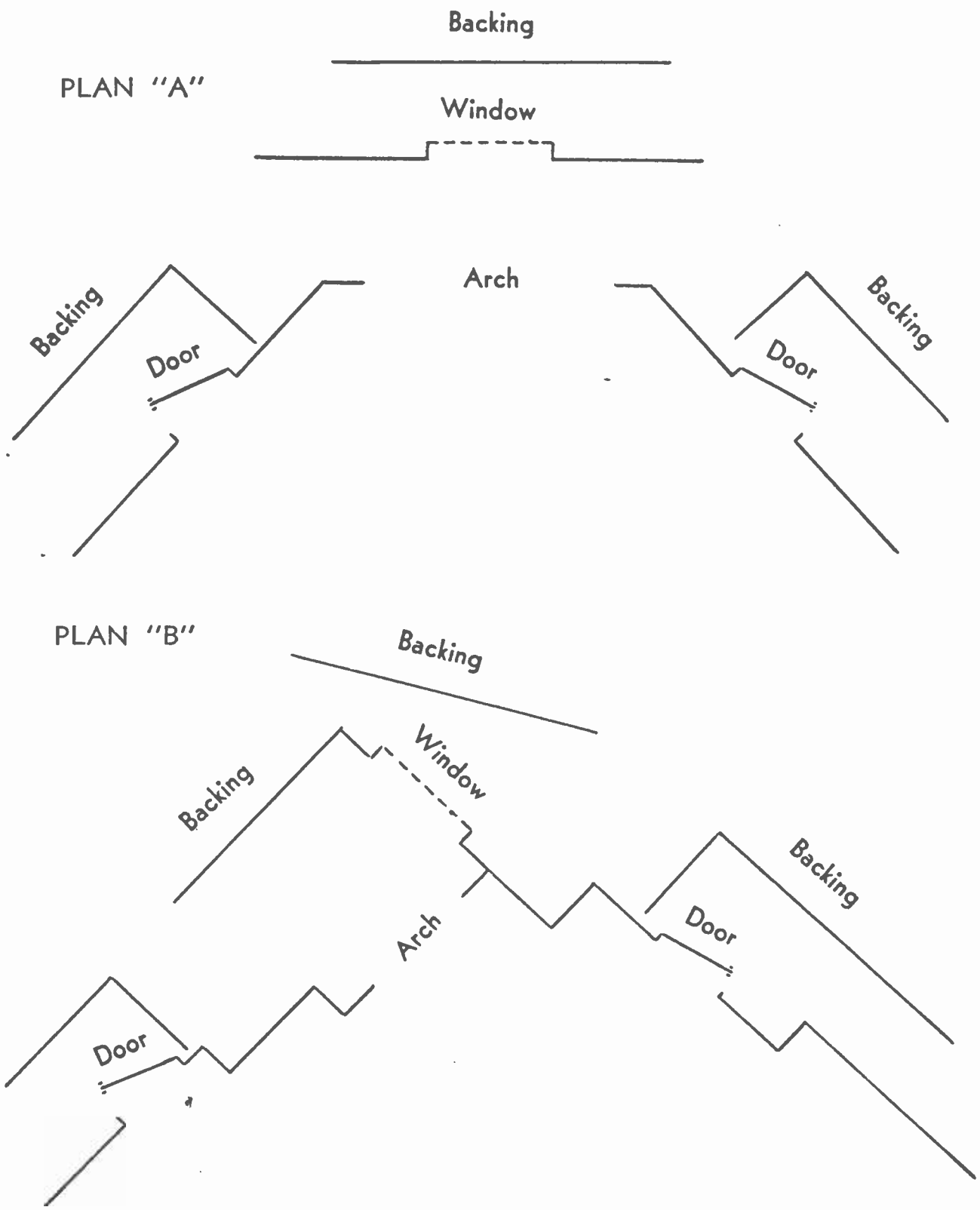
wall of the studio and because of this, camera relations to each other must remain the same throughout the performance. If camera #1 is on the right of camera #2 at the start of the program, it must remain there throughout the performance. It is of course physically possible to lift the coaxial cable that feeds #1 over the top of camera #2 but such an operation usually leads to complete confusion before the program is over. Consequently, if cameras work from the center of a studio and the scenery is set around the cameras against the walls there is no physical problem that cannot be worked out efficiently, if it is planned correctly in advance.

Building the Production

With our script adapted and the production planned at least in the director's mind, it is time to call in the working department heads. This meeting should include the scenic designer, the chief carpenter and the top cameraman. The earlier in program planning that the various production units know the overall problem, the easier the whole program will go together. It may be that some directors will turn the whole production over to the studio manager to a designer or some other responsible department head but no matter what the procedure the practical answers to lights, cameras, properties, actors' requirements, and pickup facilities must all be considered.

In planning the production your designer must consider constantly the audience's reaction to what they will see. Your bedroom must be individual enough to constantly distinguish it from the living room, so that if you suddenly cut from one room to another it is immediately evident in the minds of the audience, which room they are seeing. Angles seem to help television sets, particularly jogs and corners. Instead of planning your set with long flat areas, break it up with small-sized pieces of scenery. A room set on an angle to the cameras gives you better results than one directly facing them and it generally helps you on your studio space. Rather than a plain three-walled set as is indicated in plan A, a set constructed along the lines suggested in plan B would probably give better results.

Remember in general you are unable to make reverse angle shots as is done in the movies. There is no way for you to take down half the wall and shoot from the back of the set toward the front wall. You have the same limitations as the theatre in this respect. You must always look at your actors from the front. To



COMPARATIVE SCENERY ARRANGEMENTS

overcome this limitation ingenious scenic plots have been devised. In one production a large picture on the wall was mounted in such a way that it covered a large hole in the scenery. During the action of the play it was removed, the camera was moved in behind the set and an effective reverse angle shot was made. This operation required special planning for in ordinary programs if a shot of this kind were attempted the lights would be facing the camera and your lighting must be right or you haven't a good picture.

With the details worked out you turn your production over to your building crews. They must build and paint the scenery so that on the day of the first camera rehearsal it can be brought into the studio complete in every detail.

Stage Properties

You must check your property list and turn it over to your property man. Every single article to be used must be listed and sometimes they seem to be legion. Pictures, drapes, curtains, carpets, electric fixtures, lamps, furniture, and hand props.

You must remember that the scenery has a tendency to act like a sounding board. The minute you bring tightly stretched canvas on a frame into your studio you liven the sound quality of the studio as a whole immeasurably. As previously mentioned a carpet will help to deaden this overall liveness.

In furniture do not use dark pieces if you can avoid it. Stay on the light side, for dark furniture simply absorbs your light. You are constantly striving for naturalness without too much contrast in subject matter. Dark pianos are a liability, gray or unfinished light wood give far the best picture results. Do not use bulky heavy pieces of furniture and stay away from low chairs. A tall man standing beside anyone seated in a low chair makes a good close-up impossible. A short leading lady and a tall leading man will not be a good television combination, from the point of view of close camera work, as their faces are physically too far apart.

Everything that is to be used in the program must be checked. What titles will you use and how will they be presented? This means a conference with your title experts and complete instruc-

tions. If you plan to use still pictures either in the studio or from your slide projector they must be arranged for and some one assigned to see that they are ready on the day of the broadcast.

Motion Pictures As an Adjunct to Studio Drama

If you are planning any motion picture sequences, now is the time to arrange everything you will need. There is a very definite value in using film in conjunction with live studio dramatic plays for you immediately broaden your scope tremendously but you also increase your production costs, particularly if the motion picture sequence is made especially for a specific production.

As the director you must make the decision as to whether the costs are worth the results to be gained. Also remember that anything shot on film especially for any one live-talent studio program, is forever lost unless you again assemble the same cast for a repeat performance.. Unquestionably the use of film is good but the cost is the decisive factor.

Let's look at a few examples. In one production the first scene was in London, the second in Egypt. As we faded out our first scene, on the line—"I'll meet you in Cairo," we faded in on a motion picture of Egyptian boats on the Nile. Then we saw the pyramids, the Sphinx and a street scene in Cairo with its innumerable bazaars. We duplicated, in the studio, one of the little shops in the picture. Thus our flow of visual continuity was good. The motion picture (about one minute) gave our leading man time to change his clothes and the overall results accomplished were decidedly worthwhile. The film was a series of "stock shots" and relatively inexpensive.

In another program we were presenting a television adaptation of a full length play. On the stage, the big climax of the third act occurred when several characters listened to a prize-fight, in which the hero was fighting, over the radio. Obviously we could have done the same thing quite easily but we wanted to show the fight. To heighten the visual interest, we wanted the audience to see the fight taking place. It was utterly impossible to stage the fight in the studio as it was filled completely with the

sets for the other acts in the play. So a few days before the program was to be broadcast, we put up a fight ring in the studio and the actors who were to take part in the live television performance enacted the fight scene, before a movie camera. Theatrically the final effect was perfect as we flashed to the fight just as the radio announcer started to describe it. Economically there remained several hundred feet of film showing a prize fight that was shown once and will probably never be shown again. But when we consider that a live television program, once broadcast, is gone forever, a few strips of film are unimportant.

In another play, a Sherlock Holmes story, we closed one scene as Dr. Watson said over the telephone, "We'll be there this evening." While he and Sherlock Holmes changed their clothes, we faded in a film sequence. We saw them in a hansom cab on their way to their appointment. They pulled up in front of the house, paid the cabby and entered the outside door of a lodging house. Just as the door shut, we switched back to the studio and saw the two men as they came to the hallway door and rang the bell

Interior of a WPIX studio.

of the apartment they were searching for. We felt the movie sequence was more than worth the cost involved as it gave added interest to the picture and a touch of realism that we couldn't attain in the studio.

Casting

With the production underway the cast must be decided on. The actors to be selected must first be able to play the parts assigned to them and, as on the stage and in pictures, they must look the part and they must be able to memorize their lines. Television casting is visual casting. While the actors' voices are important, their appearance is even more so.

Your first rehearsals will probably be far removed from your television studio and your script may be utterly devoid of camera instructions. Many writers feel that they cannot write for television without a television script in front of them. This is not necessary and many directors would much prefer that an author submit his first script in play form, without any attempt to indi-

A scene from the television premier of "Susan and God" with Nancy Coleman, Gertrude Lawrence, and Paul McGrath.

cate how cameras will be used. As authors gain experience in writing for this medium they may want to indicate possible camera shots but the final pictorial job is up to the director and too many early directions only tend to confuse.

The Rehearsal

Just how a script is worked out with regards to cameras is up to each individual director. He should of course go into his first rehearsal with most of his camera angles tentatively blocked out, otherwise it would be impossible to give intelligent stage directions to his actors. But just when he will switch, on what line or piece of business can best be determined at rehearsal. Actually a good television director learns his script at rehearsal just as the actors do, but while they study lines, he studies camera positions, visual effects, and composition.

Movement of actors in a television set is sometimes vastly different than it is on the stage. Business of course must always be natural but often a good stage director will give actors crosses or movements to break up a scene. Two people should not just sit and talk for too long a time in one position. Here is where the television director has an advantage over his brother in the theater, for he can not only move the actors—he can also move the audience. If a scene tends to become monotonous from one angle he simply switches to another camera. Instead of having an actor move to a position behind the leading woman, to give a different point of view to the audience, he moves his camera and we see our leading lady over the shoulder of our leading man.

Our first rehearsal will, for the most part, be identical with one for a theatrical performance. We indicate the scenery walls with chairs or other means of marking off our space on the rehearsal hall floor. Furniture is placed as nearly as possible in the position it will occupy when the play goes on the air. Doors and windows are located and we begin our first "walk through" of the play.

The size of the sets will depend on the space in the studio and the approach the director plans to use in presenting his play. There has been some confusion in the minds of many people

unfamiliar with television production. Some of them have labored under the delusion that all settings must be small, because of limitations of the television camera. This is not true. The majority of settings have been small but only because of limited space in the studio. Sets can be as large as a director wants them to be as far as camera "pickup" is concerned but if he plans to show a large portion of a room in one shot the larger the room the further away his camera must be and the smaller the actors will appear on a television screen. The limiting factor in set size is the size of the studio and the size of the viewing screen.

In a television presentation of a scene from the Broadway success "Susan and God," we exactly duplicated the set used in the Broadway production with the exception that we made the set narrower by about ten feet as our studio was not as wide as the theater stage. In this set, the theater cast played the scene just as they did it on Broadway and the television results were highly satisfactory.

In presenting the complete Broadway play "When We Are Married" practically nothing was changed from the stage production. The theater set was duplicated in the studio except again because of space the set was not quite as wide, but none of the stage business was altered except in two scenes where it was found advisable to bring the actors closer together for pictorial reasons.

Proper Use of Cameras

In a stage production it is considered good theater technique, in a scene with many people on the stage, to have lines spoken by actors from various parts of the stage. This is particularly true in a scene where all the characters are involved. Actor A at stage center may ask a question that may be answered by actress B at extreme stage R and the next line may come from actor C at extreme L. This is not particularly good in television. Usually a director plans his camera shots so that camera #1 has a fairly long shot of two or three actors. He thus can keep the relative positions of actors, to each other, in the minds of the audience. His other two cameras will probably be situated so that he can take close-up shots of individual actors as they speak. If the

actors are spread all over the stage it is difficult in a general scene to keep the visual continuity clear. It is much better to have people relatively close together and if necessary take a line from one actor who may be out of camera range and give it to another rather than upset the camera routine, and more specifically, the sound which is picked up by the overhead boom. It is almost impossible to swing the boom microphone from one side of a set to another quickly, so unless additional microphones are available, thought must constantly be given to the sound pickup and actors in any given scene must not be too far apart. The value of close-ups must not be forgotten. Some directors have successfully presented a full length play entirely in close-up.

Accepted camera work in general requires an overall shot of the basic scene early in the program. This establishing shot gives the audience a picture of the scene as a whole. They see, for example, the kind of room and the location of the doors and windows as well as the furniture, so that the close-ups that follow can be readily placed with relation to objects in the room. The establishing shot need not necessarily be the opening shot. It is perfectly good technique to start your program with a close-up as was discussed in Chapter Five, but the camera should pull back for a long shot after a short interval so that the audience may know where the close-up is taking place. Again you may reverse this procedure by opening with a long shot and then dolly in for your close-ups.

The many possibilities that are open to a director particularly as they apply to camera switching should not be abused; unfortunately they have been in many cases. At present lap dissolves, instantaneous switches, and fades are available in the best television studios. In the not too distant future we will probably see wipes of all descriptions made possible. But many a good performance has been handicapped by injudicious use of facilities. Lap dissolves and fades should only be used when the progression of the story needs them. There is no hard and fast rule, but straight fast cuts are better in a dramatic scene, when we switch from character to character, than either fades or lap dissolves. Either of these latter too may be used effectively when there is a lapse or passage of time or we come to the end of a scene, but

they should not be used continually throughout a performance.

Getting Ready to Face the Camera

Our main objective of course in our pre-studio rehearsals is to set the show as nearly as we possibly can to what it will be on the air; then, when we go into our camera rehearsal, the majority of our problems relating to stage movements by actors and their relation to each other and to the various cameras are already

Television cameras from the actor's point of view.

behind us. Obviously we can only go so far without the cameras, but the more we accomplish the better. The first and most important thing that must be done at rehearsal is for the actors to learn their lines and stage positions. When you move into the studio you have no time for mistakes in lines or lapses of memory on the part of the cast. In almost all cases the lines motivate the show, that is, the speed at which lines are read governs the picture work. Of course there are exceptions, particularly where special camera shots are to be used, but in general, if the lines stop, so does the program, and switching cues must be based on the lines and movements of the actors.

It takes experience for any director to mentally picture the results he will get on his cameras. He must know the approximate coverage of his lenses or he may find his close-up camera in his long shot and actors completely out of a scene. He must know his approximate depth of focus and he must estimate his camera angles and picture content. The closer a director can estimate his final results the more time he can save in his final camera rehearsal. It seems possible that a dummy camera could be built by means of which a director using various openings in a mask might see the almost exact results, as far as camera coverage is concerned, that he would get from his various lenses. Some sort of system of this kind should be of tremendous help at pre-camera rehearsals. Proper sized masked openings to give the same size picture as the camera should be fairly simple to work out. With these "lens fields" a director could know just how far away from his actors his cameras should be and he could set the positions of his people much more definitely than he could by guess work.

The length of the rehearsal period will depend on the length of the play and the caliber of the actors. For a full hour performance we usually started our television rehearsals a week or ten days before the broadcast. We would go completely through the play on three successive days, then omit a day or two to give the actors time to study, and then continue with rehearsals up to the day of the broadcast. All in all we would go through the play six or seven times before we went into our studio for our camera and dress rehearsal. If experienced actors can gain com-

plete knowledge of the program in a shorter time there is no set rule and program directors should plan their rehearsal schedules accordingly.

No one can say now, what the final ratio of rehearsal time to time on the air will be. Obviously the more involved programs will take more rehearsal than simple ones but in general straight one hour dramatic programs that are done properly require about twelve hours of pre-studio rehearsal and around eight hours with cameras for a total of twenty to one. Again this is an approximate figure but it is at least a guide to the time that may be necessary.

Actors

The demands on actors in television are probably going to parallel those of the other visual arts. Television rehearsals are much more like those in the theatre than in radio. The necessity of finding an actor who can look the part as well as play it is going to increase the casting difficulties of the director and limit the possibilities of jobs for many radio actors. The basis of their remuneration will be worked out from a new premise. In radio, the basis of pay for actors is based on the time they spend in the studio and their ability to read lines. They come to the studio, they are given a typewritten manuscript and after reading it through at one or more rehearsals, they read it during the broadcast. In television it does not seem that the radio approach is the final solution to actor-employer relations. Too many requirements, other than time and dramatic ability, enter into a possible television contract. Time of course is important and a television program properly rehearsed and produced will run into astronomical figures as compared to radio. As mentioned before, the actor, aside from the time he spends in the studio, must learn his part. Who can say how long it will take individual actors to accomplish this? Aside from their ability to study and play the part there are other things to consider. Actors will have to look the part. The old Broadway bug-a-boo of "sorry you are not quite the type" will be back with a vengeance. Posture, personality and looks are going to be the key on which an actor's future

will depend almost as much as histronic ability. Costumes, make-up and hair dressing are all going to enter into a television program. Television is Broadway and Hollywood far more than it is Radio City.

Special Techniques

At our rehearsals we must also plan pieces of business necessitated by special camera effects or other presentation problems. In one performance we had a "cut back" and it was necessary for the principle actor to close one scene in a tuxedo and open the next scene in street dress, with no lapse of time. The first scene ended with a long speech by our leading man directed to another central character. Both scenes involved were fairly short, so we compromised on the trousers. He wore his tuxedo jacket, shirt, collar and tie but dark street trousers. The scene was directed in close-up and the audience never saw him in this sequence below the waist. We established the scene, by showing our leading man seated on a couch before a fireplace talking to a man standing with his back to the fireplace. We showed several close-ups of both men and a final close-up of our leading man and then as he began his last speech we cut to a close-up of the other actor who faced the speaker. The minute we switched to the other character our leading man left his position, crossing to a temporary dressing room in the studio. There he continued his speech as the boom "mike" went with him but while he spoke he removed his evening coat, collar, and tie and slipped on another collar, tie, and street coat, while we watched the reactions to his speech on the face of the actor in front of the fireplace. Our leading man then took his position for the next scene. We faded out his voice at the end of the scene and the actor we had been watching and faded in on our leading man as he said, "That's just the way it happened."

I will admit that it was a difficult job for an actor. To change coat, tie and collar while delivering a highly dramatic speech should test the histronic ability of even the best of them but the whole thing was effective and highly successful. Actors will probably be called upon to do many strange things in television. So

far they have certainly been martyrs. They have worked under hot lights in winter costumes, accepted and handled last minute changes in stage directions because of equipment failures and undergone hours of rehearsal, and have come up smiling. In one production an actress in an emotional scene dropped her head on her arms and leaned sobbing on a metal table. As she lifted her arms she found that she had left a long strip of skin on the table top. That is how hot it was under early television lights but it was the exception and not the rule. It is not easy to remember lines in front of television cameras. One actor, after his first performance said, "Never again. It's impossible. Those cameras are like one-eyed prehistoric monsters creeping up on you out of the darkness. The lights blind you. The microphone boom most of the time just grazed my head. No—I can't do my best in this medium." But when his friends and critics told him how successful the show was and congratulated him on the job he did, he was right back ready for more the next day. But television is now, and for some time in the future will remain, a very difficult job.

Another handicap from an actor's point of view is his lack of contact with the audience. As in motion pictures he never hears the applause for a job well done. If it is on film he at least can see himself as others see him but in a live broadcast he has to take the other fellow's word for his ability.

The Final Rehearsal

The day of the broadcast finally arrives, and the director sees for the first time everything he is to use in the performance assembled in one place. To a director the morning of a broadcast, particularly of a full length play is always a thrilling time. The sets are up, the camera crew and actors are in the studio and the long grind of whipping the production into shape begins. The camera crew and stage manager don their telephone head sets and the cameraman is ready to roll the camera into position for the first shot. The procedure all through the performance is the same as was outlined in Chapter Five. With the first three shots previewed, if it is a three camera job, the rehearsal starts.

It is now that you learn for the first time whether or not every-

thing you have planned and rehearsed in your early sessions will work the way you want it to. If something unforeseen happens to spoil a shot, then actors' positions or camera routine must be changed. Many times you find that you have a better shot on camera #2 than the one you had planned to use on #3. Of course this means a change in your camera switching and if you follow it through you find it just can't be done. Or you may suddenly be aware that a shot you had figured to make one way is much better from an entirely different angle. If stops occur for any reason you must go back and lead into the scene in question as time—time for cameras to change position, time for actors to cross, time for actors to change costumes, is the essence of a live television broadcast.

And so on through the play you go, with every camera shot carefully worked out and so indicated in the script; for you must be able to duplicate everything you do at rehearsal when you take the air in the evening. No two productions are ever exactly alike, each one presents new problems; but as you grow in television you learn the basic methods and the individual situations are easily met.

You will probably schedule your dress rehearsal in the afternoon, some time after luncheon, depending on the length of time consumed in your first camera run through, which was your biggest hurdle. Once you have gone through the play and you know that all your camera shots are possible and interesting, the dress rehearsal and the performance are simply a repetition but they must be perfect in detail and execution.

Live studio dramatic television programs are not easy. There is hard work for every single person who is a part of the production. They must do their jobs, just the right way at just the right time; but perfect studio co-ordination results in programs that are interesting and entertaining.

Before we leave the subject of dramatic television programs let us remember first that two people talking do not necessarily make a good program. Long scenes with little or no action simply will not hold the visual attention of the audience. Your script must be good theater or it will never be good television. Its subject matter may cover any interesting topic. It may be serious

drama, comedy, or farce, but by and large comedy dramas are the favorite with strong dramas and mystery stories a close second. The element of surprise is a valuable asset in any dramatic work and it lends itself well to television plays.

Character studies are not particularly good unless the central character is played by an artist of outstanding ability. Television drama needs action. Not the broad action of early movies but definite plot development. People must do things, not just sit and talk. The extent to which an action or a happening is picturized will depend of course on studio facilities, but in a story that is built, let us say, around an automobile accident, we must see the accident. We cannot simply describe it. The same is true of a major plot situation. It would be better not to do the story than to present it in such a way that the pictorial value is lost.

Drama of one sort or another will probably take the place in television that music has held in radio. Programs of this kind will require thousands of trained men and women. Writers, directors, scenic designers, painters, carpenters, stage crews, electricians, engineers, cameramen, actors, musicians, make-up men, and costumers. In short, television will need everything that Hollywood needs and a lot more of it.

17

MUSICAL PROGRAMS

Just what place music will eventually take in television is a question that time alone can answer. It will undoubtedly be important but whether it will ever hold the position in television that it holds in radio is another matter. Music has always been the mainstay of radio. On many stations before the war musical programs provided as much as seventy percent of the programs broadcast. This ratio dropped during the war because of the public interest in news, but music was always the number one radio feature. Music does not appeal greatly to the visual sense.

Many people close their eyes at a concert in order to better appreciate the music. So why should we expect our music lovers,

and they are the ones to be considered, to watch with eager-eyed absorption while an oboe player, a violinist, or a tuba player performs?

There are those who say that to see a great artist playing any instrument would be their idea of perfect enjoyment. We have no argument with them. Certainly every one wants to see the great artists as well as hear them; but the vast majority of our radio musical programs are played by good musicians, not stars, and we must consider this when we try to visualize hours of musical programs on television.

The motion picture industry realizes the value of music but musical pictures where the basic subject matter is an orchestra playing are few and far between. It seems reasonable to assume that music in television will be as important as it is in the entertainment world in general, exclusive of radio. Music will always be vital to many television programs, but it must relinquish the spotlight.

Many musical programs have been tried and the outlook is far from discouraging. On early programs solo artists were presented; many are still seen today and their value as television material seems to rest entirely with the artists themselves. Musicians have nothing to fear from television but they are valuable visually as much for their reputation as for their visual appeal. An early program which featured a harpist had certain valuable visual effects. We saw her hands on the strings as well as interesting shots of her face through the strings, but as solid visual entertainment an "act" of this kind is limited. Telegenic performers will always have an advantage over those not so fortunate but ability in presentations of this kind will still be the final answer.

Small Musical Units

Musical groups are not easy to make visually interesting. A string quartette was never assembled as visual entertainment. Spanish musical groups had a certain element of pictorial value when television was young. The viewers remark "Look, you can see his hands actually playing the guitar" doesn't mean much today. In short, if we are to use music as a basis for television

programs, we must combine it with other entertainment elements; when this is done a great deal is possible.

Let us look at other musical features that have been tried on television. The quartette is a snare and a delusion from a pictorial point of view. As a producer you are constantly faced with the three to four ratio of picture size. If you have four men singing side by side you pull your camera back to include all four and your picture ratio, if you fill the screen from side to side, will cut them off somewhere around their knees. This size picture is only interesting for a very short time as the audience will want a close-up. You find that a close-up of the second tenor will probably include the ear of the top tenor and half the face of the baritone. So you start all over and put two men in front and two behind. This allows you to get closer for your medium shot and still have your men slightly separated from each other on their close-up.

In this discussion we have assumed that we must bring our singing groups into close-up. Perhaps we shouldn't even attempt to do this. In a musical program should we attempt to use our television camera as we would a pair of opera glasses or should we only strive for the overall picture? If we were to attend a performance at a large New York Theater and were seated in the mezzanine, what would we see? It might be a group of singers in a special setting, a huge window perhaps under which small figures of men sang very lovely music. We could count the number of figures in the group but we probably could not distinguish a single face. Pictorially, the overall effect might be perfect, but the artists as individuals would be beyond our perception. Perhaps we should treat our television singing groups the same way and strive only for the effect achieved in an overall picture. We can only say "perhaps," for experience has shown that our audience would not consent to continual treatment of this order, but it is only fair to point out that we are asking our television picture to bring us details that we would not see if we were in the theater in person unless we were in the first five rows of the orchestra section.

An artist at a piano has a little better chance than a vocal soloist, for we do have some action and keyboard technique is of

interest to anyone who appreciates music. The biggest problem here is the matter of focal depth. A real close shot of an artist's hands on the keyboard requires constant panning because of the focal limits of the camera lens. If you pull back far enough to get the whole keyboard in focus the over all picture composition is bad as you must shoot at an angle because of the position of the artist in front of the piano.

Two pianos offer just twice as much trouble as one. Nested grand pianos force your camera way back and both artists are much too small if you attempt to show the whole unit. If you sit the two artists back to back you again run into trouble in artistic composition.

The use of several cameras will help pickups of this kind; but, after all, do we heighten the musical enjoyment by constantly switching from one camera to another? Perhaps we should treat the artists pictorially in the same way that we would see them

Olga Lunick, dancer, in an unusual set by James McNaughton at WCBW.

if we were at a concert in person; that is, decide on a good picture position and hold it without any attempt at camera gymnastics. Again we come back to the question as to whether a viewer would watch a program of this kind in preference to a highly visual program on a competitive station. The answer rests entirely with the personal likes and dislikes of the individual viewer.

Dancing

Dancers may furnish the visual interest that puts music across on television. Dancing was a lost art in radio but it may very easily come back into its own now. Every sort of dance is primarily visual entertainment. Folk dances, tap, ballroom, soft shoe and even ballet lend themselves to television. We have seen Bill Robinson tapping out his stair dance, and ballerinas in their best rendition of rhythmic excellence. From lessons in every form of dancing we may travel to performances by the stars.

Musical Comedy

In musical entertainment that is built around plot development we have a totally different picture. Musical comedies, light operas and operettas will fill a spot on television that will be just as important as the place they have filled on the stage and in the movies. But just as entertainment of that kind is more expensive to produce in other fields, so will it be far more costly on television than straight dramatic programs. In a musical production you have all the costs of a dramatic show—scenery, costumes and actors—plus an orchestra and singing and dancing chorus. This means that programs of this kind will probably not be numerous for some time to come. The orchestra, singers, and dancers almost double the price of a dramatic production. Good programs of this kind have been, perhaps, the highlights of entertainment schedules, but as yet we have not reached the competitive position in station operation where they are necessary to hold an audience.

In this country relatively few complete musical productions have been attempted, particularly those that have lasted an hour or more in length. Some of the first few were "The Pirates of

Penzance," "Topsy and Eva," "H.M.S. Pinafore" and an original work entitled "The Boys from Boise." All of these have proved conclusively that musicals will find their place in television programs. When we realize the wealth of material that may be presented we can only hope the time will come soon when the audience will demand them. Hundreds of successful musicals of the past will be seen on tomorrow's schedule.

The production problems are similar in general to a dramatic program but more thought must be given to the work of adapting the material for television presentation. In most musicals we find more scenes than we ordinarily find in dramas and studio limitations will necessitate intelligent planning. If a chorus is to be used more space must be allowed in the studio. So far the number of dancers that can be shown well is limited, unless we are content with an overall picture. Television will probably develop choreographers who will specialize in this medium. Already artists are endeavoring to design sets that will provide space and still not prevent good close-ups. A drop that looks well behind a group of dancers may be entirely unsuited for a close-up. In "The Pirates of Penzance" the overall picture of the rocky glen was very good but the detail was bad in close-up scenes as the rocks lost their realism when we saw only part of them. This is a problem that can and will be corrected, but it is one of which we must not lose sight.

The fact that singers must be able to act, or if you prefer that actors must sing, puts more demands on the cast. The close-ups are going to require personable, attractive artists. The pre-studio preparation may take longer than drama, for music and dance routines as well as the dramatic lines must be rehearsed. Once the production is ready for the camera rehearsal, the procedure is the same as for a straight dramatic show as far as camera work is concerned, the only variation being that the orchestra must be so placed in the studio that the sound pickup is satisfactory and the conductor can see the singers. Good camera work will do a great deal toward making old favorites live again. The intimacy of television helps to a great extent in "putting the show over" if that fact is considered when the production first goes into rehearsal.

Opera

Television may be the medium that changes the popular thinking with regard to opera. Let us assume there are three schools of thought on this important subject. One is that Grand Opera should only be produced in a Grand Opera House with a full orchestra, and if it can be picked up in that setting by means of mobile cameras—then and then only should it be televised. Another group maintains that opera should be streamlined, that it should take off its "top hat" and be modernized. The third group feels that opera should be presented in the best manner possible, but that it should be presented regardless of the lack of production facilities. They feel opera will stand on its own feet in spite of the limiting factors in present day television. We will not attempt to take sides in this issue but will try and discuss them all fairly for each has merit.

Lois Eastman and John Hamill in "La Bohème."

Unquestionably a good way to pick up an opera would be from a great theater. The orchestra, the diamond horseshoe, the patrons, the gallery, and the rank and file of music lovers attending a performance, would all add color to an operatic presentation; but when we stop and consider the handicaps that present themselves in a program of this kind, we wonder if it is the final answer. Operatic programs have been picked up from the Metropolitan Opera House in New York. They had a definite program value but any camera and sound installation for a pickup of a performance that is being done for a theatre audience that has paid admission to see the show must give way to those attending. This requirement limits the television broadcast in many ways. Those that have been made under these conditions tend to take on the flavor of a reporting job. The theater audience takes precedence over the home audience. The intermissions slow the program. Camera positions and the resulting pictures are not what they would be in a program planned for the home. Special lighting installations have to be made for few of us stop to think how many operatic scenes are presented in soft blue lights. They can not be played in white light that would be suitable for television for the effect in the theatre would be lost. Some pickups of this kind have been made with supplementary infra-red lights which did not hurt the pictorial appeal in the theatre and made a television picture possible but the lighting effects that could have been attained on the home receiver if the television results alone had been the only consideration, were not achieved. We saw the opera as it was presented at the "Met" but it was not a television program designed for television viewing.

The second idea, that of streamlining the opera or modernizing it, is an approach that will vary considerably in the doing and the final result can only be answered by the individual who works out a given story. Actually very little has been done but many music lovers, who are aware of what television can do, are thinking along these lines. In the theater, Billy Rose's production of Carmen Jones which was a modernized performance of Bizet's "Carmen" enacted by an all colored cast in modern dress is a sample of what might be accomplished. In television we have seen some operatic productions when the story was in-

troduced by a composer at his desk. He gave us the necessary plot, so that when our first scene came on the screen the action flowed normally and well. Concise adaptations that retain the important musical passages will probably find favor, but we need adaptors and directors who know both the opera and television before the final possibilities of this approach can be determined.

The third idea, opera as it is presented from a television studio has had by far the most experimentation. The audience reaction has been favorable for the most part, depending entirely on the ability of the artists appearing. Test programs were broadcast with small groups who were "up" in scenes from the operas and they proved that operatic excerpts could be made interesting visually as well as musically. The top achievement along these lines was the especially prepared version of Leoncavallo's "Pagliacci." The settings followed those usually seen in the theater and the roles were sung by a selected group from the Metropolitan Opera Company. More recently an hour and a half production with a full cast of outstanding operatic stars singing the roles in a performance especially tailored for television found almost universal approval. There is much that can be done in this field for proper use of cameras does a great deal to enhance the entertainment value of the great operatic works.

Hollywood has as yet done very little with opera. There is of course apathy on the part of many people to grand opera but television may be the medium that will popularize this form of entertainment. Television can do it, if anything can.

Popular Dance Bands

From opera to swing music is a broad jump but television takes it in its stride. Just how completely popular dance bands will hold a visual audience is at yet a moot question. So far, just as in motion picture shorts, the bands that have been televised have presented the routine that they do on the motion picture theater stages of America. Just how interesting they will be to viewers at home remains to be seen. People crowd into theaters to see their favorite radio bands; but will they sit at their receivers and watch musicians play and singers sing? It is of course interesting to see a name band leader at work, to see the

trio, the quartette, the soloists, and the orchestra; but it may well be that a definite visual routine or many pictorial approaches, must be worked out, if we are to watch a band week after week.

The hillbilly type of orchestra has much more visual appeal than a straight dance band. The costumes, the personalities of the individual performers, even the music, allow for a more interesting picture. The performer who plays a chorus by deflating a balloon, the musical saw performer, the hot slap bass player, and the trick trap drummer all are interesting to watch. Musical glasses may become a standard instrument in groups of this kind, just as the "jug bass" is now. But a good group can be and has proved very interesting musical material.

Visual Music

There is a totally different approach to the visual side of music that may open up new fields. This is best exemplified in the light organ. This machine has had very little publicity but it may come into prominence with the advent of television. Several means of illustrating moods with varying shades and patterns of lights have been worked out. The easiest to describe is the old-fashioned kaleidoscope. These instruments have been so modernized and adapted that we may follow the melody of a song through variations of light. We see perhaps a dull gray as the orchestra strikes a somber opening cord. Then as the violins come in—points of light appear and travel across the screen of our receiver in time with the music. Undulating, twisting, fading, approaching. Brilliant now when we hear a bold passage, soft and hazy as the music drops to a minor melody. What Walt Disney did in "Fantasia" is a sample of what might be done. It is possible that when we tune in on our favorite orchestra for a strictly musical program we will see the mood of the music carried out in moving patterns of light on our receiver; and when color finally comes, who will want to watch the performers? Whether the result is accomplished by means of kaleidoscopes, light organs, or film animation is not important—the main thing is that developments of this kind are very interesting to look at and they will mean a great deal to music on television.

We might also give some thought to the old illustrated songs of the early 1900's. It may be that we will see songs enacted, with living actors carrying out the story and embellishing the song, utilizing the approach that we used to see on lantern slides. It is something to think about. The community sing may become popular with the words of a song shown to us on our television screen as we used to have them in the motion picture theater while the organist played the popular melodies.

So far in television we have tried to present existing musical approaches as they have been worked out for the home, the dance floor, or the theater. There surely will be vast opportunities to experiment with music and pictures for television alone.

18

PUPPETS

Puppets are rapidly finding a place for themselves in television. The possibilities that this type of visual entertainment opens up are enormous. They compare favorably with many animated cartoons. They may in fact challenge real live actors. But this type of program material needs lots of special preparation, not only in the development of individual programs but also in working out a way to present these dolls effectively to the television audience, and to be effective we must go far beyond anything that has been done along these lines in ordinary performances.

The majority of theatrical people know very little about puppets, but even a superficial investigation is interesting. In reality there are two schools. Those interested in puppets, which are the hand-operated dolls and the others who specialize in marionnettes which are manikins worked by strings or wires. In general puppets are placed upon the operators hand and the operator works below the puppet. The old Punch and Judy shows were true puppet performances. Marionettes on the other hand are worked from above. In most cases the operators favor one school or the other, and devote most of their efforts to developing the type of manikin they favor. Many puppet plays have been written. Some of them go back to antiquity, but television has

already brought puppetry into the limelight of home entertainment. The success of programs already on the air will bring many more.

When we first attempted to present marionettes on television, operators insisted on bringing involved miniature stages into the television studio. All this theatrical paraphernalia is necessary when the show is presented to a live audience. Then the proscenium arch and the special stage with its overhead platform for the operators are needed; but in television most of this could be eliminated. On the stage or in an auditorium the whole performance must be planned as a consecutive flowing unit in one location but we can forget many physical limitations in the television studio.

The Television Approach

We once televised a unit with a very involved program designed for the vaudeville stage which took about 240 square feet of studio space. The whole show could have been presented in a special television "setup" in half that space and much expensive gear might have been eliminated.

A marionette or puppet show is frequently interesting to a live audience because they are constantly reminded of the small size of the manikins. The audience is fully aware that they are watching a puppet show because they see at all times the small stage situated in a room of normal size. And this factor adds considerably to the entertainment value of the show as a whole. But on the television screen we completely lose our sense of proportions. The television camera frames the picture. While it is sometimes advisable to have a front curtain, wings or a proscenium arch are completely unnecessary as we can only see as far to the side as the television camera allows us to see. If we pull back on a long shot of a marionette to include its full height, regardless of what that height may be, we see the puppet on the television screen in exactly the same proportion as we would see a human actor. If we see a puppet from his head to his toes he will appear on our screen in exactly the same size as we would see a living actor if we photographed him from head to feet.

And this fact changes the program problem for marionettes and puppets in television with this basic exception: if an oper-

ator appears in the television picture with his marionette we view the act from the same point of view as an audience attending a puppet show in real life. We are constantly reminded of the size of the marionette through comparison with the manipulator. Some operators have special acts in which they manipulate the little figures while dancing. And of course Charlie McCarthy wouldn't be worth much without Bergen. Acts of this type are the exception, for our television puppet shows of tomorrow will, in all probability, be built not to feature the skill of the operator visibly but to entertain the audience with interesting material enacted by puppets or marionettes.

If we approach the problem from this angle we open up a whole new vista. Let us follow this idea a little further. The best puppet or marionette shows, from a television point of view, have been those where realism "of a kind" was attained. In all our experiments we were striving to make these shows convincing and we succeeded up to a point. In a marionette presentation of Pinocchio we succeeded in carrying the story forward until we went in for a close-up. You might say, "Why go in?" The reason was that the lifelike actions of the well-manipulated marionettes in a long shot made us want to see them in close-up—just as we do in television programs with real people. We took the close-up and saw an uninteresting wooden doll—utterly motionless, for his only action was confined to his arms and legs. On a close-up of his face we wanted his eyes and mouth to move but they didn't. The little dog was the best thing in the show because he could wag his tail.

If we are to make the most of this type of entertainment we should entirely eliminate the theatrical audience approach and endeavor to find a way to best utilize the possibilities of both marionettes and puppets in combination. By thinking only of the overall results, regardless of the methods used, it seems entirely possible to accomplish a great deal. It may be that the proper development of puppetry may even challenge the animated cartoons of filmdom.

Possible Development

A program of this kind would take considerable planning and

preparation but the results should more than repay the work and expense involved. A basic story idea should be evolved that would allow for repeated use of specially constructed marionettes. They would require finished workmanship for they must be attractive to look at. Then for each character a separate head could be manufactured that would stand close scrutiny. The marionette leading man and woman would be able to move head, hands, arms and legs and these actions would be seen in medium or long shots. When a close-up was wanted the picture would be switched to a camera focused on the head of the same character and then we would see the eyes and lips move. The marionette should be able to smile, frown, and weep. This could be done with a hand puppet. The size of both the marionette and the puppet would make no difference in a television operation. Both could be built of a size best suited for manipulation. The correct picture results would be attained through proper use of cameras. When a close-up of the marionette's hands was wanted it might be that real hands could be used.

If the script writer used imagination and constantly bore in mind the limitless realm of fantasy, much could be accomplished. The physical operation would require a small set built in proportion to the size of the marionettes. This stage could be relatively low which would eliminate the necessity of forcing the manipulators to work from an elevated platform. This scene would be picked up by one camera and as many sets as were required could be placed side by side. Nearby would be the close-up camera for faces, hands and objects. The background necessary here would be simple as it would be back far enough to be out of focus but it should approximate a portion of the full set, roughly painted, in proportion to the close-ups to be shown. The lines should be spoken not by the puppeteers but by experienced radio actors and the number required would be few as they would be selected for their "doubling" ability.

In a program of this kind the limitations would rest almost solely with the writer if he utilized all the opportunities possible. The opportunity is so vast that programs of this nature can open a new field to those who care to venture into it. Everything that

has been done in animated drawings can be attempted with puppets. The cost of manually manipulated dolls is a fraction of that involved in film animation and a great future awaits the man or woman who can devise programs and present them on television so that they are artistic and convincing.

19

REMOTE PROGRAMS

If you were a television program director in charge of all outside pickups, exclusive of news, with a mobile unit and crew at your disposal, how would you use this equipment and what programs would you select for broadcasting?

This is a question that every television man in charge of mobile unit operation will have to answer some day. At first sight it seems fantastically simple. You might say, baseball, football, hockey, boxing—in fact the whole field of sporting events. That of course is the overall answer but there are many problems before the final picture is seen on the home receiver.

There are three complications to begin with. First, you have an operating crew that works a basic number of hours per week and you will have to give this crew two consecutive days a week off. Second, will the events you plan to pick up, come at a time that fits in with the overall station schedule. Third, can you buy the events you want for the price you want or can afford to pay?

None of these are simple problems. Let us assume you are working with a mobile unit similar to the one described in Chapter Seven. Improvement in equipment will eventually make your problems easier but in any event you will have relay transmitter engineers, cameramen, sound men, and control men in your portable unit crew. It is conceivably possible that some day permanent equipment may be installed at various pickup points, but until that time comes you will be lucky if you can get four pickups per week out of your mobile unit and one crew. If this seems an overstatement, let us quickly summarize. First, the equipment must be driven to the stadium. Then the antenna

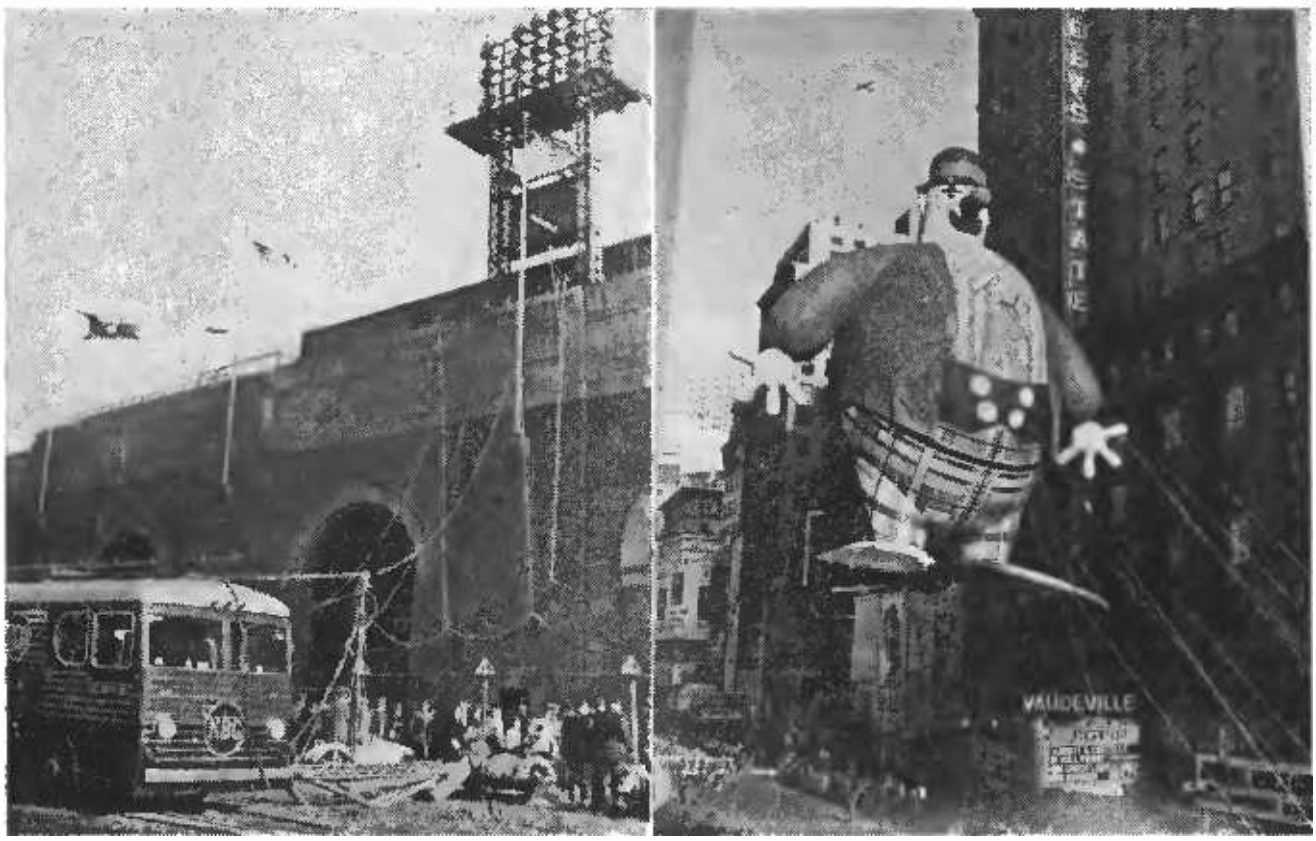
must be installed somewhere high on the top of the grandstand roof, if you are sending back your picture by relay, or lines must be run to the coaxial or telephone lead if it is going by wire. This means that perhaps hundreds of feet of cable must be run from the truck to the sending point. Unfortunately, at public gatherings the fire laws will not permit you to string wires and cables just anywhere. They must be out of the way and pass inspection. Then from each camera goes another lead to the truck. More cable and more work. And your crew can not do all this preliminary work just before the game starts. All of which means that for an afternoon broadcast your men must be on the job around nine in the morning. By the time the doors open their equipment must be all installed and ready. After lunch they are back early for preliminary signal tests and after the broadcast, everything must go back in the trucks. It all takes time.

All of this affects you as mobile unit program director, as you are not going to be able to dash out somewhere in the morning, catch another pickup in the afternoon, and top it off with a final show at night. From the first moment you start planning your schedule you must consider your physical operational problems.

Choice of Material

Now let us look at possible program events. Probably the majority of early broadcasters will face the same problems everywhere. They will not have the money available to go out and buy the event they want simply because it would be a good television broadcast. And even if they could, is it to be held at a time that fits into program operations? In your capacity as program director you may feel that the station's schedule should be built around your mobile unit, but things just do not work that way. Because baseball games, football, racing and track meets happen to be held in the afternoon doesn't mean that everyone who has a television receiver is going to devote all his afternoons to watching your programs. Thus you are forced to plan some evening programs if you are to round out your schedule. You say to yourself that everything is still fairly simple. "Baseball one or two afternoons, and hockey or wrestling at night. That's all there

is to it." But is it? When they are playing baseball in the afternoons there isn't any hockey at night. Whoever invented the seasonal sporting events of America had no thought for the television mobile unit program director. Let's see: baseball, April to September; football, September to New Year's; wrestling and hockey in the winter; horse racing for limited periods, depending on where the race is held; track meets and tennis in the summer and fall. You do get a break on boxing as the matches may be



Left—Cables from the truck to the grandstand at the Army-Navy game.
Right—A balloon in Macy's Thanksgiving parade broadcast by NBC.

scheduled summer or winter, but it is primarily a winter sport. So the first job to do in scheduling your unit is to make a rough chart for each month of the year and see how you come out. Of course you will have parades, special events, and a thousand and one invitations to pick up the doings of this or that group who feel that the world would be interested in seeing their President receive a citation from "the Ladies League for Better Bouquets," but with all these, you are still faced with the problem of finding four programs per week, fifty-two weeks a year, that are of interest to the majority of your television friends. It isn't easy.

Sports

And now we come to the right to pick up the things you want. As we mentioned before if you could select every event you wanted the problem would be a simple one; but, strangely enough, men who own baseball clubs and stadiums seem to feel that they should receive some financial remuneration for allowing you to put your television cameras in the best viewing position in the house and letting every Tom, Dick, and Harry in that part of the world see the game over a television receiver. The promoters' demands are perfectly justified, so you must now look at your program schedule from a point of view of dollar values. Is a baseball game worth more than a football game? Is hockey worth more than basketball? We will not attempt here to evaluate the relative drawing power of the various sports. But an attraction is worth just so much money per person at the box office. As long as a television broadcast helps to bring buyers to the box office through publicizing the event, then television is of value to the promoter; but the minute that television begins to keep people at home, people who would go to the event if they didn't have a receiver, then we have a totally different picture.

Wrestling

So far, television has been of advantage to promoters. For instance, many people have never seen a wrestling match. They may have seen part of a bout at their motion picture theater in the newsreel, and that about ended their experience. The possibility of putting wrestling on television came at a time when we were racking our brains in a vain endeavor to determine what to do with the mobile unit crew on Monday night. Out of the blue came the suggestion "Why not wrestling?" In an endeavor to answer this query, we contacted the powers that be and found that it was entirely possible. The promoter was agreeable at a price within our budget. Power for the mobile unit was available, they even agreed to let us raise the light level in the ring, if necessary, to get a good picture. And wrestling went on television. From many points of view, wrestling is one of the best television sports that exists today. First, as in some other features

of this kind, you have a definite field of action. Your ring is only about 16 feet square. It is brilliantly lighted while the rest of the auditorium is in darkness. And unlike boxing the contestants do not try to keep out of each other's reach. Nearly all wrestling is good close-up material. Perhaps there are tricks to the game, there are in all trades, but if the contestants are tricking you they do it beautifully. When we introduced an interview period before the bout and saw at first hand that "Battling Bowser" was after all only a kid from Freeport who was trying to get by, "the scissors," "the half Nelson," "the flying mare," all became a means of accomplishment.

It is good fun to watch a wrestling match on television. When you think your favorite is all done and he comes suddenly to life, bounds off the ropes and hits his opponent with the full force of his flying body and they both land out of the ring in the laps of the press representatives, it is grand entertainment. A very interesting development is the way the contestants play to the television cameras. It is standard practice in the wrestling game to appeal to the audience for its sympathy if a wrestler feels that he is being imposed upon by the referee. Be he right or wrong his apparently broken-hearted pantomime plea to those watching at the ring side always brings boos or cheers depending on the audience's feelings in the matter. This really is part of the fun of the game, and when a contestant turns to the television camera and with outstretched arms appeals for its sympathy and it has been done, there is a definite feeling that television has arrived.

Basketball

Basketball is another good television sport. The playing field is not too large. The rules or the technique of the game call for a procedure that is very easy to follow. We move with the ball from basket to basket. The play is easy to comprehend, you see why the stars are stars. Because of the comparatively small size of a basketball court it is possible to follow the entire play with only one camera. Of course an additional camera will give more information, but one gives very intelligent coverage.

Track Meets

Track meets are much more difficult to pick up than the two sports already mentioned. To do the right kind of a job is eventually going to take a multiple camera hookup. A pickup of this kind is particularly difficult because the events all take place at different points on the field. If you are faced with the problem of broadcasting a track meet you must decide where to put your cameras and your decision will rest on where the majority of the races will finish and how close you can get to an advantageous pickup point. You must also consider camera locations with relation to the time of day, as you can't shoot into the sun. You will be up against the fact that you cannot put your camera inside the oval. Eventually permanent conduits will be laid to allow coaxial cable leads to terminate inside the track. Until that is done you will find that you must place your camera outside, as no track association is interested in having the contestants hurdling your camera cable. This is true also of horse racing. But eventually we will be able to see the horses from inside the track.

Your inability to get in close means that the broad jump, the high jump, the pole vault, the shot-put and all inner oval events must be picked up at some distance from the contest. Fortunately, telescopic lenses make this possible, but the camera in relation to each event is not just where you would like to have it. What you really must do is to estimate when you can get the best overall results and there you place your cameras.

Indoor track meets are somewhat easier. Many of the championship events that have been held in Madison Square Garden in New York have been televised. To sit in your home and see world records shattered, to see new stars ascend as new times are set for races, new heights for pole vaults, new distances for jumps and throwing events, is a privilege that no other generation has had. With the camera located in the center of one side of the arena a fairly representative picture can be picked up of nearly everything that takes place. Multiple cameras will bring every detail to future audiences.

What television will eventually do to sports is something for the future to answer, but if ten million or more people can wit-

ness an event by means of television, the paltry few thousand in an arena mean nothing. But lots of experimental work must be done before the picture on the receiver is what it eventually will be. Some day our television audience will demand perfection and we must know how to give it to them.

Tennis

In a track meet we show the pole vault as the contestant clears, or fails to clear the bar. We see the milers as they pound around the track, saving their energy for the final spurt, we know where the important final decision will be made. But a cameraman at a tennis match has no set routine to follow. Who can know where the "champ" will knock the ball on his next shot. Of course he can always play it safe and pull back until the camera covers the entire court and quit worrying. But if he is honestly trying to do a thorough job, a tennis match will come as near to breaking down his morale as anything he may attempt.

One thing we have learned is that a close-up television camera at the net where the judges sit, is not all that one might think. You may have seen movies of a crowd at a tennis match and noticed the rhythmic swing of heads as the ball goes from court to court. Apparently it is something we do unconsciously if we are there in person; but having the camera swing from court to court, as the ball moves back and forth across the net, is inclined to make our television audience seasick. In spite of the cynical note of a moment ago, the best place for your camera on a tennis match seems to be back of one of the courts in a position where. with an easy tilt, the court closest to the camera can be covered. This throws the opposite court into a relatively small picture, but the play can still be followed easily.

There are so many interesting experiments still to be made in television camera technique that it is a little difficult to guess all the answers. If a camera was installed behind each court, assuming of course that the sun was in a position with relation to the court that such a camera arrangement was possible, what would be the effect if we switched from camera to camera each time the ball was struck?

Could the audience follow the play from such divergent points

of view? If they could, without confusion, should the camera show the near court on the serve or the receiver? Apparently this experiment has never been tried. Perhaps it is going to take a tennis expert at the camera switching controls and the result may be that we can put the viewer in the position of the player. That is just one of the many things still to be done in television pickup.

Baseball

When we first began to broadcast baseball on television we had a real argument as to where our cameras should be placed to pick up a game properly. Should one go behind the catcher with a close-up lens, or should we put it between third base and home plate? Should our camera with the wide angle lens be behind home plate, between first base and right field, between third base and left field, or hung from the top of the grandstand roof? There have been many opinions rendered. Some authorities feel that we should see a close-up of the pitcher as he winds up, that we should then pan with the ball, from a position near the third or first baseline as he throws it to the batter, and then see the batter as he hits or misses it. Other viewers contend that we should stay behind the catcher from the time the pitcher begins his windup and see the play of the ball as the catcher or umpire sees it. Still others feel that we should watch the batter at all times. Each theory has its advantages and disadvantages. The chief thing wrong with the first formula is the rapid pan with the ball from pitcher to batter. It might be better to have one camera in a close-up on the pitcher and another on the batter and switch from one camera to the other as the ball is thrown. If this is done we have nothing to cover the bases if the play is there and the close-up lens used on the pitcher is not always the best one to cover a play if the ball is hit to the outfield. If the camera is behind the catcher, a special installation of some kind is needed as the camera must be protected. If this is provided, your picture composition is bad, in that the catcher and batter are close to the camera with the pitcher off in the distant pitcher's box. If the camera is properly placed, a wide-angle lens will cover this variation in focal planes, but as the pitcher throws the

ball and it rapidly approaches the camera it looms larger as it gets nearer. The only fault with this arrangement is that if we continually watch the batter we have no way of knowing what the other players are doing. The best answer today is probably a

NBC picks up the Brooklyn Dodgers and the New York Yankees. Rifle sight view finder is visible on center camera. Commentator at extreme left.

compromise between the three methods suggested. With the multiple camera chains that we have today, where three or more cameras are used to cover a ball game, a director has perfect coverage of the play at all times. With the battery of various lenses in his turret, the cameraman may take close-ups or long shots at will. It is nothing to see a batter hit a ball and start for first and then see the fielder in deep left catch the ball in close-up. There is still some variation in the way that different plays are covered and with more than one television station available to the viewer, he will watch the one that gives him a picture which best satisfies

his individual ideas; and that means that good camera work will have a direct bearing on television audiences. In general cameras must be spotted to cover both the infield and the outfield, particularly the batter, the runner, and all infield positions. Its location must be firmly established in the minds of the audience, particularly with relation to the long-shot camera, so that when a switch is made the audience can instantly and intelligently follow the play.

Soccer

The importance of definitely fixing the camera's position in the mind of the audience cannot be stressed too much. In an early experimental pickup of a soccer game, many people were unfamiliar with the rules. The playing field in this game is a large area. We had one camera halfway between the center of the field and one goal line and the other camera in the same position near the opposite goal. During the play the ball covered so much territory that it was necessary to switch almost continuously from one camera to the other with the result that the audience was unable to follow the play. They never knew which goal the teams were approaching and consequently lost interest in the program. To hold an audience any television broadcast must be easily understandable.

The Roller Derby

A sport that came into popularity after television was an every day occurrence was the Roller Derby. T V helped this game find an audience. It is fairly simple to televise but it keeps the director and the camera men on the alert as there is no way of knowing just where the pretty captain of the girls' team is going to fall down—and we must see that. The play is very fast and exciting and it requires more than ordinary camera operation to show the audience everything that is going on.

Hockey

Hockey requires fast camera work even on a wide-angle lens. The cameraman must follow the puck and that requires concen-

trated attention and plenty of physical work. A close-up lens is not of much value as the play is so rapid it is almost impossible to keep the puck in the picture. A play at the goal however does lend itself to close-ups if the cameraman is fast enough. The ice helps the overall picture contest because of its light reflective tendencies. Hockey has proven a highly successful television sport.

Football

Football comes the closest perhaps to being the television cameraman's dream.

The game is almost perfect composition for television cameras as they operate today. The kickoff of course needs a wide-angle

The Army-Navy game in Philadelphia brought to New York by coaxial cable.

lens. From a position near the fifty-yard line if the camera is elevated, at least half the field is in camera range. As the ball is kicked it is possible to cut to close-ups, if the cameraman is familiar with the game and if he can anticipate the plays. Usually this is not difficult as in most instances he has the assistance of a "spotter," a man who knows the members of the team and

who can usually anticipate the next play from his knowledge of their systems. The director always has a safety in that if the close-up cameraman misjudges the play and loses the ball he can always cut to his wide-angle camera. From the kickoff on, the formation of the players makes an almost foolproof television picture. Of course the distance of the position of the ball from the camera constantly alters the size of the players in the picture, but in general it is quite possible to follow every play in detail. The large size of the ball also makes for a good television picture, as compared to an ice-hockey puck or a baseball. The differently marked suits of the opposing teams also go a long way toward aiding the television audience in identifying the players.

Availability of Events

Just how the promoters of the big time sporting events will cooperate with television broadcasters in the future remains to be seen. The advantages so far have been mutual. The broadcasting of professional football in the New York area may even have helped the sport gain public interest. But with the rapid sale of receivers and the growth of the television audience the price to the client and the broadcaster has increased considerably. A television broadcast of any sport tends to make the viewers want to see the game in person. The decision on the part of the promoters to approve television pickups has done a great deal to advance the medium, both by furnishing the broadcasters with program material and by allowing program personnel to gain firsthand experience in picking up the events. From experience already gained the broadcaster knows how to go about doing a thorough job. He knows where his camera should be placed, he knows what his cameramen must do and more important he knows what equipment will be needed. In sporting events of all kinds television proves conclusively the advantage of sight over sound. As an experiment, on an evening with guests in the house and a very poor picture coming in on the television receiver, we switched over to radio. The event was being described, blow by blow, by one of America's outstanding sports commentators. Unanimously everyone shouted, "Go back to television!" Poor as the transmission was, it was infinitely more interesting than

the radio account. In radio, you hear an announcer who is there, tell you what is going on. You know the results but even though the delay in forwarding the information to you is only a matter of a few seconds you never get the impression that you are there yourself. The reverse is true in television. You are there to all intents and purposes. Through the "eyes of the camera" you see the action the very second it happens and probably from a more advantageous point of view than you would have, if you were there in person.

Announcers

Television, in one sense, is a headache to radio commentators and the better the commentator, the bigger the headache. It is true of all contests, and successful sports announcers of tomorrow must learn an entirely new technique if they are going to hold their present standing.

In an early experimental broadcast a special boxing bout was staged in the studio for executives of the broadcasting stations, the managers of the contestants, important figures in the world of sport, and members of the press. A top flight commentator took over the microphone and the match started. No one anticipated that day what was to happen though we might have, had we projected ourselves only slightly into the future. The gong sounded, the contestants came into the center of the ring, and one of the boxers promptly punched his opponent in the eye. The recipient of the blow took a lusty swing and missed. This all happened "in less time than it takes to tell." How often have we read and heard that? Here we saw it happen, for the announcer in his best radio style went on something like this. "There goes the gong—the two men come out of their corners, they spar for a minute, they are just feeling each other out—oooh—a left jab to the eye—a beauty." What actually happened was that the blow was struck while the announcer was saying "the two men come out of their corners." This procedure went on throughout the broadcast and when the action was rapid the announcer was from ten to fifteen seconds behind the action. That one experiment doomed for all time the radio technique of sport commentary. It is perfectly obvious that a spectator does not have to be told what

he is seeing, some few seconds after he has seen it. This applies to all sports pickups and it makes necessary a new approach for commentators. This is not easy for experienced radio men as they have developed the ability to narrate events in the order of their happenings, no matter how far behind they actually are. The radio audience only knows what it is told and the announcer is free to tell it his way, but when the announcer has to analyze what the audience has seen and then make his comments, tell them only what they can't know from merely seeing, the job takes on an entirely new flavor.

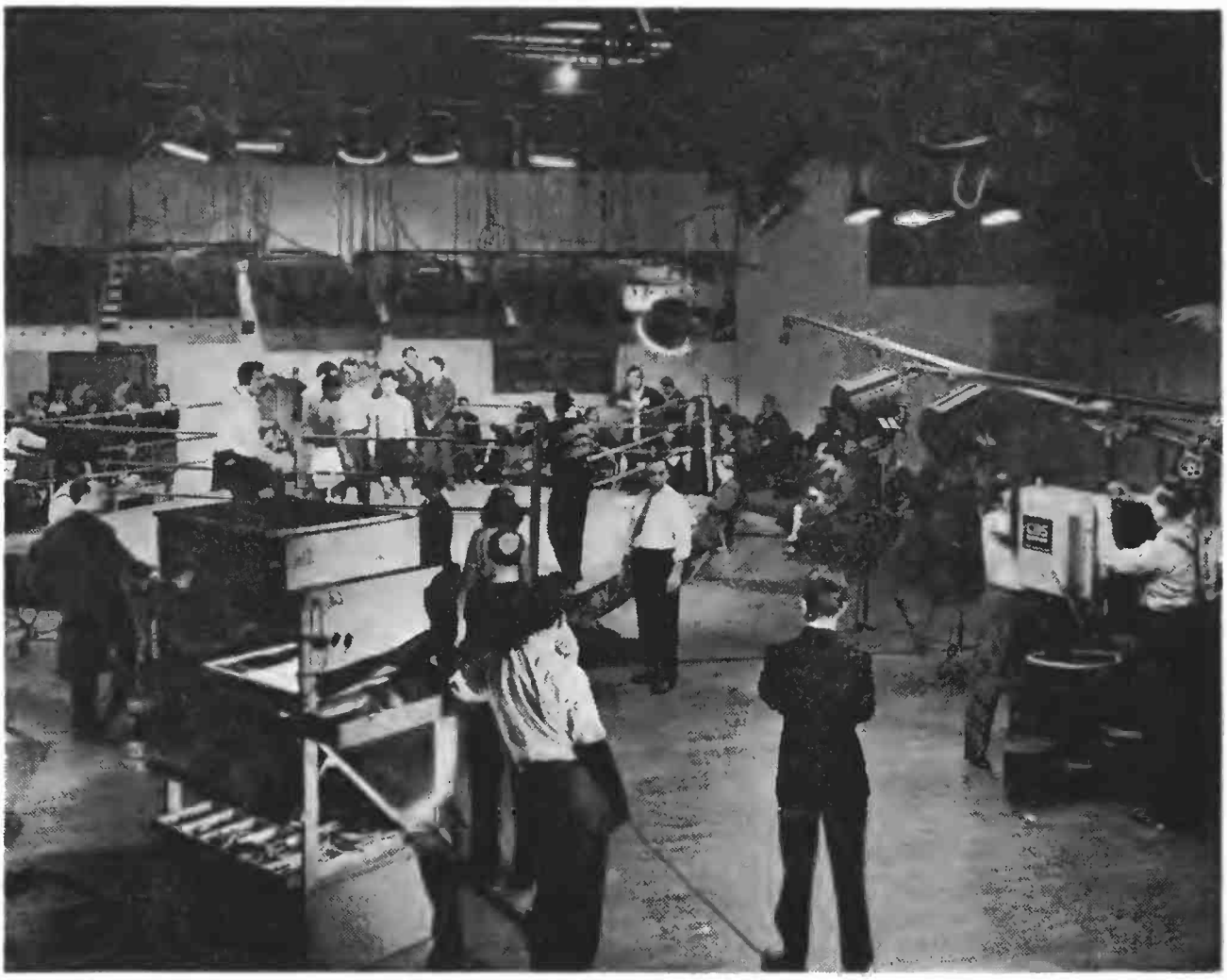
Television announcers will have an important place in sporting events but instead of being narrators of the event they become a sort of handy encyclopedia of pertinent information. In a football game an announcer never needs tell the audience that the ball is resting on the twenty-five-yard line, they know that, they can see it is, but they may not know the name of the player who made the tackle. They can see the formation of a line when it is ready for the next play but they may not know what that formation is called. In wrestling the audience can see that one man is sitting on the other's left ear and is busily engaged in trying to pull his arms out of their sockets, but they may not know that that particular hold is the "three-quarter Mariah." In a track meet we can see who wins a race or clears a high-jump bar but we like to be told factual data that is not so evident. In many cases a director can aid immeasurably by asking the announcer through his telephone headset questions that he would like to know, and which remain unanswered by what is seen. The director gets the audience's point of view and thus can ask for information on points that have not been covered. The "spotter" usually knows the answers to anything interesting about the contestants and thus a complete report is made to the audience.

Boxing

The big favorite with the majority of television viewers will probably be boxing. This sport has had extensive experimentation. We have seen amateurs and professionals. We have been able to follow elimination bouts from the start of the "Golden Gloves" and the "Diamond Belt" contests to the final evening

when the winners get their coveted prizes. Boxing events of one sort or another have been a feature of weekly television schedules almost regularly for nearly five years. The pickup of "fights" is not particularly difficult. We have had the camera on the floor of the auditorium with the audience and in specially hung cages from the front of the balcony.

One of our first professional boxing broadcasts was the Nova-Baer fight in the Yankee Stadium. Last minute arrangements



A sporting event comes to the television studio. Amateur boxing at WCBW. A special effects machine is seen in left foreground.

made it necessary for the camera to be fairly close to the ring, so down went the camera in a ringside seat. The angle of vision was not all that it should have been, and when the fans stood up in front of the camera at an exciting moment, everyone watching the picture unconsciously yelled "down in front"; but we saw everything that happened and as one viewer put it, had we bought comparable seats at the fight for the guests watching it in

our home, it would have taken almost as much money for tickets to this one event as it took to purchase the television receiver.

Most boxing matches are picked up from semi-permanent installations. Special camera cages are suspended from the front of the balcony giving the camera a clear view of the ring. The distance from the ring is not too important as our long focal length lenses put us almost inside the ropes with the fighters. The present day sensitivity of modern television cameras has almost completely overcome some of the early pickup problems particularly that of shooting into a brightly lighted ring surrounded on four sides by an unlighted auditorium.

Some day we will probably see multiple camera installations with the cameras suspended over the ring from different angles; this would allow a director to switch to the camera with the best picture, giving better pictorial results than could be gained if the viewer were in a ringside seat.

Other Experiments

Experimental pickups have been made of nearly every type of amusement. Our programs from Madison Square Garden included not only the sporting events already mentioned but also a very interesting broadcast of the six-day bicycle race. That was one event that was available to our program schedule when we wanted it, as long as the event lasted, but unless you were a fan there was only limited program interest as the boys pedaled around the track. Other pickups included the Harvest Moon Ball, the Ice Follies, the Rodeo, and the Circus. It doesn't seem possible that a television broadcast will ever hurt circus attendance. Who wants to see animals and not smell them? On second thought, perhaps some people do but, be that as it may, we were able to present some very interesting circus pictures to our television audience. With the image orthicon the Rodeo was almost as real at home as it was in the Garden. Spotlights as used in the regular show gave ample light for a good picture.

Special openings of important pictures in firstclass Hollywood style were among other experiments. Our camera, just outside the theater entrance, gave "the lookers in" a close-up of the film

celebrities as they drove up in their cabs to view the picture. In the lobby another camera gave us an opportunity for short interviews. The opening of "Gone With the Wind" at the Capitol Theater in New York was one of the most successful broadcasts of this kind.

Special Programs

Scanning the possible material available for programs to be staged when you need them is a matter that offers serious problems. It may very well be that this demand, that is tailormade mobile unit programs, may create a new form of outdoor programming. It seems fantastic that as a program manager you may have a perfectly good mobile unit and crew available and still have two or four unfilled afternoon hours in your program schedule, but such very easily may be the case.

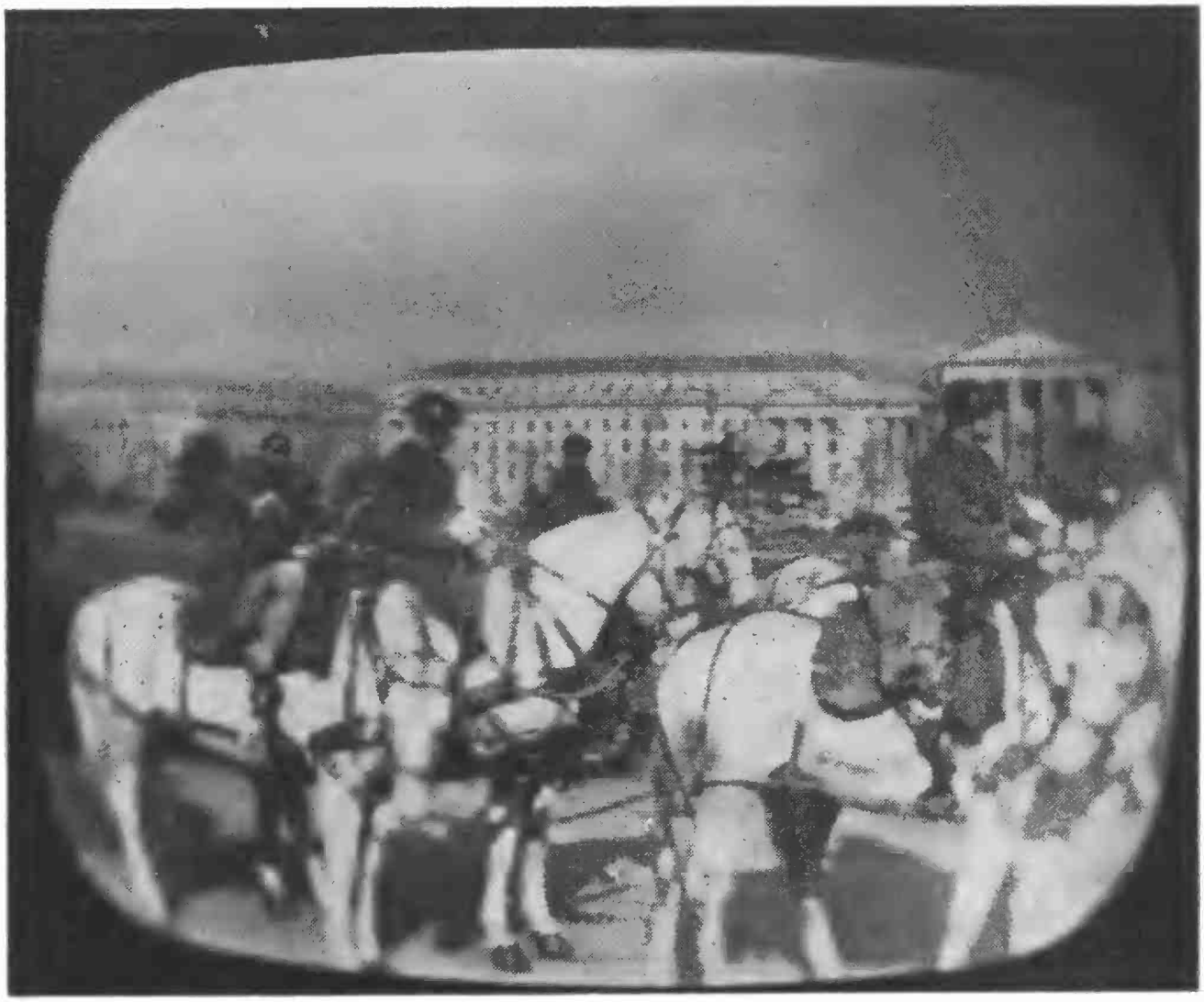
Probably tight schedules will be worked out when the time comes that you can afford to buy all the baseball, football, and kindred sports that you want, but until it does, building special programs for outdoor mobile unit pickup is almost a necessity and an art in itself.

Our first year of operation, fortunately for us, came at a time when the New York World's Fair was going on. Without that tremendous enterprize almost at our front door we would have been hard put for program material. A good electronic picture on the screen doesn't in itself hold listeners; the program content must be interesting.

The first television picture of a distant location was thrilling. On one of the early mobile unit tests, we set up the cameras at a country cross road. The close-up of the road sign read, "23 miles to New York." The thrill came when we realized that we could see that far from our transmitter. But what good was there in seeing if there was nothing to look at? At the Radio and Television Show in Berlin in 1938 one of the sets showed a vista of a Berlin Street. A camera had been focused out the window but few people were interested. You simply don't stand on a street corner and watch traffic for very long.

In our hectic search for program material we found two or three very reliable sources. One of these was the "old swim-

ming hole." Any good-sized public pool offers much to interest the viewer at home. Special features were easily arranged as applicants for competitive swimming and diving events were easily found. There is always something interesting to watch at a swimming pool and a camera dolly that made it possible to move the camera the full length of the tank gave use very interesting shots.



A photograph of a kinescope picture of an early demonstration in Washington, D. C.

Another source was found through the cooperation of the U.S. Army. In Washington, D.C. a field artillery unit performed in their usual style before our cameras. The local airport was the point of origin of many of our mobile unit shows. The arrival and departure of planes is of interest to the average American. If people will go in person to see something, they also find interest in the same subject in television.

Television offers many surprises and unexpected thrills. One afternoon at home we were watching a pickup from LaGuardia Airport in New York. We saw a large passenger plane all ready to take off. The announcer droned "all aboard for Boston." We saw on our receiver the plane taxi down the runway, head into the wind, and take off on its regular run. A few minutes later we stepped out into the afternoon sun and there directly overhead was the Boston plane winging its way East—the same plane that a minute or two before we had seen start on its journey from the airport twenty miles away. All we need is vision in using this medium. Its potentialities are unlimited.

20

NEWS

The Time: The year 1960.

The Place: A large city on the Eastern Seaboard of the United States of America.

The Scene: The News Headquarters of TYX, the local television broadcasting station.

In a comfortably air-conditioned room, with the soft glow of the late afternoon sun diffused through special plate glass walls, sits an energetic young man at a large desk. On the wall opposite him a large television screen is bringing the final minutes of play of a football game. On the right wall of the room we see what appears to be a large map of the city and the surrounding countryside, but at various points on this map are slowly moving points of light. One of them is motionless and has been for some time. A slight frown of annoyance passes across the face of the young man at the desk. With a sigh he presses a button, one of perhaps twenty-five, in a row on the desk in front of him. Immediately a light glows above it and from a hidden loudspeaker we hear a voice saying.

"H 27 answering your call." The young man at the desk turns to a microphone at his side.

"Say listen you fellows, will you please tell me what the eternal

Sam Hill you are doing? You haven't moved for half an hour."

"Thirty-seven minutes and thirty-eight seconds, to be exact," the voice replies. "You know you always said to be exact, Chief."

"I'm glad you remembered something I said," he answers, "but just what are you 'Eyes of America' doing?"

"Well right now, Chief," the voice over the loudspeaker continues, "we are watching a very good football game. You can see fine from up here. Want to take a peek?" The young man at the desk cuts in sharply.

"I do not. Do you guys think I am keeping you in a helicopter patrol to have you sit up in the sky and watch a football—" His voice stops suddenly for a large red bulb in front of him has begun to flash. He presses one of the other buttons in the long row and over his speaker he hears.

"Municipal airport calling." With a crisp, "Go ahead airport," the young man listens.

"Transoceanic plane from Paris is just off the coast. It's breaking the record from France to America. It's due at the airport in twenty minutes. Shouldn't we take it?" There is no perceptible pause as the Chief answers.

"Right. Get your plane out to escort it in. Send back a test picture as soon as you contact the ship. Get going."

"OK"

He presses the first button again and hears, "H 27 calling. Listen Chief—" He interrupts crisply.

"Keep still and listen. Get out to land's end just as fast as you can. Be ready to send in pictures of Paris plane and our T 1 as they pass you. Send test picture as soon as you see them. Get going. That's all." Again he presses a button on the desk and another voice comes in.

"M 4 speaking, Chief."

"Harry, get that mobile truck of yours out to the airport fast. I want you there when the Paris plane gets in. You've got just twenty minutes."

"We're gone."

He kills the radio telephone switch and cuts in his intercommunicating phone.

"Hello. Program Central and Master Control." Almost im-

mediately Master Control comes back.

"M C Chief." A second later, "Program Central on." His orders are concise.

"All right fellows, here it is. The Paris plane is making a new speed record. It's due at the airport in nineteen minutes. How much longer will the football game run?" The program manager answers.

"I'd guess ten minutes."

"OK. Line me up this way. Make an announcement of a special pickup as soon as the game ends. Our T 1 unit in the jet plane is on its way to contact the Paris ship. Master Control will monitor their transmitter and feed me the picture from T 1 as soon as it makes contact. H 27 in the helicopter will pick them both up at land's end. I want that picture too. The truck is on the way to the airport for the landing from the field. They will interview the passengers after the ship lands. Give me the picture from M 4 as soon as they get there. Both of you got it?"

"OK"

"Right."

During the next five minutes he repeats his instructions to the jet plane, the helicopter, and the truck all speeding toward their various destinations. A special announcement is made to the audience of what is coming and within ten minutes from the first order the test pictures come in from the jet plane. Over the loudspeaker in the news office comes:

"T 1 calling news." On a "Go ahead" from the Chief, we hear.

"We're there, Chief. Contacted plane, she's just coming into the picture. Are you getting the Paris plane?" A flip of a switch and on the preview monitor he sees a tiny speck, black against the sunset sky. He calls back.

"Hello T 1. Getting picture. Follow ship into airport. Listen into station and come in on cue." He throws another switch.

"Master Control."

"Right Chief."

"Put the newsroom line on the air and follow our switching cues." And on the television receiving sets in that area there fades in the picture of an aeroplane in full flight. On the loudspeakers the audience hears the announcer saying, "Hello every-

one. We are happy to have you witness another scoop from station TYX. The plane you are now seeing is the Paris Transoceanic Liner that will set a new transatlantic record when she lands at the airport in about ten minutes. You are seeing the ship from our special television news plane that met the Paris ship out over the Atlantic."

Suddenly both ships appear on the television screen as they are picked up by the camera from the helicopter. While we are watching a third ship comes into the picture and we see the Eastbound plane dipping its wings in salute to the new queen of the airways.

The ships reduce speed as they approach the airport and our helicopter still has them in the picture. The young man in the news room is switching his cameras back and forth from the jet plane to the helicopter, while the commentator gives a first-hand verbal description of what is happening. The planes come in for a landing and he switches controls to the cameras in the mobile unit truck waiting at the airfield. As the Paris plane glides in for a perfect landing we see and hear a new world's record in transoceanic history made.

Now of course to some of you this may sound a little like Jules Verne and as we said, at the start of our chapter, the time is 1960 but with a jet plane, a helicopter, a fast unit truck with self-contained transmitting equipment and three present-day television cameras and relay transmitters the program as outlined could be brought to you tomorrow. The television equipment needed has already been built and tested, we actually saw everything described here back in 1939. The only difference was we didn't break a flight record and it took more than ten minutes to get our cameras where we wanted them.

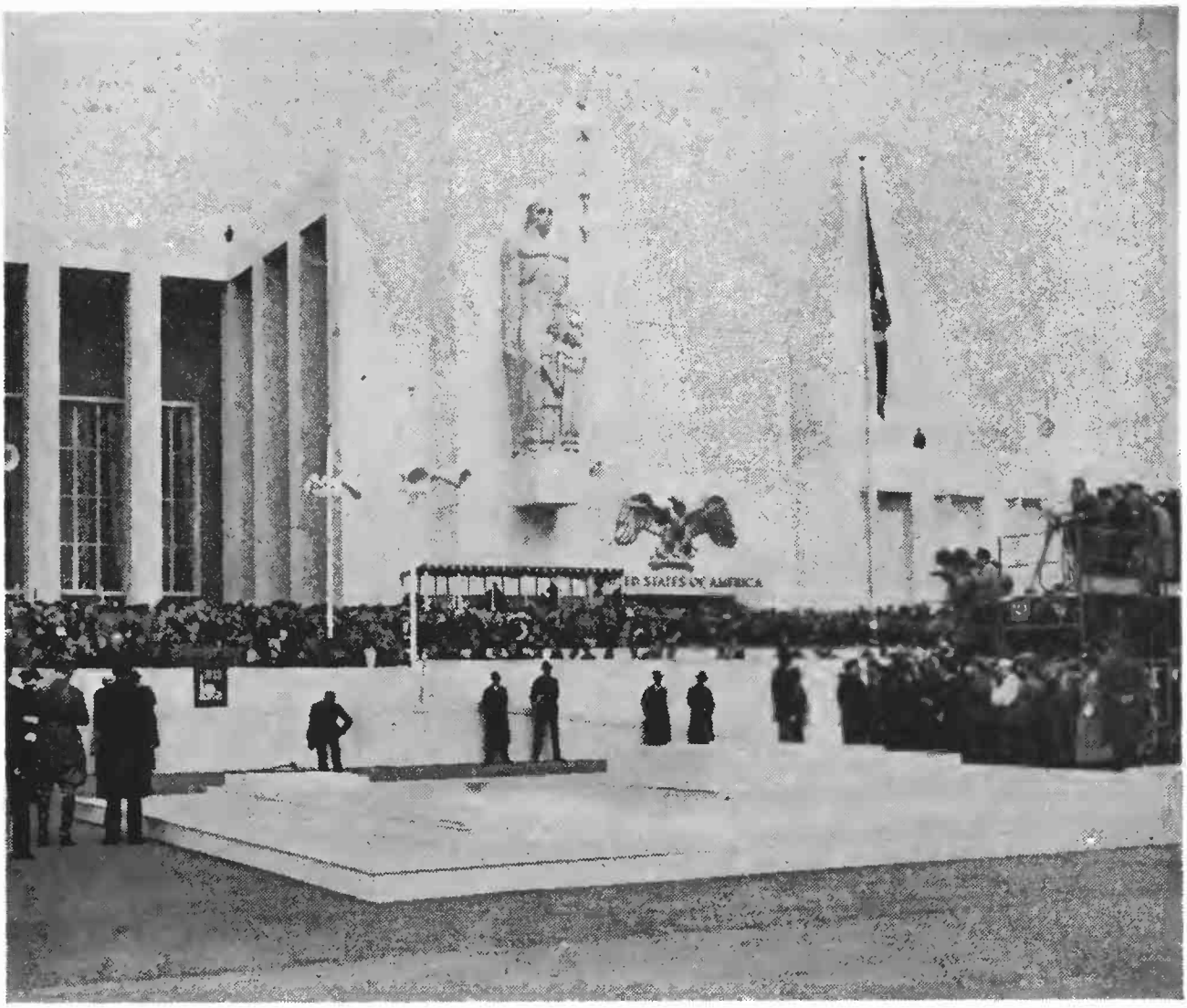
What we actually did see was the first television picture of a plane in flight, taken from another plane. A passenger plane from Philadelphia was met some distance from New York by our special plane in which a television camera had been installed. Our camera plane flew with it over New York City. We saw New York from the air, the rivers, the bridges, and the buildings, as well as a close-up of the sister ship that was flying with it. The

cameraman in the plane received instructions from the ground and showed us the views we wanted. This special job was put together as a test pickup and it included a receiver in the passenger plane. The passengers saw, just as we did on the ground, the picture the television camera plane was picking up. After its flight over New York the passenger plane flew back to Washington, D.C. High in the air above that city the New York picture, broadcast from the Empire State transmitter, was well received, but when the plane dropped below a certain altitude the picture was lost. After several tests over Washington, the plane which carried the receiving set started back for New York. At La Guardia Airport our mobile unit was waiting. The passengers in the plane were watching on their television receiver, as were other viewers in the Metropolitan New York area, a test program being put on from the studio in Radio City; but when the plane became visible to the mobile unit at the field we switched pickup controls to that point and saw the plane from Washington coming in for a landing. The passengers in the plane saw the picture too, and we have from an eye-witness that one of the passengers, casually looking at the television set, remarked "Look there's a plane coming in for a landing." Another passenger nodded his complete acceptance of the statement and remarked —"I hope they have a smooth landing." About that time the pilot cut his engines, the plane leveled off. The first viewer watching the set said "Huh—darn good landing"—and suddenly the full import of what he was seeing struck him. The realization was completely unexpected. All he said was: "My God—that's us." And it was. They were the first people in the world to actually see, from a point on the ground, the plane they were in, make a landing.

Special Events

Perhaps, in our zeal for the advancement of television we are expecting too much. We described at the start of this chapter a pickup that is physically possible for either sight or sound; but with all the wonders of radio, that great medium has never attempted to do the things we are expecting from television. Radio broadcasting stations have mobile trucks, yet we have never had

regular radio on the spot news coverage, and we expect that from television. It is possible to cover many special events at very short notice if a service is set up to handle them. On radio we have heard descriptions of parades. On television we have seen them. We have brought to the television audience, not a word of mouth description of Macy's Thanksgiving Parade, Army Day, Memorial



President Roosevelt opens the New York World's Fair. Television camera at right of picture.

Day, and St. Patrick's Day parades, and many others, but a picture.

The first instance of on the spot news coverage occurred on a routine test. The television cameramen suddenly found themselves directly in the line of sight of an unexpected fire and we saw it in the viewing room. If at an ordinary outdoor pickup anything unexpected should suddenly happen, the television audience would see it. As a matter of fact we saw one day the

body of a young woman hurtling through our picture. She had plunged or fallen from the building we were facing, and the cameras showed us her falling body. A few New Yorkers traveled across the Atlantic ocean to be in Paris when King George of England visited that city. Some stood on chairs atop tables in a

A photograph of President Roosevelt taken from a television receiver during the opening of the World's Fair, April 30, 1939.

café on the Champs Elysées when the King drove by. But later, in their living rooms in New York, they had a much better view of him on their television set when he drove up Riverside Drive than they did in France. We saw President Roosevelt open the New York World's Fair. It wasn't a brief fleeting glimpse. We saw and heard everything he said during that ceremony and we were not forced to brave the weather on that rainy April day as thousands of others did. We sat comfortably in our living room and saw everything that those who were there saw and heard.

Back in the early experimental days our news programs did not start with aeroplanes or mobile units. We felt that we must learn how to do the job of televising news from the studio. Today we have a very acceptable answer which will improve with experience, but then we were starting from scratch. Our first effort was to simply turn our television cameras on a popular radio news commentator. For some months Lowell Thomas' news program was broadcast as a regular television feature. There were no elaborate preparations, no rehearsal, in fact a camera was simply focused on him as he gave his regular radio broadcast. This experiment was successful. The audience at that time voted the program consistently one of the best programs on the air. But did that prove that programs of that kind would be successful tomorrow? We doubted it. Could a program of this kind hold the television audience against the illustrated news programs we felt sure we were going to have? Frankly, we didn't know. We felt, however, that in planning a visual news program we would have to be careful if we attempted to illustrate it with still pictures. Television is a "moving picture" and stills become lifeless and static. Motion pictures and television itself have made us impatient of still pictures. We can see them in our magazines, we want action on our television receiver. There was only one way to find the answer, so we started.

Early News Programs

The program as planned was to consist of news items, delivered orally as in radio, but each subject was to be illustrated with photographs. A news service agreed to supply us with pictures and information, so each morning the wire news was scanned, items picked out for the broadcast that evening and then pictures were selected to illustrate the points mentioned. Our first problem, and it will probably remain a constant factor as long as we have television, was that regardless of the shape of the original, the television picture had to conform to the ratio of the pickup plate. If a photograph was shot originally as a full length picture only the portion that could be picked up on a 3 to 4 ratio could be used, unless a wide margin was left visible on the receiver. Another point was the size. Nothing was

standard. The picture morgue had photographs that varied from 3 x 4 inches to 8 x 10 or even larger in size. There is a limit, with present-day lenses, as to how small photographs may be if they are to be picked up by the television camera. Eight by ten

The crowd in Times Square, New York on VE Day.

is about as small as is practical. Glossy prints were not satisfactory as they reflected the studio lights. Different sized pictures meant that two cameras had to be used, as the camera position, with relation to the photographs, had to be changed with each picture. The pictures all had to be mounted on heavy cardboard. To overcome the many difficulties that we faced we decided to photograph each picture selected and project the resultant film

print into the system by means of a standard projector. As soon as the pictures were selected, they were rushed to a photographic studio, where the proper ratio of size and the proper density were secured for their television broadcast, by placing the picture to be photographed at the proper distance from the photographic camera. Thus we were sure of a picture wider than it was high. Taking advantage of one of the idiosyncrasies of the television system, we were able to use the negatives, as it is quite possible to set controls so that negative film or still pictures come out positive on the home receiver, thus we were saved the necessity of making positive prints. Then the question arose as to how many pictures per minute were needed. We didn't know.

As a practical approach to the question ask yourself, how long do you look at an illustration in a book or magazine? The answer of course is that you look at any still picture until you have absorbed the visual message it contains. If it is merely a photograph of an individual you lose interest in a very few seconds, while you stay longer with a picture that contains lots of detail. Because of the size of the television picture on the receiver, long shots and small objects were of little or no value. Consequently, we chose close-ups and pictures with fairly simple composition to illustrate our commentator's talk. We found that we needed between ten and fifteen pictures per minute to hold the visual interest of the audience. For five minutes of elapsed time, this meant fifty to seventy-five pictures to be selected, photographed in the right proportion and size, developed, and mounted in slide holders.

When we eventually saw the finished results we came to the conclusion that there must be an easier way to illustrate news broadcasts on television, for the still picture technique alone was definitely unsuccessful.

Later Developments

Obviously there *are* many other ways to do the job and the successful news broadcasts of today are using a combination of many devices to accomplish the desired results. Maps of sufficient size and detail to allow for good close-ups, with the important towns located by means of a pointer in the hands of the commentator or his assistant, have been used. Some maps have been

prepared where a certain amount of interesting animation is possible. By placing a translucent map in a horizontal position on a piece of glass and then picking it up by means of a mirror some very unusual results are possible. The mirror is placed at a forty-five-degree angle to and above the map; when the camera is focused on the mirror the reflected map appears to be upright. Because of its flat position objects may be moved across it or allowed to rest in any desired location. By means of a controlled light source both below and above it, opaque objects when moved over it, give the effect of animation. Lighted arrows may show troop movements or dark lines may be moved to show border changes. There is really lots of flexibility in a machine of this kind and, while it is still crude, its cost is slight as compared to motion picture animation. In addition, it can be changed each day to fit the news of the moment. Many adaptations of this device will probably be worked out for tomorrow's television stations.

A combination of still pictures, animated maps and close-ups of the commentator is being used successfully today to bring us a graphic description of what is happening in the world we live in. The war was brought to our living rooms through the use of motion picture film. All in all, television news is more interesting than radio and it will very easily better its position as time goes on.

Covering Political Conventions

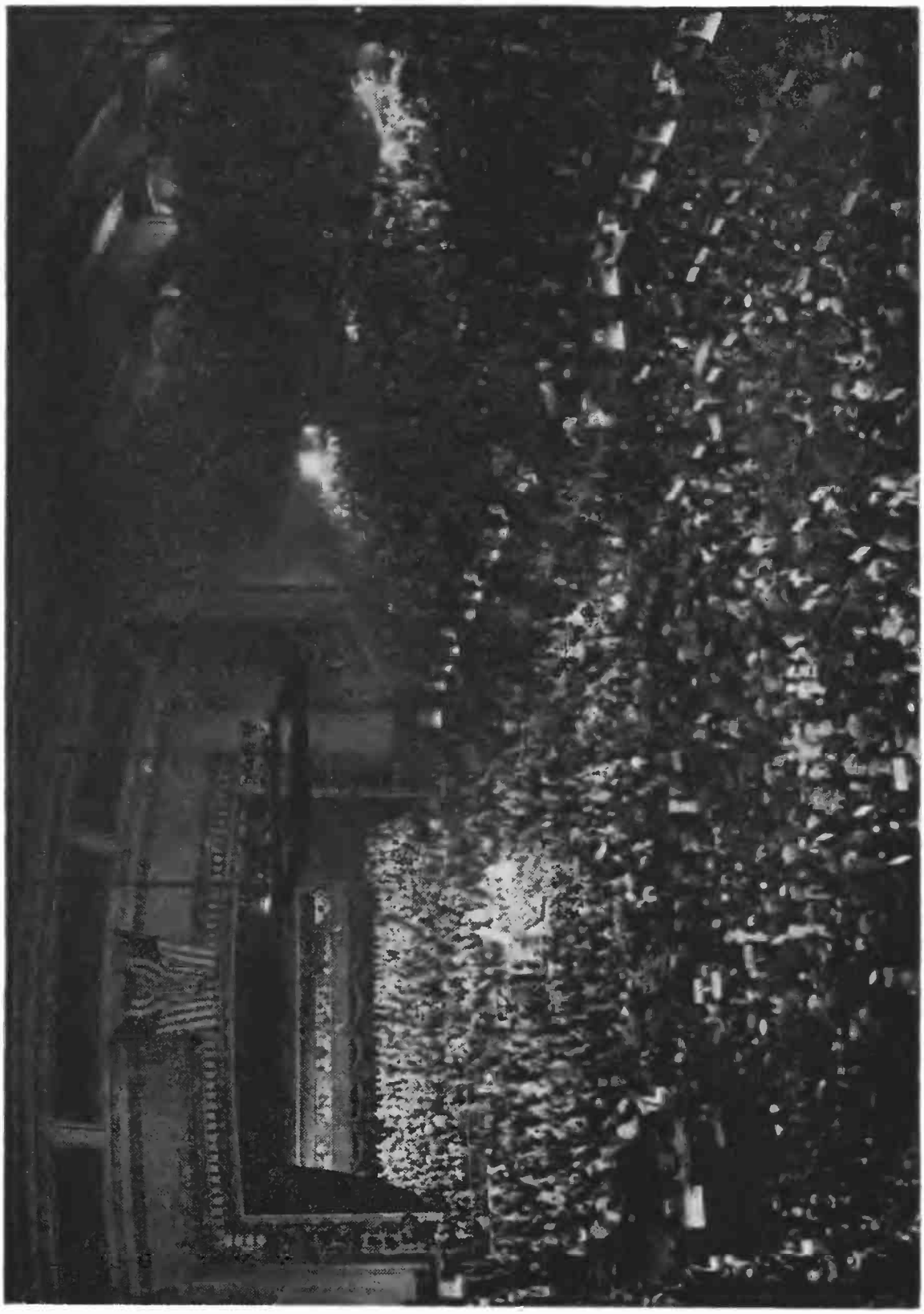
The proof of what television can really accomplish, from a news coverage point of view, was shown in the pickup of the Republican National Convention in Philadelphia in 1940. Plans were laid well in advance. In and about the convention hall were installed four television cameras. One was equipped with a telephoto lens which was focused on the speaker's stand. This camera was on a small platform hung from the balcony about midway in the hall. Beside it was another camera, with a wide-angle lens, to cover the floor of the auditorium. In our news room another camera was installed. Here we interviewed all the important personalities who attended the Convention. Columnists, commentators, convention members and the principle

speakers. Our fourth camera was out in front of the convention hall. Through telephonic communication we were able to switch to any of the four cameras as desired. The convention was in session four days and every minute of that time was broadcast over NBC's television station in New York over ninety miles away. The picture was picked up in Philadelphia, sent to New York by coaxial cable, and then broadcast from the television transmitter on the Empire State Building. The television audience saw and heard everything that took place in Philadelphia: the speakers, the demonstrations on the floor, and the final nomination of Wendell Willkie. Actually the television audience knew more about what went on than many people who were there in person. We found people who were there going to a television receiver to see who was speaking as they couldn't get where they could see in person.

An amusing side light occurred one morning, when we thought it would be interesting to have a herd of elephants, which were there publicizing one of the potential nominees, parade in front of our cameras. The director was explaining what we wanted to the elephants' trainer when one of the elephants, on which he had turned his back while talking to the trainer, affectionately put its trunk around the director's neck. He was startled, to say the least, and made a wild rush to leave the elephants forever behind him. Then the cameraman turned the camera on him and his wife who was viewing the program in Westchester County in New York saw him hurrying away from his elephantine inamorata. The moral is, that people can see what you do when you get in front of a television camera. When you are away from home, stay away from television cameras unless you want the world and your wife, to know what you are doing.

The year 1948 saw both the Republican and Democratic National Conventions scheduled in Philadelphia. There are those who say that the reason that city was selected by both parties was television.

Television is rapidly finding its place in the political field, for important congressional events have been covered and the President of the United States has been televised many times. Mem-



The Republican Convention at Philadelphia. Television camera in front of balcony at right of picture.

bers of Congress and Governmental Department heads are seen regularly from Washington.

News on Film

News coverage by means of film has been a regular feature on television programs for some time. Many stations have their own motion picture crews in the field and they are covering important news events all over the world for television release. They have in many instances shown pictures of news events from one to two days prior to their release by newsreel companies in the theatres of America. This was possible because the television station only needed one copy of the negative film and did not have to wait until hundreds of prints of the picture were sent to all the theatres in the picture company's chain. New York viewers have seen the receptions given the top military and naval commanders on their arrival in the metropolis on the evening of the day the event took place. When this news coverage project was first started it was apparently far out of line compared to the cost of studio programs, but it has proved to be not only a fine program service but also a profitable venture through the sale of the film to other stations.

The Democratic National Convention in Chicago in 1940 and both the Republican and Democratic conventions in 1944 were covered for television audiences, on film. The pictures were flown to New York and broadcast on the same day. On the evening of the day the convention opened we saw pictures of the first session that took place that morning in the Chicago Auditorium.

The wedding of Princess Elizabeth, the highlight of 1947, was broadcast in America the day after it took place. Reciprocal arrangements with the BBC have provided European coverage, and all the world news will be available for television before long.

Motion picture companies see in television an additional source of profit for their news reels and they are furnishing sponsors with the output of their studios. News on film is one of the outstanding services that television can bring to the home viewer. With stations all over the country employing crews to shoot the local events as they happen, we will see what is going on in every corner of America.

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PROGRAMS ON FILM

Whenever television programming is discussed one naturally thinks of visual entertainment; and the minute we begin to think in terms of visual programs, it is impossible to ignore the results that have been attained by the motion picture industry. Some television program directors and station managers have attempted to play down the value of film in television but without film it would have been impossible, from an economic and operational point of view, to have programmed existing television stations, both in the United States and England, as effectively as is being done today. What film will mean to the television programs of tomorrow is so important to the industry that, if we are to approach television programming intelligently, we must consider the vast possibilities that exist in its use.

Everyone who has made any comparison between film and live talent programs has pointed out the value of spontaneity in television as an argument that all programs, to be effective, must be done live. No one in his sane mind would attempt to deny that live programs are going to be an important part of any television station's program schedule, but to say that all programs will be live is as silly as saying that because we have two arms let's cut one of them off. We are going to be able to do things on film for television that cannot possibly be done live and the fact that a program on film is available to a station manager where and when he wants it is going to be tremendously important to the industry.

In television programming as it exists today, with possibly one exception, film units of one kind or another have been a component part of 90 percent of every program that has been broadcast. From the time broadcasting first started in New York in

1936 virtually 50 percent of the television programs that have been seen on home receiving sets have been on film. When NBC was on the air with a regular schedule of 15 hours per week, at least five of them were on film. At that time there were somewhere in the neighborhood of 60 employees giving their full time each week to the production of these programs. We had one live broadcasting studio, a mobile unit, and a film studio. If we had not had film available to us, we would have had to double our personnel and to have added at least one more studio; and it is doubtful whether we could have maintained that 15-hour-a-week schedule without another mobile unit, which means that the use of film replaced a studio, perhaps a mobile unit, and somewhere in the neighborhood of 50 or 60 people.

It has been said that the television audience objects to film programs merely because they are on film. This is not true. Hundreds of interested viewers have looked in on live dramatic programs and time after time they have asked, at the conclusion of the program: "Wasn't that program on film?" We must recognize the fact that the audience was paying, everyone connected with the program, a very high compliment for the finished television program they were able to produce and it was proof that the lay viewer has no objection to film as a basis for good television drama. The television director's chief aim is to have a smooth flowing performance. With the many problems that he must face in a live program, if he succeeds in putting out a program that a lay viewer thinks is on film, he has done a tremendous job. At first everyone was sympathetic to television production problems. Critics in their reviews constantly referred to the good job that was done with existing facilities, but today we are demanding perfection and mistakes are not dismissed lightly.

Perfection of Film Presentations

A television program on film has advantages that are difficult to offset in the studio, chiefly from the point of view of a smooth running performance. We have discussed in detail the problems of a director in producing a live talent dramatic program. Obviously good programs of this kind are possible but at no time are they foolproof. In a recent live program, everything had been

checked and we were ready to take the air when it was suggested that the cameraman get closer to a young lady in a close-up shot. The procedure following this first "take" was to pan to two other girls. All three were seated at a table. We had checked the camera's position with relation to the three girls so that the pan made an arc of a circle with the girls at equal distances from the camera lens. The program started, the first shot, in slightly closer than at the rehearsal, was just what we wanted. The cameraman panned to the second girl and that shot was fine; then he swung over to the third girl and catastrophe overtook us. The third girl was so close to the camera that it was impossible to focus her correctly and the result was a badly out-of-focus shot. It could not be corrected by the cameraman as his focal depth was not enough to get her face and her hat both in focus. In this case the fault was the director's, as he should not have asked the cameraman to change his position after the final rehearsal. What happened was either that in moving his camera in he lost his proper base for the arc of his pan shot or that the young lady in the third chair unconsciously leaned slightly forward. There was no way to correct the mistake as it was a very brief shot and the camera was not on a dolly. The audience's reaction was "Yes, the show was pretty good but it was too bad you missed that shot." On film the audience would never have seen that mistake.

In another live studio program we were trying to build up the menace of a sinister spirit that was influencing the lives of the people in the story. We were striving for a special effect and after hours of rehearsal, we thought we were all set. On the night of the broadcast, however, through a mistake in timing, we saw a human hand placing the properties that were supposed to be so awe inspiring; the result was that we completely lost the effect that we were trying to secure. It was an accident that might have occurred at any time in an involved television production. In still another story, the climax of the play was built around an oil lamp being shattered by a bullet. When we came to that point in the story, the mechanical contrivance that we had planned to use to break the lamp failed to work. The result was that all our time, effort, and money was completely lost, as the whole plot revolved around the lamp's breaking.

If these two programs had been on film we would have known beforehand that they would be perfect when they went on the air.

Broadening the Scope of Studio Programs

Another thing that we must consider in tomorrow's television schedules is that we must in some way broaden the treatment of the subject matter that we include in our programs. There is a definite limit to what can be accomplished within the four walls of any television studio. Almost without exception when outdoor shots on film are incorporated into a live dramatic program, the interest value is raised immeasurably. Undoubtedly every director of a live talent program will strive to enlarge his point of view by using film inserts. Every shot supposedly taken on a train will need a film sequence to cut to or the effect of movement is lost. We need to see the countryside rushing by and we can only get this by using film. But, aside from film as an adjunct to live programs, we are going to see the world before our eyes only through motion pictures.

News Films

In the early surveys made of television audience reactions, the travel film seemed to be a leader in popularity. To bring the far places of the world to the living room means that pictures taken at the scene of the action must be used. One of the outstanding regular television programs of 1945 was a film presentation of the development of the war. Every motion picture news reel is made up of not more than ten minutes of important happenings in the world. During the war this ten minutes was, for the most part, selected from the motion pictures taken by the signal corps, by other army and navy personnel, and by news reel cameramen. Thousands of feet of film were taken every week; yet five news reel companies selected ten minutes of material twice a week and that was all the public saw. Realizing that there were thousands of feet of interesting film, that the news reel companies were not showing, the National Broadcasting Company's station WNBT presented a regular program of wartime film. It found a very appreciative audience.

Only on film can we hope to cover the news of the world as it

must some day be handled. With representatives in the principal cities of the globe, a world television news service can literally "cover the earth" by sending to a central office film shots of the happenings of every country on the globe. Of course we will have television networks, but a live pickup from South Africa at the scene of the discovery of the largest diamond yet known to man does not seem practical for some time to come. Events of that nature can be put on film and sent by plane to the world television centers. Wonderful as the possibilities of future mobile unit pickups may be we are still going to use the advantages that will acrue through the use of motion pictures.

If the President of the United States, the King of England or any outstanding personality is to address the world at a predetermined date and hour, of course that broadcast must be live; but if some future Admiral Byrd is to describe the aurora borealis over the north pole or the setting sun from the mountains of the moon, the chances are it will be brought to the television audience of the world on film.

Travelogues

We have seen the wonders of India, South America, Europe, and Asia on television—all through means of film. Lecturers and world travelers have brought us visual evidence of their experiences through this medium. Burton Holmes, Julian Bryan, Carveth Wells and others have already brought many thousands of feet of film presentations to the homes of television set owners. Doug Allen's "Thrills and Chills" was one of the first regularly scheduled programs incorporating this type of entertainment. It was popular for an unusually long time. His program featured world travelers, adventurers, and explorers from almost every country and they brought back a motion picture record of their experiences from the far corners of the earth.

The procedure on almost all travel programs today is a combination live and film presentation. Usually the lecturer is introduced in person, with a live pickup from the studio. In this way we see him as he is and in this interview learn something of the details of his preparation and motives for going. Then "on cue" we cut from studio to film. If it is sound film there is, naturally,

nothing from the studio, but in the majority of programs of this kind silent film is used. A picture monitor is placed in the studio so that the lecturer and his interviewer can see the output of the film studios. With the film on the video channel the sound comes live from the studio and a flowing continuity of questions and answers is possible.

Old Pictures

At first, film programs especially made for television were virtually non-existent. Some very few had been made, but practically all of the film shown on television were old shorts and features made for exhibition in theaters. These film presentations have included almost every type and kind of program that Hollywood has ever made. Many of the old full length features have already made their television debut. At first the television broadcaster was hard put to find film material for his station but of late a fairly large amount of feature films have been made available. This is especially true of films that are difficult to book in local theatres. The demand for programs on film has brought new television film producers into existence. Most of these companies strive to cut production costs and some of their productions have been more than satisfactory. Lucky Strike's series of dramatic programs was one of the first of these and we will see many more.

The Position of the Exhibitor

The economics of television operation will be one of the principal reasons for the use of film. We need not expect that the big motion picture companies will release any great portion of their product for television. There are several reasons why they should not.

One is the fear on the part of the exhibitor as to what television programs in the home will do to his business. Just as some theater operators believed that radio would put them out of business, the bugaboo of television drives film exhibitors to a state bordering on panic.

Some few years ago a film feature that was released regularly in the theaters of America was made available for a television

showing on a New York station two weeks after it had played the metropolitan New York theaters. The program was broadcast for several weeks, when an exhibitor in a city south of Washington, D.C. wrote into the releasing office of the picture to the effect that if the picture was shown on television in New York he would no longer book the feature in his houses. At least, that's the story. Because of his demand the television release date was moved back six weeks after its New York theater showing and the Virginia Theater manager was satisfied.

Television programs cannot for years to come, if ever, hope to compete with motion picture theaters from a production point of view. Television program builders will never have the money to spend that Hollywood producers have, nor will they have the facilities. People will still want to go to their neighborhood theater or the downtown picture palaces to see the stars and the stories by outstanding authors, the super-productions that television can't hope to duplicate. Television may some day seriously affect radio as we know it today, but the motion picture industry will "adopt" television, with large screen projected pictures, and ultimately use this new art form to further its hold on the theater-going public.

Film Costs

Another reason for Hollywood's reticence is that television is limited as a source of revenue. At the height of its operation before the war there were never more than ten thousand receiving sets in America. Programs were produced as cheaply as possible and no station could afford to pay very much for its program material. New films were simply out of the question. When you realize that many feature pictures have cost a quarter of a million dollars and run for ninety minutes it puts the cost per minute at almost $3000. If the picture cost a million dollars, and there are many feature pictures that have cost more than that, it jumps the price to over $10,000 per minute. In radio our very best programs seldom cost more than $25,000 for a thirty minute program, which is about $850 per minute. If television costs twice as much to produce as radio we will have a cost of about $1600 per minute as against $3000 per minute for pictures.

That is not an impossible difference for television to absorb but it has been an impossibility up to now. Consequently the only pictures that were available to television stations were pictures with little or no box-office value left.

These basic figures as to motion picture costs (these just quoted are low) have been used in many discussions relating to the future of film in television. But it does not hold that films made especially for television need to cost as much as our present day Hollywood features. Many short subjects have been made for around $500 per minute which is less than the cost of the better radio programs. The whole problem is one that is going to test the ingenuity of future producers. When we put a television program on film, must we accept Hollywood's standards? In the motion picture industry it is "bad" technique to produce too many minutes of finished program per day. With all due respect to Hollywood's results the unwritten and unmentioned motto is "Don't shoot too much." The best directors don't hurry. They take more time than the cheaper men. Of course more time devoted to producing a picture gives some additional value but a man who knows what he wants can shoot far more than Hollywood's three minutes per day and the result can be acceptable television entertainment. The whole problem of programs on film will take planning and very intelligent operation, but good film can be produced far cheaper, than many "B" pictures of today. It has been said that the average motion picture sequence we see in our neighborhood theater is the eighth take. That is, the director photographed a given scene eight times before he got it the way he wanted it.

Everyone is interested in producing television programs that are just as good as it is possible to make them but many Hollywood traditions may be smashed in so doing.

Hollywood has proved that good pictures "pay off," but may we not seriously question the necessity of maintaining the standard of production called for in a feature motion picture, when the film is made solely for television consumption? The television audience has a right to expect and will demand good programs, but when we walk into our living room and flip a switch are we going to demand of our television programs the finished results

we see at our favorite picture theater, when we hurry through dinner, stand in line to buy a ticket, stand in line to get a seat, and finally spend most of the evening dodging the people who seem to have a mania for standing up right in front of us? Going to the theater is still more or less of an event in the lives of the American public. You are forced to exert yourself to the extent of getting yourself to the theater. But now, at least if you choose, you may wander into the living room and with no effort at all, see entertaining television programs.

Television programs can be produced that will hold your interest for a fraction of the cost that the same story would demand if it were done in true Hollywood style. Some time ago a Broadway play was adapted for television and produced over that medium. Some time later it was presented as a motion picture. All three productions, the stage, the television production, and the motion picture told the same story in entirely different ways. Each was entertaining but entirely foreign to the others in the manner of presentation and the costs varied tremendously.

Editing

The editing of television programs is also going to be a serious problem, especially in commercial programs. A director, no matter how experienced, may very easily call for the wrong shot, an engineer may press the wrong button, any one of a dozen things may happen to put a picture on the receiver that doesn't belong there. The human element, working at high speed, can only be definitely controlled by putting the program on film.

This is true for many reasons. Let us look at the situation first from the sponsor's point of view. His "commercial," the visual proof of what his product will do, must not only be interesting but it must also be technically correct. Remember we have the pure food law. We have laws that state that only certain claims may be made for any product. We cannot imply that the article to be advertised will do anything that it will not do. All of this must be adequately and minutely controlled. If the claims are made in words it is a simple problem but when we go into visual demonstrations we find new troubles presenting themselves.

On an early demonstration we had a famous radio food expert in the studio. She was to demonstrate the value of the product

she was selling by making a pan of biscuits. This was to be done in full view of the audience. They were to see every step in the operation. This meant a practical kitchen with running water, ice box, and stove. They were secured and our demonstrator started her program. She mixed the biscuits, we saw all the preparation, and the finished product "in the raw" was deposited in the practical oven. At the appointed time the oven door was opened and out came, not, the resplendent mouth watering delicacy but the sorriest batch of biscuits you ever beheld. Either the demonstrator didn't know her oven, the heat control was wrong, or the stove was full of gremlins. In any event that television program planned as a perfect demonstration of the product was a complete failure. This must not happen in tomorrow's programs. The results must be perfect and how can anyone guarantee perfect results in a live demonstration. Only on film can we be sure of our results. There we know they will be right. If we were demonstrating unbreakable glass and it broke (and it might), where are we? If a mobile unit was picking up a new car in motion at an automotive proving ground and a tire blew out on a curve which overturned the car, would you buy one? Of course not. If we are to limit all our future commercial demonstrations to those that cannot go wrong we are eliminating our best sales arguments.

On film we can forget all this. If during the shooting of a scene an accident occurs, we simply eliminate that scene and do it over. If the results are not perfect the first time we keep shooting until they are, and that can't be done in live television operation.

Probably all commercial openings will be on film. Cards in the studio must be physically handled. On the first performance of a live commercial program that had been rehearsed until we were sure of the results, a studio operator pulled the sponsor's credit card off the easel while the audience was looking at it. He should have changed the other card but he didn't and we were off to a very bad start in our first twenty seconds of program. We immediately put the whole opening on film and never had another mistake. Animation, that needs no proof of its effectiveness, can best be done on film, and many uses will be found for this type of commercial. Radio's singing commercials with film ani-

mation for a time almost monopolized the television "spot" business. We saw "Tide's" singing clothes, "B. V. D.'s" very humorous animated trade mark, "Lucky Strike's" marching cigarets. A host of twenty second or one minute spots have been created and sold to sponsors. They had to be on film for they were repeated at regular intervals. Many of the regular commercials given in conjunction with live programs are on film. Sales messages are best driven home by repetition. While the subject matter and entertainment of the live program is changed with each performance, the film commercial is repeated week after week and only re-made when the sponsor or his advertising agency feel that it has lost its sales effectiveness.

Repeat Performances

Perhaps most important of all is the possibility of repetition when a television program is once put on film. It is almost unthinkable that expensive television productions will be broadcast only once. In England it was standard practice to repeat in the afternoon a feature program of an evening or two before. The audience reception to this idea was good. While it has not as yet been included as a regular operation here many of our best programs have been repeated and the approval of the audience was definitely in favor of such a procedure. Just because it has never been done in radio doesn't mean that it shouldn't be done in television. To condemn this practice is the same as taking a first class Hollywood picture and playing it only once. We also know that if there are competitive stations, a viewer cannot look at two stations at the same time. Why then, if we build an expensive television program, should we not play it until the majority of the viewers have seen it, just as is done with a motion picture. It might even be scheduled for first, second and third run showings. We must consider the viewing habits of our audience. Television will tend to change our leisure hours but can we say that the audience will be allowed to see our program only on one specific day and hour.

The Time Situation

The mere fact that there are different time zones in the United

States is going to influence the thinking of sponsors and broadcasters. If we assume that the evening hours from eight-thirty to eleven are to be the choice time, and we have every reason to believe they will be, how can a sponsor intelligently ask viewers on the West Coast to look at an expensive production during the late afternoon and early evening hours? Radio was able to overcome this situation, for it was possible to listen to late evening eastern programs during dinner without disrupting the homelife of the average Pacific Coast radio listener. But with television can we expect people to entirely replan their lives to suit the programs on their television set? The answer of course is that we cannot. A program broadcast on the East coast at eight is five o'clock Pacific Time and the hours from five to eight will probably only be fair listening hours. So the sponsor of an evening program designed for a national audience must plan to repeat his program and he has two choices. He may, if it is a live show, and network facilities are available, broadcast a repeat performance for the West coast as is done in radio. The big argument against the use of film is its first cost, but it is quite possible that a repeat performance plus the cost of the original program may very well approach, if not exceed, the cost of putting the program on film in the first place. With his program on film the sponsor may then schedule it where and when he wants it. Film will facilitate regional network releases and we will probably see lots of them. A program on film "in the can" is an asset that cannot be equaled by any live talent show from a practical point of view. A program on film can be shown anywhere that there is a motion picture projector and until America is blanketed with television stations there will be an audience for television programs on film in communities without television stations. Early television programs on film are being shown all over America, in classrooms, YMCA's, churches, lodge halls and in motion picture theaters. Thus, all of the people in the United States can see what is being done on television and this could be accomplished only by using film.

Off-the-Line Recordings

Another important film development is the perfection of the

system of kinescope recordings. It is possible to adjust motion picture cameras, both 16 and 35 mm, so that television programs can be photographed from the receiving tube, just as they are broadcast. The wedding of Princess Elizabeth in London was covered by the BBC. As it went on the air a motion picture camera in front of a receiver recorded the whole event. The film was processed and sent by plane to New York, where it was televised the day after it took place.

The perfection of this process, which has long been the dream of many enthusiasts, means that sponsors can have a permanent record of their live programs, which can be rebroadcast on other stations if they so desire. The possibilities that kinescope-recordings offer both the broadcaster and the sponsor are many. By taking a motion picture of a live television program it is possible to re-broadcast it anywhere. Programs that are produced live in New York and Los Angeles are recorded on film and sent all over the country. Until every city in the United States is inter-connected by T V networks this procedure is and will be used. It brings the big programs costing many thousands of dollars to all the small stations. The film is simply mailed to the station and it is put on the air sometime later. It is possible that many programs that we are to see may never be seen "live" at any time. They may be enacted in a studio in front of television cameras but it is the filmed picture that the audience will see. This procedure is especially valuable for spot commercials as the time saved in production is considerable.

Basic contracts with talent restrict the use of these films to some extent and station controls are also imposed, depending on which major station produced the original program, but kinescope recordings on film have played a large part in the advancement of television coverage and they will always be a vital cog in the distribution of programs.

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VISUAL EFFECTS

In the early days of radio a considerable amount of ridicule was voiced when it was first learned that executives were planning to organize a sound effects department. A whole department to make some stupid noises? Nonsense! Just how far wrong the skeptics were is evident to anyone familiar with radio broadcasting today. Tomorrow the "video effects departments" in television will be more important to that industry than sound effects are to radio.

All of us know that the major picture studios have their special effects departments; so will television. It will be an art almost to itself and one that will be handled by trained men and women. Their chief worry among other things will be to produce and project on the viewing screen believable video effects and miniatures for comparatively little money. In the motion picture industry the cost of an accident in miniature is incidental to what the expense would be if it were done live and once that shot has been made on film it frequently may be used again; if not the money spent is unimportant when we consider the whole cost of the picture. But in television, expenditures for effects of this kind must be kept down. If they become too expensive, the producer rewrites the script and eliminates them, and if they are not believable visually they come out. So again our two main problems are cheapness and visual effectiveness. So far our experiments have been comparatively meager but the few effects we have seen have proved conclusively the value of "television takes" of material of this kind.

During our early experimental period we one day brought into the studio a large metal tank, clay, lumber, pots, pans, matches, nails, glue, paint, scissors, and cardboard. Then the

boys went to work. Some weeks later we were asked to see the result of their labor. It was very interesting. There was a seaport complete in every detail. Ships sailed in the harbor, the lighthouse beacon flashed and life in miniature seemed to move and breathe. It looked real on the television screen and the

Diorama of miniature seacoast city.

pictorial results were good; but it had taken many man-hours of work to produce it and we had on our hands a diaorama that filled half the studio and had to be dismantled before we could get it out. Impractical as this particular experiment was, it proved that miniatures could be made that would more than justify their expense if a way could be found to have them available for repeat usage when wanted. This has not been accomplished as yet, except with small moving titles and standard effects, but we may see before very long large spaces in future television studios devoted to this sort of thing or perhaps a rental studio that would supply effects when wanted.

The Use of Miniatures

The main point is that already these visual effects have found their place in television. In an early operatic presentation the full set patterned after that used in the opera for an act in Aida was made in miniature. Down stage R was a stone seat in an arbor where a miniature man and woman sat. This bench and arbor was duplicated in full size in the studio and the two artists sat in the same position as the figures in the miniature. The program started, we opened on the full stage setting with the opening music and then began to truck in, panning slightly toward the bench and arbor. Before the audience could see that the tiny figures were not real we switched to a close-up of the live artists and so on into the program. The miniature gave us a feeling of realism that we could never have achieved by opening directly on the arbor. On another occasion we constructed, as a test, a small valley with trucks moving over it, while near by was a fleet of ships at sea. We were supposedly in a aeroplane. We flew over the line of supply trucks, bombed them and saw the flash of our exploding bombs. Then we zoomed down on the squadron of ships. By manipulating the camera boom we got the effect of diving down on the ships that we saw in our cross-hair viewfinder. Incidentally what we simulated in the studio is an accomplished fact as exemplified in the control of bombs by television.

An Effects Studio

It may very well be that all pickups of visual effects will eventually come from an entirely separate studio. This approach was tried in conjunction with one dramatic program and the results were very effective. The main argument against such a procedure is, of course, the necessity of tying up studio space and camera equipment. But the advantages are many. First, space must be assigned for the building of effects and if they can be picked up from that same location, valuable space in the main studio is saved. The effects would not have to be moved and thus time and effort would be eliminated. Simple telephonic communication with the control room, a camera outlet with a monitor, and a few lights would make such a pickup point usable. Most impor-

tant of all would be the fact that the pictures emanating from this video effects studio would be silent. This would simplify production problems considerably and save confusion in the main studio.

We used this arrangement on a dramatic program that called for several important close-up effects. In the studio we showed a group of men around a dining table on which was a candelabra with the candles lighted. As the butler opened the window, one of the candles was supposed to go out. To accomplish this we put a duplicate candelabra in the effects studio. Behind the center candle on the side away from the camera, we led a line of rubber tubing which ended just below the flame, out of sight of the audience. On the air, we showed a long shot of the table and the candles burning. The window was opened and we cut to a close-up shot of the candelabra in the effects studio. The effects man blew the candle out by means of the rubber tube. While we were taking the close shot in the effects studio, the candle on the table in the main studio was extinguished, and we then flashed back to the group at the table. Sound of course came continually from the main studio. This effect might have been done in the main studio but other effects used on the same program would have been more difficult. The leading character supposedly developed a photographic negative in his dark room. As he looked at it he accidentally brushed against a bottle of acid that fell to the floor. As he fought against the fumes he discovered he was locked in and, in his efforts to escape, knocked over another bottle that slowly poured over the negative and destroyed it. This whole sequence was broadcast efficiently and well by taking the long and medium shots, plus close-ups of the actor in the main studio, while all the close-ups of the bottles, negative and the acid destroying the picture were done in the effects studio.

Mechanical Effects

Some very ingenious effects machines have already been built and we will undoubtedly see many more. On the CBS news program during the war we saw battle lines move forward, spearheads advance and captured territory change tone. The appara-

tus used is described in Chapter Twenty. The effects achieved were novel and interesting. Kaleidoscopic effects have been worked out by another studio that give an ever changing design in tune to music if you want it. It is so designed that pictures, titles and other effects can be superimposed on this moving background. Unusual effects have been accomplished by drawing directly on motion picture film, in fact a crude animated story was worked out in this way. Shadowgraphs have been experimented with to some extent, but their eventual possibilities haven't ever been touched. It should be fairly simple to illustrate stories for children by this means.

Some experiments with a fully mechanized puppet which was remotely controlled proved that the possibilities for manikins of this kind would be unlimited.

The commercial angle especially opens up a whole new field in visual effects and animated figures. Many of the trademarks of well known brands could do a real sales job if they were properly animated. We may see many of our favorite products proving their usefulness without a human being in the picture. Just how this will be accomplished awaits the ingenuity of a budding genius, but the demand would indicate that we will see it done.

The important thing in all video effects is that they must be visually effective and they must "work" on cue. They must be sure-fire and smooth or all semblance to reality is lost. As yet comparatively little has been done with transparencies, where one object is seemingly made to move through space. The effects that have been accomplished in Hollywood by this means will surely be used in television.

Electrical Photographic Effects

What can be accomplished by means of utilizing the television system itself still remains for the most part an unexplored field. Lack of studio space and proper equipment has hampered developments along these lines. The mere fact that the output of two cameras can be put together in one picture makes many startling effects possible.

A rather unusual setting for an underwater ballet scene was secured by taking a close-up of a glass tank of fish and electrically

putting the fish in the scene with the dancers. First a full-sized set was built, painted to resemble the bottom of the ocean. Here the dancers performed their ballet. This picture was lap dissolved into the line with the camera that showed the close-up of the gold fish bowl and thus the dancers and the fish appeared in the same picture, with the fish apparently swimming around the dancers.

With the right lenses, lighting and scenery it is possible to inject small figures into normal sized settings. We might easily put dancers on pianos, on table tops, in a man's hand, or where you will. This could be accomplished by mixing the output from a close-up camera with a very long shot from another. On a test with a special lens we filled a television screen with a penny.

Visual Effects on Film

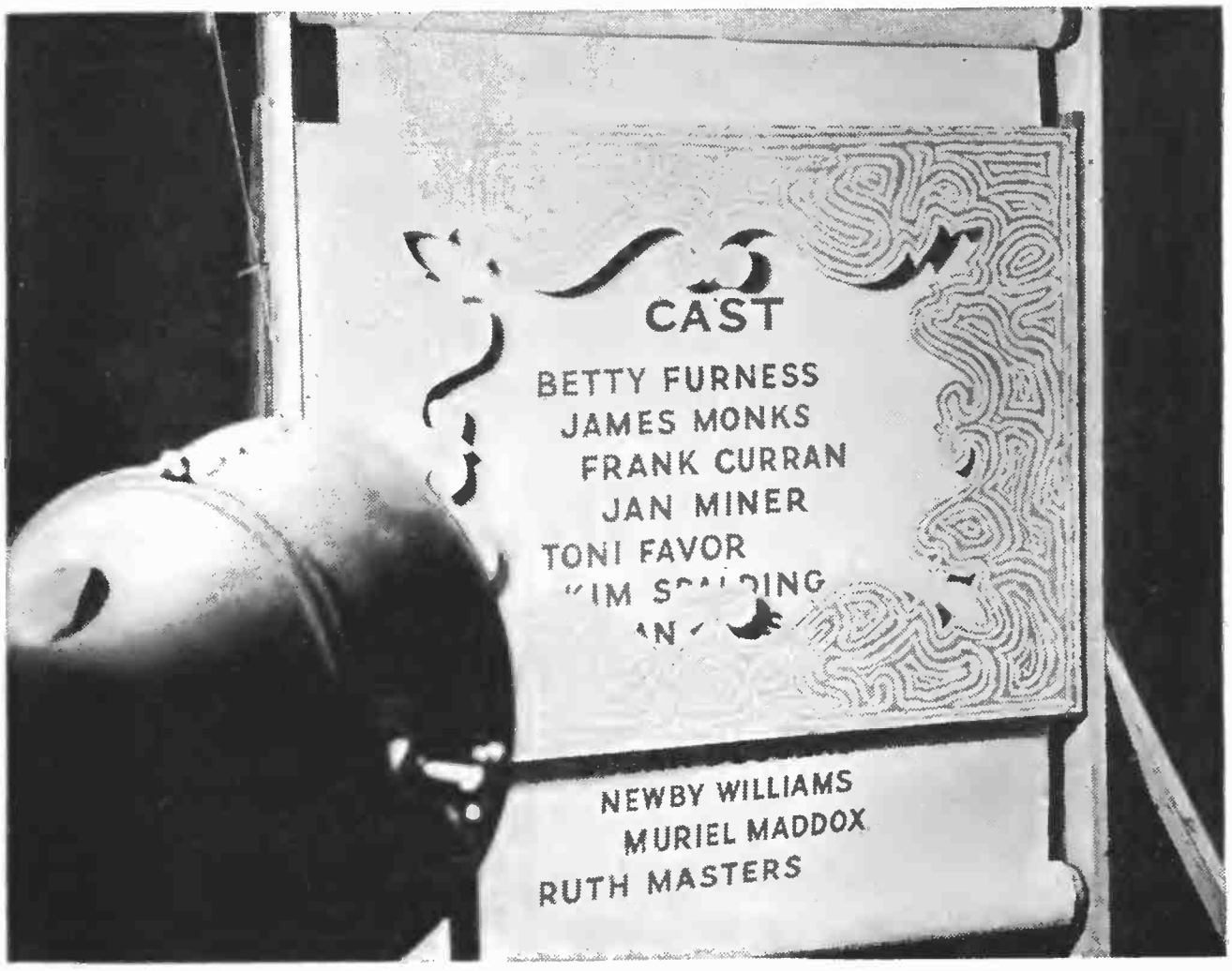
What has been accomplished through animation on film needs no discussion here. It undoubtedly will be used extensively in television but it is an expensive method. If an animated opening on film can be used on a commercial program over and over again, then it will be financially justified; but the cost of animated film precludes the possibility of using this technique on one-time shots. A way may be found, however, to use visual effects on film more than once. We may see film libraries of effects that may be bought or rented, just as we have libraries of sound effects records today. But whether they are on film or done live, we will find visual effects claiming a prominent place in television and the field is wide open for the video expert.

Titles

An important division in the visual effects department will be television "titles." They will be as important in this medium as they are in the motion picture industry. A program gets off to a good start if the opening titles are easily readable, clever, and interesting; and to accomplish this takes thought, ingenuity, and often hard work.

From the very start of program experimentation there were two schools of thought regarding the opening of a television program. There was the radio group who felt that television

programs should be opened by an announcer, just as they are in radio, and those who leaned toward the visual, who felt, we should adopt the Hollywood pictorial opening technique. Both have their place, but the visual method is far more expensive and for the most part more effectual.



A moving title as used at WCBW.

There are many factors to be considered. First copy changes, that mean only a scratched-out word or two in a radio script, take on new importance in television. If an announcer has learned his copy, and he should if he is going to do a good visual job, then changes become of major importance for they are another hazard which he must overcome. It goes without saying that if visual titles have been made, any change necessitates doing them over. All of which means that television titles and copy must be worked out well in advance of the program and once they are set they should not be changed.

Titles usually are prepared on cards which are placed in front of the television camera. The size of the cards is not important as long as they are big enough to be picked up by the camera. In general a card approximately 7 x 10 inches in size is as small as is practical with normal lenses. If the cards are larger the camera simply pulls back to fill the mosaic with the copy to be shown.

The best results so far have been obtained by using a gray card for title work. White or black lettering may then be used satisfactorily. The present system is not at its best when we attempt to reproduce white on black or black on white for it generally results in some picture distortion. This is usually visible as a streak continuing on across the picture following the letters. The scanning beam builds up energy with the black letters on a white background and fails to cut off with the last letter. This is a fault in our present-day system that will probably be eliminated eventually, but it can be overcome now by using a gray background.

Lettering

The size of the letters to be used is very important, as well as the length of the message on any one title card. Regardless of the size of the original card in the studio, the picture the audience sees is always the size of their receiver screen. Because the majority of our screens are small we must plan the "copy" accordingly.

Five lines of about twenty letters each is roughly the present capacity of a receiver. It has been said that many more words may successfully be put on a "title card" and it has been and probably will be done. But the audience is not interested in trying to read small type on their receiver. If copy is not easy to read from the position in front of the receiver that the viewer likes best, you will not put your message over. Many title credits on motion pictures are completely unreadable when the film is televised. The surest test is to draw your letters on a piece of paper 7 x 10 in size and then stand off about ten feet and see if you can read it easily in a medium light. If you cannot then you must reduce the number of words on the card. Lettering and

style are important but any type of lettering that is easily readable is satisfactory.

Types and Styles of Titles

The general approach used will rest entirely with the director and his art department. Titles may be embellished with figures and scrolls. Any style printing may be used. Decorative motifs

A photograph of receiver picture in early tests at NBC.

may be included. Titles can be lettered over still pictures if the picture is one that lends itself to this operation. The name of the dramatic work to be broadcast often suggests such title treatment.

Aside from placing cards on easels many variations will be worked out for work of this kind. A large paddle wheel with block letters on the paddles was used effectively. The paddles were about two by three feet in size and a solid wooden letter

was glued to the board. Cross lighting gave an effective shadow design. The wheel was turned toward the camera, which threw the panel out of focus as it turned down and forward toward the camera, and as the second panel came into focus an almost perfect dissolve was accomplished.

Vertical or horizontal moving titles can be worked out effectively by placing opaque letters on a transparent or translucent moving roll. The vertically moving title gave the best results. In using this type of machine great care must be used in its manufacture. The machine must be heavy enough to allow the rollers to be turned without shaking. Uneven movement of any kind in title work fairly screams "amateurish." A good substantial machine has been proven practical, and when the rollers are turned by a motor, a constant steady movement is assured.

A special title machine was used effectively at NBC that not only gave precise clear titles but made possible mechanical lap dissolves and superimpositions. While electrical dissolves are constantly used the value of a mechanical lap is especially important for title work as it means that only one television camera is needed. The effects were attained by placing a title card in the machine in a direct line with the camera but behind a half-silvered mirror set at a forty-five-degree angle to the camera. At right angles to the first card a second card was placed. Both cards were in metal holders that slid into position from the top.

When the first picture was lighted we saw it through the mirror. Then as the lights were gradually dimmed on the first card and brought up on the card at right angles to the camera, the first card faded out of the television picture and was replaced by the second card—reflected in the mirror. While we were looking at the second card, the first one was replaced by a third and the lights were then reversed. Thus a constant flow of changing titles was achieved. We undoubtedly will see special wipes developed through purely mechanical means and they will help in creating interesting titles.

One program at NBC was titled by panning along a clothesline with the names and credits roughly drawn on the washing. There is no limit as to what may be done along these lines. The suggestion of a story from a book is achieved by printing the

various title credits on pages and slowly turning them. Theater prosceniums, with the copy on the rising curtain, are suitable for a theatrical suggestion. Revolving turntables and spinning disks open up combinations. In short, imagination and competent execution are almost the only limiting factors aside from cost. Good titles cost money but they are worth it. In any big production center the art title department will be an important cog in good television programs.

23

TELEVISION RIGHTS

Once television facilities are in existence and a means of sending pictures into individual homes is available, the first question that confronts a program manager is, What shall we put on our transmitter? Once that choice is made, be it music, drama, news, or anything else, the question immediately arises, Have we the right to broadcast this material? It is not an easy question to answer, for in many cases we have no precedent. There is no doubt that the next few years will see definite precedents set regarding what may and may not be done, but as yet on certain legal angles many attorneys are as vague as a summer zephyr.

Author's Rights

If it is planned to produce an original dramatic work especially written for television the problem is a simple one. The producer and the author agree on a price. A contract is signed and the deal is closed. But when the material to be used is an adaptation of a book or a play that was written some years ago, the problem becomes much more complicated.

Under the copyright laws of this and other countries every original work may be protected by an author or composer for a given length of time. Though many of our present-day industries that utilize copyrighted material were unknown at the time the copyright act was written, it is so broad in its scope that

original works performed in modern mediums of expression automatically come under its egis. But television is unique in its requirements and care must be taken to be certain that the right to use copyrighted material of any kind is firmly established.

Our present copyright law gives an author, or his heirs complete rights for 28 years to any original material and at the end of that time the copyright may be renewed for another 28 years.

It also provides that an author or composer may dispose of the rights to his original material to a publisher, a producer, or to any one he desires; and naturally the title to the work then rests with the copyright owner. After 56 years, the work that was originally copyrighted, goes into "public domain" and is available for use by anyone. If material in "public domain" is selected for production, it must be definitely established that the material to be used is actually the work originally copyrighted, for a story may be revised, edited, and republished and a new copyright obtained for the revised work. If this were done it would prevent the use of that particular version without the permission of the copyright owner. If a broadcaster can lay his hands on a copy of the material he plans to use and that material holds a copyright date over 56 years old, he then may make an adaptation of the work and televise it without royalty. In fact if he copyrights that adaptation it may not be used again without his permission.

Another important point when clearing a script for television use is to determine the true owner. If a play or picture scenario were sold to a producer before television was heard of, the television rights might remain with the author or his heirs depending on the terms of the original contract. Obviously an author did not sell a right that was non-existent at that time unless the sales contract specifically stated that it included any future rights that might accrue and this clause in past contracts was very unusual.

Specific Instances

In one case we wanted to do a television adaptation of a published story by an English author, who had died some time before. We secured permission from his estate through his Lon-

don literary agents as they controlled complete rights to all works.

In another we wanted to do a play that had been produced in New York some years ago by an author who was also deceased. We went to the executor of his estate who advised us that he didn't control the television rights as the rights of the play had been sold to the producer. Further investigation proved that he had sold only stage and motion picture rights and that the estate still controlled the television rights and they gave us permission to use it for a small royalty.

In still another case a Broadway play agent representing a foreign author gave us permission to do a performance of a certain play. We started rehearsal and then learned that the play as produced in New York had been a translation from the Italian and that the translator maintained that he controlled the television rights. Then to make matters worse the producer claimed that he had acquired an interest in the television rights through his New York production. The final blow came when a second play agent advised us that the first agent no longer represented the author and that we must deal with him. With such an array of legal technicalities staring us in the face we simply dropped all plans for the play's production.

The above was an unusual situation. In general it is quite simple to determine who really owns a work. In recent writing there is no problem unless the piece has already been sold for pictures, the theater, or for publication. In that case it is necessary to be sure that there are no television restrictions in any of the sales contracts. Many contracts drawn during the past ten years have contained a clause prohibiting the author from selling the television rights even though the original purchaser didn't buy them. We will probably see script clearance departments set up by the main television station operators, and naturally writers' representatives will know the complete picture with respect to the authors they represent, so future clearance should not be too serious a problem. The important thing to remember is—be sure you have an undisputed clearance on the material you plan to produce.

Royalties

When television broadcasting first started it was very difficult to establish a fair price for the right to produce a script. The questions of course included: What value should be placed on the one-time performance right of a fifteen-minute dramatic story to a restricted television audience? How much for a thirty-minute vehicle or for a full-length play? When a price is agreed upon are we not setting a precedent for future television script royalties?

The final answers to these questions remain under discussion after several years of commercial broadcasting. Just how much royalties on scripts eventually will be cannot even be guessed at now. The medium is far too new to form an opinion. It is difficult to even form a basis. Should material be evaluated on the number of stations broadcasting the story, thus on the number of people seeing it, or should contracts be written for a certain length of time? It is only reasonable to expect that authors will jealously guard their rights and thus their eventual income from a successful television script. So far only one-time performance rights have been granted for television productions and this is a basis of payment that most authors would like to see continued. They would prefer to have a continual source of revenue over a long period of time on everything they write.

The principle difficulty encountered so far in setting a price on television scripts has been the market, for we find independently-owned stations, with small growing audiences, buying scripts for their own use. Instances where material has been contracted for network release pose new problems. While we will probably see a minimum rate set for material, the top prices will depend most likely on the merits of each script accepted. In the early days of television the royalty for a one-time performance ran anywhere from ten dollars to fifty depending on the length of the play and the theatrical value of the work.

While this fee was actually low it was tremendously high if future prices are to be based on what was paid then. A $50.00 royalty on a stage play for an hour performance on television to be seen by 5000 sets, which was about the maximum number in

the metropolitan New York area at that time, would mean a royalty of $10,000 if the same basis was used when the television audience reached a million sets or more. No one expects any such fantastic figure to be reached but tomorrow's good television writers will make a lot of money.

Music Rights

The first step in approaching the problem of producing a dramatic-musical program is to make sure that you have the right to use the music as well as the dialogue in your television broadcast. As we begin to consider this problem we find that rights to all musical compositions that are to be included in radio and television broadcasts fall into two general classifications: dramatic or grand rights and non-dramatic or small rights.

Non-Dramatic Rights

A non-dramatic or small right is one which involves the rendition of the work as a strictly musical selection, that is, the right of a singer to sing the song publicly or an orchestra to play it. In the United States the majority of the successful composers belong to one of two large associations which may license any one to use their music. There are some composers and publishers who control their works independently but most composers prefer to have their work handled by an association. To obtain the right to use a work controlled by an association a broadcaster pays an annual license fee and under this license he may use the music of any composer it represents, as a member must release his music through the association. The license confers the right to broadcast non-dramatic rights only.

Dramatic Rights

If a musical composition is to be dramatized or enacted in any way an entirely different right is involved. Composers and publishers, for the most part, have retained these dramatic or grand rights to themselves and permission to use a work in this way must be obtained from the publisher, or composer direct, depending on who holds the rights. This right is based on the fact that the United States Copyright Act gives a composer, among other

rights, the right to dramatize his material so there is a potential dramatic right in every piece of music which rests with the composer, his publisher, if that right was included in the contract with the publisher, or his authorized agent.

Just when a song that is sung on television involves a grand right has not been clearly defined. In many cases it still remains a legal opinion. If a singer is shown singing a song as part of a program with no plot development involved it is purely a small right. If the same singer were to sing the song as a serenade under a balcony and because of his singing the object of his affection says "yes," is there a grand right involved? There will probably be definite decisions rendered on this and similar situations before long, but until then every case will probably have to be analyzed on its own merits.

Naturally, if you are planning a live musical comedy or opera and you secure the right to do the performance from the copyright owner that will automatically include the dramatic rights to the music, but if you are planning to dramatize a popular song be sure you have the right to do so.

These two rights, grand and small rights, have been discussed so far solely with regard to performing or broadcasting rights. That is the right to sing the song, or play the music publicly in a theater, or dance hall or to broadcast it over a radio or television station.

In live radio and television broadcasting while both dramatic and non-dramatic rights may be involved, depending on how the music in question is used, when the performing or exhibition right is once cleared, the broadcaster may proceed without the possibility of legal entanglements.

Mechanical Rights

But when the song in question is to be recorded either on a phonograph disk, on motion picture film or any other reproducing medium, other rights come into the picture. These are called mechanical or synchronization rights and they must be cleared before the music may be recorded.

Let's take a simple case where we are about to put a song "on wax" for future radio broadcasting. The maker of the record must

secure from the copyright owner a release allowing him mechanically to record this music. This is secured and the record is made, but before that record can be played on a radio program, the broadcaster must have cleared the performing right. The right to record the music does not carry the performance right. If it is merely a record of a singer singing a song, any broadcaster may include it on his program, if he carries a license, with the association that controls the song. If it is by a composer who has not assigned his performing rights to an association or if a dramatic right is involved, then the broadcaster must secure permission from the copyright owner before he can broadcast the music on the record.

The same is true of motion pictures and here we are very much interested; for if we plan to televise a motion picture we must know for a certainty that we have the right to include it in our television program. The mere fact that we have the film in our possession with the permission of the owner of the picture to broadcast it does not mean that we have the right to broadcast the music that is recorded and is a part of the picture. If the music that is included in the picture has been composed by a member of the association under whose license we operate we may broadcast it but we must be sure that such is the case.

Just as in a dramatic work, the copyright on a piece of music lapses after a period of fifty-six years and the song goes into "public domain," free for anyone to use. In the face of this there are still problems, for any musician may make an arrangement of a piece of music in the public domain and copyright that arrangement. If the arranger is a member of the society that licenses your broadcasts then you may use it, if he is not, you may not use it without his permission. The usual procedure when booking a picture is to get a music sheet from the booker or distributing agent so that you can quickly see whether you have the right to broadcast the music that is included in the picture by identifying not only the composer but the arranger as well. If it is impossible to obtain a music cue sheet then it is necessary for an accomplished musician to listen to the music on the film and try to identify it. Even then there is a possibility of trouble for he might hear the melody of Old Black Joe and knowing it

was in public domain think you were in the clear; but before you really are you must be sure that the musical arrangement of the song is in public domain or is by an arranger who is a member of the society that has licensed you to use their music. If you can't identify the melody and the arrangement of all the music in a motion picture don't broadcast it unless you want to take a chance on a lawsuit.

The same situation exists in the exhibition of motion pictures in theaters, as in broadcasting. There the exhibitor pays a license fee to the associations or the owner of the copyright for the right to exhibit the music which was put on the film under the license paid by the producer to the composer.

State Laws

The points that have been referred to above are all based on the laws of the United States as a whole, but there are certain State Laws that may affect television operation in individual localities. Some states have a law governing "the right of privacy," which means that pictures of individuals may not be exhibited without their express permission. This law primarily affects pictorial news programs. It has been established that a photograph of an individual in a crowd at any public gathering does not necessarily invade the right of privacy if that individual is shown merely as one of a group of people in a comparatively "long shot" of the crowd. The individual must not be shown, however, as a personality in close-up without his permission. The above interpretation applies in general to strictly news pictures distributed clearly as an information service. Whether a sponsor may use such material to further the sale of a product without a release from each person in the picture may affect their use in commercial television. In general, if you are planning a television program of any kind and there is a question in your own mind about anything you plan to use, it is far wiser to get a competent legal opinion *before* the broadcast than afterwards. Remember, too, that purely visual material may be copyrighted and the right to use it must be secured. This is particularly true of photographs, drawings, paintings, reproductions,

maps, and anything of like nature. You must not televise anything that merely seems to fit your program requirements.

In general, be sure you have express permission to broadcast everything you plan to use and be doubly sure that the party granting that permission has the right to do so.

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OTHER TELEVISION PRODUCTION PROBLEMS

Before we "sign off" this section of our book we might look at some program points that we have not discussed in other chapters. The first of these might well be television's place in religion. Little has been done in developing programs of this type but the comparatively few religious programs that have been produced have demonstrated that the church can be brought to the home. There may be those who feel that people should "go to the church," that the edifice itself is part and parcel of their creed; but after all the church building was but a means to an end, the instrument in which people gathered to "hear the word of God." Through television they can now "hear and see" the beauties of the service, and it opens the doors of many homes that house those who might not feel inclined to make the effort or are unable to leave their firesides.

Probably the first strictly religious services in this country were televised on Easter Sunday, March 24, 1940. From the NBC's studios in Radio City both Protestant and Catholic services went out to the television audience. The Protestant service included an Easter Message by the Reverend Dr. Samuel McCrea Cavert and vocal renditions by the Westminster Choir. The Rt. Reverend Monsignor Fulton J. Sheen conducted the Catholic service with choral selections by the Paulist Choir.

About a month later the traditional Jewish Passover was conducted by Rabbi Saul B. Applebaum. The prayers in the observance of Seder, as carried out in the home with a family at their dining table, was the subject matter of the program. Special

selections by the choir of the Central Synagogue completed the ceremony.

Easter was observed by special programs on each of the three stations in operation in 1945 and Christmas has always had special religious programs. Just as radio took the Sunday service out of the confines of the Church, so will television, but it will do it more efficiently and in a more interesting manner.

Individual Programs

All through this book we have stressed the visual angle of the medium. The necessity of creating a believable pictorial setting. This is true in the main of all television programs but we found that there are exceptions. A representative of a small dramatic group approached us with the suggestion that her actors do Thornton Wilder's, "The Happy Journey to Camden and Trenton." As an argument in favor of our accepting her proposition, she explained that there was no scenery required. The immediate reaction was, "Then it isn't for television. You must have scenery or you haven't a picture." Finally, with a great many misgivings we consented to an audition, and we were forced to admit that they disproved our theory.

When that particular company of players put the sketch on the air it was fine television. There were no properties and no scenery. The automobile was four kitchen chairs, there was no moving landscape as they drove along but the material was so well written for production without scenery that when it was played by competent actors you completely forgot the lack of scenery and properties. Of course the use of close-up shots helped the visual appeal. There may be other plays in the same category but they are few and far between. We did try some other sketches that called for the same treatment but they were not comparably successful.

Audience Reactions

Television surveys of audience reactions prove conclusively that as a sales medium television has no equal. Several stations and sponsors have made extensive investigations and some of the results obtained seem almost unbelievable. They may, however, not be a true cross-section of tomorrow's television audience.

Usually a purchaser of a new television set is so enthralled in seeing a picture in his home that he is very lenient as to program content. From the results attained so far we know that in radio-television homes, television almost completely ends the use of radio particularly during the evening hours. The medium, however, does heighten the particular likes and dislikes of the individual viewer. It has also changed listener-viewer habits in that the audience does not simply tune in one station and leave it as was done in radio. The audience selects the program they like regardless of the station it is on. Audience mail response is exceedingly high as is the proportion of sets in use. Compared to radio, sponsor identification is a delight to the advertiser.

Off Camera Narration

A production technique that has been used considerably of late is one in which the thoughts of a character are heard while the artist thinks in pantomime. This is done of course by recording the aural sequence in advance and then playing the voice record while we look at the artist. The first use of this device was in London in a production of "Julius Caesar." We saw the actor as he gazed into the past and heard what he was thinking. The principle has been expanded of late to replace an announcer or narrator. We might see a girl at a desk writing in her diary. We hear the thoughts she is penning from the recording and thus when we fade in the first scene of the play we need no further explanation of the situation. By reverting to further use of this technique throughout the production, time may be gained for change of costumes for we may look at any member of the cast in a pantomime scene or even a miniature or silent movie clip. It also allows for quick scenery changes as the sound output of the studio is dead while a sequence of this kind is on the air.

Scenic Problems

While we have argued in favor of detail in television scenery all through the book there are times when the lack of resolution of the television system makes minute detail unnecessary. If we see a medium close-up of scenic detail it must be perfect; if, on the other hand, we purposely avoid camera shots that expose faults many things are possible. On a recent garden demonstra-

tion we had a large box of dirt in the studio. At the back of this box were low evergreen trees, with their roots wrapped in burlap. Behind the trees was a plain piece of scenery. In front of them was placed a very low white garden fence. In the studio, the overall picture, the disjointed assemblage of properties

The bookcase is printed on paper and mounted on a flat board.

looked atrocious. It was just a box of dirt with some unplanted trees but over the system it looked entirely different. The little fence threw a shadow of exactly the same shade as the sacks that bound the trees together. A trellis laid against the plain scenery made it a garden wall. By never showing the front or sides of the box and by not showing the detail of our properties the overall effect was a practical terrace garden. This technique is not generally followed but it is possible if it is well planned and executed. It should seem obvious that a cigar in television need not necessarily be a Corona-Corona nor an expensive table setting be gold plated but producers in some commercial programs have called for both of these items and have had them, as the client pays the bill. Good production planning calls for the vital essentials but not the costly superficial stage dressing of Hollywood. The money spent for scenery and properties in dramatic productions is far out of line with what it should be and means to restrict this cost must be found.

In early productions, before we had a staff of artists at our disposal, we were hard put for scenery and we found then that it is possible to do a good job with paper scenery. It may have to be fireproofed to comply with local fire laws, but as far as the camera is concerned it is realistic. We used a paper bookcase which was a full-sized bookcase printed on paper pasted on a piece of cardboard and the camera failed to distinguish it from the real thing. Various theatrical supply houses have full interior sets printed on paper for use in small communities. They are very useful in television. Photomurals televise well if the perspective is right. They are expensive but can be used many times and give a far more realistic exterior setting than can be gained in any other way.

Special Lighting Effects

An interesting production trick is to turn room lights on and off through manipulation of the electronic picture controls. In an early dramatic program it was necessary to "discover" the set with the lights out and then, as an actor made his entrance, to bring up the lights to their normal level as he turned on a light switch. We spent hours trying to work out a minimum amount

of light to establish that the room was unlighted as the show started and still have a good picture. We finally used the electronic method. The stage set is normally lighted but the video engineer sets his electronic controls below normal to give the effect of a partially darkened room. This is best accomplished by high-lighting certain areas with hot light and then adding enough overall lighting to give a good picture under normal shading settings. Then when the controls are thrown out of perfect adjustment we see the hot light and a moon light effect of contrasty light and shadow is possible. The only danger is that the home audience may try to remedy the picture by adjusting the controls on their receiver. If this is done the effect is lost as they must readjust their set, when the picture returns to normal.

Simul-casts

An interesting development in programs is the simultaneous broadcasting of both radio and television programs. This has proved successful in several instances. Of course an immediate problem in a procedure of this kind is which technique shall dominate the program. In most cases there is no choice. Programs must be geared for visual appeal if the subject matter is such that seeing what is happening spoils the dramatic effect. If a program attempts to build a dramatic situation by a supposedly first hand recital of an incident, the participant must not be shown with a script in his hand. This means that visitors on a television program must know their lines for an interview or the recital of a past incident suffers on radio on account of the hesitation that is perfectly acceptable on TV. In many cases concessions have been made to both mediums that have made simul-casts successful.

There is a particular problem that must be met when sporting events are covered at the same time by both mediums. A sponsor is really shortsighted when he tries to have an announcer cover both mediums. The rapid fire description of a ball game is essential on radio but it becomes not only boring but extremely annoying on television. We do not like to be told about something that we see taking place. The costs of rights and facilities being what they are, the sponsor would do far better by hiring an extra

announcer rather than try to have one man do both jobs.

While the simultaneous broadcasting of programs is commercially possible it is probably a device that will not be continued very long. It served its purpose during the transitory period when the advertiser felt that his high costs had to be covered by the audience on both mediums but the majority of good television programs are not good radio and vice versa.

Censorship

Just who will censor television programs and how it will be handled is going to be a very interesting development. It is something that demands immediate action and steps have already been taken to put it into operation. A code of program ethics has been suggested for television based on those endorsed by the Motion Picture Industry and the National Association of Broadcasters. But even though the industry as a whole endorses a moral code it is going to be a difficult matter to see that no slips occur. Undoubtedly television broadcasters and everyone connected with the preparation and production of programs will exert the utmost caution to prevent immoral and profane material from going out on the air. In rehearsed programs and those on film there is no serious problem, but the spontaneous unrehearsed programs are something else again. In an animated discussion, where two people, with vastly different points of view on a subject are put before the camera and told to go ahead, somebody might say "damn." In spite of this we must take advantage of the spontaneity of some unrehearsed programs. They actually are the strongest argument for live television programs. We cannot eliminate everyone from programs of that kind who under stress of emotion or through a slip of the tongue might mutter a "swear word." A censor with the power and authority to cut a station off the air, gains nothing by doing it after an accident of this kind occurs. Regular offenders naturally will receive short shift. One might say it doesn't happen on the radio, why should it in television? Perhaps it is because the medium is so new or perhaps it is because a television program is so much more natural than radio. Remember there is no script, no microphone to cater to as the "mike" follows the performer.

It is something to think about.

The censorship of picture material also is cause for worry. If we are watching an automobile race and there is a serious accident in front of our camera, must we cut away to something far less interesting? All motion picture news reels are carefully edited. Could we show the accident on our television receivers and not allow the motion picture companies to show it if they had it? In the studio can we show everything we might see on the beach? If not, when are bathing suits indecent for the sea-beach and when for the studio? In spite of all any censor can do it is quite possible that shots will be made that should not go on the air. Even in a rehearsed program, if we were showing a rather abbreviated bathing suit, it might be possible that an actress might vary her position with relation to the camera, so that the picture intended became something else again. The first thought would be, don't take the shot but in a two-camera program, camera routines can become badly muddled if a camera shot is eliminated, because of the necessity of moving the other camera while the first one is on the air. So the problem becomes, spoil the show or show the lady. The proper procedure of course is to immediately react to things of this kind and at all times be prepared to cut, but it is not easy to do.

Certain States are already planning television censorship control. The problem of working out a logical practical system of program censorship must be set up by the industry or the government will do it for them. The big question will be, what is indecent and what is not? On a certain program two young ladies were shown in negligees in their bedroom, prior to putting on a leg make-up to replace stockings. Naturally their legs had to be bare to put the make-up on and the girls would put it on in their home before they were fully dressed. Is a scene of this kind censorable because of partly undressed girls shown in their bedroom? In another chapter of this book we will discuss a commercial that showed a young lady in a bath tub. Is that questionable? It would seem that the answer to both questions depends on how it is done but far more involved situations are bound to arise as the industry grows and we must have an answer ready.

Other Studio Problems

Today the color response of cameras is very often a headache to a director. The results will vary with each individual pickup tube and to a far greater degree when different types of lights are used to illuminate a scene. The response in black and white to a shade of blue that is lighted with fluorescent lights will be different than that obtained when incandescent lighting or even mercury vapor lamps are used. All of this makes the production problem a little harder for the director particularly in a fashion show or where materials are being shown. Several ingenious color charts have been worked out. Splotches of various colored cards have been placed upon a stand or board and by viewing them through the camera the various results can be tabulated. For directors dealing in color this knowledge is important. Costumes for television will be made of special color combinations for the contrast visible to the naked eye is completely lost on the viewing screen. Shades of pink and blue may result in identical tones of gray; brown, purple, and dark green give similar results; so special planning and color combinations will probably be used by the wardrobe department in costuming a program.

We Must Produce Good Entertainment

In general, production as a whole must be improved if we are to maintain a quality that our viewing audience has a right to expect. And every day we are seeing new equipment being added to facilitate program operations. One of the best of the new units is a high boom or "crane" type camera. With this base it is possible to make shots high in the air, as the boom is about sixteen feet long. While it is expensive this unit is valuable as it broadens the scope of camera operation.

Periscopes have also been worked out where by using mirrors either high in the air or on the studio floor we again add to our picture possibilities. The "split screen" is another feature that is possible and is in general use. By means of a special circuit the output of two cameras can be shown on the viewing screen at the same time. One picture occupies the right half of the screen and the other the left half. Thus it is possible to have a man in

Washington, in half the picture, talking to a man in New York in the other half. It is valuable in telephone scenes and its unique possibilities open up new vistas to the producer.

But with all our expensive equipment television is only as good as the people who operate it. Trained personnel are absolutely necessary to properly produce good programs. Some of our present-day mistakes are dismissed lightly. They should not be. Of course accidents will happen in live television productions. There was the program for instance when the young lady was demonstrating with a hot iron and while she blithely told how simple and easy it was to operate it suddenly burst into flame. Again on a program titled "The Closed Book" the book opened revealing the cast, the time, and the locale; then another page turned revealing not the name of the director but the closing title "The End." It was almost "the end" before the program even started. Constant care, alertness, and "know how" must be the watchword of television producers.

Modern Programs

That television programming is moving in the right direction is evident in the caliber of entertainment being offered. Baseball, football, and sporting events in general have created a demand for sets that exceeds the supply available. Outstanding programs with big name stars are proving every day that television is rapidly finding its place in the sun. Station schedules are improving, with a wider range of subject matter and better produced entertainment. Sponsors are making money available and it is being well spent. The type of programs that early program builders saw possible are being produced. There is still room for improvement, but every sign points to the fulfilment of that goal.

Part Three

THE COMMERCIAL ASPECT

A fashion show in the General Electric Studios. Commentator under microphone at right.

25

COMMERCIAL PROGRAMS

When we first launched our craft on the sea of commercial television we were sailing an uncharted ocean. There was virtually nothing to guide us, no precedents, no definite information. We were on our own and no one could know then what the final result would be.

We knew that the experiment was a very important one to television program development for we were now taking everything we knew about visual entertainment values and were trying to apply that knowledge to the requirements of an advertiser. If the sponsor was to pay eventually for programs, if he was to fill the same position in television that he had filled in radio, these experiments had to be successful. The chief question that a prospective television client asked in 1944-45 was: "Why should I go into television now?" This point of view is not that of sponsors today but it was before the war ended. You might ask: "Why mention it?" But the situation must be understood if we are to discuss early commercials on television.

Actually, after about twelve years of program experimentation our progress with "Commercials" was woefully restricted. As we have mentioned elsewhere in this book, Pearl Harbor virtually stopped all television broadcasting; then, in the fall of 1943, farsighted people began to realize that the war would be over some day and that if nothing was done to learn something of the sales aspect of television they might find themselves in a very embarrassing position when sets eventually went on sale. So limited experiments were started.

Up to this time two of the New York stations, NBC's WNBT and CBS' WCBW had completely controlled all production problems that were broadcast over their facilities. Their answer to

prospective clients' requests for commercial programs during the early days of the war was: "We haven't the facilities nor the manpower now, but when the time comes that they are available, we will gladly produce your commercial television programs for you. We will have the trained staff and 'know-how' based on our years of production experience." This seemed logical to some advertisers, who took the position that when television meant something to them as an advertising medium, then they would hire the people who knew how to produce good and effective programs and their troubles would be solved.

About this time Du Mont's WABD began transmitting a good picture and a policy wholly at variance with the other two stations was announced. They offered their station facilities, fully-manned studios, equipment, and time on the air absolutely free to any advertising agency, client or client's representative who cared to experiment in television programming. The producer of the program was to pay for the talent, scripts, and any program expense involved, but there was no charge made by the station.

This offer on the part of Du Mont put a totally different aspect on the commercial television picture in New York. Almost immediately those with the idea of finding out something about this new medium began to investigate.

Many of the big advertising agencies were not sold on television. They held the view that television as a good advertising medium was still many years off. They said, "There are only about five thousand receiving sets in the metropolitan New York area. Why should we recommend that our client invest any money at all now?" Others felt that here was a God-given opportunity, with the small audience, to find out at first-hand what might be accomplished. They knew that many mistakes would be made but they said: "Now is the time to make them." They saw that experimental errors might not be serious with the small audience then in existence but that they would be when a large television audience existed. They also maintained that the cost would never be as low again as it was then. And in rebuttal of the statement that eventually clients would hire expert program builders, they asked, "Where are the experts to come from?"

Actually there were very few experienced television program producers available. Most of those who had had experience before the war were either in the armed forces or scattered to the far corners of the earth.

With all of these arguments being discussed pro and con, some five or six sponsors decided to go ahead on an experimental basis and commercial television was launched. That was the picture in New York a year or so before and leading up to VE Day. In this chapter we will discuss some of the programs that have been produced and insofar as is possible try and draw some conclusions.

Early Commercials

Back in 1939 and '40, before the situation just described existed at all, certain limited experiments had been made. We will not attempt to cover all the programs presented nor all the advertisers who had ventured into this new medium. Only those programs which were the first of their type or those that presented new problems will be included.

In the spring of 1939, the National Broadcasting Company launched their program schedule of fifteen hours of entertainment per week, and it was from then until December 7, 1941 that the first commercials made their appearance. The schedule as a whole was "sustaining" as commercial station licenses; that is, the right to charge a client for time on the air, had not as yet been granted to the existing stations by the F.C.C. During this period and "for free" most of the so-called commercial films produced by the large manufacturers, were televised. This included semi-educational pictures showing how automobiles were made, trips through the great manufacturing plants of this country, and other promotional subjects. These quasi-commercials also included travel films put out by the leading railroad, steamship and aeroplane lines of this and foreign countries. The man who paid originally to have the picture produced was more than glad to have it shown to the television audience, for his biggest problem in pictures of this kind was distribution. The broadcaster, on the other hand, had to stay on the air a given number of hours per week to hold his license and he was also anxious to

establish friendly relations with large potential advertisers; thus he was more than glad to televise these pictures free of charge. But these industrial films soon proved that in themselves they were not the answer to television commercial programs. There were too many long shots, dark interiors, badly-lit sequences. But perhaps most important of all there was no attempt at direct selling. They used an almost straight educational approach with comparatively few references to the product except in a general way. There were those who felt that television commercials should be limited to this general type of selling but the majority of the people interested in the future of commercial television believed otherwise.

Early Fashion Shows

One of the early groups of potential sponsors for television programs were the business houses interested in fashions. Radio had been virtually a dead loss as far as being a medium for selling women's clothes; those interested saw in television the answer to all their prayers. Stores, manufacturers, newspapers and magazines were all interested in seeing how fashions could best be presented on television and this problem is one that is still being actively weighed.

In all fashion shows where dresses are featured we come up immediately against two serious problems. First, the necessity of showing the complete outfit, from the top of a model's pretty head to the soles of her well-shod feet, means that we must pull our cameras back and take a long shot. In dramatic programs we might use a long shot to establish a scene or location but we usually go into close-ups as soon as possible and carry the action forward in close intimate shots. This isn't possible in a fashion show. It is true that we can go into a close-up to show details of shoulders, sleeves, belts, and pockets but we must pull back to give an overall picture of the dress. As yet, it is impossible to show many things that the advertiser would like to have the audience see as there is a definite limit to the size of small objects that can be shown. Texture for instance cannot be televised satisfactorily as the system simply will not resolve the detail. In the long shot, the small size of the viewing screen is a limitation;

but we can show the lines of the garments, the styling, and the overall appearance. The second problem was the lack of color. The color in almost every article featured was important, yet all we could show were varying shades of gray. A light pink dress looked no different than a blue, a green, or a lavender.

A fashion show where models were shown on turntable. Commentator at right.

Another problem was the aspect ratio of the picture. If we could have shown all our models lying down we could have come in closer but to get the necessary height, we had to include a lot of open space on either side of a model. Scenery was a problem. If we painted a set that was visually interesting where the stage was empty, we found that our scenic decorations detracted seriously from the good clear contrasting picture of the dress we wanted to show.

Actually there is very little "theater" in a program of this kind. In a live fashion show, models walk around in new dresses. And that is all they do. The movies had introduced little or no dramatic interest in fashions and how was television to do the

job? Even today the main criticism of fashion shows is that they are too static. It seems only logical that it is going to take a combination fashion expert and theatrical producer to turn the trick. Frankly, we have not found the answer.

With these problems in mind we launched into our fashion experiments. We learned many fundamentals quickly. First, a model must be completely outfitted. A chic dress requires all the accouterments—hat, shoes, gloves, and bag. Models must learn to move but *not too much* especially when close-ups of various parts of the dress, gloves, hat or jewelry are attempted. Color of the clothes to be shown again caused trouble.

In all programs built for entertainment, we cater to the limitations of the system. Costumes are selected for the various players that give the best television picture but in a fashion show we ask the system to pick up what we want to show. It does not always do it satisfactorily. In one program we attempted to present a special line of winter fur coats. They were all dark brown or black. The dark coats absorbed so much light that the picture was almost unintelligible. And again we found that models merely "walking on" are not the best type of television entertainment.

Particular Programs

One of our first shows was a major effort and was fairly successful. Five complete sets were constructed. First we saw our fashion authority in close-up. And let us pause a moment here. It is quite possible that fashion experts are not the ones who should narrate the program. While they may know how to design dresses, they may not have a television personality from either a visual or aural point of view. Of course we want to meet these personalities, but they should not attempt, except in special cases, to carry the show. If we are to hear an oral description of the dresses we are to see, that narration must flow and be well-delivered and if we are to see our narrator at any time she must be "telegenic." Realizing this we had the words of a fashion authority read, by an attractive actress. We saw her as she greeted the audience, and briefly set the scene then we flashed to a hotel lobby. Four young ladies were checking in. A bellboy brought

in their traveling bags, which gave us an opportunity for a close-up inspection of the bags and as the girls entered we saw the four traveling outfits they were wearing. Then to give them a chance to change we cut to a single girl in a raincoat, umbrella and hat. With an electric fan and some strips of cellophane we managed an interesting shot of a girl in a futuristic rainstorm. To get a little male interest we switched to a beach umbrella and models in bathing suits. Then a close-up, while milady had her hair done by an expert. From this to a tea table with appropriate gowns and hats and we closed with all the models in evening gowns. The visual content just described was backed up with "off camera" comment by our announcer.

In another program we tried to dramatize our fashion show to some extent, by working out a semi-pantomime plot for the models. The scene was a sidewalk café. There were tables, a waiter and the necessary properties. Two of the girls were discovered at a table finishing lunch. We saw close-ups of their hats, gloves, and jewelry. As they paid the check their purses were seen. Another girl came in and they discussed her outfit. Then as they arose to go we saw what they were wearing. At the entrance they met a friend with her dog and we saw the latest thing in canine trappings. They left her as she joined the other girl in the restaurant. We saw the waiter help them with their coats. The plot was simple but it gave legitimate action; and with the natural business throughout the program the narrator had a real reason for mentioning the articles we saw.

Other early shows featured hats, furs, accessories, jewelry, make-up, swimming suits and shoes. None of these programs made any attempt to include in their format any entertainment. All of the television time was free to the potential sponsors and the station staff worked with the stores and manufacturers in developing a program.

What to Show and How to Show it

From these simple program experiments it was seen very readily that while fashions could easily be televised the mere showing had only a limited value from an entertainment point of view. Of course the audience was new in those days and they had not

as yet completely lost their amazement at the marvels of the new medium. While the station welcomed these experimenters, none of them attempted to put on regularly scheduled programs week after week. They were interested in one time only and not a great deal was gained in determining the receptivity of the audience of the future to programs of this kind. The sole reason for doing program experimentation was to gain information for the advertisers rather than to attempt to sell goods. But fashions held no monopoly on television.

One of the early programs was a complete visual demonstration of the most important machines in every-day office use put on for a well-known business machine company. Into the studio were brought adding machines, typewriters, mimeographing and duplicating units—practically the full line manufactured by that company. There were expert demonstrators at each machine and a pretty announcer took us on a television tour from one machine to another. Aside from the fact that nearly all the machines were black, with a tendency to flare, we saw all of them in operation. A speed champion did tricks on a typewriter at the conclusion.

Automobiles

The 1938 Automobile Show in New York was one of the first commercial programs to tie studio and mobile unit pickups together into a single production. All the representatives of the various automobile manufacturers were in town and the television program was a sales promotion job on the part of the broadcasting station. In this program we attempted to mold the commercial and entertainment units into a connected whole. In the studio we had a family group gathered about an old album. As they looked at the pictures in the book we switched to our film studio for stereopticon slides of early model automobiles. At the finish of the pictures we cut back to the family scene in the studio, where the father of the family remarked: "Yesterday the automobile industry became a reality, tomorrow it will be television. We will be able to see things at home like this." Then we cut to a series of variety acts to show some of the entertainment possibilities of the medium. Then another switching cue,

as the father said: "In television we'll see the new models in automobiles too." This time we cut to our mobile unit cameras in Rockefeller Plaza and there were the new models in person. We saw the new cars as they were driven up to the main entrance at Radio City.

Picking up a new model automobile in Rockefeller Plaza, 1938.

The program was a definite success. We easily demonstrated some of the possibilities of future commercial television programs. All of our facilities were in use during the program—the film studio for the slides, the studio for the live talent part of the program, and the mobile unit out-of-doors. As it was a special demonstration it was scheduled in the afternoon which made the outdoor pickup possible; had it been an evening program, which is where it would be in normal operations, the mobile unit or commercial feature would have demanded lights which would have made the whole program much more involved.

Commercial Announcements

In view of the radio network rule that commercial messages must be limited to a small percentage of the overall program time the question had often been asked: How long will television commercials be? Some people maintained that they would be longer, others shorter, than radio plugs. It seemed then that they could be longer if they were interesting. So far no one has resented very seriously the length of commercials but there has been definite criticism of their subject matter and manner of presentation. One of the best commercial television programs ever produced was over an hour in length. Naturally it was not sixty minutes of sales messages but it was a commercial from start to finish. Considerable ingenuity and imagination was evidenced in the completed script and it was an almost perfect sample of what can be done if some real thought is given to a problem. The original order was to produce a television program to publicize the opening of a new downtown furniture store by a company that had been in business in New York for many years. There was nothing glamorous, nothing of particular interest as program material. In fact it was a difficult program assignment if we were to get away from the prosaic commercial approach. The men who finally solved the problem did a very commendable job. Taking the well-known sentence "New York is a fine place to visit but no place to live in," as the motivating idea back of the program, our writers started the story by introducing two visitors in New York and they made the aforementioned remark to the guide who was showing them the big town. To disprove their statement he told them the life story of a man who came to New York as a young man. We saw him get his first job. We were with him when he first met his future wife; attended their marriage; shared his heartaches and pleasures, saw his advancement in the business world, the opening of his first shop, and finally the culmination of his ambition with the opening of his big downtown store. The whole program was built around the product and the men who made it successful. In short it was an hour of commercial but told in such a way that it held our interest every minute of the time it was on the air.

While this program again was for one time only, it gave some slight indication of what might be done in the handling of commercials on television. During this early series of experiments some of the regular commercial programs that were broadcasting on radio at that time were brought before the cameras for a sustained series of broadcasts. While they were basically so good from a program point of view that they were interesting on television, they proved that radio programs will have to be regroomed before they will be as visually interesting as they must be to hold their position. If a program is good radio there are about ten chances to one that it will not be good television. Pantomime is perfect visual material and television is going to need visual interest in every program if we are going to keep our audience looking.

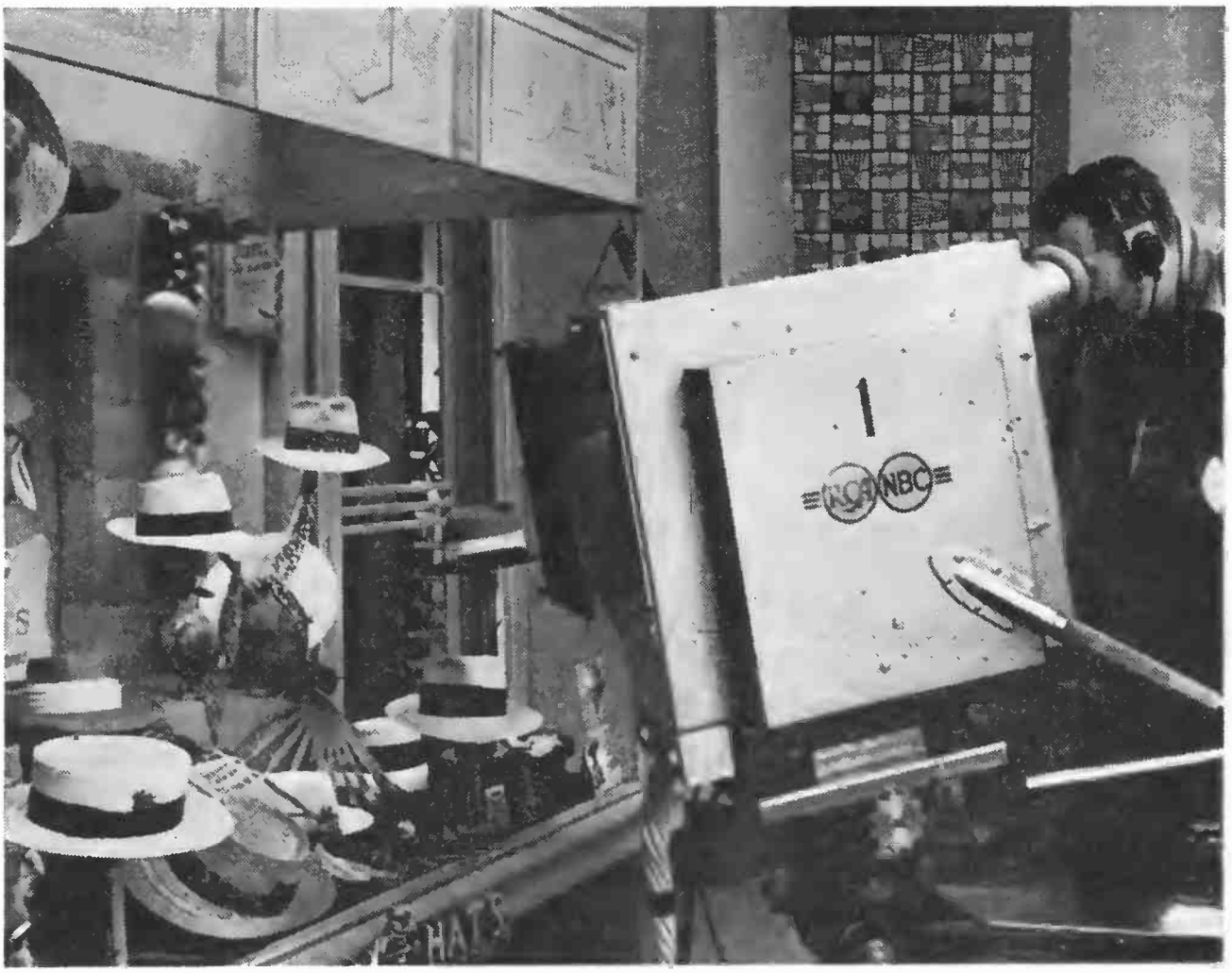
Sponsoring Sports

Probably the high point in commercial programs on regularly at this time was the sponsorship by Adams' Hats of wrestling. Elaborate commercial displays were built in the studio. One that was very effective consisted of a complete reproduction of a hat store window. After an overall view of the window the camera dollied in for close-ups of the merchandise on display. The program would open in the studio and then switch to the arena for the mobile unit pickup. Between bouts we came back to the studio for our visual messages.

The Proof of Television Effectiveness

Slowly other advertisers began regular broadcasts and early in this experimental period the possibilities in television advertising were conclusively proved in a survey which included both the radio and television audience. Several copy points were stressed in a radio commercial for several programs and these same points were covered in a television commercial. Then the audience was contacted in person in their homes. While those people who had listened to the radio program remembered having heard the points mentioned their conception of how the articles mentioned were used was vague while those who had seen the television program knew what the questioner was talking about, they knew

what the product would do, they had seen it demonstrated and this will be true of every product that is properly presented in the days ahead of us.



An Adam's Hat shop window as reproduced in the WNBT studios.

Commercial Authorization

On July 1, 1941, the F.C.C. authorized stations holding commercial licenses to charge clients for advertising programs. At that time, in spite of the war in Europe there was a cumulative interest that was beginning to make itself felt. Sets were on the market and it was just prior to and during this period that some five or six thousand receivers were purchased in and around New York.

Interest on the part of advertisers was still low, but there were some sponsors who were willing to go ahead and several contracts for regular programs were signed. The Bulova Watch Company,

introduced a time signal on NBC which consisted of a clock face that filled the screen and was held for a full minute while the second hand turned; but there were no oral announcements. All that was heard was a music box.

Botany Ties began broadcasting a weather report on film. This was a short animated film showing the doings of Botany's "Woolly Lamb," with a direct plug for the product and then a slide showing "Tomorrow's Weather." Several other sponsors began to plan programs. Then came December 7th.

The outbreak of war found commercial television actually nowhere to all practical purposes. The eighteen months of operation had stressed the entertainment end of the medium and aside from the comparatively few programs that had been attempted the development of commercial programs had been insignificant. There were not enough receiving sets in the hands of the public to make television as a medium interesting. The cost per viewer was far too high and sponsors in general had decided to wait. Within a matter of a few months television for all commercial purposes closed for the duration in New York.

The Renaissance

But television refused to stay dormant and after some fourteen months of idleness a new surge of interest began to quicken the pulse of potential advertisers. Station operators realized that the war would not last forever and that there were still many things to be learned. Equipment was dusted off and a restricted program schedule, primarily directed to the returning servicemen in the hospitals in and around New York, was resumed. The offer made by Du Mont to furnish facilities free of charge brings us to the situation described at the start of this chapter. While the New York stations had been comparatively idle, the General Electric station in Schenectady had been broadcasting a limited schedule all through the war and had done more experimentation along commercial lines than anyone else. Most of these programs had been carried out in conjunction with advertising agencies. When Du Mont made their facilities available several sponsors decided to go ahead in New York.

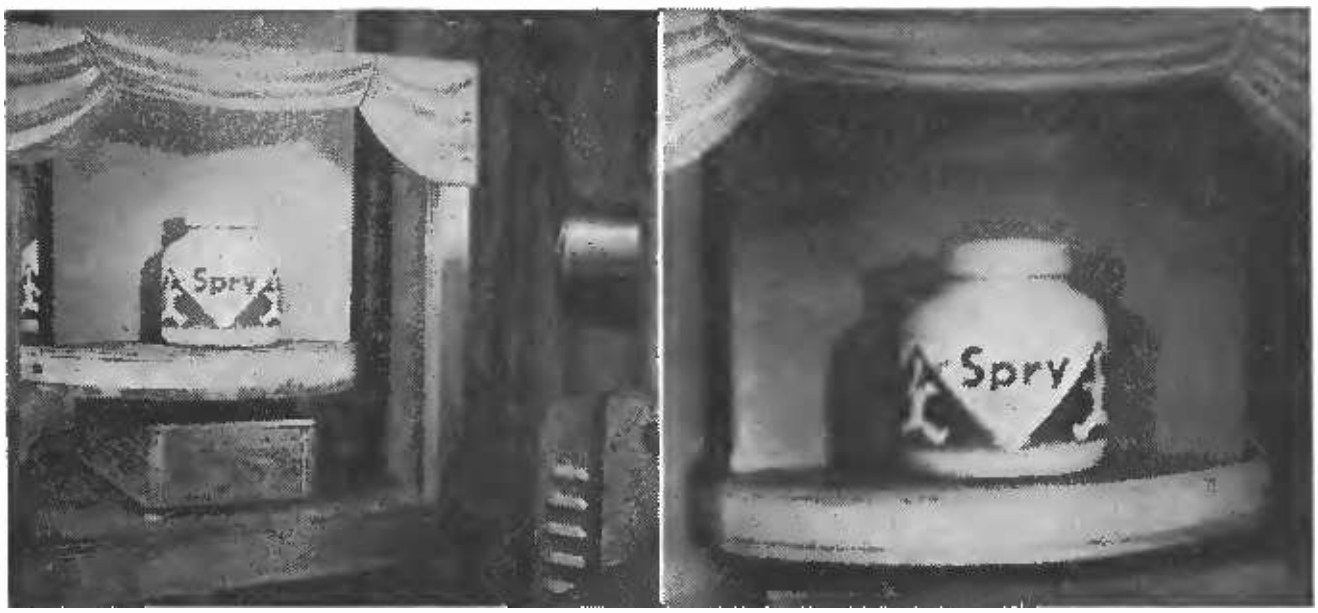
One of the first of the new programs was "Wednesday's At

Nine" sponsored by Lever Brothers. During the two years that this program was on the air many important commercial ideas were tried out. Some were successful while others proved impossible of production at the time. One of the troubles encountered was that it was virtually impossible to show various degrees of "whiteness." Soap manufacturers in much of their magazine and radio copy have stressed the results obtainable through the use of their product. The problem was to show this by means of television. It simply couldn't be done with the equipment in use at that time. Two identically white shirts would appear vastly different when shown side by side if there was the slightest variation in light level on either garment or if there was a variation in the shading controls. It was easy enough to compare a blue shirt and a white one but it wasn't exactly cricket to say that they were both white and such a misstatement of fact could only lead to embarrassing complications. This experiment proved that as yet television can't do everything and if we are to get the most out of the medium we must cater to it, even if it means changing a whole advertising campaign. Television may easily influence sales plans of tomorrow.

The sponsorship of the program alternated between a laundry soap, a bath soap, a shaving cream, and a shortening. The last three were simple, due to the fact that they were demonstratable—a girl in a bath tub, a man in a shower were easy. But the program showed that television copywriters of tomorrow are going to have as much plain hard work in devising visual approaches as radio gag men have now.

Some of the effects we tried were interesting. Our girl in the tub was a young lady in a shoulderless evening gown standing behind a sidewall of a bath tub. The camera framed the picture and made the illusion complete. Another interesting effect was achieved by having two actors face each other through a square hole in a piece of scenery painted to look like a mirror. A perfect effect was achieved as we never saw the face of the man facing the mirror. He unhappily shaved until his "reflection" handed him a tube of the proper brand and said, "Here, try this." This trick was a complete surprise to the audience and helped put our commercial message across.

The shortening was simple—actual demonstrations of how to prepare cookies, pies, and cakes with a close-up of the finished product. All in all, we proved that any demonstratable product was fairly simple, but to visualize the cleaning efficiency of a brand of soap was something else again. Another problem was the lack of interest in laundry soap. No one is interested in dirty dishes and soiled clothes.



Left—Revolving turntable used for display purposes at WABD.
Right—Kinescope photograph of the television picture delivered to the audience during a Lever Brothers program.

Visual and Aural Messages

In all television commercials there still remains to be tested the amount of oral plugging a product needs. If a boxing contest is sponsored and if a large banner with "Fight Fleas with Fixum" is visible in the background all through the broadcast, does the client need to do a lot of talking? Will a banner of this kind be annoying? In early baseball broadcasts the large "Gem" sign on the fence next to the score board in the ball park was prominent in all our pictures; all it needed was a slight reference to it to make our sustaining program a sponsored one.

Repetition of slogans, visual identifications, and openings will do a great deal to establish identity in the minds of the audience. In a recent survey the sponsor identification of a certain televi-

sion program was 95% which is higher than any radio program on the air today.

The Wide Variety of Sponsors

It was evident very early in this experimental period that demonstrable products were easy to make interesting. When there was something to actually do, a demonstration was obviously good television. Mending tape was an interesting commercial as the audience saw the results that could be attained by using the product. A dog food manufacturer came up with a good idea. The story is that the hungry little dog turned up his nose at some very delicious-looking food and gobbled up the proper dog food on cue, simply because there was kerosene on the competitive dish.

Through most of these commercial endeavors there was evidence of the realization that entertainment was vital, that the television audience would demand it; and some producers leaned over backwards in trying to incorporate it in the commercials. Vocal soloists were injected into fashion shows for no apparent reason. Puppets were made masters of ceremonies and in most cases failed to entertain. Some few of the live commercial programs were planned with the entertainment built around the product or designed simply as a vehicle to carry the commercial message to advantage, but no successful combination was definitely established. The film programs had more true entertainment; with them the sponsor's name was shown before and after a travelogue or short that had been originally produced for theater consumption.

The Straight Commercial Program

In the midst of feeling around for new approaches, this thought was suggested: no one resents the advertisements in today's magazines. Most everyone reads them but they need not unless they care to. Why not try an unadulterated straight commercial? Why not present the subject matter with a simple "service to viewers" approach? With this in mind Macy's launched their "Teleshopping with Martha Manning."

At no time was this program planned to be anything but an

informative source of shopping news. It was only five minutes in length and was broadcast just before the regular evening schedule began and it proved that television commercials in themselves can be made to be interesting visual fare. On this deliberately factual program more individual articles were shown in five minutes than other advertisers were presenting in programs of twice that length of time. The formula in general was to introduce the mistress of ceremony who after a very short opening presented the articles that were featured that week.

The program proved many things. First, we succeeded in making television do what we wanted it to. There was of course a limit to the size of objects below which it was impossible to go in presenting small articles, but purses, hats, Mothers' Day gifts, soaps, perfumes, camp outfits, brides' gifts, bathing suits, coats, dresses, household appliances, and many other articles were shown well.

Second, we found that rapid camera switches and good close-ups held interest. We did not dwell on any one article for too long a time. Once the audience had seen it we switched to something else. At no time did the program drag. The copy was pertinent and short.

It was never without an audience because of its lack of entertainment for coming as it did, just before the regular evening schedule it was not forced down the throat of those who were not interested. If the televiewers didn't want to look they didn't have to, but they did. A program of this type belongs in the morning or afternoon but undoubtedly a store may show milady their bargains for the day by television and then wait for the phone to ring. In the main we must develop a good technique of presentation, the correct way to emphasize the visual sales appeal, but if a program of this kind is handled correctly, it will do a job.

Unanswered Problems

In spite of the experiments that have been made and of those programs that are now on the air, serious study of commercial problems opens up vast fields. All of the commercial experiments discussed in this chapter are ancient history now. But these early ventures were perhaps more exploratory than anything else and

while some of the experience gained then has been incorporated into the commercials we see every day, in the main, present-day sponsors have a tendency to do just what they did in radio. Just because we have tacked sales messages on to an entertaining radio show is there any reason to believe that we must do the same thing in television? If we raise the emotional reactions of the audience to a pitch equivalent to that achieved in the theater or by a movie can we then blatantly ask them to buy the cure that fixed father without incurring their resentment? Must we follow radio precedent at all? There is perhaps sound reasoning behind this procedure. If radio sold goods by merely repeating over and over the good qualities of a product then television should be able to do the same thing. But just as television is more effective when the commercial message is designed for visual presentation, so too is it conversely annoying when the audience is constantly subjected to a commercial that doesn't find the audience approval that the sponsor had hoped for. In other words the sponsor by constant visual repetition of a commercial runs the risk of extreme adverse criticism. While many thousands of dollars are being spent on the entertainment end of the program many sponsors seem satisfied to show the same film strip lauding their product week after week. If television is to "make friends and sell people" then it behooves those who make the final decisions on a sponsor's commercial to see that it does. Many of the one minute spots are clever and interesting but their appeal fades with too much repetition. Another commercial approach that is questionable is the similarity of competitive advertising copy. If every time we are shown a refrigerator we are shown the same features in the same manner regardless of make, is the sales job being done properly? Every cigaret commercial makes the same claims no matter what the brand. If television is expected to sell goods it at least ought to be given an individual copy story worked out in an interesting visual manner that is different from the story of the competing manufacturers. Sponsors are really asking a good deal of the viewer when, just as the interesting part of a dramatic scene should be played, the story is broken off and he is forced to interest himself in a new idea—namely, an unwanted commercial. A few sponsors have realized this and are presenting

novel and amusing commercial messages which meet with definite audience approval. How to put television sales messages across effectually and hold the approbation and attention of the audience is an approach that must be learned if commercial programs are to be as successful as they can be.

It is difficult at this time to even estimate what the costs of tomorrow's television programs will be. Even today it is hard to arrive at an exact estimate. Station time is a set figure but the production costs vary tremendously. Because of existing facilities, a production, built in one part of the city, transported to the broadcasting studio and, after it is used, returned to a warehouse makes for a wide range in prices. This procedure is often necessary as very few producing studios have building facilities on or near the premises. Salaries of artists vary from about two dollars an hour for important parts in a dramatic show where several days of rehearsal are required to fantastic fees for the stars and V I P. In 1945 the average cost of commercial television programs was very close to ten dollars per minute of time on the air. This figure was for program content alone, facilities charges were additional. By 1950 a conservative estimate would probably be between one hundred to two hundred and fifty dollars per minute and in many cases far higher. In spite of the limited experiments so far carried out, it is a certainty that television stations with a large viewing audience will eventually make commercial television programs a good investment for the sponsor. If radio could do a successful sales job, television will do a better one.

26

LARGE STATION OPERATION

The problem of supplying programs to the television audience brought the broadcaster face to face with a vicious circle. Which should come first, the audience or the programs? There were those who maintained that the average American would not buy a television receiver until a good program service was available; on the other hand, there was plenty of argument to prove that

the broadcaster could not afford to provide good programs until there was an audience with television receivers to pick up the entertainment offered. Actually, television broadcasters had to carry the load until such time as there were enough receivers in the hands of the public to warrant advertisers buying time on their stations. Every survey showed that the American people would buy receivers and that meant the broadcaster must provide programs. How best to do this has been the problem the broadcaster has had to meet.

The first problem of course is studio space and as program schedules expand so too will the demand for more facilities. Each New York station has met the demand in a slightly different way. NBC has over-flowed from their two studios that were redesigned for TV operations, into their radio studios. These originally were equipped with remote television pickup chains and additional studios were scheduled as needed. In addition to these mid-town studios they completely reconverted a large motion picture studio uptown and have additional space available there. CBS redesigned their large studio space in the Grand Central Terminal and made two large and one small permanent studios. In addition they took more space in an old lodge hall and equipped it for television operation. ABC took over an indoor riding academy which they split up into two large studios with several smaller studios adjacent to them. DuMont had three studios in Wanamakers in addition to their small studios in the center of the city. PIX built two studios in an addition to the News Building and also leased outside studio space. In addition to these studios, adapted for strictly studio types of programs, each New York station is originating broadcasts from theatres in mid-Manhattan. Programs that play to live audiences are broadcast from these theatres. Just when the demand for additional space will end will depend on the eventual program schedule that must be met.

Rehearsal Time

Any plans for a major television station should be based first on the number of hours the station will be on the air. There is a very definite limit to the number of program hours that can be

produced in any one studio regardless of its size. We have today both large and small studios in operation and we still come back to the fact that while pretentious program units will require large studios, no two programs can rehearse in one room at the same time. Consequently a simple basic statement of television operational requirements is that the number of studios necessary will depend on the number of hours on the air.

Before we go into probable requirements based on studio operations as they are being handled today, we must take several production facts into consideration. We know there is a reasonable rehearsal limit below which we cannot go. All our experiments so far have shown that it takes just so long to acquaint everyone involved in a program with the part he must play in it. Just as a chain is no stronger than its weakest link, so too will the rehearsal time depend on the time it takes to coordinate the action of the slowest operator in the production regardless of his importance.

In all our discussions in this chapter we have taken an arbitrary figure in the amount of camera rehearsal time that should be allowed for each program. It is based on actual experience. The average camera rehearsal time on the better dramatic programs was almost eight hours to one. This did not include line rehearsals. The actors came into the studio "up in their lines." Scenery, properties, and lights were in place and a complete routine of camera shots had been previously worked out. Curiously enough short programs if they are at all involved, demand more rehearsal than long ones. On a five-minute program the best ratio was around twelve to one and it ran as high as twenty to one when things went wrong. This average is based on twenty-four programs. At no time were we able to improve that average, as the more we accomplished the more we strove to better the production, and that tendency will prevail with everyone who is attempting to produce good television programs. As programs become more involved, and more perfect results are demanded, it may be that the time devoted to preparation will be extended. If this happens any time element that we fix for rehearsals today may be completely out of line tomorrow. On the other hand, experienced personnel may be able to deliver a higher quality of

entertainment and still hold the rehearsal time factor constant.

It is quite possible that the overall weekly program schedule on any station may suffer from lack of studio facilities. If more studios were available, which would allow more rehearsal time per program, it might be reflected in the final results on the air. Lack of studios may make it necessary to eliminate certain program suggestions altogether and, while this policy may be criticized, there is an economic limit to studio facilities. Actually the overall problem is to provide adequate facilities and then do the best possible job with the utmost efficiency.

There is another factor that we must consider before we can begin to crystallize our studio requirements. That is the working hours of personnel. For the sake of argument let us assume that our crews are going to work a forty-hour week. This means that we must constantly evaluate the cost of personnel against the capital and overhead tied up in studios and equipment. Obviously you can't afford to pay personnel while they are not working, so again we come back to the number of studios we must provide to get the maximum result from our employees.

A Place to Rehearse

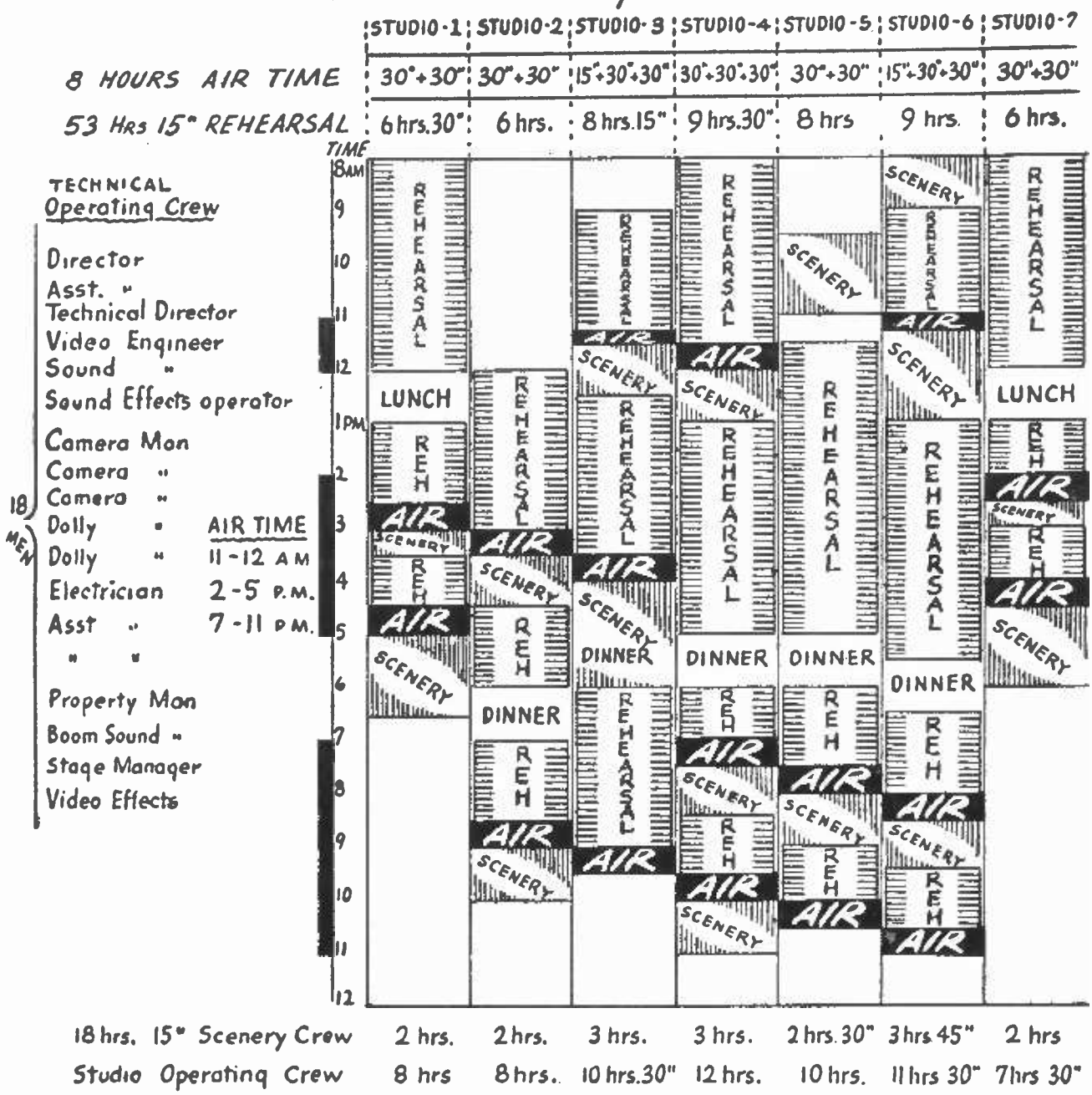
Physically we must first have rehearsal rooms. The number will depend on the hours on the air we plan to broadcast. Here the early "walk throughs" are held as well as pre-camera rehearsals. Every hour spent in a room of this kind frees a broadcasting studio. If these rooms can be a duplicate, in size and arrangement, of the studio in which the program is to be broadcast a certain amount of time might be saved later. The first contact between the director and the artist, however, will take place in this pre-rehearsal room in an involved program. We found that, as we learned what we wanted, the rehearsal room was more and more in demand and it may be that two rehearsal rooms should be planned for every studio.

The amount of rehearsal time spent in the rehearsal room as well as in the television studio proper will vary tremendously with each program. We have previously mentioned a ratio of eight to one for dramatic programs. On the other hand, many programs went on the air with a ratio of two to one in the studio

with no pre-rehearsals. Vaudeville acts, quiz programs, interviews, and many others can be televised successfully with only a camera walk through. In general, an overall rehearsal ratio of between four and six to one should be practical.

To try and visualize the whole operation let's lay it out on a studio chart.

Chart of suggested studio operations for eight hours per day of LIVE Television Programs.



This chart is based on the assumption that each studio is of sufficient size to allow scenery for two half hour programs to be set up at one time (Three cameras, two of them on dollies, would be used.)

Now let us look at what might be a typical operation for an eight-hour day. Some New York stations are on the air in excess

of that number of hours now, and any plans for studios in a major station should be so worked out that a full day's schedule could be handled even though the original building plan fell short of that capacity.

One Day's Schedule

Just as a case in point let us assume that our schedule worked out something like this. Daily:

11 A.M. to 12 M. 2 P.M. to 5 P.M. 7 P.M. to 11 P.M.

Let us also assume that we had seven television studios. Now let us break down the studios, and the personnel we would have to engage on a permanent basis, to make the operation of such a schedule possible. A typical day's program might be worked out as follows:

11:00 to 11:15	Studio 6	15-minute programs
11:15 to 11:30	" 3	
11:30 to 12:00	" 4	
2:00 to 2:30	" 7	
2:30 to 3:00	" 1	
3:00 to 3:30	" 2	
3:30 to 4:00	" 3	
4:00 to 4:30	" 7	
4:30 to 5:00	" 1	
7:00 to 7:30	" 4	30-minute programs
7:30 to 8:00	" 5	
8:00 to 8:30	" 6	
8:30 to 9:00	" 2	
9:00 to 9:30	" 3	
9:30 to 10:00	" 4	
10:00 to 10:30	" 5	
10:30 to 11:00	" 6	

Of course we have taken many arbitrary premises. For instance a typical day might not consist of fifteen thirty-minute programs

and two fifteen-minute units. It might have three or four straight hour broadcasts or many more shorter units; but no matter how we split up our broadcasting schedule we will approach some parallel to the studio requirements we have laid out.

This chart too is based on the false premise that all programs will originate live from the broadcasting station. We know they will not. Many programs will be on film and obviously every hour of film eliminates a studio and the personnel necessary to operate it. Furthermore we will have many hours of mobile unit pickups which will eliminate studios unless we plan to offer studio facilities to our client for his commercials. We do not know as yet what the demands will be so let us assume we are going to fill eight hours per day with live talent programs.

This chart of suggested studio operations for eight hours a day is based on several other assumptions: First, that each studio is of sufficient size to allow for the placing at one time of all the scenery to be used, in one hour of television programs. Second, it is assumed that each thirty-minute unit can be rehearsed with cameras in approximately three hours. In studio #1 we show five and one-half consecutive hours of rehearsal before the first program goes on the air with an additional hour before the second program is broadcast.

We have presupposed that the second program will have been rehearsed during part of this five-and-one-half-hour rehearsal period. The program to be broadcast between 4:30 and 5:00 might rehearse from 8:00 to 10:00 in the morning and from 3:30 to 4:30 in the afternoon. The first program from this studio, scheduled from 2:30 to 3:00, would rehearse from 10:00 to 12:00 and from 1:00 to 2:30. This would allow three hours rehearsal for the program broadcast from 4:30 to 5:00 and three and one-half hours for the program broadcast between 2:30 and 3:00.

If these two-and-one-half hour programs were competitive commercial programs, and it was found impossible to rehearse both programs in the same studio on the same day, it is obvious that another studio and another operating crew would be necessary. This procedure would apply to each program on the air and to each studio in use.

Changing the Scenery

We have made no attempt to indicate the exact number of studio operating crews necessary to do the job. In studio #4, for example, we show three thirty-minute programs. If the procedure suggested in studio #1 were applied here one operating crew would report at 8:00 A.M. and rehearse until 11:30 A.M. The program would then be broadcast from 11:30 to 12:00. At 1 o'clock a new operating crew would report and would rehearse and broadcast the two programs scheduled from 7:00 to 7:30 and from 9:30 to 10:00. We have made no attempt to fill in the extra day for the first operating crew. Under this procedure they have only worked a four-hour day but at the same time, unless there is an additional studio available, there is no way, with only seven studios. to utilize their services in active operation for the other four hours. We will always be forced to balance operating man-hours against studio facilities. It will always be virtually impossible to get 100% efficiency out of any operating crew. We have arbitrarily allotted time for changing scenery during rehearsal periods. This has been done in an attempt to increase the efficiency of the scenery crew. It will be seen that if the scenery time scheduled on the chart during an operational day is eliminated and all scenery is changed after the studio is through for the day, two crews would still be required assuming of course that two hours were sufficient in each studio. The chart in this case only shows the possibility of daytime operation. Night rates for personnel will probably be higher. The actual time necessary to change scenery cannot be estimated without some knowledge of program requirements. No reference has been made in this chart to the number of men involved in the scenery crew. That will rest entirely with the amount of scenery used for each program, and that again will depend on the type of programs produced and the production standards set by the station. It seems only reasonable to assume that the seventeen program units indicated on the chart would require at least one set each, and some programs may run as high as five or six sets per unit. All of these sets must be designed, built, and painted and no attempt has

been made to estimate the amount of time or the number of men required to do this.

Roughly, it is seen that each hour of program per day is going to require a studio, an operating crew of eighteen men for each studio, a crew to change scenery and a crew to build and paint it. We have attempted in this chart to show how one studio might be eliminated in a normal day's operation if the programs were planned and produced as indicated. The chart only covers production for one day. On a seven-day operating week it is obvious that it would be necessary to use additional crews for the extra two days and all schedules should be arranged to allow the same crew to produce the same program each week.

A Weekly Schedule

Let us stop for a minute and consider a real week's schedule. In spite of everything we have shown in our operations chart, actual broadcasting should be far simpler. In the first place, as we have said, no large television station will attempt a program schedule comprised entirely of live studio pickups. Film programs will fill many hours. Just what the percentage will be can only be a guess but authorities have rated the percentage of programs on film from forty to sixty percent. Again, many program hours will originate out of the studio by means of mobile unit pickup. It is probably a fair estimate to say that almost twenty percent of all live programs will come from points outside the studio. This figure is probably low as every boxing match, football or baseball game—in fact every sports program—runs well over an hour, and it is fair to assume that our audience will want to see the whole event. This means that five remote pickups per week, which is about the limit that could be handled by one crew, might deliver over ten hours of programs weekly.

In planning facilities for an eight-hour day a broadcaster should plan as a minimum on from four to six studios. Each studio should have at least three cameras with a fourth as a standby or for use on special programs. He should have at least two complete sets of mobile equipment with three or more cameras in each unit. He should have a projection room with at least two television cameras. To serve these cameras he should

have two thirty-five millimeter motion picture projectors and probably two sixteen millimeter film projectors. He will also need one or two still picture projectors and some type of projector for small objects and printed material either pictorial or reading matter.

Studio Construction

Above all every production center should be planned to take care of normal expansion, eight hours per day can only be the beginning. Several ingenious studio arrangements have been planned by outstanding architects but few take into consideration the overall size of the plant that must eventually be built.

Various suggestions have been made for studio construction. Some favor large revolving stages, others movable platforms. Thought has been given to the reconversion of existing theaters. The mobility of cameras tends to rule out the revolving stage for it is easier to move the cameras than the scenery. If a revolving stage could be divided into soundproof segments, however, so that one set could be changed while another was on the air, much studio space could be saved; but from experience such an arrangement seems questionable. Individual movable platforms that could be moved out of a studio with a set fully assembled might be workable, and the theatrical fly gallery of the legitimate stage will be used extensively. We will probably see many innovations along these lines for time and space must be saved, but studio space alone is not all that needs be considered.

Before anything can go into the studios it must be planned by the executive department and the office space needed in a major station will be considerable. The program department will need room to spread out for it is there that the material that we will see on our receiver is chosen, written, and developed.

From our program offices, we go to our scenic designers' department. There each program is laid out and designed. Drawings are made which go on to the carpenter shop. When the scenery is constructed it must be painted. While this is being done the property department is securing properties and they must have space to work. Shops and equipment for the costume department must be planned. Finally the production as a whole is ready to

be assembled in the studio for rehearsal. While all this was going on actors have been rehearsing in the rehearsal room and they now move into the dressing-rooms for make-up and costumes. Only after all this has been done, and remember this routine will be followed on each individual program, are you ready for the camera rehearsal in the studio. Let us look at another chart.

Space	Personnel
Executive Office Space	Station Manager Sales Program Engineering
Program Production Dept.	Writers Directors
Engineering Dept.	Engineers Operating Maintenance
Sales and Service	Salesmen
Scenic Dept.	Designers Artists
Carpenter Shop	Carpenters
Property Shop	Property Men
Electrical Dept.	Electricians
Visual and Sound Effects	Effects Specialists
Paint Shop	Artists
Wardrobe Dept.	Costumers
Control Room	Operating Engineers
Studio	Operating Crew Actors
Dressing-rooms	Make-up Men Hairdressers
Film Studio	Projectionist Operating Engineer Librarian

Space	Personnel
Master Control	Operating Engineers
Transmitter	Operating Engineers Maintenance

Personnel

Each of these department units function on every television program. How much physical space each one will need will vary but they must all have somewhere "to hang their hat."

Just how many men or women you will need in each department will of course depend on the demands put on them. In the program department the number needed will depend on individual ability and the creative nature of their work. In the early days we felt that if a director selected a script, adapted it for television, cast it, rehearsed it, and produced it he was doing a good job if he delivered one full hour of drama every three weeks.

The one group of employees that is very definitely set is the studio operating crew. It will be physically impossible to eliminate any of the crew listed on our studio chart as facilities exist today and nothing that we know of would cause very much change in the future. You must have a man at each control and on each piece of equipment, whether it be a camera, a dolly, a sound boom or a light.

The final union control of all television operators will determine salaries and category. Today, at some studios, the cameramen are electrical engineers, because of the theory that each cameraman should be able to get the most out of his equipment through his personal knowledge of its electrical operation. In other studios the cameramen are in the program department, selected because of some experience in the operation of ordinary photographic cameras. In Hollywood the motion picture cameramen have, in some instances, "gone on the floor" in a television studio. But, whatever their background, you still must have a cameraman for every television camera you plan to use every time you plan to use it. The demands on scenery will astonish

you, for you will find that you cannot use the same scenery week after week. Of course some sets will be used time after time but even though there is a legitimate reason for the same set its constant use is visually very monotonous.

Any major studio must include in the overall plan facilities for background projection. So far this process has had very few tests but it will be a factor in many programs and studios must allow space to handle it. We will discuss its operation in a later chapter.

Theoretical Problems

The present-day radio station manager who plans to go into television has a basic personnel problem that only he can solve. Should he put his best radio executives and operators who are making his radio station a success into television or should he leave them where they are, and put new personnel in television? This isn't exactly an easy problem. If he brings in new men to operate his television station, what should he do with his competent radio crews when television becomes the backbone of his broadcasting business? Television isn't radio. A good radio man cannot step into a comparable position in television, sometime in the future, with only a superficial knowledge of its operation.

If, because a radio station manager needs his radio men in their present positions and brings in new television crews what can he do with his television personnel when his radio men finally take over? The answer probably is that television some day will require many more men and women than it is employing now. Television will absorb both radio and television crews but the process will be an interesting one for the people involved.

Studio Locations

An immediate problem is of course the location of future television studios. Should they be in the heart of a great city as radio stations are, or should they be out in the suburbs? There are arguments on both sides. The price of property, overhead, and rent will of course be less out of the city; but will transportation offset this? Will actors, directors, and other employees, to say

Exterior of General Electric's Schenectady studio with relay transmitter.

nothing of sponsors travel out to a plant some distance from the heart of things?

If the public is to be as much a part of television as it is in radio how will people get out to a television "lot" to witness and participate in programs?

In all probability television will make its own rules and will not be hidebound by radio precedents and conventions. Space in metropolitan areas will be expensive. Separate studios in various locations will seriously affect efficient operation. In New York, radio actors fly from one studio to another to virtually compete with themselves on various stations. Many times they are on the air on one program while they are due for rehearsal at another. In Hollywood, however, if actors go to a studio for a day's work they stay there. The same is true in the theater. Television will make the same demands as motion pictures or the theater. The very nature of the actor's job will require him to be available for long periods of time.

If studios are out of town clients, celebrities, and the public who want to see a broadcast will have to come to the place of origin no matter where it is.

In Schenectady the General Electric Studio is in a detached building on its own grounds. Because of this they have been able to work outside and produce programs impossible in New York's downtown studios. In England the Alexandria Palace studio of the B.B.C. was in a park quite some distance from the center of London. Buses took the actors out to the studio where they spent the day.

The Ultimate Requirements

We must look at a major television station from a broad point of view. Even with only eight hours of programs a day, we are talking about a total number of hours of ertainment per week per station that approaches if it doesn't surpass the entire weekly output of the motion picture industry with all its Hollywood and newsreel facilities. To try and meet this demand a major television station must have huge program facilities. They should include not only ample studios, and ample in this case is unpredictable now, but also tennis courts, sports arenas, baseball and

football stadiums, swimming tanks, and perhaps a permanent circus ground. Eventually television need not run madly from one point of interest to another for program material. It is not inconceivable that we may see features of all kinds done exclusively for television. When we cease to cater to the few thousand people who attend any sporting event and play everything for the cameras we will have better entertainment in the homes of millions of viewers. These are problems that only time can solve, but large combined studios outside the metropolitan area are already being considered and it is probably only a matter of a few years before they become a reality.

At first the FCC required that a commercial television station broadcast twenty-eight hours per week and at least two hours every day. Who can say now what tomorrow's schedules may be? Eight hours, twelve, or eighteen? There are those who say that television will never entirely replace radio. Others claim that radio will cease to exist when the visual service is fully operating. We do know that silent motion pictures are no longer a factor in theaters and that may be an indication of where we may be going. Sound movies killed the silent screen, visual television may eliminate sightless radio.

Now where are all of tomorrow's television programs to come from? No one organization can hope to supply the demand for entertainment, education, and factual news that this medium will require. The answer is that we will probably see hundreds of independent program-producing companies. Thousands of hours will be on film, produced by the entire motion picture industry. Thousands of hours will be made up of sports pickups. The world is entertained today in many ways; we may see all of the now-existent originating entertainment centers of the world releasing their features and finding their audience through television. In any event we know this, a major television station will cost real money to equip and many dollars a year to operate. The eventual profit or loss sustained will depend entirely on how rapidly television develops as an industry, but it will be a "big business." Tomorrow's major television station will not be a one-ring circus, it will be a ten-ring affair with a new show every day. By its very nature, and through public demand, it must be the Greatest Show on Earth.

TELEVISION PROGRAM PERSONNEL

I. PREPARATION

1. Program Manager
2. Director
3. Assistant Director
4. Writer
5. Designer
6. Carpenter
7. Assistant Carpenter
8. Scenic Artist
9. Assistant Scenic Artist
10. Property Man
11. Electrician
12. Stage Manager
13. Video Effects and Titles
14. Make-up Man
15. Costumer
16. Grips

II. OPERATION

In Control Room	On Mobile Unit
Director	Director
Assistant Director	Chief Engineer
17. Switching Engineer	Switching Engineer
18. Video Engineer	Video Engineer
19. Sound Engineer	Sound Engineer
20. Sound Effects Operator	

In Studio	Outside
21. Cameraman	Cameraman
22. Dolly Man	
23. Cameraman	Cameraman
24. Cameraman	Cameraman

25.	Boom Man	Sound Technician
	Video Effects and Title Man	
	Stage Manager	Stage Manager
	Electrician	Electrician
26.	Assistant Electrician	Assistant Electrician
	Grips	Grips
	Property Man	Property Man

In Projection Room

27. Shading Engineer
28. Projectionist
29. Librarian

Master Control Personnel, Transmitter Crew, Maintenance Crew

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SMALL STATION OPERATION

In spite of all the trials, tribulations, trouble, and expense that we have outlined in the preceding chapter for the large station operator, the man who plans a single station in a moderately sized city should find himself in a very good economic position. He can immediately forget many of the problems that confront a metropolitan station particularly if that station is a network originating point. His only responsibility is to bring to his community a daily schedule that is of a sufficiently high standard to hold his audience and with the programs that should and will be available to him, this is not a difficult nor economically prohibitive assignment.

For the sake of argument let us assume that he plans a broadcasting schedule of eight hours a day. He may, if he can make the proper arrangements, simply operate as an outlet for network programs, coming from the large originating station. His only problem then is to build and operate a television transmitter and

broadcast the programs fed to him. There may be many privately owned stations that will choose to operate this way for several reasons. First there will probably be more programs available than there are competitive television stations in many localities. It seems only reasonable to assume that there will be at least five competitive major stations in every large community. If these five stations each maintain an eight hour per day schedule there will be forty hours of programs produced daily in that originating city. This means to the small station operator, that in the metropolitan centers enough programs are being produced daily to program five stations. Unless he has four competitors in his area, he will find more programs available than he could possibly use. Let's not discount the fact that network originating stations will attempt to tie up local outlets with non-competitive release contracts; but in spite of this, the local station manager is in a very strong position. It stands to reason that distribution will be a dominant factor in the cost of television programs. The production costs on any program will be relatively expensive in exact proportion to the number of people who see them. If an elaborate program is produced on a New York station it must in some way be made available to the millions of viewers outside the metropolitan area.

We mentioned that there should be programs on at least five major large city stations. This does not mean that there will necessarily be five television networks, but the majority of the good programs seen on any one large station will surely, through some means or other, be made available to stations serving non-competitive areas.

The Availability of Film

Programs on film will play a tremendously important place in this operation. While they will be used as radio transcriptions are today they will never have to overcome the difficulties that transcribed radio programs faced. In the early days ot radio broadcasting the quality of recorded programs was not up to that attainable in the studio with live talent. On film that difference does not exist and we will never have that problem in television, for if a film is properly photographed and recorded for television

release, the sight and sound reception in the home will be just as good from film programs as it will be from live programs.

If an advertiser's program was originally produced on film he would be free to arrange a simultaneous showing of his program in every city in the United States on the same day and at the same hour if he so desired. He could accomplish the same end by rotating his program; that is, he could place this week's program in New York and have it broadcast next week at the same time in Chicago, and so on throughout the country with the consequent saving in print costs. Direct pickup on television networks will be unbeatable for broadcasting events of national importance such as sporting events, special ceremonies, and spot news, but again we are faced with the unhappy fact that unless the television audience stop everything that they are doing to watch the program at the time it is being broadcast, regardless of what time a day it happens to come, that program will be lost unless it is put on film. And it is the local station manager who will reap most of the benefits from operations of this kind.

He will of course need a good film studio, projectors, and television pickup equipment; but once this is secured the cost of operation and personnel is relatively small. It seems well within reason to believe that a single station could be programmed entirely by film if it was so desired.

Local Programs

But of course the local station manager must consider his obligation to his community and plan on studios for a certain amount of live pickups. How many will depend on his total hours on the air and the percentage that will be live. He still must face the overall ratio of one studio for each hour of programs broadcast, but if he has a network service available to him as well as film, judicious program arrangements may allow for a possible ninety minutes from one studio during a day. This might be accomplished by using the studio thirty minutes in the morning, again in the afternoon and finally at night if he had rehearsal rooms and the studios were large enough to handle all the scenery needed.

He faces the same personnel problem per studio as the major operators, his only saving might be in the elimination of one

camera. Local production technically must be as good as that provided by the originating network station. He must have a trained studio crew and, while their individual salaries may be lower than their metropolitan team-mates, their work must be as good as those in the big cities. He will be restricted of course in talent, but General Electric in Schenectady has maintained an interesting live schedule without the professional actors that are available to stations in New York, Chicago, and Los Angeles.

A possible source of live talent material may come to him through traveling television units. It has been suggested that companies of actors and actresses be formed, that these professionally trained artists then "get up" in a repertoire of television plays, and that they then travel from city to city and enact their material before the television cameras of the various stations throughout the country. This, of course, would mean that the television station would take the place of the theater that used to house the traveling road-shows and vaudeville acts of yesteryear. Physically this plan is possible. It would seem much more expedient and economical, however, to put the program on film and then ship the film from station to station rather than the actors.

Local department stores are going to use time on television and every station should plan facilities to handle business of this kind. The medium has already proved its value in this type of advertising. We will see in our homes complete demonstrations of everything a store has to offer.

In addition to his film and studio requirements it may be that a single station manager will find mobile unit pickup equipment a virtual necessity. Just as major sporting events will be of interest nationally so, too, will local contests be valuable program material for many communities. New improvements in this type of equipment have widened its use. Cameras are lighter, the mobile unit has been broken down into "suit case" equipment that can be carried in an ordinary light truck and installed wherever it is to be used. Public gatherings, lectures, church services, and other civic and community events should prove to be interesting television material. The more sensitive cameras now available should make pickups of this nature practical.

A television station in a moderately sized city should be not

only a good investment for its owners but also should provide employment for many people and visual entertainment, education and news to the whole community.

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TELEVISION NETWORKS

While television networks today are a long way from what they will be eventually, tests already made have proved that pictures can successfully span the country. Ever since early 1941 a limited network has been functioning in and around New York City. This service was expanded rapidly. From an early operation with stations in New York, Schenectady, and Philadelphia competitive network service soon linked Boston and Richmond, Virginia. Then came network facilities toward the west and Chicago, Cleveland, Pittsburgh, Milwaukee and St. Louis were added to the cable. These cities all received programs originating in New York, while Chicago programs were sent eastward. Network service will move westward in a march that will end only when New York and the west coast are joined together in a permanently operated flow of programs.

Possible Means of Distribution

Television signals may be sent from point to point in four ways. By coaxial cable, by air relay and for short distances by a "Balanced Pair" of ordinary telephone wires or by transmitting a signal through a hollow metal shield similar to a gutter pipe. Successful tests have been conducted by means of each method and pictures have been transmitted with comparatively little loss in overall values. The last two methods have proved practical so far for short distances only but both coaxial cable and air relay have been tested over long distances with good results.

The prime mover in the development of television network facilities by means of coaxial cable has been The American Telephone and Telegraph Company. Their plans call for complete

coverage of the nation. They announced a program calling for the completion of six thousand miles of cable in five years and they finished the job ahead of schedule. When a few short gaps are completed, transcontinental service will become available.

The first tests by this means go back to 1937 over a two line coaxial cable which was installed between New York City and Philadelphia. This line was first constructed for commercial telephonic services but its ability to handle television has already been proved. In New York a picture was picked up by a television camera and fed through one cable to Philadelphia and returned to New York by the other. Two monitor screens were set up, side by side. On one was seen the picture as it was originally picked up and on the other at the same instant was seen the picture that had traveled roughly one hundred and eighty miles, namely to Pennsylvania and back. In looking at both pictures it was difficult to observe any difference that could be attributed to the long distance trip.

The pickup of the Republican National Convention in Philadelphia was sent back to New York over this cable in 1940 and then broadcast to the New York area. In that same year the telephone company installed a four cable coaxial circuit from Stevens Point, Wisconsin to Minneapolis, Minnesota, a distance of some two hundred miles. Tests were made in 1941 over these lines, the picture traveling each way twice for a total distance of about eight hundred miles, and still the picture was satisfactory. So from everything we know now it is quite logical to say that television pictures eventually can be sent from Coast to Coast, from Canada to Mexico, the limiting factors being money, men, and material.

Physically, a coaxial cable is a copper tube with a single wire in its center. With proper terminal and repeater equipment, a pair of these coaxials can handle over four hundred and fifty telephone circuits all at the same time. This capacity makes it possible to transmit both the visual impulses and their accompanying television sound. As many as eight of these coaxial cables have been put together in one casing and we may see even more included eventually.

The big important factor in coaxial networks is the cost.

When a cable is used to transmit a television program it naturally cancels the availability of the circuit for telephonic communications. It is only reasonable to expect that the charge for the use of these facilities for television will be in the neighborhood of the amount of revenue the company would receive if the line was being used for telephone service.

The telephone company originally made these facilities available for television experimentation from Washington to New York. This new, two-way coaxial circuit made it possible to pick up programs in Washington or Philadelphia and broadcast them in New York or the other way around. While the lines were available to television broadcasters for experimental programs without charge for a brief period of time, a rate was soon established and network programs went on a commercial basis.

The early availability of network facilities stimulated the growth of television immeasurably. In some cities "on the cable," stations went on the air with no local pickup facilities of any kind. They simply built a transmitter and broadcast network programs. This was a temporary situation but it created an immediate demand for receivers in that area without putting the broadcasters to the expense of installing expensive studio equipment.

When the first coaxial cable was put in service to the west there were some four or five competing stations in New York putting commercial programs on the air. They couldn't all have the cable so a plan was worked out where they shared the line. One station sent their programs west on certain hours on certain days then in turn the other stations took over. This operation completely broke down the tight affiliations between stations outside of New York and any one network. A station in Pittsburgh might broadcast programs coming from competitive network originating points. This was only possible where there were fewer local outlets than there were stations in New York or Chicago and it continued only until dual coaxial facilities were made available.

Air Relays

The other basic means of transmitting picture signals from point to point over long distances is through the use of a microwave relay system, popularly known as a radio relay.

The first practical demonstration was conducted by RCA-NBC in 1941. It is true that before this pictures had been received in Schenectady from New York and rebroadcast; but this phenomenon was not a true operating network from a commercial point of view, as this link was too long and from an engineering point of view it was not reliable.

In a radio relay system a highly directional signal is sent out on a very high frequency. This is far above that used by ordinary television transmitters and the receivers in the hands of the public cannot pick up these signals. But some thirty to forty miles from the transmitter a receiver, tuned to receive the frequency being used, is set up. This "relay station" not only receives the picture from the originating station but sends it on, "relays" it, to another receiver another thirty or forty miles further on. Through amplification at each relay point the picture can theoretically be sent as far as desired but there is a slight loss in picture signal each time it is sent on, so with present facilities, or until such time as this loss is overcome, there is a limit to the distance that a picture can be sent. Manufacturers and engineers tell us, however, that present day equipment is capable of delivering a picture from coast to coast. This means that one hundred relay points spaced thirty miles apart should take a picture from New York to Hollywood. While a project of this kind is no simple operation, still by comparison to wartime expenditures it fades almost into insignificance. Facilities for a national television network could be put in operation for less than the cost of one battleship. A big advantage in relay operation is that once the relays are installed they are purely automatic. If a tube blows out another automatically swings into operation. So a circuit rider can keep many relays supplied with tubes with a normal amount of expense and effort. Naturally the higher the physical location of the relay the further its signal

will carry. Mountain top relay sites should cut down the number needed to span America.

One of the first major links in the overall network system to use this means of transmission was put into operation by the telephone company between Boston and New York. To provide constant service in the face of possible power failure each relay point on the system was capable of generating its own power. If the normal power supply failed, immediately a set of batteries were automatically cut in and if the power failure lasted for more than thirty seconds local generators started and the television programs were picked up and sent on with no break in service.

In addition to the New York-Boston link, the Philco Manufacturing Company installed an air link between Philadelphia and New York and General Electric sends their pictures from New York to Schenectady by air relay. The picture quality is just as good when sent through the air as it is when sent by coaxial cable and combinations of these two means of transmission will be used to provide the network service that spans America.

This electronic high road is capable of carrying much more traffic than just one television program. It is stated that a radio relay system can handle several television programs, in addition to telephonic communications, airplane radio beacons, frequency modulation programs, and many other services.

Early Relay Tests

Let us go back to our original network demonstration. First, the mobile unit pickup equipment, with its transmitter was sent to Camp Upton on Long Island in New York. This pickup point is around seventy miles from New York City. A location for the first relay point had been selected near Hauppauge some seventeen miles from Camp Upton. Another relay station had been set up near Bellmore which was twenty-three miles southwest of the first point and finally a directional receiving antenna was erected on one of the upper floors of the R.C.A. Building twenty-eight miles from Bellmore where a bank of receivers was installed.

This network thus consisted of a pickup unit, a transmitter, two relay points where the original picture signal was received and then rebroadcast in a slightly different direction and on a different frequency and finally the receiver in Radio City.

The experiment was a decided success. On the receivers in New York City, we saw the troops in training at Camp Upton. The pictures were good and proved that television networks could operate through the use of air relays as well as by coaxial cable.

Radio relays may some day replace telephone poles. Plans are underway to handle the telegraphic services of the country by radio relay. The American Business Machine Company has made tests between Washington and Schenectady and the Raytheon Manufacturing Company is planning the "Sky Top" relay system for operation in the Western United States. This plan calls for relay stations on high mountain peaks of the Sierra Nevada and Rocky Mountain ranges. If these tests are successful the number of relay points necessary will be considerably reduced because of the long range that can be covered from a high mountain top.

Stratovision

If the latest idea in the distribution of television programs should prove feasible we could forget both relay and coaxial networks. This plan which has been termed "Stratovision" has been suggested jointly by the Westinghouse Electric Corporation and the Glenn L. Martin Company. This idea would require specially designed aeroplanes equipped with suitable transmitting equipment flying high in the air over a given area. It is claimed that with the plane at an altitude of thirty thousand feet a television signal could be broadcast over an area some 422 miles in diameter. Eight planes could transmit a signal that could be picked up anywhere between New York and San Francisco. Additional planes would give television service to other parts of the country. This suggestion gives us some idea of what we may expect in the way of important developments. Stratovision if it was practical

and there are no electronic reasons now known to prevent it, would not only give immediate network service but it also would eliminate the necessity of ground stations entirely. Each plane would carry four television transmitters and would broadcast four different programs at the same time. These programs would originate in central studios somewhere in America and would be sent to the plane by point to point relay. Each plane would then broadcast the programs and also by means of a relay transmitter send them on to the next plane. How this would affect local programs and who would control the programs broadcast from the plane involves an almost complete change in television operations as we know them today.

The progress already made in long distance transmissions, regardless of the service used, proves conclusively that television networks will span the nation. How it will affect the lives of the American people remains to be seen, but television will be available to every home from the Canadian border to Mexico and from the Atlantic to the Pacific, just as radio was. In program schedules we may have a more serious problem than in radio because of time zones but, if Los Angeles and Seattle can look in on New York and Washington, a way will be found to utilize this network to the best advantage of the people of America.

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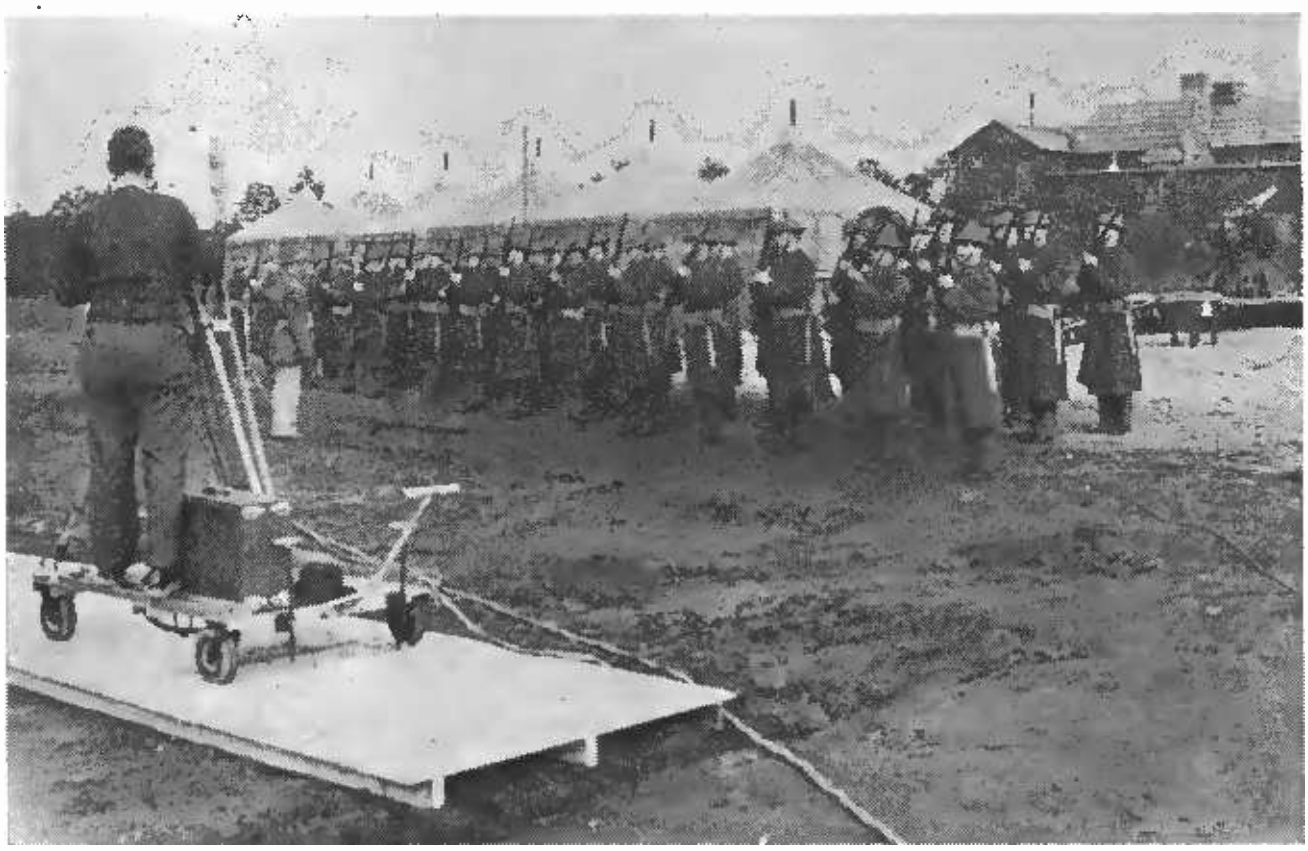
THEATER TELEVISION

Just what will television in the theaters of America mean to the average American? Actual experimentation in this country has, up to this time, been extremely limited but it has been successfully demonstrated that large screen theater television is practical and the next ten years should see tremendous strides taken in this branch of the industry.

The first successful commercial tests of theater television were

made in England. Several systems were developed and in 1939 television projectors capable of delivering a picture approximately fifteen by twenty feet in size were installed in four London theaters. The program content for the most part consisted of pickups of horse racing from the tracks near London and boxing bouts from the local arenas. The success of the enterprise, from an audience point of view, was immediate. Racing and boxing fans jammed the theaters and for the Derby paid as high as two dollars and fifty cents a seat. It seemed that theater television was a commercial reality almost over night. Then came the war and the discontinuance of all English television broadcasts.



Troops at Camp Upton seen in New Yorker Theatre on first radio relay demonstration.

In the United States both Scophany and Baird demonstrated their large screen systems but no commercial development was attempted. While English experiments were being carried out, The Radio Corporation of America had been conducting tests of their own and had developed a practical large screen television projector. This system was demonstrated to the members of the

Federal Communications Commission in the spring of 1941 at the New Yorker Theatre in New York.

The television projector was installed in the front of the theater balcony and it threw a picture about fifteen feet high by twenty feet wide on a motion picture screen on the theater stage. The program was fed to the theater projector by telephone wires from the NBC studios in the RCA Building some ten city blocks away. The entertainment included live pickups in the studio and among other acts a brief ballet sequence and the enactment of a dramatic story that included film inserts. Then controls were switched to Camp Upton, seventy miles from the theater and the picture from that point, being picked up by the mobile unit, was sent on to New York by means of a radio relay system.

Some few weeks later, on May 9, 1941, a preview of this newest development in theater entertainment was unveiled to a house full of specially invited guests. The lobby resembled a Hollywood première, for most of the top executives of the Motion Picture Industry were present. The equipment was the same as that used for the FCC demonstration and the program included Lowell Thomas and the news, a round table discussion of the future possibilities of theater television by some of the leading authorities in the world of sports and a dramatic presentation of an episode of one of radio's then popular programs, "The Parker Family." All of these units originated in the NBC studios in Radio City. A televised motion picture newsreel came next and then, after a brief intermission, direct from Madison Square Garden, the audience saw on the theater screen the World's Middleweight Championship Bout between Billy Soose and Ken Overlin. That evening was a memorable one in television history as it demonstrated conclusively what theater television could do.

Theater Versus Home Television

We talk today of radio as one of the big industries of America, and it is; but its "gross take" falls far below that of the box offices of the motion picture theaters of America. Unquestionably, theater television and the home brand will be competitors for big attractions, and it seems probable that a chain of tele-

Drawing of RCA's large screen demonstration at the New Yorker Theatre.

vision theaters might have a decided advantage if the motion picture industry as a whole endorsed such an operation. There were approximately eighteen thousand theaters in ten thousand and fifteen cities and towns in the United States in 1944. These theaters contain eleven million, seven hundred thousand seats. There was a motion picture theater for every eight thousand people. The American public paid one hundred and fifty million dollars a month to see the pictures shown in these theaters. This amounts in two months to more than the radio industry spends for broadcasting in a year.

Now can we assume that the people of this country are spending six times as much each year as is spent for all the radio programs they hear because sight is six times more effective than sound? When their home television receivers deliver them sight, will they patronize theaters less? We do not need to know the

answers to these questions now but we may easily deduce from the above figures that home television will have a tremendous competitor in theater television for high priced national events. It is easily seen that with the income possible from the theater audiences of America that the World's Series, world championship boxing bouts, and all the really big sporting events may never be seen in the home simply because theater television could outbid any sponsor with its tremendous cash audience. But after all that isn't too important. The really vital thing is that by means of television, either in the home or in the theater, everyone in America will be able some day to see everything that happens anywhere in this world we live in.

Distribution

There are those who claim that television should be made available only to sets in the home, that theaters should not be given channels. Obviously this is a biased opinion, for the frequencies allotted to theater television will in no way affect the public broadcasting services. But once the theaters of this country are tied together in a television chain it will be interesting to try to deduce just what television might mean to the motion picture industry. Let us look ahead a few years. Today an expensive motion picture is produced in Hollywood. The money involved in the production is tied up over a period of many months, sometimes for years, as a picture producer must await his final financial return until after the picture has played in thousands of theaters throughout the world. Aside from his original production costs he has a large investment in picture prints, and the life of a print is limited. But with television it would be possible that, with at most a dozen prints, a producer might turn over the money involved in a big production in a matter of a few weeks. Let us assume for a moment that one large theater in every city was a part of a television theater chain. A new motion picture costing a million or more is completed. If that picture were shown for one week over that chain of theaters by means of television, it would be possible for nearly everyone in America to see it in that length of time if they desired to. Today

certain first-run houses hold a picture for a considerable length of time. This happens because those certain theaters have it exclusively. The picture is not shown in other cities or in other theaters in the same city until the potential audience that might see the picture in that particular theater has either attended or shown no inclination to do so. Only then is it released for showing in other theaters. By means of a theater television network every theater in the country might become a first run house.

Studio set used in dramatic playlet during large screen demonstration.

Live Dramatic Productions

This same procedure might completely change the legitimate theatrical field as we know it today. The stage play, *Life With Father* ran on Broadway for years simply because only so many people could get into the theatre at one time. If, by means of television, everyone in America could see a play with its New York cast in their local neighborhood theater, its run would probably end in less than a month. Theatrical producers are interested in profits and if they and the actors involved in the production could make as much in a month by means of television, as they would make from a Broadway showing in years they would use television and be free for other productions. Theater television might seriously affect legitimate Broadway theaters for it would deliver the same actors in plays by the best writers to every theater everywhere.

Special Events

Everything possible in sports pickups for home television is available as program material in the theater. Instead of sitting in the sun on a hot day to watch a baseball game or freezing on a cold one to see a football game, sports fans of tomorrow will be able to recline in a comfortable theater and see the games just as they happen without experiencing the rigors of either summer or winter.

There has been a certain amount of criticism of sporting events on theater television based on the fact that if special events were televised in the theater at the moment they happen the regular motion picture schedule could not be adhered to. Realizing the truth of these statements a new approach to the subject has been made through experiments in a new type of projection equipment. This development when fully completed would utilize a motion picture camera to photograph the televised event at the time it happened, from a television receiver. The film thus exposed would then be developed and printed immediately and a few seconds after the event took place it would be projected on to the theater screen by means of a standard motion picture projector, or if so desired, it could be held and shown later. The

value of such a system is evident for special events could then be scheduled to conform to the regular theater program and still be far ahead of any other means of communication. It would also allow for a special news release, the final round of a boxing bout, an exciting inning in a ball game or the finish of a horse race to be shown at a preadvertised time on the evening theater program. But regardless of the system used, theater television is a medium to be reckoned with that may influence the whole entertainment field.

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FUTURE DEVELOPMENTS

Any discussion of the future development of television must be theoretical as the final answers to the questions raised can only come from the laboratories. We as laymen, however, should be aware of what is planned and be ready to use the results.

One of the interesting developments in New York City is the final crystalization of an idea that had been discussed for some time but had never been worked out. This is the centralization of television transmitters at a common broadcasting point. It has been quite obvious that with transmitter antennas in different physical locations in any given city it was extremely difficult to aline receiving antennas for perfect reception on all stations. If a home antenna was lined up perfectly for one station it was impossible to get perfect reception from stations located in a position out of line with the first. Every installation of a home antenna was a compromise with the antenna so positioned that the picture received in the home was the best that could be received from all the broadcasting stations in that area. In most cases this meant that the viewer never had perfect reception from any station. This situation has been overcome in New York by locating the broadcasting antennas of five stations in one location. The television mast atop the Empire State Building will carry the signal output of five powerful television stations. This means that when a home receiving antenna is lined up for good reception

from the Empire State tower, perfect pictures should be received from all five stations. It is true that one is above the other but the building is so high that the position of the lowest antenna will be far above any other location in greater New York. WOR has its own high antenna tower on the banks of the Hudson, but NBC, CBS, ABC, Du Mont and PIX are all on the Empire State Building. It is something that competitive stations in other localities should consider.

Color Television

While it was demonstrated as early as 1940 that color television was possible, its commercial debut was delayed for several reasons. The principal one was, "What shall our TV color standards be?" CBS had developed a system that required a three color spinning disk in front of the camera as well as in front of the receiving tube in the home. The revolutions of this color wheel were synchronized so that the red, blue and green filters in the home receiver passed in front of the receiving tube at the exact moment that they revolved in front of the pickup tube in the camera in the studio. RCA developed an all electronic system which eliminated the moving disk. This was accomplished by using three separate pickup tubes in the camera and by a system of filters, each tube picked up only one of the three basic colors. In the receivers a unique treatment of the inside face of the receiving tube translated the three colors which were broadcast in a dot sequential procedure into a perfect color representation of the scene in the studio.

In comparative tests before the FCC in Washington, CBS, RCA and Color Television, Inc. demonstrated their systems. It was decided that the results obtained under the Columbia system were the best and the FCC authorized the use of this system for commercial color broadcasting.

In color every problem that had to be met in black and white becomes more vital, especially in actual studio operation. Color response varies with the type of light and the individual pickup tube in a camera. Electronic shading becomes of major importance, for the overall colors in the picture may become distorted if there is a preponderance of any one of the three

Color camera used in 1940-41 demonstrations at CBS. The revolving color disk is in projecting tube at right of camera.

colors. The exact amount of red, blue, or green as seen by the camera through the filters must be reproduced on the viewing screen, and this is controlled by the shading engineer. Costumes, scenery and make-up require much more attention, and the movement of actors before the camera demands a much more detailed lighting job than in black and white, as color response has a tendency to change under varying degrees of light. All the motion picture commercials that we now see must be remade in color. Whether all television broadcasts of the future will be in color, or whether we will see both color and black and white, remains for the future to answer. In any event, color is going to be much more fascinating to the viewer and much more difficult to produce.

Cameras

As television advances we will probably see lighter and more flexible cameras. In the studios we will probably see many more cameras being used. Three cameras were thought to be all that was necessary in the early days but modern studios are now equipped for four, five and six cameras. They have proved their worth through improved program results. Before many years pass we should see remotely controlled cameras installed in the ceiling, from the walls, and from cat walks. How future possibilities are developed and used remains to be seen but more cameras should triple the visual interest of a production if they are properly used.

In sports we should again have many cameras. In our chapter on baseball we discussed the problem of where cameras should be located. That will not be too important in the days to come as every base and every player will at all times be covered by a camera. Again it seems probable that low powered transmitters can be developed that would allow for free movement of a camera similar to the present day walkie-talkie. If television cameras could be loosened from their restraining coaxial cable leads, much more in the way of pickups could be accomplished. At a horse race it would be possible to have cameras all the way around the track and we would see the various positions of the horses all through the race.

Other Uses

Another possibility in the use of remotely controlled cameras is in outdoor news pickups. As described in the chapter on the mobile unit (Chapter Seven) it is common practice to focus cameras remotely. It should be just as simple to pan or elevate cameras in the same way. This might mean that cameras could be installed in key positions and the output of the camera could be made available without a crew of men being present. Cameras could be permanently installed at airports, depots, busy street corners, and any other place that might provide last minute news. The pictures from these cameras could be taken at will through lines to the master control room.

A television camera in the nose of a plane and the pictures received on the viewing screens at the control point in recent tests. The results possible through the use of television cameras in robot planes are clearly evident.

RCA has already put on the market a light serviceable camera for commercial use. If the manager of a large plant wanted to see at any time what was going on in various parts of the building

or if he wanted to check his production line it would be a very simple matter, if he had an intra-factory television system. With television he could look where he willed whenever he wanted. Along these same lines private television systems will probably be used extensively throughout large department stores. There have been several operational plans suggested but it is obvious that television viewing screens throughout the store could call attention to articles on sale in all departments and a system of this kind should do a great deal toward increasing the overall sales of the store.

Background Projection

One of the big advantages that will be available to live studio productions of the future will be the use of background projection. Undoubtedly this operation will take a very prominent place in every program. Just as "process shots," as they are called in Hollywood, bring Cairo and the South African jungle, the Taj Mahal and the Himalayas to the picture lot, so too will the far places of the world come to the television studio. Background projection, to the uninitiated, means throwing a scene by means of motion picture projectors on a translucent screen thus replacing ordinary scenery as the actors work in front of the projected scene. Many of the big scenes in motion pictures are made in this way and its use in television opens up new vistas of what can be done from a scenic point of view. Instead of thousands of pieces of scenery tomorrow's scene dock may become rolls of film in a tin can.

Comparatively very little has been done in experimenting with motion pictures as a source of background scenery for, as explained elsewhere, a special shutter is needed on the television camera to synchronize the twenty-four frame per second motion picture to the thirty frame television camera. Again perfect synchronization must be achieved between the rear projector and the camera or we might see nothing but a blank screen because of the intermittent operation of a motion picture. In Hollywood the projector and the camera are locked together by synchronous motors so that the camera shutter opens only when the projected picture is on the screen. Some adaption of the same process

The exterior scene behind Jean O'Neil was projected on a translucent screen from a stereopticon slide.

can be worked out for use in the television studio.

The proof that projected still picture backgrounds can be used, has already been demonstrated. Two factors limited the development of this type of pickup: first, the size of present day studios and secondly, lack of sensitivity of the old iconoscope. In spite of this, still pictures projected on a screen have been used successfully as scenery with the actors appearing in front of the projected picture. The high light level required to see the actors in front of the screen made it necessary to install a very strong light in the projector. The heat generated by the lamp was so high that special cooling devices had to be installed to prevent

the slide from breaking. But this was overcome and the operational proof of the feasibility of background projected scenery was demonstrated. Studios of tomorrow should be designed to provide space for pickups of this kind. Naturally the size of the picture projected will depend on the distance of the projector from the screen so that considerable physical space is required in the studio. More sensitive pickup tubes will mean that the key lighting in front of the screen can be lowered and a sharp clear picture should easily be attained. To switch from a scene in a ballroom to a feudal castle will not mean hours of work building sets but simply another slide in the projector. The possibilities this procedure opens up are unlimited.

Electronic Superimposition

Another interesting possibility for tomorrow that is as yet only an engineering promise, but men who know tell us it can be done, is to take the scenery entirely out of the television studio. The procedure would be that, if a scene in a park were wanted, a mobile camera would be set up in front of a predetermined outdoor scene. Measurements, with relation to each other, of trees, benches, and other physical properties would be made and their positions chalked out on the studio floor. Then the actors would assemble in the studio and enact the scene in front of a black drop. The output of the two cameras, the one in the park picking up the scene and the one in the studio picking up the actors would be blended together, fed into the same circuit, and the audience would see the actors playing the scene in a real park. If this can be accomplished and we are told that it can be, it is possible that a great deal can be done in cutting down on production expense. It may be possible through further development of this theory to put live actors in miniature sets or even in front of sets projected into the system from slides. We know this can be done by background projection but it may some day be done electronically by projecting the slide directly into a camera and then putting the actors in front of it. Another program possibility is to combine the use of either mobile unit pickup or film with action in the studio. We might show a roadside stand in the

studio but so arrange the electronic circuits that this stand only took up two thirds, or any percentage that we wanted, of the television picture screen. In that part not used in the studio picture we might show automobiles traveling down a highway past our roadside stand. The moving automobiles might be on film or be actually picked up by a remote camera. Experiments have already been made successfully of pickups of this kind.

The Upper Frequencies

There is very little doubt in the minds of those who have investigated the subject, that the real future of television lies in the high frequencies. In 1950 all the stations in the United States were operating on channels lying between 50 and 216 megacycles. It was quite apparent that the thirteen channels assigned to television were inadequate to give this country the video service it will some day demand. The Federal Communications Commission had arbitrarily assigned certain channels to various cities and communities and it was on these channels that all the television stations in existence were operating then. Working on the premise of providing the best service possible to the greatest number of people, the thirteen television channels had been so apportioned that it was possible to have some four hundred television stations in the United States. Compared to radio's 900 A.M. (amplitude modulation) stations, and with channels provided for many more F.M. (frequency modulation) transmitters, the television situation was woefully inadequate, but with the necessity of channels six megacycles wide there was no way to provide for any more and still allow workable space in the lower part of the spectrum for other services.

It was with the idea in mind of providing additional space for television that the commission set aside the frequencies between 480 and 920 megacycles for television experimentation. In this segment of the spectrum twenty-two television channels not six megacycles but twenty megacycles wide if necessary have been reserved. It is within this space and on these channels that the future of television lies.

One might well ask: If we are to go there eventually, why not

now? When experiments were first made in the lower frequencies the problem of lack of space in the spectrum was not considered as important as the problem of broadcasting a picture, but almost immediately that situation changed and those in charge of regulating the future of television realized the soundness of the question quoted above. Seeking an answer, experimental stations operating in the ultra high frequencies were put on the air. The results attained have proved that they are definitely feasible. Their success opened up the whole realm of the upper frequencies. The limitation of only a certain number of stations has been removed. If we were to have color and three dimensional television we had to have more space and that answer has been found. It may be necessary to broadcast on both the high and low frequencies to prevent sets already in the hands of the public from becoming obsolete, but that is a simple matter. With stations operating in the ultra high frequencies we should see television stations in all the comparatively small cities of the United States. While their coverage will be restricted, the price of the transmitter will be greatly reduced and the possibility of taking television out of the "blue chip" category seems possible. Cheaper installations will mean many more television stations, more programs, more hours on the air and more employment.

Everything considered, it is safe to say that the future holds unlimited possibilities for television. Future developments will make everything we are even thinking of today seem antiquated and dull. In television tomorrow holds a glorious promise.

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JOBS IN TELEVISION

The number of people that will eventually be required in the production of television programs should provide ample opportunities for all those who desire to enter this field, but they must have the talents and the necessary training to be of value.

One musical program that was broadcast for an hour employed over one hundred and fifty people in its preparation and execution. Of course this particular program used a large orchestra, but even if we eliminate the musicians and break this feature hour down into separate fifteen minute units, we will find that television is going to require, on an average, very close to one hundred people to write, prepare the production and put it on the air. When we multiply this figure by the number of hours of broadcasting each day and then by the number of stations in each city that originate programs we begin to see the number of jobs that must be filled.

Television will offer employment to millions of workers, and it will not be limited to any one class of people. Before we even approach the operational schedule let us check off the people who will be involved in providing facilities. First, transmitting equipment must be manufactured. This means jobs for engineering designers and builders. It takes brains to design television equipment and it takes hours of labor to execute those ideas and turn them out as finished serviceable goods.

Hand in hand with transmitters will come the demand for receivers. Today it is estimated that there are fifty-nine million radio receiving sets in America. This gives us some idea of the number of television receivers we will have eventually. Again they must be designed, built, and serviced. This means thousands of jobs for the days ahead.

Operation

Just how many television stations we will see in operation can only be a guess but, whatever the number, thousands of engineers will be needed to operate them. The mere fact that every television station will require more employees than are needed in radio will make the medium more expensive and will increase the operating cost of the station; but much of this added cost will go directly to payroll which means more jobs and income for many more people. The industry should be a godsend to the youth of America, for television will require youth. Experience will, of course, be important but thousands of people in all lines of television work will be needed.

Writers

A great unexplored field lies ahead in writing alone. As said before, we cannot expect high priced successful writers in other fields to devote all their time to television. At its inception many people saw in this visual medium an immediate development that would quickly overshadow radio. It does not seem today that such will be the case. Too many things must be manufactured in all lines to allow television to develop as rapidly as it might under different economic conditions. It will grow rapidly but not to the extent that tremendous fees will be paid for scripts or actors in the immediate future. This means that the young writer will be in demand. He may throw aside many of the requirements of radio scripts and write for visual presentations. He may develop his own style and approach, for television will develop a means of presentation that we have not seen on the stage or motion picture screens. The vast amount of material that will be needed opens the door wide.

Actors

Radio, great as it is, restricted tremendously the number of jobs in America that called for actors. The movies were another restricting influence. Before sound pictures came into reality every major city and many comparatively small ones supported at least two theaters where actors were needed. Vaudeville was

popular. Dramatic stock companies flourished which gave opportunities to thousands of thespians. Theatrical road companies brought New York successes to the hinterlands. Then came the movies and radio. These two industries threw hundreds of actors out of their jobs, for a local theater with its group of performers could not hope to compete with Hollywood. Radio centralized its program production in New York, Chicago, and Hollywood. Within a decade we saw the almost complete extermination of dramatic stock companies, vaudeville, and "road companies." Theaters were torn down or taken over by the movies and the distribution factor of both radio and the motion picture industry meant that comparatively small groups of performers could entertain the world. It is true this left only the best and raised our standards of entertainment, but from an actor's point of view it was almost catastrophic in its effect. It no longer took many actors to entertain America when one radio program or one movie was seen or heard by everyone everywhere. While television will, we hope, hold the entertainment standard set by other media, it still will require many additional actors because of the vast amount of programs and material that must be produced. It will also take longer to prepare for television broadcasts. In radio a group of competent actors assemble for two hours and broadcast a dramatic program. In some cases many radio actors work as many as three radio programs per day. That can't be done in television. If dramatic serials are attempted it will mean that actors will be engaged on a weekly basis and they will devote most of that time to learning, rehearsing, and broadcasting one television program per day. Where ten actors were needed in radio at least twenty-five will be required in television to provide the same number of hours of program time on the air. It is only normal that radio actors will hold on to their present high paid positions as long as they can for, in spite of its advantages from an audience point of view, television cannot for some time hope to pay actors for one program a comparable amount to what they receive now on radio for three.

Thus television opens the way for young actors. It will be the proving ground for inexperienced youthful aspirants and from this group will come the future stars of America.

Directors

Many people have asked with justifiable curiosity, "Where are tomorrow's television directors to come from?" It is a question that cannot be passed off lightly. The answer is that they will come from all branches of the entertainment field. From radio, from the movies, from the theatre and from television itself. Many men who are directing today started only a few years ago as studio managers and assistant directors. They showed an aptitude that gave them their chance when the opportunity presented itself and promotion has been rapid for television is demanding more and more people in the program production side of the industry. But the majority of directors actively engaged in television had a well-rounded background in the entertainment world. For the most part they brought to television many years of experience from the theater, from radio, or from motion pictures—in many cases from all three. In view of the fact that television makes use of some of the normal production procedure from all three mediums, a director with experience in any one of them can find a place for himself in television. It is not necessarily true that a man with motion picture experience will do a better studio job than a radio or stage director. The first prerequisite is that he know a good show when he sees it and is able to make the best possible use of his television facilities to visualize it to his audience. If a show is bad in the theater the chances are that it will be worse on television. Television direction isn't easy. A director can only rest on his laurels after the show is off the air. It has often been said that in Hollywood a good cutter can make or break a director. This is still true, but in a different sense, in television; the director does his own cutting, which makes the job just a little more difficult.

In general, a television director must know how to cast and how to get the cast he has assembled to read lines as they should be read. He must know dramatic values and tempos and how to get a finished production in the studio. From radio he must know where and how much to cut to conform to the time limits of his broadcast and when to speed up and when to slow down the speed of his performers. From motion pictures he must know

picture values and how to achieve the best results through proper lighting and use of cameras. He must know when to cut, what shots to use and what to eliminate. Above all he must be able to handle some twenty-five to fifty people. He must know what he wants and how to get it in the least possible time. Time will always be of vital importance in all television program preparation and the highest paid director will probably be the man who can put on the best program in the least amount of time.

Naturally those who come into the medium in the hope of becoming television directors cannot at the outset have had very much actual television experience. That is true of all television program work, but employers will not demand it. All they will be interested in is the applicant's basic entertainment knowledge. They will be more interested in his potential development than his television experience. If his background is right he can learn how to produce television programs.

The Producer

The job demanding much more experience in the entertainment field is that of producer. The word is used as it is in Hollywood rather than in radio. This man is responsible to his principals, be they sponsors or network officials for the overall results attained on the program. He makes the decision as to how his budget will be broken down, and what the program content will be. He engages the director and the players. He decides what will be spent on scenery, costumes and all the component parts that go to make a good television program. As each program unit will be under the direct supervision of a producer it is obvious that we will need as many producers as there are programs.

The Cameraman

The man at the controls of the television camera today is, because of the nature of program production procedure, in a different position than his counterpart in the motion picture industry. We might say that a picture director tells the cameraman what he wants and the cameraman gets it for him. This basically is true also in television. The cameraman is responsible for proper focus, lenses, stops, and artistic picture composition; but the

speed of the whole operation is so rapid, and the cutting together of the output of all the cameras in the studio is so important, that the man who sees the overall result of the shots picked up in the studio on his various monitor screens in the control room, is in a much more advantageous position to decide what should be done in the studio than the individual camera operator. Right or wrong the procedure today throws the full weight of responsibility of picture subject matter on to the director. The cameraman is responsible for a good sharp picture at all times. He must be able to take his cues for camera movement and placement through his telephone head set and immediately deliver the picture wanted. He can of course and is to some extent at liberty to decide the precise angle to shoot from; a director must rely on his cameraman for that. A very slight change in a camera's position, especially in close-up, may benefit a picture immeasurably. Television cameramen should be able to think fast and to take advantage of any pictorial possibilities that appear. They must work rapidly and get their shots in a relatively short space of time.

Today, the chief studio engineer has usurped the position of chief cinematographer in Hollywood. It may be that we will see experienced cameramen come in to their own and take their place beside the director in the control room. The electrical engineer was the logical man for the job in the early days, as the electronic picture was more important than the artistic one; but when the system is finally set so that electronic operational procedure becomes more nearly routine, we will become vastly more interested in picture composition. A good cameraman, instructing his assistants in the studio, who is capable of delivering to a director the most artistic pictures possible, when he wants them, should do much to improve any television production.

The outside cameraman on sport and news pickups, as well as on all unrehearsed programs, has a much greater responsibility and much more latitude in what he picks up with his camera than the men in the studio on a rehearsed program where shots are set in advance. For the most part his camera position is fixed, but if at a ball game he isn't on the right play at the right time, he alone is responsible. There will be jobs for thousands of cameramen in television and they should find a place for themselves comparable to movie cameramen in the near future.

Studio Program Personnel

Obviously every studio, every individual program, must have an executive on the floor. He will function much as a stage manager in the theater. His responsibilities will include the proper placement of everything used in a production, the presence of the artists, costumes, properties, lights, and all the accoutrements needed. He must be able to intrepret how a given scene in a studio will look best in the viewing room. A man who knows his business can do a great deal to aid the pictorial value and smoothness of a production. He is in personal contact with the subject matter while the director is only seeing what the camera picks up. Slight changes in the studio sometimes help a picture tremendously. He can make or break a good show by seeing that everything in the studio functions perfectly.

It goes without saying that television will also need hundreds of competent make-up men, costumers, scenic designers, painters, carpenters, electricians, property men, and grips. The industry should give employment to many thousands of people in these lines of work. Experienced artisans will find employment first but if the supply of experienced men is exhausted, television will train new ones.

Lastly television will need hundreds of good executives—men with sound judgment who will decide how the medium shall be handled, what the public will see, and how it will be presented. On these men will rest a great responsibility and the industry will welcome men who are capable of doing a god job.

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A SUMMARY OF TELEVISION PROGRESS

In many respects the history of television follows closely the development of other important inventions. Very few of our modern conveniences, that we accept today without a thought, came into general use without a struggle on the part of those who sought to prove their advantages to the public. While television has had comparatively few viewers who were willing to

forget all about it and go back to radio or took the "go get a horse" attitude that greeted the early automobiles, television has taken longer to launch and has cost more money on the part of those who believed in it, than any other modern invention. But, in spite of the delays caused at first by a lack of knowledge and later by war, television has advanced.

Early Historic Dates

The first date that is in any way associated with television is 1817. In that year Baron Jons Jacob Berzelius, a Swedish chemist succeeded in isolating selenium. This date is an important one for the discovery of selenium made television possible some hundred years later. Though he had discovered a material capable of changing light energy into electrical energy neither he nor anyone else realized it, nor did they have any intimation of the importance of his discovery or the part it was to play in the history of the world. This day was the beginning but also marked the first setback in the development of television for the discoverer of selenium knew nothing about photo-electricity. Nevertheless the "germ" of television had come into existence.

The next step was the accidental discovery that selenium would react to light. It had been used in electrical circuits as a resisting substance to limit the flow of current and, in 1873, a telegraph operator by the name of May noticed that the flow of electricity through the selenium varied with the amount of light shining on it. This meant that light energy could be turned into electrical energy and scientists were quick to see the possibilities of such a fact. Shortly after May's discovery the early development of television began both in Europe and America. All of these experiments were centered around the possibility of finding a means of controlling the characteristics of selenium and putting them to work. An early idea involved the construction of a group of closely assembled selenium cells and then throwing a picture on them of varying brightness. As each individual cell would release electrical energy in proportion to the amount of light thrown upon, it seemed possible to send a picture by means of such an arrangement, if each cell was connected by wires to

a corresponding lamp. (See drawing, page 80.) The idea was discarded due to the thousands of wire lines necessary to provide a good picture.

A Step Forward

In spite of this setback the idea of television was still alive. In 1880 the principle of scanning was suggested. This meant breaking the picture down into small segments and then sending them, one at a time, to the receiving point where they would be reassembled. Maurice Le Blanc suggested this basic principle and he proposed to accomplish it by means of a system of revolving mirrors. Then, in 1884, Paul Nipkow took out a patent in Germany for scanning a picture by means of a spinning disk with holes punched near the edge in the form of a spiral. When the disk was rotated the eye could see only the top line of the picture through the first hole in the disk, the second hole scanned the second line and so on until the whole picture became visible line by line. The system was planned to deliver each line of a picture to a selenium cell behind the disk. As the cell would react to the amount of light thrown on it the strength of each signal sent would vary with the shades of black and white in the original picture. The process was reversed at the point of reception. A light source was to distribute the varying degrees of light and shade controlled by another disk spinning in exact synchronization with the one at the point of pickup. Variations of this principle were the basis of "mechanical television." But with the theory evolved, television again stopped. There was no means available to receive properly the rapid changes of light and there was no way to amplify the low level currents generated by the light cells.

Experiments with Electricity

The next important step came with the turn of the century. Scientists had continued their search for a means of developing Nipkow's principle and into their investigations electrical advancement began to appear as a possible aid. Photoelectric cells were built and demonstrated and, in 1895, Marconi had sent and received his first wireless signals. Karl Braun, using electricity for

the first time in conjunction with television, began work on a crude receiving tube in which he sprayed electrons on to a chemical substance within a vacuum tube. It was successfully demonstrated that the stream of electrons could be reduced to a fine point and directed as desired by means of magnets. This tube was the forerunner of the receiving tube we have today. In 1907, using this tube as a receiver, Boris Rosing, a Russian, patented a television system; but the pickup equipment was still mechanical. Shortly after this the idea of a full electronic system was suggested by A. A. Campbell-Swinton. Then came World War I and television development stopped again.

With the end of hostilities research was resumed and improvements in Dr. Lee de Forest's three-element vacuum tube, which had been developed during the war, gave impetus to the work. Demonstrations were given in 1925 by C. F. Jenkins, an American, and John L. Baird, a Scotchman, using the mechanical scanning system. Based on the success achieved by these two men, one in America and the other in England, television started forward again. Regular demonstrations in this country began around 1926 and for almost ten years interest was high. The system used was a development of the scanning disk for picking up the picture while the receiver was electronic.

Programs on the Air

Naturally, American manufacturers of electronic equipment were interested in this new medium. So was The Bell Telephone Company. This company successfully demonstrated the possibility of sending pictures by wire as early as 1927 and, in the following year, using a long wave radio signal as a carrier, subjects were televised in London, broadcast from there, and received here. During this period several long distance demonstrations were made and, in May, 1928, radio station WGY in Schenectady, went on the air with a regular program schedule. Programs were broadcast three days each week and on September 11 of that year the first complete dramatic program ever to be broadcast in this country by means of television, went on the air. The play, a one-act melodrama, was a piece entitled "The Queen's Messenger."

It was not long before other companies began to realize the potential possibilities of television. The end of the year 1931 saw five television stations with experimental programs on the air. They were General Electric in Schenectady, RCA-NBC, CBS, and Gimbel Brothers in New York and Don Lee in Los Angeles. All of these stations were using some variation of the mechanical scanning system with a one hundred-and-eighty-line picture. Eventually the line structure was raised to two hundred and forty lines but that was the highest definition achieved by this system.

These regular schedules on the air were of comparatively short duration for by 1932 every station had discontinued their transmissions. The reason for the termination was obvious as the experiments had proved that the limits imposed by the scanning disk were such that the perfection needed would never be attained as there was a definite limit to the scanning speed that could be developed with mechanical pickup equipment. Seeing the impossibility of developing a workable commercial system. the stations went off the air. Television stopped again and went back to the laboratory.

The Beginning of the Electronic System

The success attained, meager though it was, strengthened the belief in the minds of those interested that television could be made a commercial reality if higher definition pictures could be produced. Already new discoveries were pointing a way to accomplish this. In 1923, Vladimir K. Zworkin had filed a patent application on the first form of the modern television camera tube. He called it the "Iconoscope" from the Greek words, "icon" —image and "scope"—to observe. Shortly after this he demonstrated a tube for televising a scene without any mechanically moving parts. He had also demonstrated a receiving tube, the "Kinescope," which was all electric in its operation; but so far this device had been used only in conjunction with mechanical scanning. In the interim he had gone on with the development of his electronic pickup tube. Other inventors were also working along the same lines and Philco T. Farnsworth developed an electric camera tube that he called an "Image Dissector."

In the meantime, Baird and others had been active in England and in 1935 it was recommended that the British Government establish a short wave television system as a public service. The year 1936 saw the start in England of regular television transmissions with the use of a full electronic system. The number of hours on the air was limited, but a regular service was established.

Here in America we were as yet a long way from any regular service. Experiments had been made using the electronic system with a 240-line picture, but to really improve the mechanical system it was obvious that a better picture must be delivered and development work was begun to accomplish this. In 1936, RCA broadcast the first television picture using the electronic system to deliver a 343-line image. Shortly after this Don Lee, CBS, and the Zenith Television Corporation began making plans for electronic broadcasts. For the next year or two no regular schedules of any moment were attempted but many experimental programs were broadcast. The line structure of the picture was raised to 441 lines and the overall detail of the picture was improved. The year 1939 seemed, in the minds of many, the real starting point for television in America. NBC began a regular program schedule of fifteen hours per week. Zenith inaugurated a regular schedule in Chicago. Don Lee was on the air regularly in Los Angeles. Manufacturers offered receiving sets for sale to the public. Imposing demonstrations were given daily at the New York World's Fair. The stage seemed set for television.

Television in England

While America had been getting ready Europe had gone ahead and by the summer of 1938 was far in the lead. The BBC had studios in Alexandra Palace and had two years of program experience behind them. Their program schedule at that time included an hour of film each weekday morning for dealer set demonstrations. An hour of live television in the afternoon every day except Sunday, and from one to two hours every evening for a total of over fourteen hours of live studio programs each week. The permanent staff, devoting their time exclusively to television, was approximately three hundred and sixty-seven people. Some six thousand receiving sets had been sold and plans were

under way for extensive additions to their studio facilities. Shortly after this program quality was improved, public interest became much more evident, and the sale of sets jumped considerably.

Between 1936 and 1939 the English television audience had seen variety, drama, music, and educational programs from the television studios. They had seen the Coronation procession of King George VI and Queen Elizabeth, plays telecast directly from the stage of London theaters, the English Derby from Epsom Downs, the Oxford-Cambridge boat races, tennis at Wimbledon, and many other outstanding events.

Holland

In Holland the most significant television activity of importance consisted of public demonstrations given by means of a completely mobile unit. The cameras and receivers were transported from city to city to public fairs and other gatherings; at every showing there was considerable public interest. The ironical part of the whole thing was that the company who inaugurated these demonstrations did so to show to the people of Europe that television was not sufficiently developed to make it worthwhile as a public service. They attempted to demonstrate this fact with a picture, better perhaps, than the one the BBC was broadcasting in London.

Germany

At the 1938 radio show in Berlin television was very much in evidence. Four different makes of sets were offered to the public with pictures varying from 7 to 16 inches in size. Two companies, "Telefunken" and "Fernseh Ag" had large screen demonstrations. The Germans had been using a mechanical system but were then changing over to the full electronic operation. A limited program service was on the air. Television telephone service was in operation and was open to the public between Berlin, Leipzig, and Munich. Anyone planning to use this service would notify in advance the party they wished to talk to who would come to the post office at the appointed hour and then by means of television both parties saw as well as heard each other.

France

In France the mechanical system which had been in use for regular transmissions was being discarded. Because of the stationary nature of the French mechanical camera, close-ups were achieved by moving the whole set, be it a room, a garden or whatever the play called for, up to the camera. The entire stage was on a movable base. The impracticality of the whole thing was self-evident to anyone, so the advent of the electronic system was looked forward to with considerable rejoicing on the part of those involved in producing programs. Good electronic receiving sets had been developed and with the antenna on the Eiffel Tower, French television enthusiasts anticipated a new era.

Then came the outbreak of war. The BBC closed their studios and development everywhere in Europe ended. In the United States television continued, but from 1936 to the present time it has undergone growing pains, perhaps unequalled by any other new industry. It has started and stopped and then started again. It was for a brief period authorized as a commercial medium. This status was then cancelled to be authorized again later. Frequencies have been changed, necessitating changes in transmitters and receivers; the war has intervened. Arguments for and against television have made themselves felt. The unexpected results experienced through transmissions by stations in various parts of the country raised more questions concerning the allocation of frequencies that had to be answered.

The Problem in America

The motivating force behind all the delays in regulations has been a desire on the part of the FCC, the manufacturers, and the broadcasters to establish an American system of television that would do the most good for the greatest number of people. Many manufacturers were anxious to go ahead as early as 1938. As a matter of fact sets were manufactured and placed on sale But the first advertisement that stated that television was ready and that sets were on sale brought down severe criticism by the FCC. They felt that if thousands of sets were purchased by the public it would be impossible to change the standards later.

The result was that while some few thousand sets were sold, television is only now experiencing a complete go ahead on the part of everyone in the industry.

From the first the possibility of improvements in the system was one of the main stumbling blocks. The false starts with mechanical television and the improvements evident in the electronic system were conclusive evidence that better and better television could eventually be developed. What to do in the meantime was the burning question. Definite factions and lines of thought were developing and the whole American situation was far from what it should have been.

In 1939, NBC, Zenith, and Don Lee were on the air with regular schedules. In September the BBC went off the air. In November the General Electric Company began tests. The FCC authorized nineteen television channels for experimental broadcasting but forbade any commercial operation in which fees were charged for the use of facilities.

In February of 1940 the FCC approved limited commercial television operation effective in September. In March the order was rescinded and a new hearing was set for the following April. Confusion as to where television was going was evident on all sides. Some people bought sets, others decided to wait. In that same month General Electric rebroadcast pictures in the Albany-Schenectady area that originated in New York, starting a service that has been continued with some few interruptions ever since. The Philco Radio and Television Corporation went on the air to broadcast the Republican National Convention to those sets in the Philadelphia area, with NBC releasing the pictures in New York.

In September the Columbia Broadcasting System demonstrated three-color television. The argument immediately started over whether to go ahead with monochrome or wait for color. In November the Allen B. Du Mont Laboratories went on the air with experimental tests in New York. In January of 1941 Balaban and Katz began experimental broadcasts in Chicago. In May, FCC issued new rules, set up new frequencies for channels and authorized commercial television to become effective on July 1st.

The change in channels meant that all the receiving sets as well as the transmitters on the channels affected had to be altered. Incidentally, television lost a channel in this new alignment, the channels available were reduced from nineteen to eighteen. Only seven were in the relatively lower frequencies, however, and nothing had been tried on channels in the upper frequencies.

Commercial Television at Last

On July 1, 1941, commercial operations began with NBC and CBS on the air with fifteen hours of program per week. More sets were sold until the television receivers in the New York area were estimated to be around six thousand sets. Some few hundred were in the Albany-Schenectady area, some in Chicago and somewhere in the neighborhood of a thousand in Los Angeles. Then came Pearl Harbor. No one knew exactly how our entry into the war would affect television but they soon found out. At first the possibilities of the medium as an aid in training air raid groups and other civilian war workers was utilized, but the war soon began to make inroads in technical personnel and equipment. In January, Zenith discontinued their broadcasting operations. In June, CBS reduced their program schedule to four hours per week, while Du Mont inaugurated a regular weekly service. In September, Television Productions began operations in Hollywood and two months later CBS discontinued service altogether. In April of 1943 a policy of accepting commercial programs produced by advertising agencies for broadcasting was in augurated by General Electric and in May the same policy was decided on by Du Mont.

In the midst of all this stopping and starting the overall television picture was not good. No new sets were being manufactured as everything that was produced went to the armed forces. Old sets were wearing out and no new tubes were available. The final answer as to what was eventually to happen to television was reached in 1944. The FCC asked the entire industry to get together and submit a working plan. This resulted in the formation of the Radio Technical Planning Board, composed of the outstanding men in the electronic field. Their findings were accepted by the FCC as the basis of television operations.

In May, 1944, CBS resumed a program schedule of four hours

per week, and during the following year and a half programs were broadcast every night by some one of the three stations operating in New York. During the next four years television finally started and continued its advance until today we have over a hundred stations in operation in the United States. Almost fifty per cent of them are connected by some type of network facilities, and there are over seven million receivers in American homes. This vast growth took place even though the FCC suspended the acceptance of new station applications until a final decision was reached as to the higher frequencies. Meanwhile color tests were being made, and in October, 1950 the FCC authorized CBS to start commercial color transmissions on November 20.

This announcement started a controversy of major proportions in the industry. Both RCA and Color Television, Inc. had held comparative tests before the FCC in Washington. When the CBS system was accepted, protests were made by most of the prominent set manufacturers, as none of the sets in the hands of the public would receive broadcasts in color without the addition of a converter. Nor could color transmissions be received in monochrome unless an adapter was added, because the CBS color system operated on a different line standard than that used for black-and-white. It was feared that this decision would affect the sale of receivers, as the public might be undecided as to whether to buy black-and-white receivers or wait for color.

All this is now history.

Television in the last few years has demonstrated definitely just what a wonderful medium of communication it really is. The successful advertising results to sponsors, the financial success of dealers, the increased revenue to stock holders have removed the limitations that seemed for a while to be almost insurmountable. New channels mean more stations and more stations mean a greater demand for programs. Programs need actors, ideas and program and engineering personnel. All these contributing factors mean more sets in the homes of the American public. Interworld television is only around the corner. Television is still very young but it is swiftly emerging in the minds of everyone as the wonderful medium it really is. Nothing can stop television.

A TELEVISION SCRIPT

The following television shooting script is not included in this book as a criterion of dramatic material. It is intended simply to illustrate the complete operation involved in putting a script of this kind on the air. Individual directors might use different camera routines, program managers might not like the story, but the constant flow of pictures in unbroken continuity is common to all dramatic television productions.

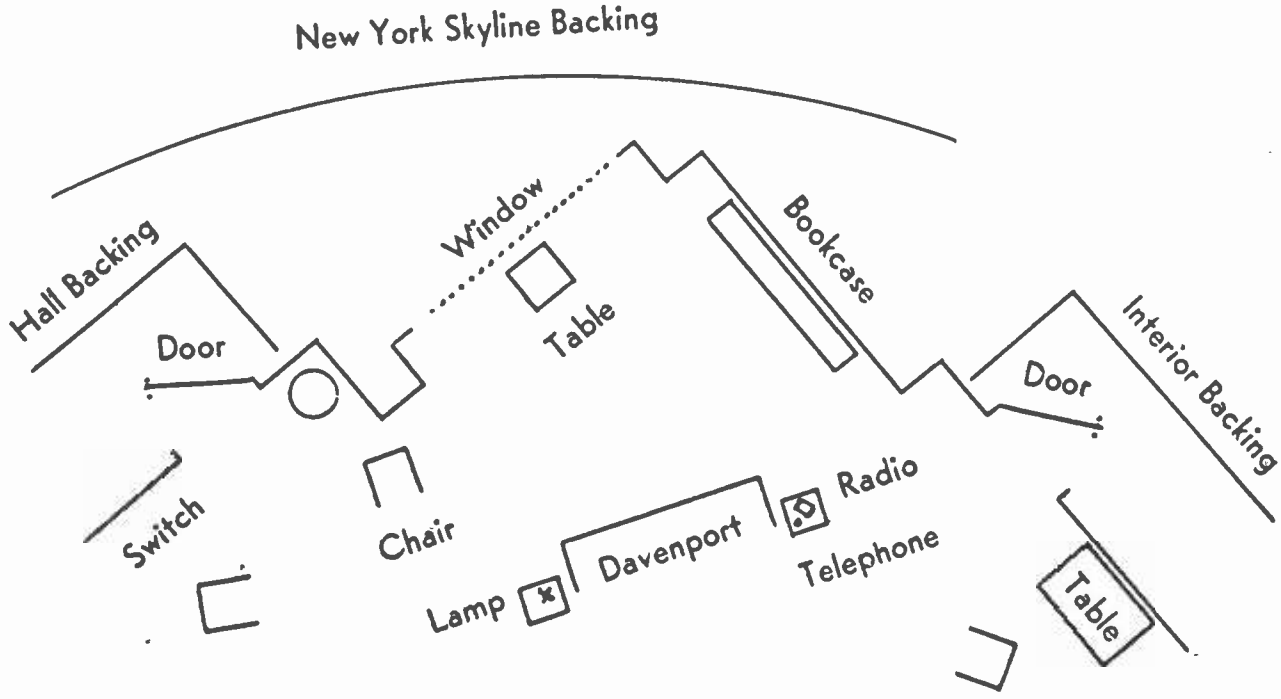
WHEN TOMORROW COMES

A Sample Television Shooting Script

From a story suggested by Julian Funt

The scene is a New York bachelor apartment.

Down stage R is the hall door. Below it a light switch, above it a small table. Up C a large window looks out on a typical New York skyline. A plant on a stand in the window. A book case up L and below it in the L wall a door leads to the balance of the



Studio Set for WHEN TOMORROW COMES

apartment. Another table below this door. In the C of the room is a large davenport. At its R end is a small table with an unlighted (practical) electric lamp. At the L end of the davenport is another small table on which are a radio and a telephone. There are comfortable chairs down R, up R.C. and down L. It is early evening and the moonlight streams in through the window on to the couch. The radio is heard softly.

The camera routine is laid out for a wide-angle lens on camera #1, to work C on a dolly. Cameras #2 and #3, will be equipped with close-up lenses and work R and L of number one.

Camera directions will be indicated from a point facing the actors while stage directions will be from on stage, facing the cameras. Thus stage R is the camera's L. All shots and movements of cameras while on the air are indicated in capital letters, while ready cues are in parenthesis in small type.

Preview
Camera #2
(Close-up of Bill)
Camera #1
(M.S. Bill)

START MUSIC — Popular melodic air.
CAMERA #3 TITLE — *(Moving title to read as follows)*

Start title machine
FADE IN #3

WHEN TOMORROW COMES

BY

DOROTHY ERWIN

BILL . . . JAMES TAYLOR
HELEN . . . ROSE NORTON
TERRY . . . . JOHN LEHE
THE PLACE . NEW YORK CITY
THE TIME 1945

LAP DISSOLVE TO
CAMERA # 1. M.S. Bill
(#3 ready M.S. door down R.)

Bill is seated on the right end of the couch. He fumbles nervously with the knife on the end of his watch chain. He is obviously under a tremendous mental strain. He rises. Buttons his coat. Half turns toward the window. Changes his mind. He sits again. Reaches over and turns off the radio.

CAMERA #2 C.U. BILL

STOP MUSIC

(#1 pulls back to cover door R and couch L.C.)

(*A key is heard in the lock of the door R.*)

(*Bill freezes as he hears the key*)

BILL: (*In a panic*) Who's there?

CAMERA #3 M.S. DOOR

(*We see the door before it opens*)

The light from the hall streams in as it opens.

BILL: (*Off Camera*) Who is it?

(#2 pulls back a little)

TERRY: (*Standing in doorway*) Just me, Bill.

CAMERA #2 M.S. BILL

BILL: Come in. (*He sinks back on the couch*)

CAMERA #3 M.S. TERRY

TERRY: (*He closes door and presses light switch below door.*)

LIGHTS UP FULL

What are you doing here in the dark?

(#2 in a little)
CAMERA #1, FULL SHOT OF ROOM

(#3 ready C.U. Terry.)

CAMERA #2 C.U. BILL
(#1 in a little)

CAMERA #3 C.U. TERRY

CAMERA #2 C.U. BILL
(#3 back to get M.S. shot of Terry as he rises.)
CAMERA #1 BOTH MEN

(#2 back a little.)

BILL: Nothing, I—
TERRY: (*Throwing his hat on table above door.*) What's the matter, Bill?
(*Xing toward couch*)
BILL: I thought for a moment that you were—
TERRY: That I was who? (*He starts to swing chair below window to C.*)
BILL: (*Slowly*) Helen.
TERRY: (*He stops his action on Bill's speech.*) Helen! Is she in town?
BILL: (*Breaking the tension that has existed up to now.*) Yeah. She got in today. She phoned from the station.
TERRY: (*He swings chair to L. of Bill and sits.*) (*Sympathetically*) Are you sure that you want to go ahead with this, Bill?
BILL: Definitely.
TERRY: She's going to take it pretty hard.
BILL: There isn't any other way.

TERRY: Ah Bill—

BILL: (*Hard*) No Terry. I'm going through with it.

CAMERA #3 M.S. TERRY

TERRY: (*He rises*) I don't envy. you your job. Oh, why did this have to happen? Why did it have to be you—and she's such a swell girl.

BILL: (*Bitterly*) Cut it, Terry.

TERRY: When is she coming?

CAMERA #2 M.S. BILL
(#3 ready on door R.)

BILL: She's on the way up here now. She ought to be here any minute.

TERRY: Then I'm getting out.

BILL: You might at least wait till she gets here.

CAMERA #1 BOTH MEN
DOOR BELL RINGS
(#2 back to get Bill and Helen.)

TERRY: (*Sits again*) O.K.
(*Bill looks at door*)

TERRY: (*Watching Bill*)
(*He rises*)
Well, this is it.
(*He X's to door and opens it. Helen stands in the door way.*) (*She wears a W.A.C. uniform.*)

CAMERA #1 PANS WITH TERRY

CAMERA #3 M.S. HELEN AND TERRY
(#1 pulls back to include couch and door.)

(*Casually*) Hello, Helen.

HELEN: (*Very cordially*) Why Terry, you old tramp you. I didn't expect to see you here. When did you become a civilian?

TERRY: (*Opening door wide and stepping above it*) About a month ago.

HELEN: (*She sees Bill.*) Oh Bill. (*She X's to him impulsively*)

CAMERA #1 AS SHE X's
(#3 in for close shot Helen and Bill.)

BILL: (*Who has risen*) (*Very coolly*) Hello Helen. It's nice to see you again.
(*Terry closes door R and X's above them to door L.*)

HELEN: Nice to—(*She stops—chilled by his reception.*)
Then it *is* true. Everything you said in your letter is *true.* I couldn't believe it. (*Again impulsively*) Oh Bill, it can't be. After everything we've had together, England—those nights just outside London— Oh Bill—

BILL: I'm sorry Helen.

TERRY: *(He exits door L.)*

CAMERA #2 M.S. HELEN AND BILL

HELEN: *(Ignoring Terry's exit)* You're sorry. I'm not. I wouldn't give them up for anything.

BILL: I didn't mean that.

HELEN: What did you mean?

BILL: That I'm sorry I had to write you that letter.

HELEN: *(Pulls him down on the couch beside her)* Bill you can't mean it. What happened? What have I done?

BILL: You haven't done anything.

HELEN: You mean—that you have?

CAMERA #3 C.U. HELEN AND BILL
(#1 in for C.U. of both)

BILL: Yes. You see—I've—I've changed, Helen.

HELEN: I never thought you would. You gave me something—something I've never lost and never will—but it will always be incomplete without you.

(#2 in for C.U. of Helen)

BILL: You'll get along all right without me.

CAMERA #2 C.U. HELEN
(#3 in for C.U. Bill)

HELEN: Get along? Yes, mebbe. But who wants to just get

along? Oh Bill. I don't mean to go on like this—perhaps I shouldn't have come here at all. My pride should have stopped me—but somehow I don't seem to have any. When I got your letter my world just seemed to stop. There wasn't anything left. Perhaps you don't realize what you meant to me.

CAMERA #3 C.U. BILL

BILL: I couldn't have meant anything that you can't forget. You're young—with the world before you. There are other fellows—

CAMERA #1 C.U. OF BOTH
(#3 moves to L and up stage.)

HELEN: Bill I just can't understand how you can look me in the eye and say things like that. Yes, you have changed. Somehow I didn't think it was possible. You've always been so fine, so real, so dependable. I always felt that I could count on you.

I never thought you'd let me down.

BILL: I'm not letting you down, Helen.

CAMERA #3 C.U. OF BILL INCLUDING HELEN FROM BEHIND HER

(#1 Back to include Helen as she rises.)

HELEN: How can you say that? You seem to forget that I love you. I don't care what you say or do I'll always love you.

BILL: You're making this kind of tough, Helen.

CAMERA #2 CLOSE UP HELEN

HELEN: *I'm* making it tough. What do you think you are doing to me? All the things we've talked about—our plans, our life together, you're tearing them to shreds. (*She rises*) Oh it isn't true—I won't believe it. (*Bill rises*) To end everything between us here—now—with a few words. In just a few seconds to destroy something beautiful.

CAMERA #1 ON BOTH

BILL: That's life, I guess.

HELEN: Life?

CAMERA #3 C.U. BILL

BILL: Yes. We plan and build and then suddenly everything is

changed. Nothing is the way it was and can never be again.

CAMERA #2 C.U. HELEN

HELEN: (*After a long pause*) OK Bill. If that's the way you want it.

BILL: I do Helen.

CAMERA #1 ON BOTH
(#2 moves to his R.)

HELEN: All right. But let me say this. No matter what happens—if things don't work out. If she—

BILL: Let's keep her out of it.

HELEN: Just as you say. But Bill, before we say goodbye, I want you to know that I think you are the grandest guy that ever lived.

BILL: Oh Helen! (*He moves toward her impulsively*)

CAMERA #2 C.U. OF HELEN OVER BILL'S SHOULDER
(#1 in for C.U. of both.)

HELEN: I mean it. I was nothing, a nobody. You gave me everything I have. Self-reliance — courage. You taught me how to find a place for myself. And I love you for it Bill. I loved you for something else too. No-

body ever meant to me what you did. I hoped and planned, now that the war is over, to have our home and— (*She breaks off*) Forget it, I won't bore you any longer.

BILL: You're not boring me.

HELEN: I guess you think I'm just a punk kid after all.

CAMERA #3 C.U. OF BILL OVER HELEN'S SHOULDER

BILL: I'll never think that after the job you've done. You've changed completely. You've grown up.

(#2 moves to get M.S. of Helen at door.)

HELEN: Are you trying to say that our love was just a kid affair? A war romance?

BILL: It was a fight against time Helen. Neither of us knew what was ahead of us. We both had a job to do and we did it. And now that it's all over, we still have a job to do.

CAMERA #1 C.U. ON BOTH

HELEN: Bill how can you say that? We've

#1 DOLLIES BACK KEEPING THEM BOTH IN PICTURE
(#3 ready on Terry at door.)

earned the right to be happy. (*Long pause.*) The right to to be happy. Yes, you've earned that right, Bill. I'm going now. (*She crosses part way to the door R.*) In a way I'm sorry I came. But I had to. Somehow I didn't believe those words you wrote in that letter. I had to hear you say them. And now that you have—Goodbye Bill. Lots of luck and—be happy. You're breaking my heart but I want to thank you for every thing you've given me. They were the happiest days of my life and even you can't ever take them away from me. Goodbye, Bill. (*She goes out the door R and closes it.*)

CAMERA #2 M.S. HELEN IN DOOR

CAMERA #1 ON BILL

BILL: (*He stands still a minute.*) Helen—my Helen. (*He X's toward the door R.*) I had to do it.

(#2 moves to get closing shot on Bill and Terry.)

(He turns and walks towards the couch. In doing this he walks directly into the small table at R of couch knocking it and the lamp over. It crashes to the floor. He feels helplessly for the couch—finds it and sinks down on it.)

LIGHTS DOWN

CAMERA #3 M.S. TERRY FOLLOWS TERRY TO COUCH

(The door L opens and Terry enters. The light from the door streams on to Bill on the couch. Terry X's to him.)

TERRY: *(Kneeling at his side.)* Bill—Bill.

CAMERA #2 C.U. BILL AND TERRY

BILL: She's gone, Terry. Gone. But I did it. She never knew I lied. She doesn't know I'm blind.

TERRY: Blind or not Bill, you're still one hell of a guy.

FADE OUT CAMERA

The picture fades.

A GLOSSARY OF TERMS

ASPECT RATIO—The ratio of width to height in a frame.
AUDIO—Pertaining to sound transmission, from the Latin, meaning "I hear."
BLACK SCREEN—Nothing visible to a viewer on his receiving set.
BLANKING—Elimination from a television picture of the visible results of the action of the scanning beam as it returns from right to left.
BLOOM—Glare caused by an object reflecting light into the lens of the camera.
BRIGHTNESS CONTROL—The knob on the receiver which varies the average illumination of the reproduced image.
BUSINESS—Any action or movement in a dramatic program.
CAMERA CABLE—The wire that carries the picture from the camera to the control room.
CAMERA CHAIN—A television camera and the necessary electronic equipment to deliver a picture for broadcasting.
CAMERA TUBE—The tube that converts light energy into corresponding electrical energy.
CATHODE—The electron source in a vacuum tube.
CATHODE RAY RECEIVER TUBE—Vacuum tube for converting electrical energy into corresponding light energy.
CENTER (C)—A stage direction meaning the middle of a stage.
CENTER UP—To center the composition of a picture and bring it into proper frame.
CLOSED CIRCUIT—The picture is not broadcast, but fed to viewing screens at certain locations by wire. A private showing.
CLOSE-UP (C.U.)—A shot taken at close range in which the object or person practically fills the screen.
COAXIAL CABLE—A special type of cable composed of a copper tube with a single wire in its center capable of conveying television signals. A pair can provide 480 telephone circuits, or both the visual images and accompanying sound for television programs.
CONTRAST—Picture signal strength, similar to volume in sound.
CONTRAST CONTROL—The knob on the receiver for controlling the volume of signal received.
CONTROL ROOM—The room or location containing the monitoring equipment from which the program is both directed and controlled.
CYCLE—A unit of electrical measurement. One complete alternation of an electric wave.
DEFLECTION COILS—The electro-magnets in the yoke that control the scanning beam.
DIPOLE—A type of antenna used for reception of high frequency broadcasts.

DOLLY—A wheeled trucklike platform used to move the camera into different positions on the set.

DOLLY SHOT—A shot taken when the camera is moving upon a dolly.

DOUBLE—To play more than one part in a dramatic program.

ELECTRON GUN—Electron source for a strong and highly concentrated electron stream.

FADE-IN—The gradual appearance of a picture from total darkness to full visibility.

FADE-OUT—The gradual disappearance of the screen image from its full brilliance to total darkness.

FIELD—The scanning of every other line in a picture. Two fields make one frame.

FOCUS—A control for bringing the picture into the sharpest definition possible.

FRAME—One complete picture. Thirty of these are shown in one second on a television screen.

FRAMING CONTROL—A knob, or knobs, on the receiver for centering and adjusting the height and width of a picture.

FREQUENCY—The number of cycles per second.

FRONT PORCH—Difference in time from the start of the blanking signal to the start of the synchronizing signal.

GHOST—An additional and unwanted image appearing in a television picture as a result of signal reflection.

GOBO—A light-reflector used to direct light both in the studio and out of doors.

HEIGHT—Vertical adjustment of picture size.

HOT LIGHT—A concentrated light used in the studio for emphasizing features and bringing out contours.

ICONOSCOPE—(Slang: "Ike") A type of television camera tube developed by RCA.

IMAGE DISSECTOR—A television pickup tube developed by Farnsworth.

IMAGE ORTHICON—RCA's latest ultra sensitive pickup tube.

INTERLACING—A technique of dividing each picture into two sets of lines, one set transmitted after the other, to eliminate flicker.

KEYSTONING—Electrical compensation for difference in angle between scanning and optical path.

KILOCYCLE—A thousand cycles.

KINESCOPE—A type of cathode ray receiver tube developed by RCA.

LAP DISSOLVE—To fade the picture from one camera out as the picture from the other camera is faded in, overlapping one picture on another.

LEFT (L.)—A stage direction, meaning to the actor's left as he faces the audience.

LEVEL—Measurement of an electrical circuit.

LINE—A single scanning line across a picture, 525 lines make a complete television frame.

"LIVE" TALENT—Participants in a program picked up directly in the studio.

LONG SHOT (L.S.)—An establishing shot taken from a distance sufficient to include a complete view of the scene.

MEDIUM SHOT (M.S.)—A camera position from a middle distance. It might include an actor from about knee level to his head.

MEGACYCLE—A million cycles.

MICROPHONE BOOM—An adjustable crane which suspends the microphone.

MONOSCOPE—A pickup tube with a single picture; a test pattern or call letters, etched on the mosaic.

MOSAIC—A photosensitive plate in the camera "pickup tube." The picture is projected upon it by a lens and scanned by the electron gun turning the picture into electrical impulses.

"ON THE LINE"—A picture going to the transmitter for broadcasting.

ORTHICON—An RCA development of a more sensitive "pickup" tube. It requires less light than the iconoscope.

PAN—From the word "panorama." To swing the camera to the right or left horizontally.

PEDESTAL—Blanking signal.

PROCESS SHOT—A scene projected from the rear on to a translucent screen. The picture is then used as a background for studio action, replacing or forming part of the scenery.

REMOTE—A program originating outside of the main studio.

RETAKE—To rephotograph a scene in a motion picture.

RIGHT (R.)—A stage direction, meaning to the actor's right as he faces the audience.

SAWTOOTH—A wave of electric current or voltage used in scanning.

SCANNING—The action of the electron stream in traveling across the mosaic line by line in the camera pickup tube, thus releasing the electric charges held there.

SHADING—Eliminating electrically the undesired signals in a picture caused by scanning.

SIGN ON—To commence broadcasting with a statement of station frequency and power.

SIGNAL—Any form of intelligence transmitted by radio wave or wire communication.

SNAP SWITCH—An instantaneous cut from one camera to another.

SUPERIMPOSITION—To impose the picture from one camera on to the picture from another. To put the output of two cameras on the line at the same time.

SWEEP CIRCUIT—Scanning circuit.

SYNCHRONIZATION—The maintenance of exact timing between the electron stream in the camera pickup tube and the cathode ray tube in the receiver.

TELECAST—A television broadcast.

TELEVISION—The transmission of a succession of images and their reception in such a way as to give the impression of a continuous reproduction of a scene to a distant viewer.

TILTING—A vertical change in the position of a camera.

TRUCKING SHOT—A shot taken as the camera, on a moving dolly, picks up a scene.

VIDEO—Pertaining to the transmission of transient visual images, from the Latin, meaning "I see."

WALK THROUGH—A rehearsal in which all stage business is observed without cameras.

WIDTH—Horizontal adjustment of picture size.

WIPE—A picture is replaced by another by apparently pushing the first picture off the screen by the edge of another. The bottom edge of the top picture pushes the top of the bottom picture down off the screen. In a horizontal wipe the action is from the side of the picture. In a fan wipe it is semi-circular.

WOMP—A sudden surge in signal strength resulting in a flare-up of light in the picture.

X—A stage direction meaning to cross or move.

YOKE—The electro-magnetic control of the scanning beam in a pickup tube or receiver.

Here is what the critics say:

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Theatre Arts Monthly

The volume benefits greatly from the author's wealth of practical experience. . . . The chapters on programs are unsurpassed.

Journalism Quarterly

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About the Author

THOMAS H. HUTCHINSON, now actively engaged in New York as a television producer and director, has probably produced, directed and seen more television programs than any other man in America. He was a participant in the advent of television in America and studied at first hand the development of television in England, Holland, France, and Germany.

As television program manager and director for the National Broadcasting Company, the R. K. O. Television Corporation, Ruthrauff & Ryan, McCann Erickson and other metropolitan advertising agencies, he has produced over five hundred hours of television entertainment. He has, as well, an impressive list of "firsts" to his credit. He took part in the first electronic television demonstration in New York in 1936, directed the first one-hour commercial program and the first thirty-minute dramatic program in 1937, the first scene from a Broadway success (Gertrude Lawrence in *Susan and God*) in 1938, the first full-length drama (*The Donovan Affair*) in 1939, the first television demonstration in Washington, D. C., and the first motion picture produced for television for R. K. O. He directed the first commercial television programs for Lever Brothers, Macy's, and Swift. More recently he has directed TV programs sponsored by Sheffield Milk and The Whitehall Pharmacal Company.

He taught what was probably the first course in television programming and production at New York University and is now active in the educational field in conjunction with his commercial commitments. HERE IS TELEVISION is the fruit of more than fourteen years of active television experience.

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