

BEHIND THE SCENES IN TELEVISION

By David C. Cooke

DODD, MEAD & COMPANY · NEW YORK

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Books by David C. Cooke

HOW AIRPLANES ARE MADE

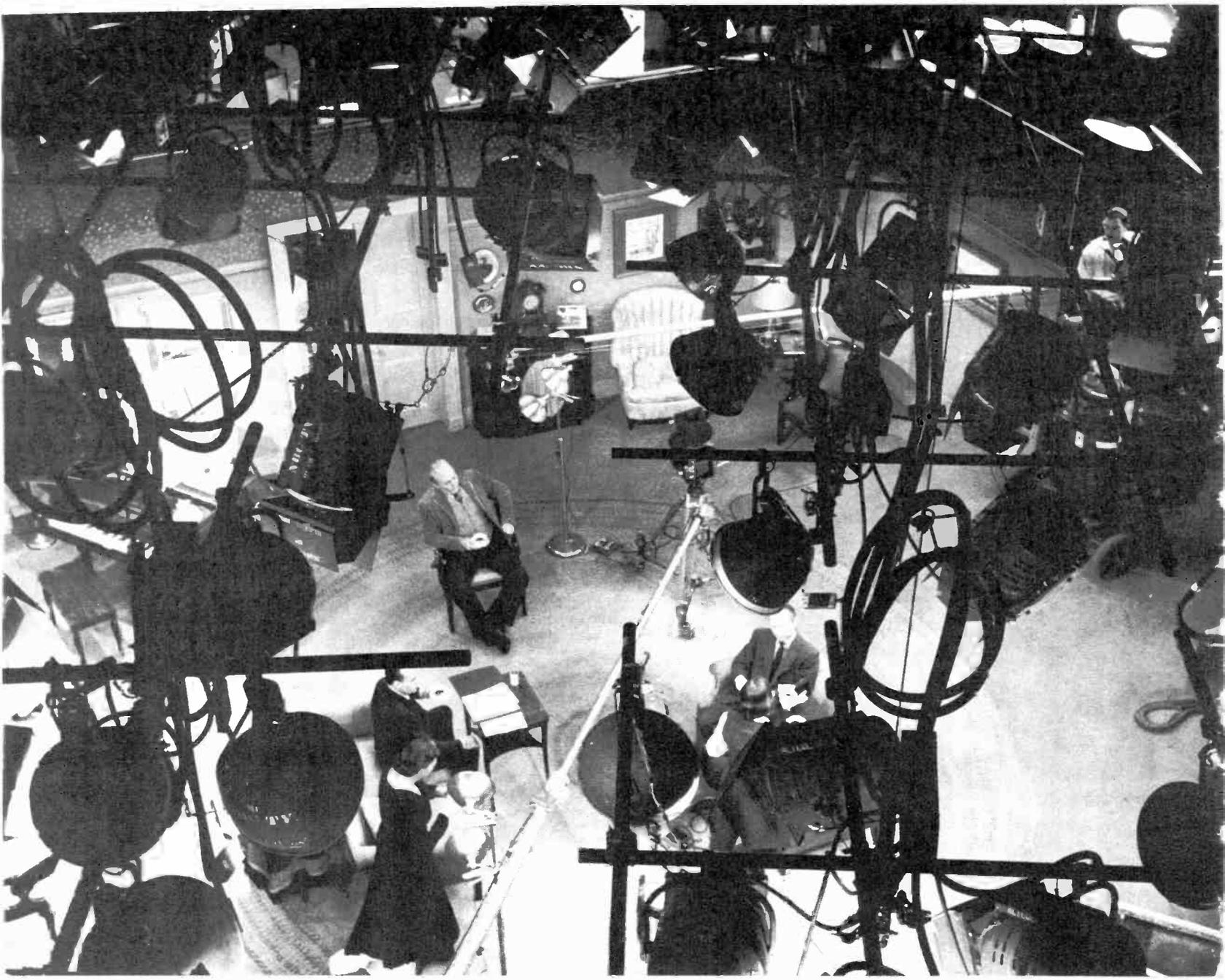
HOW AUTOMOBILES ARE MADE

HOW ATOMIC SUBMARINES ARE MADE

BEHIND THE SCENES AT AN AIRPORT

BEHIND THE SCENES IN TELEVISION

The author wishes to express his appreciation to the National Broadcasting Company for allowing him to tour every section of its studio at Radio City, New York, in search of information for this book. Special thanks are also due to Sid Desfor and Jack Zwillinger, who made arrangements to supply photographs, and to Milton Brown, who set up appointments, acted as guide, and who read, corrected, and approved all of the copy to prevent any errors, no matter how small, from finding their way into print. Without their assistance, as well as that of Joe Ryan and scores of technical personnel who answered almost endless questions, this book would not have been possible in its present form.



Foreword

The word "television" is a combination of the Greek *tele* which means "from far off," and *vision* which means "see." Together, they mean "see from far off." In this book, however, we go behind the scenes at the National Broadcasting Company at Radio City, New York, to give you a close-up story of the things that are done in many different parts of a television studio to bring entertainment and education into your home.

5 Television is a fascinating business, just as it is almost a magic science. But there is no magic in the way shows are prepared for sending out over the airwaves. From beginning to end, no matter what part of a studio you visit, the work is difficult, requiring a tremendous amount of planning and split-second timing. But the most amazing thing of all—in some ways almost as amazing as the development of television—is how the scores of different things that must be done are ever finished on time to give you new shows hour after hour.

As far back as 1923, Brigadier-General David Sarnoff of the Radio Corporation of America said, "I believe that television, which is the technical name for seeing as well as hearing by radio, will come to pass in due time."

Today, there are more than 41,000,000 television sets in use by home viewers in the United States alone. These millions of families want good shows to entertain them during their free time. This book explains what the television industry is doing in an effort to produce such shows.

DAVID C. COOKE

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Men and Ideas

The first step in planning a television show is to think of a new idea. The idea may come from someone who makes his living by writing for television, or it may be dreamed up by the men in charge of the program, who then give a writer the task of preparing a script that they can use.

After the script has been delivered and approved by the script director, show director, and producer, any or all of whom may think of ways to make the script better by certain changes, a staff discussion is held.

6

Each man who sits in on a staff discussion is an expert. One is a scenery designer; another the unit manager, one of whose problems is to figure how much the show will cost; and another the technical director. If the show will require costumes or special effects such as snow or rain, experts in these fields are called in also.

The producer tells each man exactly what he must do, and how soon it must be done. There is no such thing as an "easy" show to prepare. Some are more difficult to get ready than others, but each has its own special problems, all of which must be solved long before it is time to go on the air.

Most television shows last only thirty minutes or an hour, but these sometimes require several weeks to prepare and cost from about \$35,000 to more than \$100,000. Because of the time lag from an idea to the actual show, as many as five or six different shows in one series are being prepared at the same time. The job is sometimes so enormous that it's a wonder how a show is ever put together and made ready to go before the cameras at the right time.

After a script has been delivered and approved, the producer calls in his staff to discuss the entire project.



Ground Plans are Drawn

After studying the script to find out how many sets will be necessary for the show, the set designer and his staff decide how these should be placed in the studio. All of the sets must be in exactly the right location for the actors and cameramen, so that no time will be lost in getting from one to another during the show.

8 The designers draw top views of the sets, to exact scale, on a floor plan of the studio. But they cannot use the entire floor space, for city laws state that certain sections must be left open in case of fire. At the same time the center of the studio must be kept as clear as possible, so that the cameramen, sound men, and lighting experts will have plenty of room to move their equipment around. If a script calls for more scenes than there is room for in the studio, sets must be designed which can be moved on and off soundlessly.

This is only one part of the job of the set designers. The script may call for special furniture or other things. They check through a "property" book to see if these are in the stockroom; if not, drawings must be made of the items they want, so that these can be bought or made to order.

The main job of the set designers is to make a television program seem real. If the script calls for a scene to take place inside a prison, the set has to *look* like part of a prison. Or if the scene is supposed to happen in a cave, the set has to look like a *real* cave.

Set designers figure how the sets should be placed in the studio, make sketches of special items they will require.



THE GLASS KEY -
STUDIO ONE

Scenery is Designed

After the designers have completed their plans for sets which must be made for a show, they next make small exact-scale color drawings of the various sets. These are necessary so that the carpenters and painters in the shop will know what they are to make and how it should be painted. Full-color sets are made for black and white shows as well as those being telecast in color. The scenery designers have discovered that proper colors make it much easier for actors to play a scene, since they feel more comfortable on sets which seem to be real.

10

During the early days of television, before the invention of camera tubes which were sensitive to all colors, the scenery designers had to be careful to keep certain shades of blue and red out of their sets, since these photographed white. In fact, light blue was used only when a white effect was desired, since pure white came through the cameras too bright and hard.

Scenery designers must figure ways to make sets as cheaply as possible. The inside of a cave, for instance, is made of wrapping paper fastened to a wood framework with staples and painted the correct color. They must also be careful about flooring. It would be difficult for cameramen to move their heavy equipment over rugs, roads, grass, gravel, or flagstones. These are usually painted on the studio floor, or on thin sheets of plywood which are laid on the floor. Scenery designers use many tricks to fool the television viewer into believing he is seeing something that is not actually there.

The scenery designers make small, full-color sketches of the various sets, drawing everything to exact scale.



Sets are Made

The paintings made by the scenery designers, along with the drawings and plans, are now passed along to the men whose job it is to make the sets. These men are not merely carpenters; they are artists who can do things with wood which the average person would consider almost impossible.

12 For some scenes they may be called upon to make something as simple as a table, and for others they may have to make a dungeon, castle, or a crater on the moon. They can make a brick wall in a matter of minutes, using sheets of special light-weight plastic "bricks" which photograph better than real bricks; they can make trick furniture which will break into firewood if a person hits it lightly with his fist; they can make the inside of a spaceship which looks so real that you would almost think, seeing it on television, it was ready to blast off on a long journey into outer space.

But while the set builders have important jobs, like everyone else in a television studio, they must work quickly. All of the sets for a show must be made and ready for moving to the studio within a few days, so that work can be started on sets for the next week's show.

A television company's set and scenery department usually is not located in the main studio building, because of lack of space. In a single year one television company spent about \$500,000 for hiring trucks to carry sets and scenery from the shop to the studio. After use, these sets are numbered and put away in special bins for possible future use.

Carpenters in the scenery department can make anything from a simple table to a castle or a crater on the moon.



Drops and Flats

Some sets, usually located far in the background behind the actors, are called “drops” or “flats.” These are painted either on thin plywood or canvas, depending upon how they are to be used. Some of the canvas drops are also referred to as “flyers,” because they can be pulled up into the air out of the way after use.

Drops and flats are sketched on the plywood or canvas by experienced artists, following small drawings which have been sent to them by the scenery designers. They start work by marking off the plywood or canvas in squares to match similar squares in the scale drawing. By using this method, large background scenery can be made exactly the same as the small drawings.

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After the design has been sketched in with a piece of charcoal, color paints are added. Special fast-drying paints are used, so that one coat can be put on top of another without having to wait a long time for the first one to dry. Some of these drops and flats are small, measuring only a few feet, and others are so large they cover the entire wall of the largest television studio. The large plywood flats are made to come apart in sections, so that they can be moved from the shop to the studio. Each section is numbered to make it easy for stage handlers to put them together on the studio floor. After use, the drops and flats are numbered and stored away.

There are no such words as “good enough” in the scenery department of a television studio. Drops and flats are made with as much care as fine oil paintings, so that viewers will think they are looking at real scenes.

Artists mark off the thin plywood flats or canvas drops in squares, then draw in scenery details with charcoal.



Actors and Dancers are Cast

While the sets are being made in the scenery shop, the casting director and his staff start to look for actors or dancers who will be needed for the show. Well-known stars are usually signed up right away, but new actors or dancers must be able to prove that they have enough talent. Casting directors are always looking for new people, because that is the only way stars can be found.

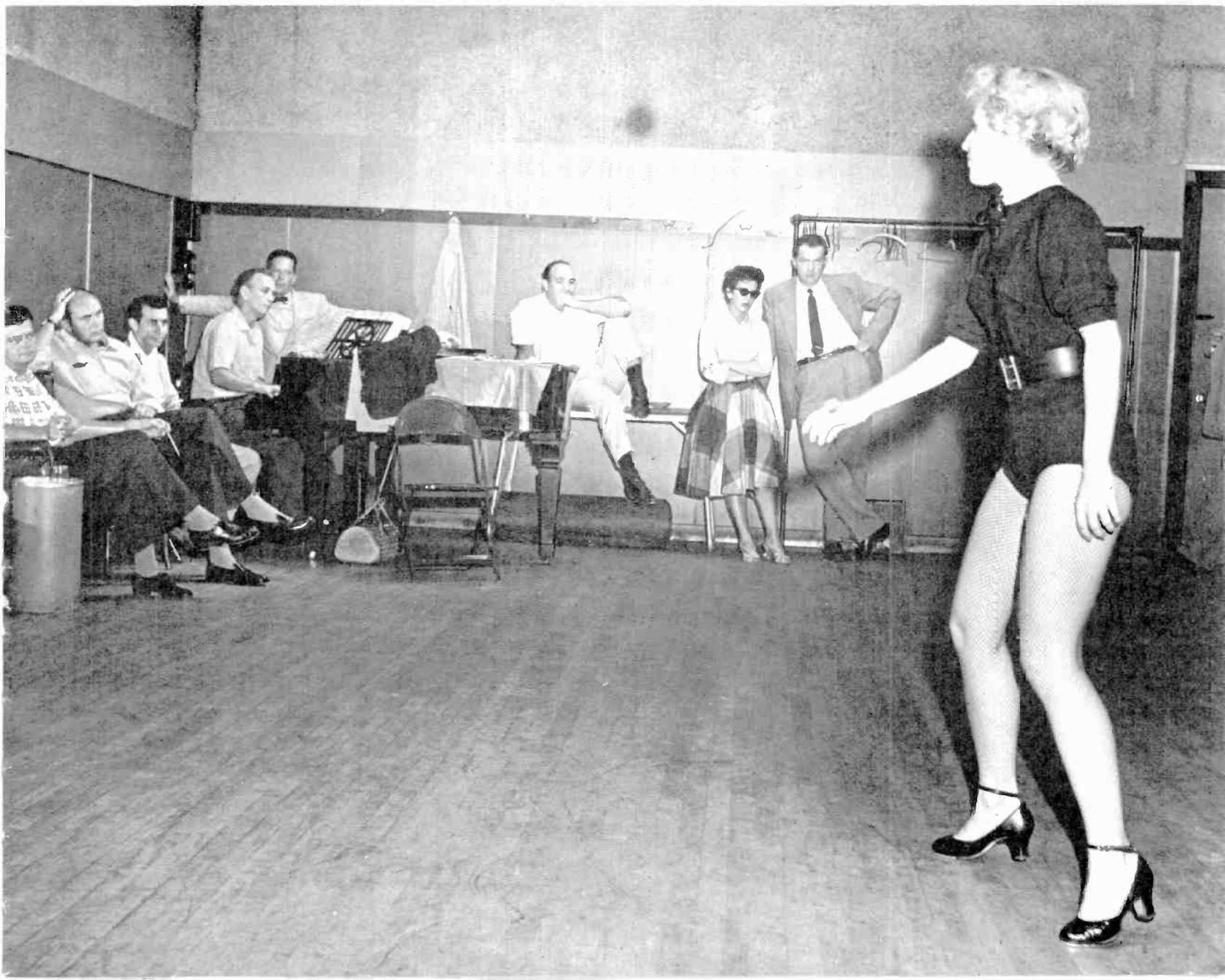
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Actors trying out for a part are given copies of the script and asked to read lines. Those who do the best job are usually given the part. However, this is not always true. Sometimes an older, more experienced actor may be able to read lines better but does not get the part because the script calls for a younger person.

Reading lines is only one of the many things a casting director has to consider. The script may call for a cowboy or a detective of a certain age; the actor must look like a cowboy or detective in order to be right. Finding people the right age who “look” right for a part is one of the most difficult jobs of a casting director.

After all the actors have been selected for a show, they are given copies of the script to read and memorize. Scripts for an hour show are sometimes more than a hundred pages long, and the actors must learn all their lines perfectly. If the script calls for dancers, they must learn every step in each number. This usually means many days of hard practice.

New actors or dancers who have not worked for a studio have to prove their talent by performing for the casting director.



The Show is Rehearsed

The first rehearsals of a show are usually not held in the studio where it will be telecast. This is because the studio may be in use for another show, and also because rental prices are high. Some large studios rent for as much as \$300 an hour.

18 Almost any bare room or stage will serve for these first rehearsals. There are still so many things to do that finished sets are not needed. During rehearsals actors read their lines from the script and learn how they must stand or where they must walk. If the show director does not like the way an actor reads his lines, he tells him what is wrong and has him do it over and over again until he gets it right. The director also makes notes on his copy of the script, to remind him about the different camera shots he will need during certain scenes, and exactly when these different shots are to be made.

During rehearsals the director starts to think about time. Slowly, as the actors learn their lines, he takes out something here and there or adds something else, so that when the show goes before the cameras it will not be too long or too short. Sometimes he changes other lines to make them sound better. When a writer invents a play he has to think out what the actors will say, but in the actual running of the play some of these lines may not sound right to the director, who is trying to make the show seem to be about real people faced with a real problem.

Rehearsals often continue all day long for a week or more before the actors learn all their lines and the director is completely satisfied.

During rehearsals actors read their lines from the script and learn how they must stand or where they must walk.



Costumes are Fitted

While a show is still in rehearsal the actors must be fitted for the various costumes they will need to play their parts. Costumes are always supplied by the studio, except in cases where the actors will be wearing ordinary street clothes. But even then the director tells them what type of clothes they must wear. If a scene is supposed to show a man walking through deep snow, for instance, he would look out of place wearing an open-necked sport shirt.

20

Almost any kind of clothing you can imagine may be found in the costume department. There are army uniforms, dresses for waitresses, coveralls for farmers, ten-gallon hats for cowboys, football uniforms, and many other kinds. They not only have a large selection of costumes, but many different sizes. However, these must often be altered to fit the actors. An expert tailor finds the closest size for the actors and then makes measurements to alter the clothes so that they will not be too tight or too loose.

On rare occasions a script may call for some kind of clothing that cannot be found in the costume department. These are made to order from drawings by people who have made a study of all kinds of costumes.

Sometimes a script may call for a costume to be torn during a fight or through some accident. These are intentionally torn in the costume department, sewed up with thin thread, and then torn again, to be sure that they will tear properly when the time comes. After a final test, the tear is sewed up once again to make it ready for the show.

While different sizes of costumes are kept in stock, they must be altered by a tailor to fit the actors perfectly.



The Stage is Set

A day or two before the show is to go on the air the drops and flats and sets which were made in the scenery department are sent to the studio. These are assembled on the floor according to plans drawn by the set designers.

22 Even though much of the carpentry work and painting has been completed, there are still a number of things to do in order to finish the sets. The various flats are fastened together and braced from the rear by a network of lumber. The show director makes sure that if an actor has to slam a door the entire wall will not shake, or that if someone is supposed to lean against a column or post it will not wobble. Such accidents would make the television viewers at home laugh when they are not supposed to laugh, and that might spoil the entire effect of a scene.

After the large pieces have been assembled, certain decorations must be added to make the sets look real. The director also checks to be sure that the lighting experts will be able to place their lights in the right places, and that there will not be too many shadows. There is also the chance that someone along the line has made a mistake. These mistakes, no matter how small, are taken care of while the sets are being made ready in the studio. A score or more of men may be working on the studio floor at the same time, each taking care of his particular job, each working quickly but carefully.

As each set is finished, the director marks it off on his sheet. When the final set is ready, the actors or dancers are notified to come in for dress rehearsals.

Sets and flats made in the scenery department are finally assembled on the studio floor in their proper locations.



The Prop Department

A television show calls for many things besides scenery and actors. The director may want a vase filled with certain kinds of flowers, bottles of ginger ale, a sliced tomato, dishes, glasses, statues, machine guns, hand grenades, or even a gasoline pump or taxicab. It would be too expensive to buy all the many things needed for every show, and then throw them away. All television companies have large property departments, where they keep everything under the sun from back-scratchers to stuffed animals.

24

As many as three hundred pieces of property, or "props," may be required for a single show, and the director searches through a prop book to see if these are in stock. If anything is needed that cannot be found in the book, people are sent out to buy the necessary items. On one occasion three men spent more than a week searching through odd shops before one of them found a special Chinese clock called for in the script. After the clock was used on the show, it was entered in the prop book and placed on a shelf for future use.

The prop department looks like nothing so much as a collection of junk. There are pieces of wood painted yellow to look like butter, empty glasses which appear to be filled with milk, artificial ice cream and pie and cake and bread, wooden guns which look so real you'd think they could shoot, and every kind of telephone that has ever been made. All of these things are extremely important to staging shows. The man in charge of the department keeps a list of all the props that are taken out and also sees that they are returned again.

All television companies have large prop departments, where they keep everything you could possibly imagine.



Show Credits are Printed

Did you ever notice that, at the beginning or end of a television show, the names of many of the people who worked on the show are flashed on the screen? These credits tell the names of the actors, writer, director, producer, technical director, set designer, musical director, costume man, lighting expert, cameramen, and others.

Credits usually move up across the screen, white type on a black background. White on black is used because it stands out better and is not as glaring as black on white. It is as important for these people to be given credit for a good show as it is for anyone else to be given credit for something well done.

26

The director sends a list of these credits, in the exact order they are to appear, to the sign shop. A printer sets the type for each of the credits and carefully places the type in a special hand printing machine. If the paper slips before he has finished printing all the credits, or if the ink smears, he must do the job over again.

When the credits are sent to the studio, they are wrapped around a drum in a machine called a "crawl." In the early days of television the crawl was turned by hand while a camera was focused on it, but this sometimes made the credits jerk on the television screen. The crawl is now operated by electricity, so that it will run smoothly. If the director finds that he is short on time, he may tell the stage manager to speed up the crawl, so that all the credits can be shown before the show is switched off and another one comes on.

Names of people who worked on the show are printed on long strips of paper, white type on a black background.



Case Hofferman

Matt Brooks
Fred Davis

Technical Director
Jack Irving

Assistant Director
Milton Delugg

Designer
Wedd Andrews

Printer
Guy Keet

Lighting
Herbald Hine

Production
Lincoln Davis

TYPE
CLEANER

The Magic of Makeup

Of all the tricks in television to make play-acting seem real, none are more amazing than those used by the makeup man. A makeup artist can within minutes change the appearance of an actor's face so much that even his closest friends will not recognize him.

28

Just as there are all kinds of items in the prop department, so the makeup man must have many different shapes of ears, noses, and chins. He can put bags under an actor's eyes, a jagged scar down the side of his face, or make him look as if he has just been in a rough fist fight. Even though casting directors try to find an actor who looks right for a part, this is not always possible. Here is where the makeup man is important. He can turn a young man into a monster from another planet or make a pretty girl look like a witch.

One television company's makeup man is prouder of his rapid-aging process than anything else he has developed. This process, which makes an actor seem to age fifty years in a matter of seconds, calls for coating the actor's face with two layers of makeup. The bottom layer is that of a person at the age of, say, eighty. Over this is added the makeup of the actor as he looks at thirty. The top layer will wash away, the second is waterproof.

As the actor comes rushing off the set for a quick aging while the camera shifts to another scene, all he has to do is wash his face. The top layer of makeup instantly comes away, bringing into view the bottom waterproof, eighty-year-old makeup.

Only on television can people grow old so quickly!

A makeup artist can change the appearance of an actor's face so that even his best friends will not know him.



Dress Rehearsal

The entire cast finally moves into the studio on the morning of the day the show is to be telecast. Until this time they have been learning lines, learning how they should act, learning where they should walk. Now, for the first time, they rehearse with cameras and in front of finished sets, wearing makeup and the costumes they are to wear for the various parts.

30

During dress rehearsals the show director is not on the studio floor with the actors. He is in the control room, watching the actors on three television sets, each coming direct from one of the three cameras. He speaks to the actors and cameramen through a microphone, telling them what they should do. For certain scenes, the floor manager marks the studio floor with chalk to show the actors exactly where they must stand.

Each cameraman has a pad of paper on a shelf attached to the rear of his camera, where he keeps a record of the kind of pictures he is to take during each scene. Camera Number One, for instance, may be shooting a big close-up of one actor while camera Number Two is focused on a group of people and camera Number Three is getting into position for another view. If the cameramen did not have records of what they are to do next, the right actors may not be seen at the right times.

After all the actors and cameramen know what they are to do every second of the show, they run through the entire program once again, to make certain that it comes out to the right length. If it is either short or long by as little as a few seconds, the director finds ways to cut or stretch it to the correct time.

During dress rehearsals actors perform with cameras and in front of finished sets, wearing costumes and makeup.



Special Effects

If the show is to have special effects such as fog, fire, smoke, rain, snow, or wind, these are attended to in time for the dress rehearsal.

The special effects men in a television studio can produce almost anything a director desires, from an erupting volcano to a coffee pot which boils over at the right moment. They have even made a candle for a birthday cake which could not be blown out no matter how hard the actor tried.

32 Because of strict laws, open fires cannot be made in a television studio. Where actual fires are necessary for a show, however, these are usually "logs" made of stovepipes covered with plaster and asbestos to look like real wood. Torn up pieces of asbestos are soaked with alcohol and tucked in among the imitation logs. When these strips are lighted with a match, they produce a real-looking fire which can be put out quickly after the scene is over.

The special effects men have a machine to produce fog. Before this machine was developed, television fog had been made by smoke candles. These were not satisfactory, since they gave off a strong vapor which made the actors cough. The smoke also looked like smoke instead of fog. This new machine produces realistic fog that will swirl, hang, and allow the actors to walk through it.

The special effects experts have several ways to make falling snow. They can use plastic spray, bleached cornflakes, confetti, or powdered ice, each of which is chosen at different times, depending upon the scene.

Using machines of their own invention, special effects men can create anything in a studio from fog to snow.



Rear-Projection

Everything in television costs a great deal of money, and the studios are constantly seeking ways to produce shows more reasonably. One of their big expenses is scenery. Most scenery must be made slowly and carefully by hand, but at times a director can cut costs by using a system known as rear-projection. In some instances this rear-projection method is even better than specially-made scenery.

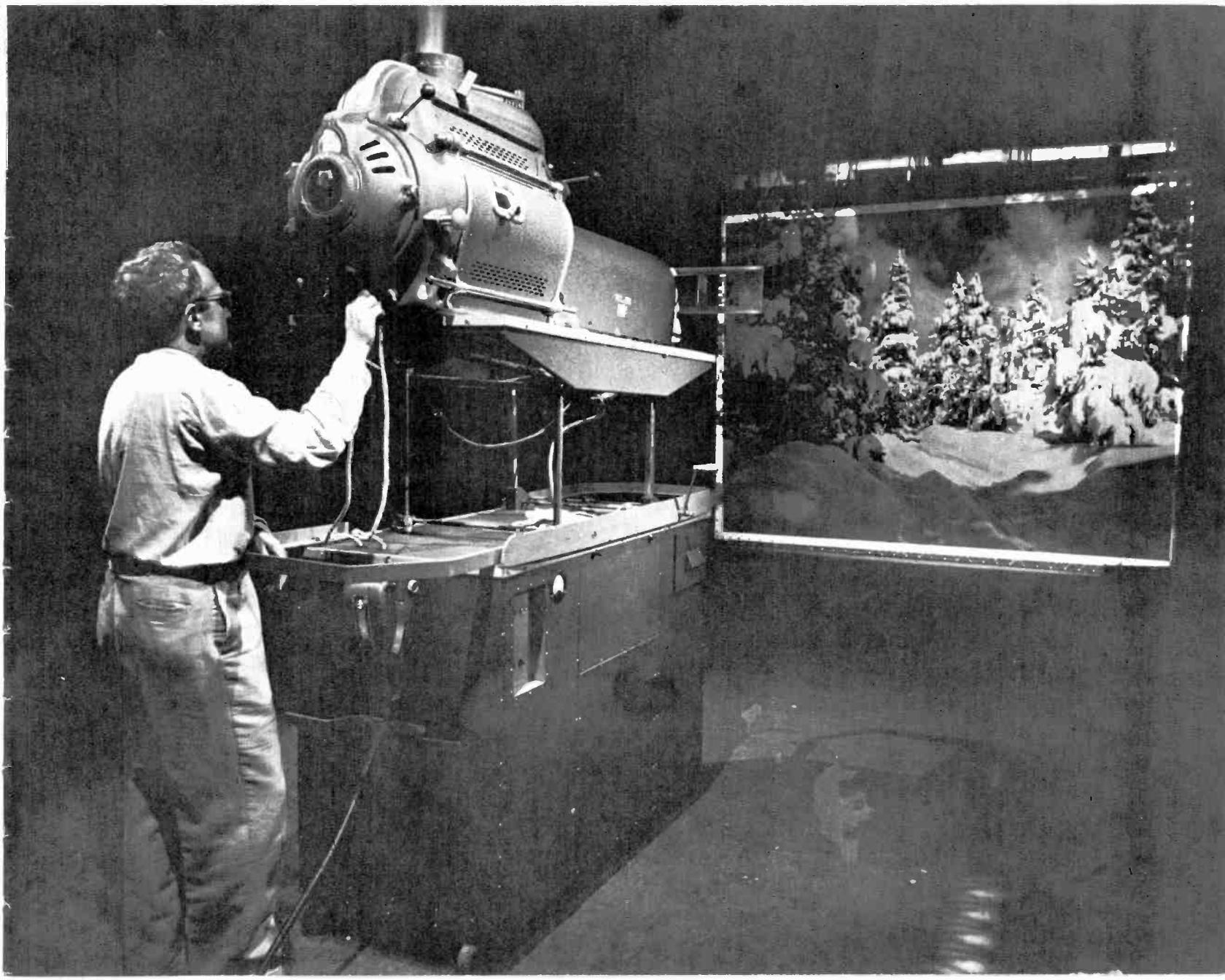
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In rear-projection, a powerful arc-light machine called a Telarc flashes a color or black-and-white film slide on a large screen made of material that allows the picture to show through on the other side. The latest model Telarc, which was designed by the special effects department, is three and a half times more powerful than rear-projection machines used previously. These earlier machines were not successful, because the picture they cast usually had a dull, "washed out" appearance.

With the rear-projection system, producers can plan shows set in any part of the world without concern about scenery. They can move the Grand Canyon or a forest or a battleground into the studio, making the set look real by placing a few props in front of the screen.

Rear-projection is not limited to still film slides. When actors are supposed to be riding in an automobile, for instance, a movie of an actual street scene can be flashed on the screen which takes the place of the car's rear window. This gives viewers the feeling that the actors are in a real car traveling down a real street.

In rear-projection, a film slide is flashed on a screen which allows the view to show through on the other side.



Camera Work

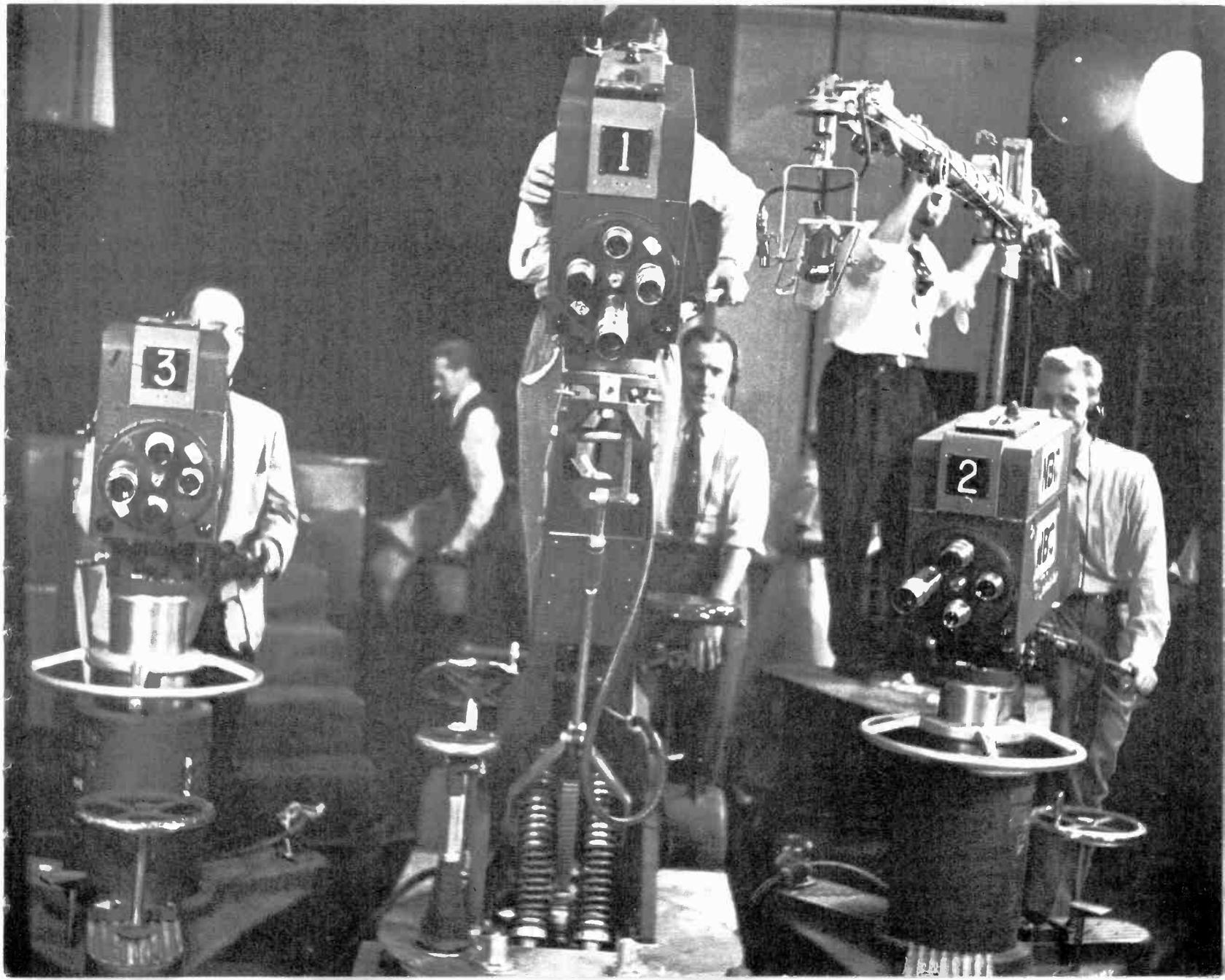
No one on a television set is more important than the cameramen. Even with the best script and best actors and best director in the world, the show would not be good unless the cameramen did their work properly, sending clear, sharp pictures out over the airwaves to home television sets. Some of the best directors were once cameramen.

36

Three cameras are normally used in presenting a show. Camera Number One is mounted on a wheeled platform, or dolly. A dolly camera can follow behind an actor as he walks from one part of a set to another, or it can be moved back as an actor walks toward it. Cameras Number Two and Three are also mounted on wheeled platforms, but while they can be moved to take different shots, they are rarely moved while pictures from them are going out over the air.

The television camera is different from the ordinary camera using film, since a television camera does not actually “take” a picture. What it does is *show* a picture through its electronic tube. Each camera on a set has four lenses on a turret in front of its electronic tube. The cameramen use certain lenses when they are different distances from the actors. The job would be much easier if one lens could be used for all shots, but this is not possible. When a cameraman shifts from one lens to another, he must also focus the camera to make the picture clear and sharp. The lens on a normal film camera moves back and forth to achieve clear focus, but in a television camera the lens remains still while the electronic tube inside the camera is moved back and forth.

Three cameras are normally used on a set; the show would not be as good as possible unless each cameraman did his work properly.



The Importance of Sound

The sound portion of a television show, unlike the picture, goes out over normal radio waves and can be picked up by any radio tuned to the right wavelength, or frequency. However, a radio-type microphone is not usually used to pick up sound in a television studio, since the director does not want the microphone to show in the picture.

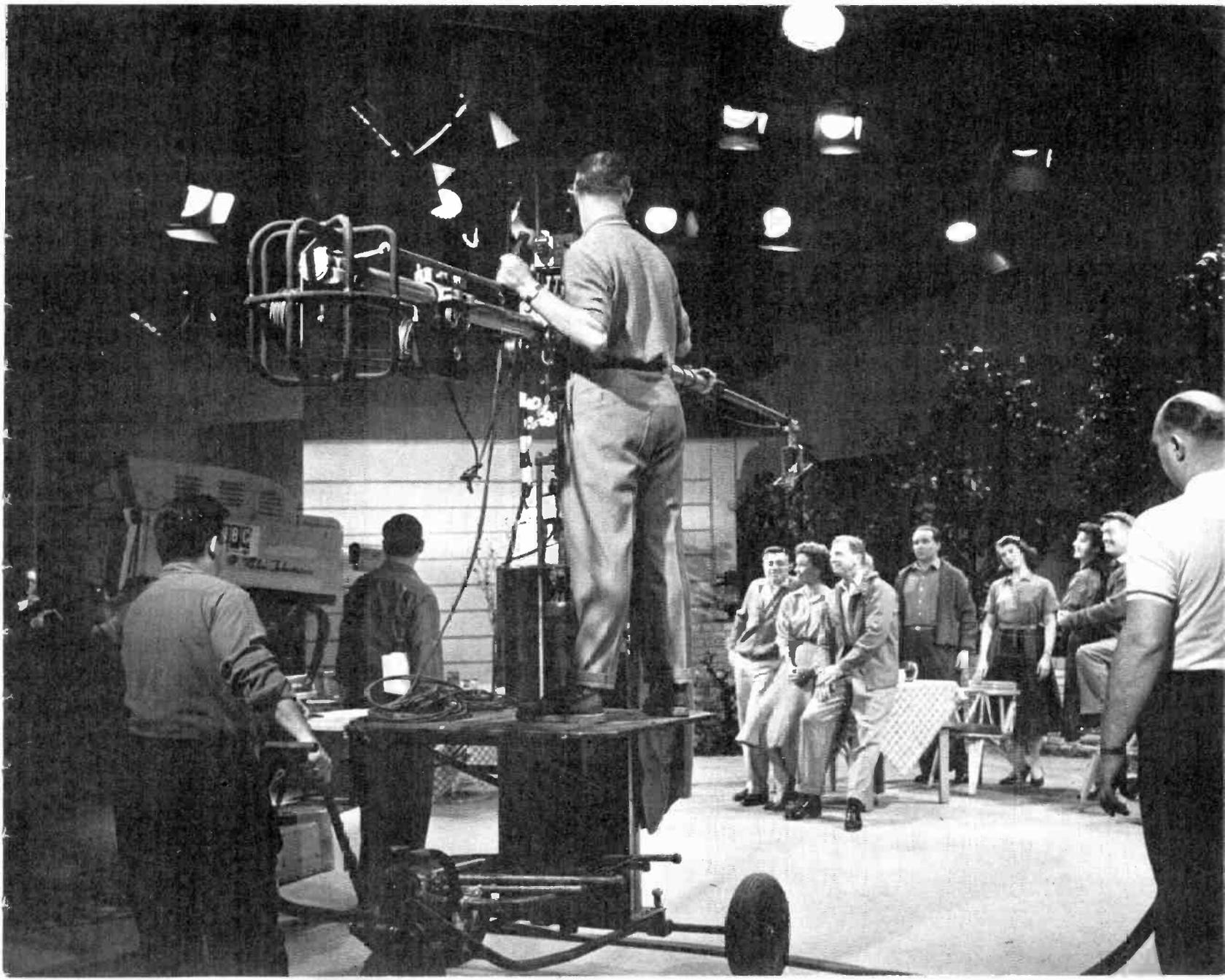
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Just as a camera must be focused on an actor so that home viewers can see what he is doing, a microphone must also be nearby to pick up what he is saying. This microphone is on a long metal pole called a “boom,” and the man who operates it is called a “boom man.” He must keep the microphone within a foot and a half of an actor’s head while he is speaking.

Only one side of a microphone is sensitive. If two actors are talking to each other, the boom man must turn the microphone so that it is pointed toward the one who is speaking. Because of this necessity for split-second timing, the boom man must know throughout the entire show which actor is supposed to speak next, so that his lines will be picked up clearly and distinctly.

The boom man’s job is just as important as that of a cameraman. Home viewers not only want to see what is going on, they also want to hear what is being said. But while the boom man must pick up every word spoken by the actors, he must be careful that other studio noises—such as stagehands moving scenery—are not heard. These noises would destroy the viewers’ feeling that the show was real instead of being merely a story.

The boom man must pick up the dialogue of each actor, at the same time keeping his microphone out of the picture.



Lights and Shadows

Second in importance on the studio floor only to the cameramen and boom man is the lighting engineer. Since a picture is made up of combinations of light and darkness, his floodlights must be adjusted at the right angle to make each scene most effective. The lighting engineer places lights above and on both sides of a set. Sometimes, for special effect, he shines a spotlight on one part of an actor's face.

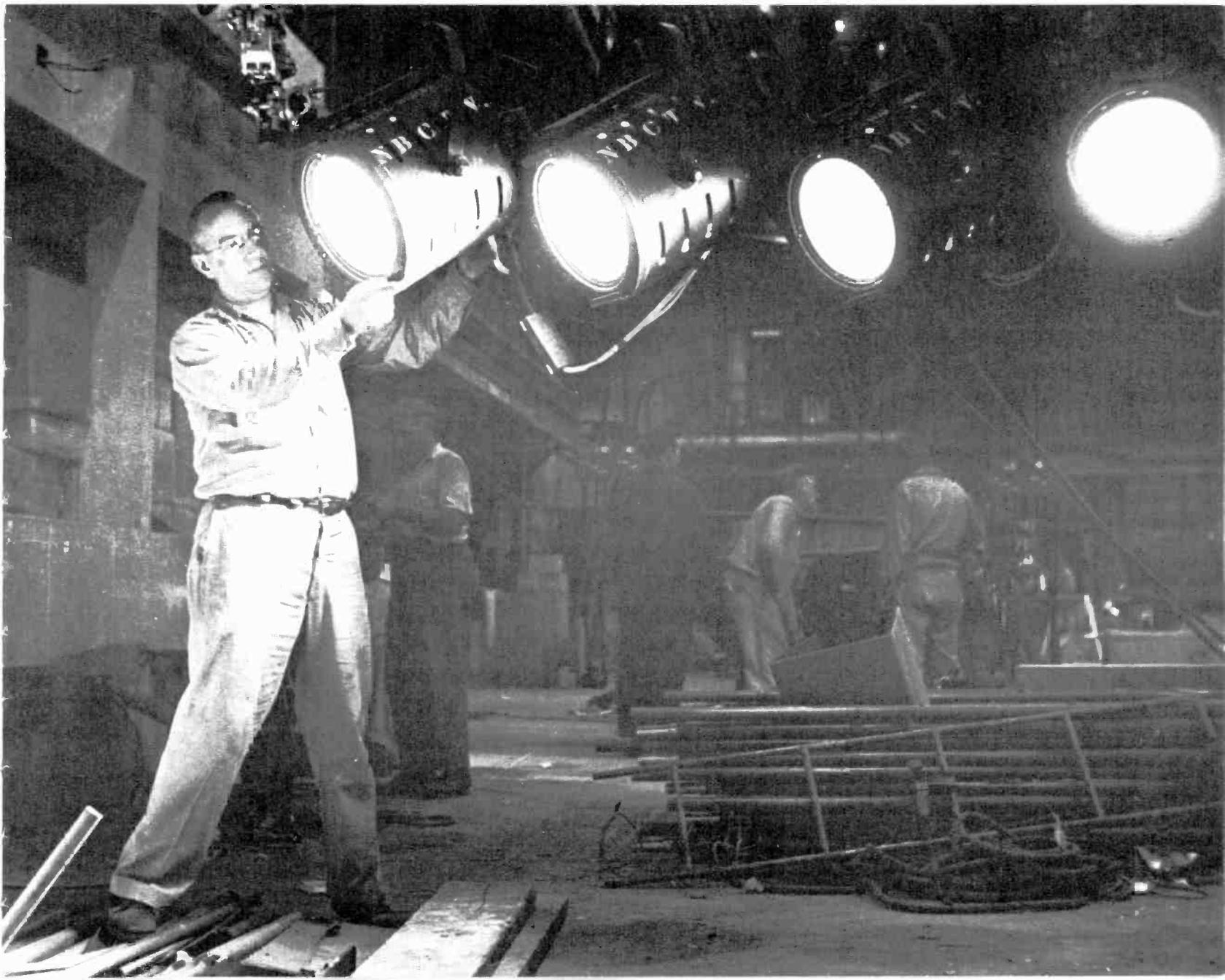
One of the most difficult jobs of the lighting engineer is to prevent the actors or props from casting shadows—except, of course, in cases where shadows are either desired or necessary.

40

Because of the small size of home receivers in comparison with motion picture screens, many more close-up shots are taken, thus increasing the need for perfect lighting. Also, in a live television show a scene can be photographed only once, and the lights must be adjusted so that each of the cameras will be able to get a good picture.

After a show is on the air, the lighting engineer controls his lights from a control board which looks more complicated than the largest pipe organ. He can raise or lower any combination of his scores of lights, make them brighter or dimmer, or even turn them in a complete circle to shine on another set. But even with all this equipment the lighting engineers are not satisfied. They are constantly seeking newer, better ways to light the sets to make them brighter than they are now.

A lighting engineer adjusts his lights carefully to make each scene most effective and keep out unwanted shadows.



The "Heart" of a Studio

The control room of a television studio is the "heart" of the entire operation, and it is the busiest place you can imagine when a show is on the air. The control room is fully soundproofed, so that the director's orders to the people working with him will not be heard on the studio floor.

42 The director is in constant contact not only with the cameramen through a telephone system, but also with the stage manager, through a small radio receiver called a "pocket ear" over which the director actually broadcasts to him. It is the stage manager's duty to relay the director's instructions to the actors and to see that everything goes smoothly in the studio.

The director tells the technical director when he wants to shift from one camera to another. The picture going out over the air is always shown on one "monitor," while other television receivers show what is coming in from the remaining cameras. Aside from switching from one camera to another, the technical director is in touch with the film studio and tells them when to insert commercials or other film which is to be used on the show.

The video or picture engineer, who sits on a lower level from the director and technical director, has smaller receivers in front of him. He adjusts the pictures from all the cameras to make them the same brightness.

At the same time, the audio or sound engineer, who is in contact with the boom man by a telephone system, takes care of adjusting the sound. He also mixes background music and sound effects with the actors' dialogue.

When a show is on the air, the control room is filled with people and is the busiest place in the studio.



Film Studio

The film studio is a fairly small room by comparison with the large show studios, but the work done here is vitally important to the entire network. All movies, filmed commercials, special inserts, and other effects come from this section. Experience in handling all types and sizes of film makes the men in the film studio experts in their work.

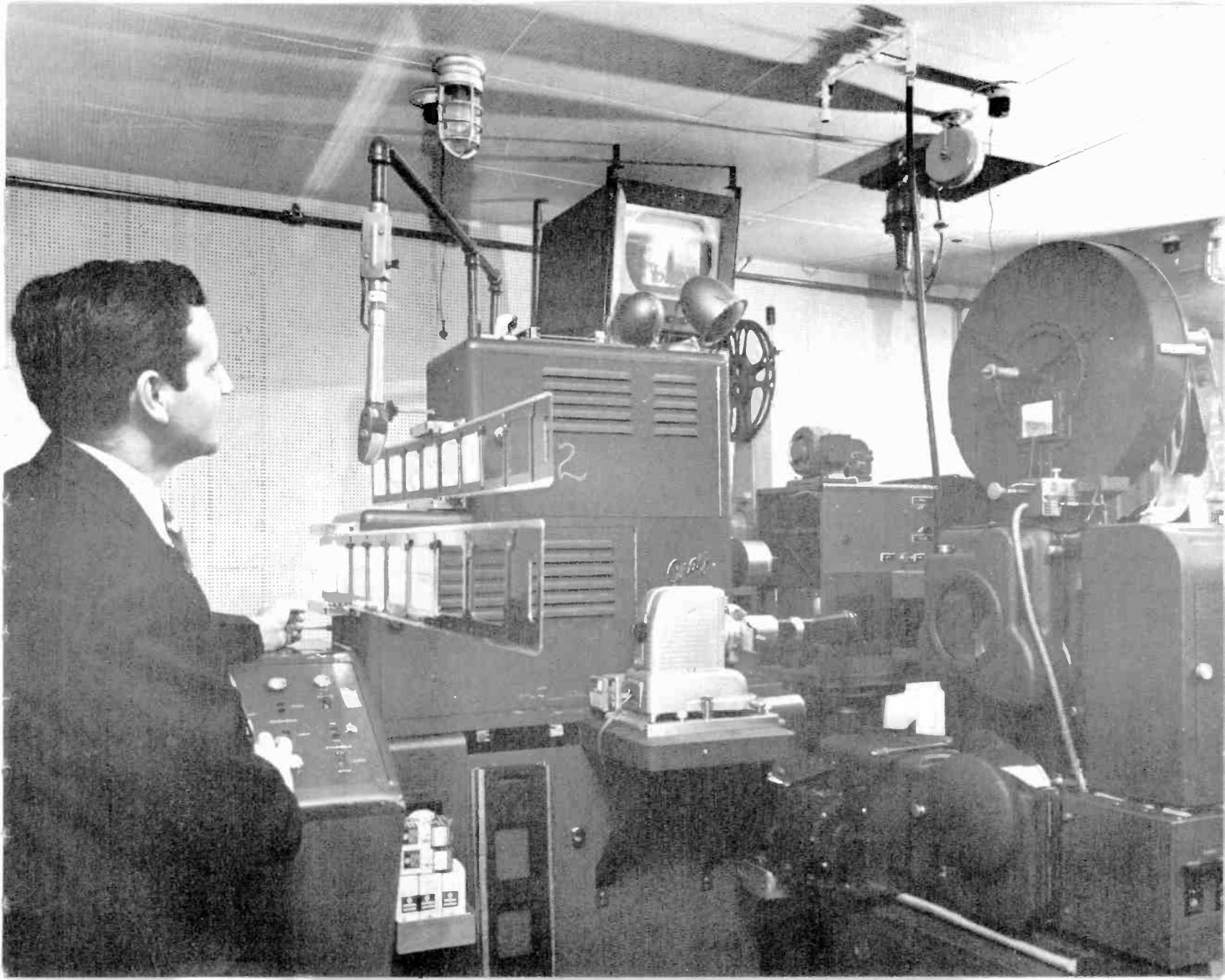
44

The film studio technicians have a small television receiver in which they can see the pictures they are sending out. If they are telecasting a full-length movie, they have to stop their main machine every so often to put in commercials, which also may be on film in another projector. This requires perfect timing, so that the movie will go off just as the commercial comes on and the movie starts again as soon as the commercial is finished.

This is only part of the job that film studio technicians must do. Since television time is usually cut into half hour or hour sections, the movies must sometimes be shortened so that they will not run over into another show. This means that a movie must be trimmed to within seconds of the allotted time; but more than that, the technicians have to be careful that important scenes are not cut out. In order to make these cuts, they often have to watch the same movie several times, making note of the sections which can be left out without harming the story.

More film is being used in television all the time, and because of this the work of the film technicians is becoming much more important than it was in the past.

The film studio is a fairly small room, but the work done here is vitally important to the entire network.



Master Control Room

Did you ever wonder how a television company switches from one show to another at the end of a program? Probably not. Most of us take such things for granted, without even thinking about them. Actually, though, it is an extremely involved job. The studio from which the next show will come may be in a different part of the building, it may be in a different part of the city, or it may be in a city thousands of miles away. But still, no matter how near or how far away it is, the following show must come on the air at exactly the right second. This is the job of the master control room.

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Where the studio control room is the “heart” of a television company, the master control room must be considered the “brain.” Without this section, the entire network system would collapse.

By using the most modern machine methods, the master control room practically eliminates the chance of human error in the operation of controls. A precision time clock automatically disconnects circuits from one studio at the end of a program and immediately switches to another studio. The desk can also cut off a live program, pick up a commercial from the film studio, and then return to the studio after the commercial is finished.

Designed to take care of present as well as any possible future needs, the master control room is equipped to handle both audio and video, or sound and picture, from twenty different studios. In case of necessity, the master controls could easily take care of as many as fifty studios.

Some of the most complicated electronic machines ever built are used in the master control room of a studio.



Shows are Kinescoped

Kinescope recordings are made of almost all live shows. A kinescope is actually a film of a television show which can be kept in the studio's film library for many years for future use. The reruns of old shows you sometimes see during summer months are kinescope recordings. These shows-on-film can save a studio a great deal of money during the course of a year.

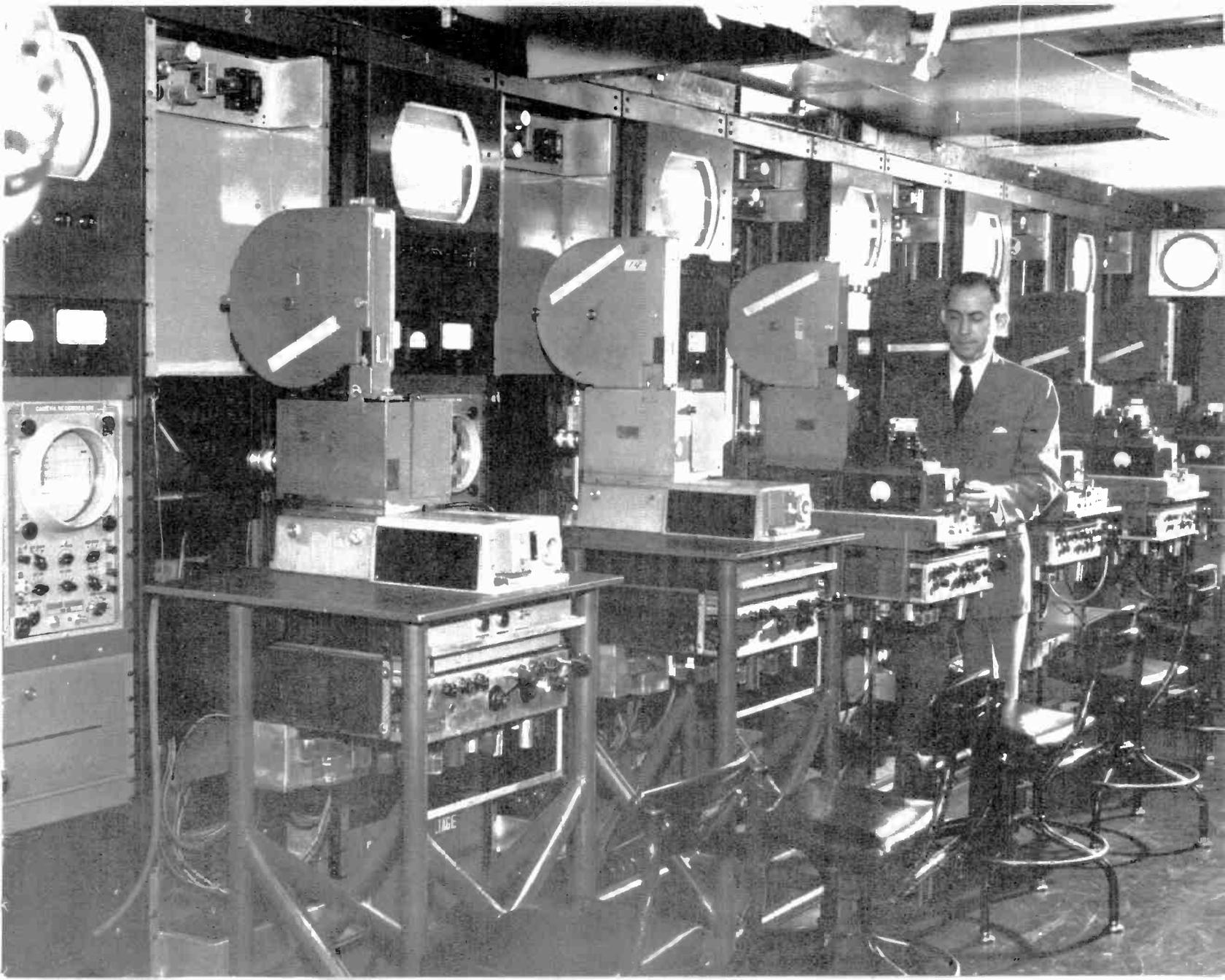
48

The kinescope room does not pick up pictures from all three cameras on a studio set. It receives the same picture that is sent out to viewers across the country. The sound portion of the show is also picked up electronically on the side of the kinescope film, just as with motion pictures.

Kinescopes are also often made *before* a show goes on the air. Sometimes a sponsor wants to see what the show will be like, to see if he approves everything that goes into it. If not, he makes suggestions for changes. As a rule, however, sponsors do not interfere with a director. New shows are kinescoped, too, so that they can be shown to companies which may want to sponsor them. In this case the kinescope recordings are called "pilot films," since they are the first shows in what the producer hopes will be a new series. If no company can be found to sponsor these new shows, the pilot films are rarely sent out over the air. Many new shows die this way every year.

Kinescope recordings are important for making permanent records of news and sports events as well as shows which come from studios. By means of these films, dramatic news events and thrilling sports action can be held in the film library for future use.

Kinescope recordings are made of most live shows, sports events, and news features, for use again in the future.



The Film Library

Here, tucked away in round, airtight tins in special bins, are kinescopes of sports contests, news events, and old shows. But these three listings are only a small, minor part of the film in the library. If a director wants to use a film sequence with his live program, to show things that would be impossible to duplicate in a studio, he calls upon the film library for help.

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There are actual battle scenes from World War I, World War II, and the Korean War. There are scenes of daredevils walking on the wings of old-time airplanes. There are scenes of train wrecks, automobile wrecks, burning houses, exploding steamships, whales on the surface of the water, schools of porpoises playing under the water, and all sorts of animals on land. There are scenes showing the inside of a submarine, army paratroopers jumping from planes, and electric company linemen at work in bad weather as well as good.

The man in charge of the film library can locate any scene a director may wish, and he can do it in a matter of minutes. His record book lists everything he has in the library, and exactly where to find it.

But there is much more than motion picture and kinescope film in the library. Tape recordings have been made of almost every important speech since the beginning of radio. If a director wants a recording of Winston Churchill's famous "blood, sweat, and tears" speech, the film library has it; if he wants a recording of Franklin D. Roosevelt's speech to Congress when he asked for a declaration of war against Japan, the film library has it, too.

The film library contains hundreds of thousands of feet of film as well as speeches by important world figures.



News as it Happens

One of the major activities of a television company is news coverage, and more people listen to and watch news programs than any other type. Home viewers want to know what is going on in the world, and television can tell them as quickly as radio and much faster than newspapers.

In addition to scheduled programs, the large television networks give their viewers special non-scheduled news stories as they happen. If the news department receives an important special story, it will break into any program, no matter how important the show may be, to tell the viewers the news.

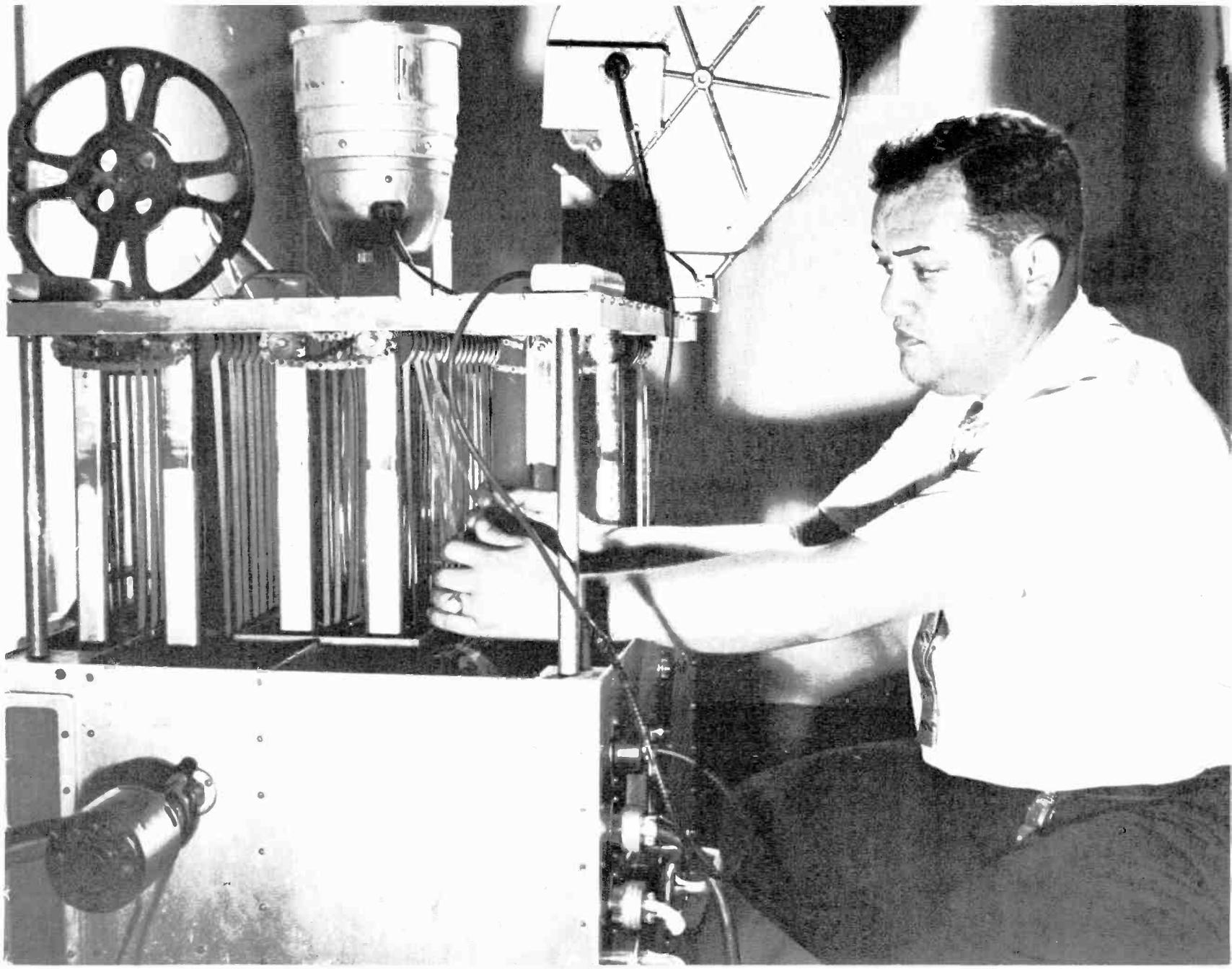
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Between 20,000 and 30,000 feet of news film is rushed to the news department of one television network every day, from cameramen all over the world. Permanent foreign bureaus are maintained in London, Paris, Rome, Berlin, Tokyo, and many other important cities, and additional news film is obtained from worldwide newsreel companies.

When undeveloped film is received by the news department by messenger, it is rushed to the darkroom for developing. Through a special process using secret chemicals, the film can be made ready for telecasting within twenty minutes from the time developing starts. This means that in many cases important news events can be seen on television within an hour after they occur.

More than three hundred reporters, cameramen, commentators, and writers are employed by the news department of a studio to bring viewers coverage of news events as quickly as possible.

Through a special developing process, important news film can be made ready for telecasting in 20 minutes.



TV Animals Rehearse, Too

Many producers like to have animals on their shows because they know that home viewers enjoy seeing dogs or other animals performing. Some animals are so popular that they are even listed as the stars of their shows. These dogs and horses are carefully trained by their masters to do certain things on signal, but at times spoken commands are necessary.

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Rin-Tin-Tin, Lassie, and Cleo are among the most popular dogs on television. Their masters read the scripts and rehearse their pets over and over, so that when a command or signal is given they will do the right thing at the right time. It usually takes much longer to prepare an animal actor for a show than a human actor.

It is amusing to see the motions that some of the animal trainers go through to give signals to their pets. The home viewers never see these motions, since the trainers always stand out of sight, usually next to one of the cameras.

In some cases, where the actors are not speaking lines while an animal is performing, the microphone can be shut off for a few seconds while the trainer calls commands. Or where a movie is being made for showing on television, the actors can speak their lines without a microphone while the animal's owner tells it what to do. In such cases, the actors record the same lines later and these are added to the film. But since this method of dubbing is expensive and time-consuming, most directors prefer to have animals that can do certain things strictly on signal.

It is amusing to see the motions that some of the animal trainers go through to give signals to their actor-pets.



Remote Pickup

In the early days of television all programs had to come either from a studio or from locations which could be connected to a studio by wire. But now, through the use of new inventions, cameramen in specially-equipped cars or vans can travel as much as twenty-five miles from a studio to photograph parades or other events. These vehicles are complete telecasting stations using portable generators to supply the power to relay both pictures and sound back to the studio, where they are sent out over the air.

56 Carrying lightweight "walkie-lookie" cameras, cameramen can even leave the car or van, if necessary, to take their pictures. In this case, the signals are sent back to the vehicle and then relayed to a studio.

An entire walkie-lookie outfit weighs only fifty-three pounds, and the camera is only slightly larger than a cigar box. All of the equipment, including batteries and telecasting instruments, is strapped to the operator's back; the camera can be mounted on a tripod or the cameraman can hold it in his hands, depending upon how it is being used. The main electronic picture tube in a walkie-lookie is about the thickness of a pocket flashlight, while that in a normal studio camera is fourteen inches long and has a diameter of about three and a half inches.

With remote-pickup equipment, viewers can be shown things which would be impossible with larger and heavier machines. An operator can take it into a submarine, up in an airplane, or even into the mountains many miles from the nearest power lines.

Using remote-pickup equipment, cameramen can travel up to 25 miles from a studio to photograph special events.



Publicity Pictures

While the main function of a television studio is to send electronic pictures and sound out over the airwaves, its publicity photographers take thousands of still pictures every year for use by newspapers and magazines. People like to read about television stars, and they also want to know about new shows before they go on the air. This is where the publicity department operates.

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If a magazine or newspaper editor decides he would like to have a feature story about a certain actor, he either writes or phones the publicity department and explains what he has in mind. The still photographers are willing to cooperate in getting pictures of anything or anyone an editor wants, because it is their job to publicize the stars and the studio. Book authors are given the same kind of help, and all of the pictures in this book were taken by the studio's still photographers.

Sometimes the preparations made for these pictures are almost as elaborate as those for an actual show. Sets are built in the photographic studio, actors are clothed by the costume department and makeup applied to give the best effect. Props are drawn from stock, and lights are set up to prevent unwanted shadows.

The publicity photographers take even more care in camera work than is needed in the show studios. After a set has been built and the actors made ready, the photographers may take pictures of the same scene over and over for as long as two or three hours to get a few that are perfect in every detail.

Sometimes the preparations to take publicity pictures are almost as elaborate as those for an actual show.



The Repair Department

Like all other machines, those used in television sometimes need repairs. The inside of a camera is a jungle of tubes, wiring, condensers, resistors, and other electronic equipment. These are so sensitive that the smallest defect will cause a camera to go out of order.

The men who operate the video and audio machines know how to repair some things, but when a big job comes up the equipment must be taken care of by experts. Just to be on the safe side, even if nothing has gone wrong, cameras and control rooms are given thorough inspections every few months.

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Most of the experts in the repair shop have worked at the factory where the various equipment was made. If a cameraman or a director tells them how a faulty machine is performing, they usually know what to do to make it right again. But while they know what to do, some of these jobs require a great deal of work. If a connection has come loose, for instance, it may be necessary to take a machine almost completely apart to get to the trouble. Or if a condenser or resistor has burned out, it may be necessary to test a dozen or more of these to find out which one is bad.

It is not only expensive to produce a television show, but the machines used to put a show on the air are also expensive. A camera may cost as much as \$75,000, and some of the parts in it cost more than \$1,800 to replace. Because of this expense, all of the equipment in a studio is handled very carefully. Camera lenses are even removed and put away for safety when they are not in use.

Experts in the repair department know how to take care of anything that may go wrong with studio equipment.



How Television Works

The electronic picture tube in a television camera is one of the greatest miracles of science, containing some of the most delicate instruments ever made. One of these is a piece of copper mesh with 250,000 holes in every square inch. Other parts are so small that they have to be assembled under a high-powered microscope. Called an "image orthicon" in technical language, this picture tube is the most important single piece of equipment in television.

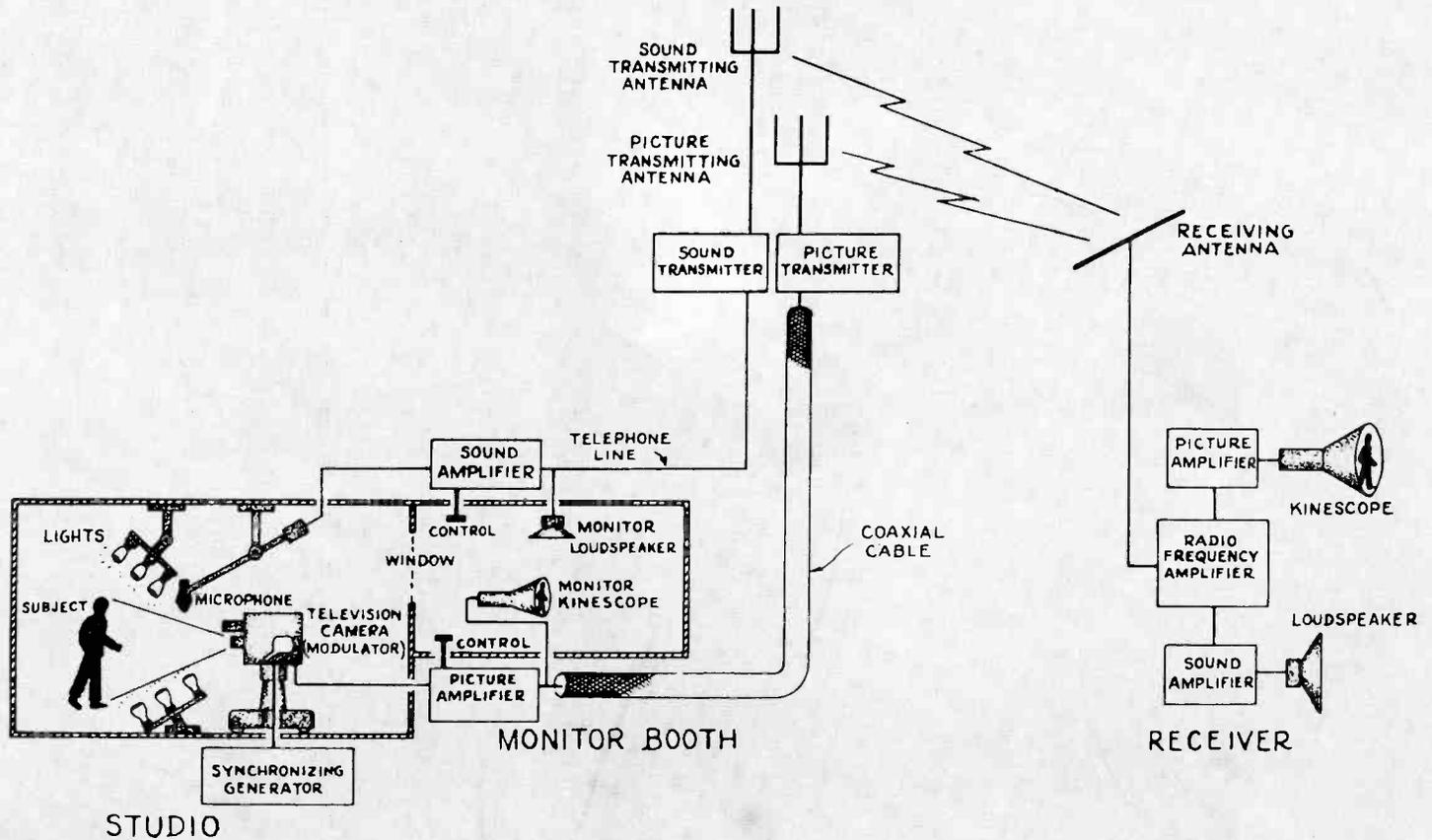
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Like an ordinary film camera, a television camera picks up patterns of light and dark. But here the similarity ends, for while the film camera makes a negative, the television camera changes its picture into hundreds of thousands of tiny dots which are sent out over the air as electronic impulses traveling at the speed of 186,000 miles per second.

When these impulses are picked up by a rooftop antenna and carried down wires to a television receiver, the image from the studio camera is reproduced on a light-sensitive screen to form a picture. No matter how small or how large your home set may be, the picture it shows is made up of 525 horizontal lines, each containing thousands of light and dark electronic dots. These lines are so close together that they are hardly noticeable.

While the image on a television screen seems to be changing all the time, it is actually made up of thirty still pictures a second. But since the human eye is not fast enough to see all of these pictures separately, they overlap to give the illusion of constant motion.

Television picture and sound waves travel from the studio to your home receiver at the speed of 186,000 miles per second.



A Look at the Future

Television is such a new science that almost everyone old enough to read can remember when his family bought its first set. Since those days tremendous advances have been made, and television is now one of the most important means of communication in the world.

64 Television will become even more important in the future. Scientists working in laboratories have already figured ways to hook it up with the telephone system, so that you will be able to see as well as hear the person at the other end of the line. What's more, you will be able to talk over this video-phone without having to hold a receiver to your ear or a microphone to your mouth.

Each year television sets have been improved, but in the future they will be so flat that they can be installed in the wall of a new house. They will also be built into the walls of school classrooms, probably covering an entire wall, so that students will be able to see important news events and educational programs.

"Closed circuit" television traveling over a wire between two locations is important today in many kinds of business; it will be far more important in the future. By the use of television the manager of a large factory, for instance, will be able to look at any part of the plant he wishes merely by pressing a button.

No invention in the world can save more time in visual communication or give more entertainment than television. It has changed the life of people in almost every civilized country in the last few years. It will change our lives even more in the future.