MOVIES FOR TV

John H. Battison

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As a considerable part of television broadcasting involves films, knowledge of the techniques and uses of motion pictures for television is profitable for technician, producer, station director, and sponsor alike.

This book is a comprehensive, practical guide to those techniques. It provides the information, both on technical equipment and on program planning, needed to insure the best results from movies on television, including a great deal of experienced advice on technical and artistic details that may cause trouble.

The first part of the book clearly explains the principles and the operation of TV transmitting equipment; the individual characteristics and operation of all leading movie cameras; methods and equipment for sound and kinescope recording, and all allied equipment.

Here you will learn, for instance, how the different types of projectors operate, what may go wrong with them, and how to avoid such troubles; what lights and lighting accessories give the best effects on television; the special values of different types of lenses, filters, and other photographic equipment; many ways of making still and moving titles; how to make fades, dissolves, and many other special effects; and the basic characteristics of movies suitable or unsuitable for TV.

The last part of the book then discusses the details of program planning and production. There are hundreds of practical suggestions on such matters as the use of

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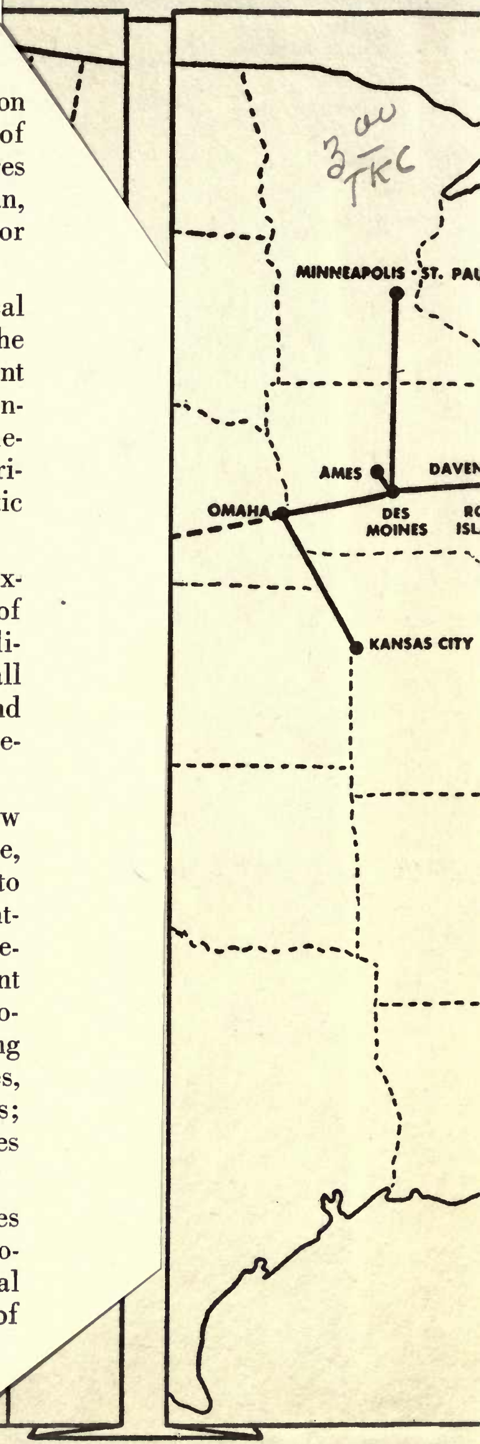
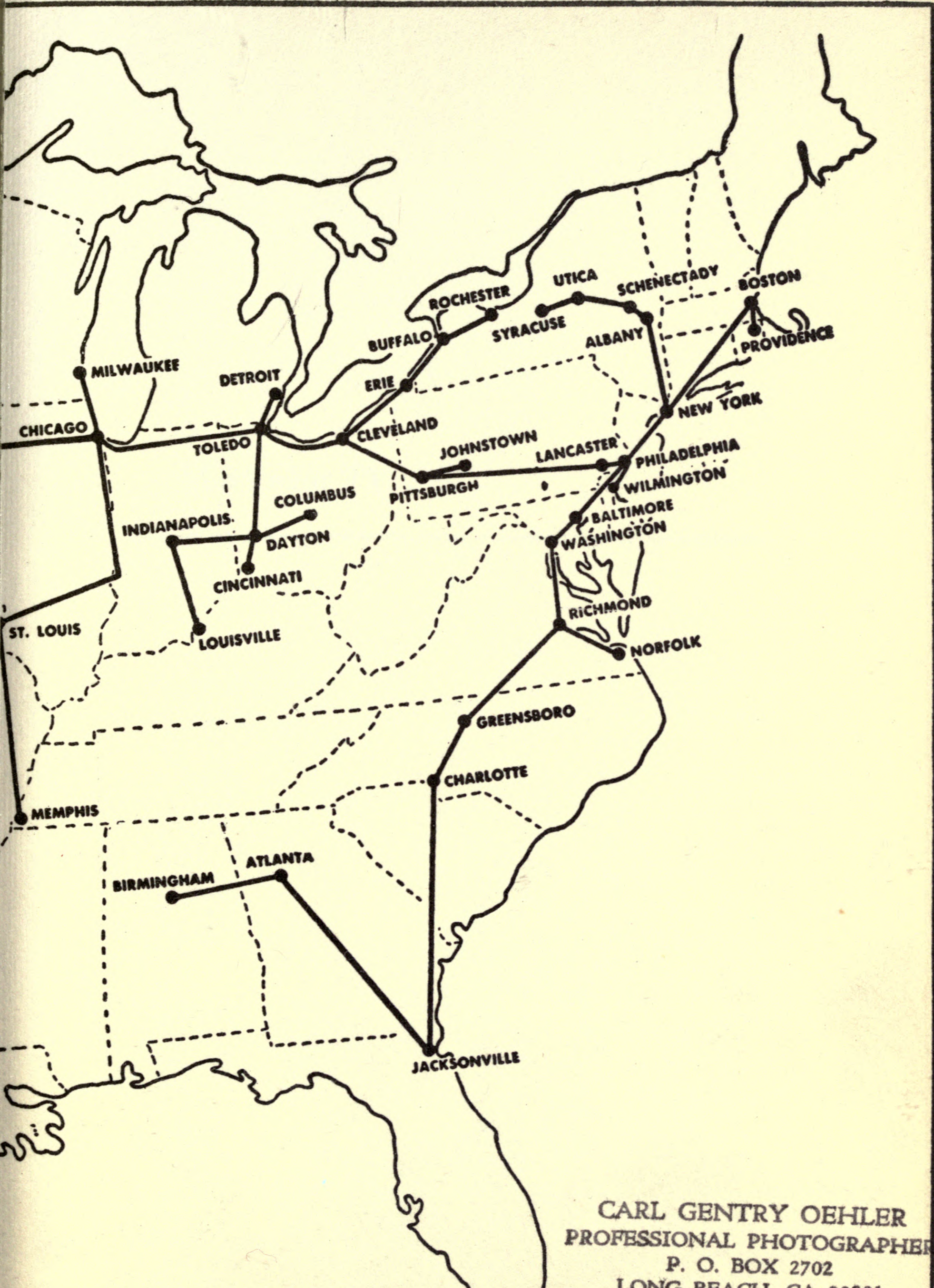
Jacket design by Irving Miller





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Movies for TV

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MOVIES FOR TV

JOHN H. BATTISON

Associate Editor Tele-Tech Magazine, Lecturer in Films for Television, New York University, Active Member of the Society of Motion Picture and Television Engineers, Senior Member of the Institute of Radio Engineers, Member of the British Institution of Radio Engineers

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TO

ARTHUR B. CHURCH

WITH AFFECTIONATE APPRECIATION FOR THE START HE GAVE ME IN AMERICAN TELEVISION

INTRODUCTION

Television and the manner in which its programs are produced have been treated many times by many competent authors, but since the publication of most of these books another factor has required increased attention. This is the motion picture angle. The earlier books dismissed films in a chapter or so, mainly because there was not a great deal to say.

Since then, however, much has been learned about movie techniques and methods of handling film. Its use for commercials is beginning to be understood, and production arrangements are now fairly well standardized. Technical methods for reproducing film over the television system will require improvement, and this applies particularly to video recording equipment. The future of television is inevitably bound up with movies, and, to a lesser extent, the future of movies is bound up with television. Thus, the ways of the film industry with its half century of know-how are proving invaluable in the studios of the television stations. Hollywood's techniques are not wholly applicable to television, but the best of its experience added to the radio experience of broadcasters should blend to build a solid foundation for the future union of the two media.

Unless motion picture films are used intelligently, many of the smaller, one-station towns far from the coaxial cable, or the microwave link, will not make the best of the facilities granted them to use in the public interest. For a while the novelty of seeing pictures on a screen on the end of a big glass bottle holds the audience, and all the oldest and deadliest movies are received rapturously. But, the day comes when even the latest five-year-old government war picture or Office of War Information epic fails to hold the audience against the charms of Fred Allen or Charlie McCarthy. The wise management guards against this by handling film intelligently and employing people who know enough about the subject so that a reasonably efficient job can be done.

For most stations in the situation assumed in the foregoing paragraph, live production using many actors in the cast may not be possible on any great scale owing to talent costs. Rehearsal time alone is often a big factor in the total figure, and perhaps even $500 would be too high for a thirty-minute show on a sustaining basis. The one-shot nature of television ensures that once the telecast is over the money is forever gone, and only a log entry exists to show what was got for it. Kinescoping recording is out, unless there is a service available, and that is most unlikely in the size of town we are discussing. Also, the high cost of such equipment precludes the station's installing it.

The alternative is film recording directly or, in other words, making a film and using this for the actual and repeat broadcasts if required. The beauty of this system is that it can be rented out to other small stations—or large ones if it is good enough!—and thus some, or even all, of the initial costs can be recouped. The studio lighting equipment is available, the studio is available, and probably the television cameramen will be able to double in celluloid—or, to be more precise, acetate. The equipment required—camera, recorder, and accessories—need not cost very much: $3,000 would buy everything needed for a modest, double sound system outfit. The station producer should be capable of producing a reasonable show if he knows his television production. Even though the members of the film department may not be very experienced their familiarity with the equipment and the uses to which it is put will go a long way toward creating a creditable program.

The outline of this book is based on the courses "Films for Television" which I am teaching at New York University, and previously The Television Workshop (New York City), and other television schools. Putting the course into a book necessarily involves writing more than is normally laid down in a class syllabus since many subjects which are covered indirectly by class discussion must receive separate mention here.

I would like to stress that reading this book is not intended to make the reader an expert in the field of movies *or* television, but it should pave the way to an understanding of what goes on in the film department and serve to buffer the initial inexperience of the beginner on first beholding film equipment. Practically all the equipment used in this sphere is either illustrated or described, and for a person who wants to work in a projection room the projector notes should be quite valuable. About 25 per cent of the jobs in television are directly or indirectly connected with films, and a person who knows something about all the aspects of his field is usually able to do a better job. This book is written for the student; the ad agency man who is, perhaps, not yet in television; the station personnel who are expecting to enter television; or just for the intelligent reader who likes to know what makes things tick—or even for the prospective sponsor who would like to know what he can expect from the art.

Very few works are without blemish, especially when there are many arbitrary, individual ways of defining or performing the same action, and I am sure that more than one meaning can be found for some of the statements included here. Moreover, many people have their own definitions and ways of doing things in an art as new and fluid as television. This is as it should be, for only by the successful combining of many ideas and methods can a solid, progressive art be founded.

This project has only been made possible through the wholehearted cooperation given me by the manufacturers of the equipment described and illustrated herein. For granting permission to reproduce their photographs and draw upon their instruction books to extract diagrams and tables, I extend grateful acknowledgment to: The American Standards Association Inc.; Acme (Producers Service Company); Messrs. Bell & Howell; Berndt-Bach (Auricon equipment); The Columbia Broadcasting System; E. I. Du Pont; Dr. Frank Back (Zoomar Lens); Eastman Kodak Company; General Electric Company; The Houston Corporation; J. A.

Maurer; Mitchell Camera Company; Moviola Manufacturing Company; The National Broadcasting Company; Neumade Products; Radio Corporation of America; The Society of Motion Picture and Television Engineers; and Town-Craft Models. And I say "thank you" to Bud Gamble for his invaluable assistance and to John Alton for permission to use a photograph from his book "Painting With Light."

John H. Battison

New York City

CONTENTS

PART ONE

FUNDAMENTALS

CHAPTER 1

PRINCIPLES OF MOVIES

WHAT FILM IS

This chapter is designed to introduce the reader into the world and language of motion pictures or films, as they are generally called. It presents in a brief form the fundamentals of photography without exerting any pressure on the reader to become a photographer, or requiring any interest in the subject apart from that which is inherently indicated by the fact of his interest in television. In fact, as this book progresses the reader will see that, properly speaking, television and photography cannot be separated and that almost everything which applies to photography also applies to television. Even the original criticism of television—that it only produced an ephemeral image while photography's action was permanent—no longer applies. As will be shown in the chapters on kinescope recording, records of television pictures are now made as easily as photographs with a movie camera.

Webster describes film as: a thin, flexible, transparent sheet of cellulose nitrate or acetate, or similar material, coated with a light-sensitive emulsion used for taking photographs; or, the base—the thin sheet of cellulose alone; or the film alone—the sensitive emulsion. In general, when speaking of film in the motion picture and television industry, the complete product is meant. Emulsion and base are referred to by name separately.

In general use there are two types of base, the acetate and the nitrate. There are other bases used, but they are in such small supply and usage that they will be ignored since it is extremely unlikely that television personnel will encounter them. Most 35 mm film is made of the nitrate base, which is highly inflammable. In fact, it might almost be called explosive since it requires very little air to burn fiercely with intense heat. On the other hand, the acetate base used for 16 mm film is slow-burning and is considered non-inflammable. It can be caused to catch fire but requires the application of heat for a comparatively long time. Safety film has the words "safety film" printed along its edges so there is no mistaking it. If these words do not appear, it must be treated as nitrate stock.

Wherever 35 mm film is used the local fire ordinances are very strict in their application to the premises in which it is used. Steel, fireproof projection booths are required, and a number of other restrictions also apply to complicate matters. As a result of this, and cost factors which are discussed in the next chapter, 16 mm film is used almost exclusively for television in all but the largest stations. The question will at once be asked: Why not use acetate base for 35 mm film? There are three answers to this. One is that the acetate base is not as clear as the nitrate. Instead of being completely transparent and with no identity of its own, it tends to produce pictures that are slightly opaque where the only coloring, or shading, should be from the emulsion. Then, also, the acetate base is slightly more brittle than nitrate. This is a big factor in the theatre world. A film print for the movie theatre has to be projected a certain number of times before it is scrapped, and the acetate film wears out very rapidly by comparison. Acetate dries out in the air very much more quickly than nitrate and during the run through the projector is exposed to considerable heat. This hastens the drying (the heat in a 35 mm projector is very much greater than in a 16 mm, because lower-powered lamps are used in the smaller, semi-professional projectors), and the film is more likely to break in the machine. As far as cost is concerned, there is very little difference; if there is any, it is in favor of nitrate. Finally, the acetate film must be kept in cans with humidifiers to keep the film moist.

The 35 mm film is perforated on both edges and has four perforations to the frame. Each foot of film has 16 frames, or pictures. The film is approximately one and three-eighths inches wide, but because the perforations occupy a certain amount of space, the picture or frame is approximately one inch wide by three-quarters of an inch high. This proportion is known as the aspect ratio and is approximately 4:3: that is, the frame is four units wide and three units high. The same standard has been chosen for television pictures. This makes the problem of using films on television simpler. In England, the aspect ratio of television picture is 5:4. This is not very different from 4:3, and the average viewer would not notice it, but of course it necessitates a slight change in the film transmission equipment. It is being changed to conform with U. S. standards. Figure 1-1 shows a strip of 35 mm film with these items indicated.

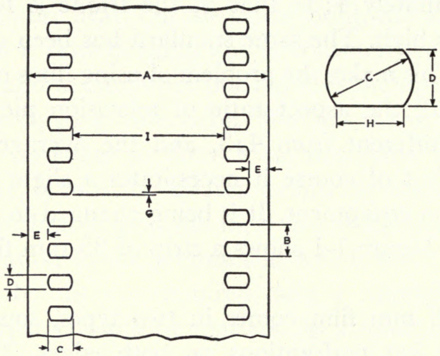
The 16 mm film comes in two types, sound and silent. The silent type has perforations on both edges. The sound film has perforations on one side only. On the other side of the latter is the sound track; quite obviously there would not be enough room for the track if the perforations were on both sides. Because the film is comparatively narrow, there is no tendency for the one-sided pull on the perforations to set it askew in the gate. Each type of film has forty frames to the foot and one perforation to each frame. The 16 mm film is approximately 0.63 of an inch wide. Figure 1-2 illustrates these features on 16 mm film. The frame area in the camera is 0.41 inches by 0.294 inches. To allow for shrinkage it is 0.022 inches and 0.008 inches respectively less in the projector.

Before continuing, it may be of interest to mention the other sizes of film that have been developed, some of which are still in use although none of them has been used for television. Everyone is familiar with the 8 mm film used by so many amateurs, but in addition to that there is 9.5 mm film put out by Pathe which is very popular in England and France. In an effort to produce a good quality sound film for semi-professional and advanced amateur use, Pathe also introduced the 17.5 mm film. The extra 1.5 mm were used to carry the sound track at the same size as the 35 mm film track in an effort to retain the quality of the latter. A long

American Standard

Cutting and Perforating Dimensions for 35 Millimeter Motion Picture Negative Raw Stock*

ASA
Reg. U. S. Pat. Off.
Z22.34-1949
Revision of
Z22.34-1944
*UDC 778.5



Dimensions	Inches	Millimeters
A	1.377 ± 0.001	34.98 ± 0.03
†B	0.1870 ± 0.0005	4.750 ± 0.013
C	0.1100 ± 0.0004	2.794 ± 0.01
D	0.073 ± 0.0004	1.85 ± 0.01
†E	0.079 ± 0.002	2.01 ± 0.05
†G	Not > 0.001	Not > 0.025
**H	0.082	2.08
†I	0.999 ± 0.002	25.37 ± 0.05
L‡	18.70 ± 0.015	474.98 ± 0.38

These dimensions and tolerances apply to the material immediately after cutting and perforating.

*This film is used for motion picture negatives and certain special processes.
**A calculated value for a dimension not measured routinely in production.
†This dimension and tolerance was given in respect to the center line of the perforations in the previous standard Z22.34-1944.
‡This dimension represents the length of any 100 consecutive perforation intervals.

Approved August 19, 1949, by the American Standards Association, Incorporated

Sponsor: Society of Motion Picture Engineers

*Universal Decimal Classification

Fig. 1-1. Dimensions and details of 35 mm film stock showing perforations and general appearance. Frame size (camera) 0.868 by 0.631 inches. Projector aperture is 0.825 by 0.600 inches.

time ago, before 16 mm, 8 mm or 17.5 mm film, another size was introduced—28 mm—but this did not become popular and very soon was forgotten.

Photography depends on chemistry for its operation. This is not intended as a primer on photography, but a very brief explanation of what goes on inside the camera will help the student appreciate some of the problems he will face in the film and television industry. Photography has come a long way since the crude experiments in the eighteenth century, but it still depends on the same thing—the chemical effect of light on a film coated with certain chemicals. Despite all the progress that has been made, silver still plays a very important part in the operation.

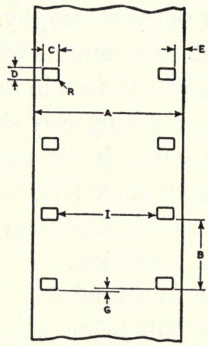
The base is made by combining various ingredients, which depend on the type of film being made, and pouring the resulting thick liquid onto a slowly rotating drum perhaps 5–6 feet wide. The drum speed is designed so that all the volatile solvents have evaporated in a little less than one revolution. The resulting sheet is pulled off continuously and rolled for convenience; it may be as long as 2000 feet and is of uniform thickness except for the edges which are discarded. Since the characteristics of every batch of base mixture are not constant, but vary even from roll to roll, the advice to obtain all film for a particular production with the same batch number is readily understood in its application to base as well as emulsion.

The coating is really much more important, for it is this which takes and records the product of the producers, cameramen, actors, and the whole film company. Therefore, it is essential that it be uniform in as many respects as possible. Gelatin is used to support the particles of silver salts which constitute the active agents in the emulsion. It also acts in the same way as manganese dioxide in a dry cell: that is, it is a depolarizer and removes halogen produced by the action of light on the silver salts.

Emulsion is made by dissolving gelatin and heating it. Silver bromide is added and an excessive quantity of potassium bromide, the latter being added as a sort of catalyst. Silver nitrate is then added, and minute crystals of silver halide are precipitated; these

American Standard
Cutting and Perforating Dimensions for
16 Millimeter Silent Motion Picture
Negative and Positive Raw Stock

ASA
Reg. U. S. Pat. Off.
Z22.5-1947
Revision of Z22.5-1941



Dimensions	Inches	Millimeters
A	0.629 ± 0.001	15.98 ± 0.03
†B*	0.3000 ± 0.0005	7.620 ± 0.013
C	0.0720 ± 0.0004	1.83 ± 0.01
D	0.0500 ± 0.0004	1.27 ± 0.01
†E	0.036 ± 0.002	0.91 ± 0.05
†G	Not > 0.001	Not > 0.025
†I	0.413 ± 0.001	10.490 ± 0.025
L‡	30.00 ± 0.03	762.00 ± 0.76
R	0.010	0.25

These dimensions and tolerances apply to the material immediately after cutting and perforating.

*In any group of four consecutive perforations, the maximum difference of pitch shall not exceed 0.001 inch and should be as much smaller as possible. (This requirement has been added to the previous standard Z22.5-1941.)

†This dimension and tolerance was given in respect to the center line of the perforations in the previous standard Z22.5-1941.

‡This dimension represents the length of any 100 consecutive perforation intervals.

Approved July 16, 1947, by the American Standards Association.
Sponsor: Society of Motion Picture Engineers.

Fig. 1-2. 16 mm film stock showing perforations and dimensions. Frame dimensions are given in text. If the film is used for sound recording the sprocket holes on the left-hand side are omitted.

are the crystals which form the image on exposure. If the mixture is cooked for a long time at a high temperature and the nitrate is added quickly, a fast, coarse-grain emulsion is formed. If the nitrate is added slowly and cooked for a shorter time at a lower temperature, a slower, fine-grain film is produced.

It is necessary to wash the gelatinous mass formed from the above operation to remove the excess salts which would otherwise crystallize. Then a further amount of gelatin is added and the batch recooked in what is sometimes called the second ripening. This increases sensitivity due to the formation of sulphides of silver on the halide crystals. This is a very important operation, for fogging and sensitivity are affected by it. The mixture is then refrigerated until required.

A complicated process of dyeing is involved prior to coating the base with the emulsion, and the various types of emulsion, such as panchromatic and blue-sensitive, positive films emulsion, are produced at this stage. The layer is about 1/1000 inch thick (after drying). The film is then perforated and slit into the required widths.

This is a very exacting process, since it is important that the film does not vary in width or it might stick in the camera or projector. After slitting, it is perforated and cut into suitable lengths which may vary from as short as 50 feet for amateur camera use to as much as 2000 feet, although 1200 feet is a more common length than 2000 feet. Each batch of film is numbered along the edge at frequently recurring intervals with a code number so that its manufacture can be checked for quality control and for identification purposes during processing. The effects of heat in the manufacturing process have already been pointed out; they are just as important during storage, for if stored in an overheated place fogging is liable to occur. For that reason, film offered for sale in tropical places should be regarded with suspicion unless the conditions under which it was stored are known for certain to have been properly maintained.

On being exposed to light, a chemical change occurs in the emulsion forming a latent image of the scene in front of the lens.

There is no apparent change in the emulsion, but on being immersed in a developer, an image or picture is produced. This is in a negative form in which the objects which were black in the original are white, and those which were white are black. More light is reflected from the light-colored sections of the scene and, therefore, more chemical action takes place in the corresponding section of the film. When this is developed, silver is deposited in the dark areas, and in the lighter areas where there was no light, the undeposited silver is washed away.

Before the film so made can be used, it is necessary to reverse it, thus making a positive which has the same colors and shades of light as the original. This can be done in two ways. One method is by direct reversal in which the film which was in the camera, known as a reversal film, is chemically treated a second time. This treatment literally reverses the colors of the film, and parts which were white become black, and those which were black become white. The film then has the same color-shade values as the original scene, and is known as a direct-reversal positive. In the other, and more generally used system, the negative is photographed onto another film. In exactly the same manner in which the color values were reversed when the negative was made, so are the colors again reversed on the second film. By virture of this double reversing, the second film becomes a positive which is then used for projection or televising. It will be seen that the former method suffers from the drawback that only one film exists, and if anything happens to it there is no way of replacing it.

There are many different types of film stock available. The various manufacturers have their own trade names for them, but film emulsions fall into certain well-defined categories. Negative and positive stocks have already been mentioned. In this case, the difference in the raw (unexposed) film is in the speed and fineness of grain. Emulsion speed is the main difference between the different types. By emulsion speed is meant the sensitivity of the emulsion to light and the speed with which a picture is formed on the film. Modern chemistry has achieved a great deal in preparing fast emulsions, but unfortunately as the speed of the film increases another change occurs. The grain of the emulsion becomes coarse. The silver salt in the emulsion is, of course, composed of millions of tiny particles. These particles constitute the grain of the film. If the film is enlarged many times these particles become visible and impart a "grainy" appearance to the picture. This is similar to what is seen if a half tone reproduction is examined with a powerful magnifying glass.

The cameraman has to decide between a fast film with coarse grain and a slower film with finer grain. In studio conditions where the lights can be adjusted as required, a slow film can be used and optically perfect pictures obtained. It is often apparent in newsreels that a faster film has been used to catch action that occurred in poor light. In addition to the poorer definition and loss of detail in the faster film, one other drawback is encountered: this is extreme contrast. High contrast and loss of detail go hand in hand. This can be seen by watching newsreel pictures of a fire or other unexpected happenings after dark. The blacks and whites are vivid and in the white areas there is little detail.

The types of film in general use vary considerably according to the purpose for which they are to be used. For movie work, panchromatic film is very popular although it is considered by some technicians to possess a small drawback in that it has a very slight grayish color in the base. Panchromatic film is sensitive to all colors and thus always has to be handled in complete darkness, whereas the much slower orthochromatic film can be developed in a red light. However, since it is not usual to develop film in containers in which they can be seen—unless it happens to be a short test-piece in a bottle—this is not too important. But this high sensitivity is important in the case of handling new reels of film to be placed in the camera. It is comparatively easy to fog a considerable amount of film by careless handling in bright light. Orthochromatic film is the slowest normally used for film work. The color limitations of this film make it possible to perform some very interesting and useful trick effects. For instance, it is not sensitive to red, and blue photographs extremely light. By taking advantage of these effects and using certain filters, many tricks can be performed. The Super-XX type of film is rarely used in studio work, due to the extreme contrast obtained and the "graininess" of the emulsion. The only time when it would be used is in the case of an event occurring after dark where proper studio lighting could not be provided. Many brands of film are on the market, but most studios use those sold under the names of Kodak, Ansco, and Du Pont. In film work it always pays to use a well-known make as the emulsion can always be depended on to be consistent in its speed and grain. When purchasing film for a shooting which is expected to take a good many feet, it is good practice to buy all the film ordered for the shooting at one time and at one store. In that way the cameraman will be able to ensure that all the film has the same emulsion batch number. This means that the exposure, and results, will be the same for all scenes on the film. This helps to prevent exposure errors and maintains an even quality of photography. This may seem a very small point to mention; it would be if this were being written for an experienced film man. But that is one of the things learned by experience and is important to mention here for the reason that in a small station or production unit, the temptation might be very strong to save a few dollars by using a few hundred feet of film from a number of odd batches. While this would probably not cause any damage, it *might* ruin a shot, causing it to be shot over again. At the least, it could cause a variation in the color-lighting values of the various scenes. Different manufacturers have their own systems of expressing the speed of the films they produce. However, they all bear a relationship to each other, and no matter which one happens to be in vogue at the moment it is possible to translate any value in one system into its equivalent in the favored one.

While film costs for 16 mm stock are not excessive, they are not exactly cheap, although compared to 35 mm the price is most attractive. For use in the average small station or motion picture studio the 200-foot magazine will probably be the most popular. A number of the popular, semi-professional 16 mm cameras are capable of using a 400-foot magazine instead of the standard 100-foot reel. These magazines are external to the camera and can be loaded beforehand if available in sufficient quantity. This facilitates changing film in the field. For film bought in semi-bulk for professional use at a station, the price varies between $3 and $5 per hundred feet of picture stock, while for sound stock it is around $1 per hundred feet. If bought in 1000-foot lengths and rewound onto the reels in use in the various cameras the price is lower, but here another source of poor quality is found. This work has to be done in total darkness, hence there is a strong likelihood of finger marks getting onto the emulsion during this process.

The actual developing, or processing of film as it has come to be called, is almost always done by a laboratory specializing in this kind of work. For one thing it is a complicated process, not so much by the method for standard film, but because of the mass of film involved. Even 100 feet of film seem an awful lot when they are curled around one's legs on the darkroom floor! The equipment necessary to develop, fix, and dry film, and then print a positive is very expensive and certainly outside the budget of any but the largest station or studio unless outside work can be obtained to help pay for it. For that reason most film these days is sent to one or another of the processing labs which exist in most cities of any size. Usually a film taken there in the morning is ready by the evening of the same day. These laboratories often have sound-dubbing equipment, and can print the sound track, or *marry* it, to the picture negative in cases where the double sound system is used. Very often, too, they have projection rooms where the film can be projected while the sound is recorded in cases where the sound was not recorded at the time the print was made. In this way a synchronized sound film can be made using a silent camera if the players say their words while acting so that they can lip sync them when projected on the screen. The only requirement is that the camera be driven by a synchronous electric motor so that the speed of the film will not vary and thus throw the sound out of synchronization.

It has already been mentioned that both 35 mm film and 16 mm film pass through the projector at the rate of 24 frames per second. This is the standard rate for sound in frames per second, but not in feet per second, or lineal speed. For 35 mm film the lineal speed is 90 feet per minute, while for 16 mm it is 36 feet per minute.

Thus a standard 400-foot reel of 16 mm film runs for 11 minutes, and 1000 feet of 35 mm run for the same length of time. An average length for a newsreel or one-reel cartoon is about 800 or 900 feet.

In the contact printer, many effects are obtained which add to the atmosphere of the film; however, in this chapter it is considered as a printer only. The negative film is run through the gate of this machine with the unexposed, positive film in close contact with it. It is, in fact, very similar to making contact prints from the usual box camera negatives. A variable printing light projects onto the negative, and this, of course, forms an image on the positive film, which is opposite in color values when developed. Since the strength of the light can be controlled, any slight mistakes in exposure when taking the negatives can be corrected, and because of the amount of light available a slow positive is used with a very fine grain. Figure 1-3 shows a standard type of film printer.

Color film is quite complicated in its operation and chemistry. It will be covered more fully in the chapter on color film and television. In brief, there are two general processes, the additive and the subtractive. In each system the film has to go through a number of different treatments and in addition to being a long process it is also costly. While color film as such is of no value to television at present, owing to the absence of color transmissions, it can be transmitted quite satisfactorily as a black and white film. The only precaution to observe is to avoid using film with a lot of blue in it, such as long shots of landscapes. However, this type of shot is very rarely used in television films due to the limitations of size and resolution of the television screen.

Later chapters will deal with the mechanical details of the equipment used. Therefore, having presented a description of the medium used to record the images which constitute moving pictures, it seems appropriate to demonstrate the manner in which these pictures are given the appearance of moving. The motion picture film and television both depend for their existence on a phenomenon known as persistence of vision. This is a "defect" of the human eye in which the object seen does not immediately vanish from the retina when the eye is turned away, or the object removed, but the

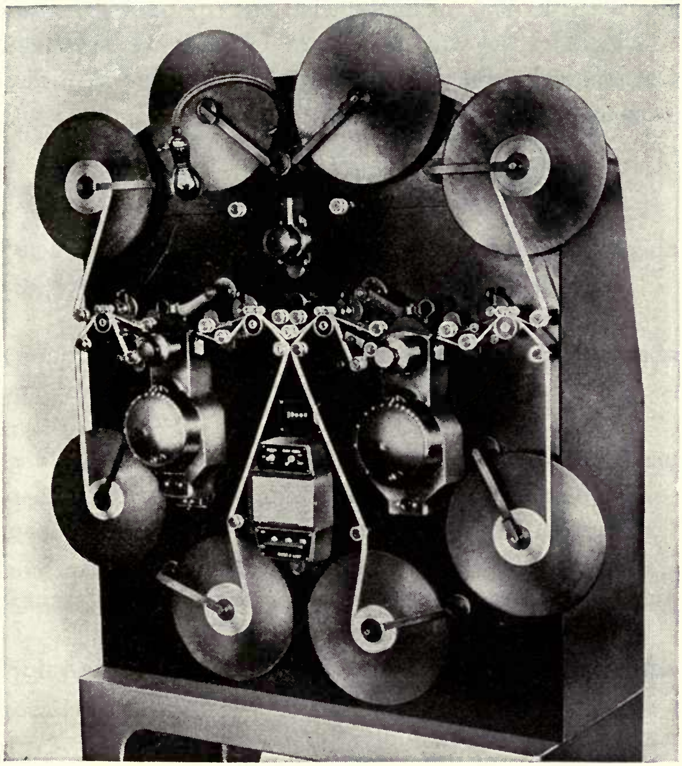


Fig. 1-3. Houston contact printer for 16 mm film.

image remains for a finite period. When a movie film is made, the camera records a number of pictures of the action taking place, each one slightly different from the previous one. These pictures are made at the rate of twenty-four every second (Note: every reference in this book to film speed will assume a speed of twenty-four frames a second, unless stated otherwise), which is the speed at which films are projected in movie theatres and for television. When these pictures are projected on the screen in rapid succession the eye sees the first one, and while the image of that one is still present, the next one, which is slightly different, is received over the top of the first. These blend, as do the subsequent ones, into what appears to be a moving picture. Although this is an effect of the human eye, it also occurs in some of the television equipment used for televising movies, and, as will be seen in Chapter 14, this feature of the iconoscope is utilized in the film camera chain for transmitting films over television.

TERMINOLOGY

aberration Imperfection in focus, caused by the lens' failing to bring all the light rays to focus at the same place on the emulsion.

abstract set A set which has no particular character of its own and is used for decorative purposes or purely irrational, abstract work.

acetate An abbreviation of the name cellulose acetate which is a non-inflammable, transparent, flexible film used to form the base on which the emulsion is deposited to make cinematograph film for 16 mm operation.

achromatic lens Lens used to correct for the different focal points of different colors.

actinic light Light which has high photographic value and hence affects motion picture film very quickly.

active lines The actual number of lines in a television picture which contribute to the information presented. In present standards there are about 490 active lines.

ambient light The general level of light in the studio which is not directed especially at the subject.

angle shot A camera shot from an unusual angle, such as one from a high roof looking down.

angstrom unit The unit used for expressing the length of light waves. Also, it is coming into use to express the color values obtained from different types of illumination.

animation The imparting of movement to inanimate objects or the process of making drawings, etc., appear to move.

aperture The opening in the masking plate through which the light from the scene to be photographed passes. Also, the measure of the amount of light passing through the lens. It is expressed as the ratio of the diameter to the focal length of the lens.

aspect ratio The relationship between the width and the height of the picture. The ratio is standardized in the United States as 4:3.

astigmatism A defect in a lens causing part of the picture to be out of focus.

audio The common name for the sound portion of a film or a television transmission, from the Latin *audire* to hear.

baby spot A small spotlight used to highlight small areas of a scene or an actor. For example, played on the hair it accentuates it in a close-up.

backdrop A painted sheet of canvas or similar material which hangs down behind the actors and forms a scenic background which is the basis for the rest of the scenery.

background projection Scenic effects, such as views from the window of a car apparently in motion, produced by projecting pictures on a translucent screen behind the actors.

base The material of which film is made. It may be cellulose nitrate or acetate. The former is highly inflammable, the latter flameproof.

big close-up A head-shot only and of one person.

bird's-eye perspective Perspective seen from above and in front and used sometimes for effect shots.

black light An almost invisible light, either infrared or ultraviolet. It is used to illuminate scenes where normal light would interfere with other operations. The best example of its use was the American Broadcasting Company's use of it in the opening telecast of *Otello* from the Metropolitan Opera House in the fall of 1948.

blanking The signal from the signal generator, in a television studio, which cuts off the horizontal and vertical driving pulses during the time that they are returning to begin a fresh line, so that they will not be seen by the viewer during this time.

blimp A soundproof cover which encloses the film camera during shooting. Its purpose is to deaden the sound of the camera and prevent it from being picked up by the microphone when making sound films.

bloom A glare caused by light being reflected into the camera lens, or by large white areas in the scene or film.

blooper A device for making a hole in the sound track on a film where a splice occurs to prevent a "plop" in the loudspeaker as it passes the sound head. If possible, the splice is made at a point where there is no modulation.

boom A long arm which suspends the microphone over the heads of the actors in a television or movie studio and keeps it out of the field of the camera. Also known as a *crane* when used to support a camera.

business Any bit of action which is not able to be described by any usual terms with short words, and which, while adding a lot to the story, is only incidental. For example, the scene is a cocktail party; *business* would be a general shot of the guests drinking and talking and getting drinks.

busy background A background with so much detail that some of the effectiveness of the actors is lost.

camera field angle scale A plastic scale used by producers in planning camera shots. It is transparent and shows the various angles of field covered by the different lenses in use; used with the floor plan, it enables most of the camera work to be planned before the production starts.

cans Slang for earphones worn by almost everyone in the studio during operations.

celluloid A mixture of pyroxylin and camphor, originally a trade name. It was the base for all early films, but now it is used only for 35 mm film and still cameras. When cold it is hard and strong, but on warming it becomes soft. It is highly inflammable and not used for 16 mm film.

clip A short length of film "clipped" or cut from a complete film.

It is used to provide an *insert* for a television show, or a short scene for some purpose.

close shot A short distance picture which includes a small part of the background and accentuates a detail.

close-up A shot of the actors in which only the head or part of the head and shoulders is seen. Abbreviation CU. It can be made at short distances with ordinary lenses, or a long-focus lens can be used to get the same effect at a distance.

close-up shot The closest possible close-up.

cold light A light that contains relatively little red value. It is produced by mercury-arc-vapor and fluorescent lamps. It is accompanied by the production of much less heat than is produced by incandescents.

condenser Optical application, a lens which collects the light from the lamp and focusses it on the film being projected. Also, the lens in a spotlight which focusses the light on the subject.

contrast The variation in light value between the darkest and lightest parts of a picture. Pictures with high contrast are very black and white and have poor detail: the intensity of the blackness or whiteness washes it out.

counter The indicator on the camera which indicates how much film has been exposed or remains.

crane A long arm mounted on a *dolly* which makes it possible for the operator to raise or lower the camera and thus obtain high or low angle shots.

crowfoot A spider-like device on the feet of a tripod to prevent the legs from opening on very slippery floors.

cue The signal for an actor or some part of the program to commence.

cue sheet-timing The script of the program indicating the times at which different actions take place and the time allowed for them.

cut A verb meaning to cut off the action, i.e., stop the scene or go off the air; it also means to switch instantaneously from one camera to another. It may also be used as a noun, as: a *film cut* (cf *clip*).

cyclorama A backdrop with a photographic or painted scene on it.

dark spot The dark spot sometimes seen in transmission due to the emission of secondary electrons from the *mosaic* in a camera tube.

depth of focus The distance from the camera within which everything is in focus.

depth of field (not the same as *depth of focus*) The limits of distance between which all objects are in focus with any given setting of the camera.

diorama A miniature set, same as *miniature*. Sometimes a small area is made full-size for live action to take place in it. But, the advent of process shots has reduced the necessity for this type of scenery and will probably eliminate it completely.

dissolve The gradual overlapping of one image by another followed by the slow disappearance of the first. It is used to bridge two separate sequences without slowing down the action much, or causing an abrupt break. Lap dissolves, diagonal lateral dissolves, etc., are discussed in detail in the chapter on editing.

dolly A noun meaning a truck on which the camera is mounted and on which the cameraman also sits. It is moved in accordance with the director's instructions. It may also be used as a verb meaning to move slowly toward (*dolly-in*) or away from (*dolly-out*) the set. In the former, a smaller amount of the set is covered by the camera and in the latter the area photographed increases.

dolly shot Merely a shot utilizing a moving dolly.

double system sound recording A system of sound recording in which the sound is recorded on a separate film from the one on which the picture is photographed. It provides the best quality.

down stage Toward the camera.

dub-in The process of adding sound to the film after the film has been made. It has also come to mean the addition of anything after the original has been made.

edge flare An unwanted light produced by the spurious emission of electrons due to the action of the scanning beam in the film camera tube. It can be reduced by using film that does not have black areas at the edges. It may also be countered by edge lighting which consists of a small lamp illuminating the edge of the *mosaic.*

elevation A vertical sketch of the stage and settings to show the detail in the vertical plane.

establishing shot A very important shot in any film for television, or television program. It shows all the important parts of the scene in one shot, just as though the viewer were standing there, and orients him to the story as quickly as possible.

emulsion The photosensitive coating on the film. It is usually a form of silver halide suspended in gelatin, for black and white films. Silver is deposited on the film after it has been acted upon by light and developed. The greater reaction it has to light, the faster it is said to be.

fades There are many variations of the fade which is a gradual change in the intensity of the picture. In a *fade-out,* the picture grows gradually darker until the screen is black, in a *fade-in,* the picture gradually appears out of the darkness.

fade to black A favorite method of ending a television play, or a film. The picture is gradually faded down until the screen is black. In television, it is done electronically; in motion pictures, optically. (*See section on effects.*)

feature The term used to describe the main event of a program. A feature film is usually at least 9000 feet long (35 mm).

field Optical-program, the area covered by the lens of the camera and therefore recorded on the film or the television screen. Electronic-optical, one set of scanning lines. In the U. S. system of television, the scene to be televised is scanned twice by the camera for each complete picture. The first time the odd-numbered lines are transmitted, 1 . . . 3 . . . , etc., the second time the even-numbered lines are sent, 2 . . . 4 . . . 6 . . . , etc. When both sets of lines have been transmitted the equivalent of one *frame* or complete picture has been sent. Since 525 lines are sent for every picture, or frame, in television, it will be seen that 262½ lines are sent in each field.

film camera chain The complete series of equipment used to present films on television. It consists of an iconoscope camera, camera control and shading desk, the associated power supplies, and one or more projectors. The output of this chain is fed to the master switching control where it is mixed and selected as required. Frequently a slide projector is mounted beside the film projectors so that station announcement slides may be shown over the same circuit.

film commercial The advertising message placed on film for projection over the film facilities of the television station.

film loop A piece of film, quite short, which is continuous. It is run through the projector as it is needed.

film sequence or **insert** A portion of a television program made up of film or movie scenes.

filter A glass or gelatin disc placed in front of the lens of a camera to change the light values reaching the film, or camera tube, to obtain special effects or to correct for bad light values.

flat Flat sections of canvas- or plywood-covered scenery used to form walls or backgrounds for room scenes.

flat lighting An over-all lighting which does not provide any highlights or contrast or modelling of the stage or actors. Usually poor technique.

flicker An unsteady picture. In television reception, it is caused by a faulty receiver or effects external to the receiver. In a film projection, it is caused by too slow a speed of projection.

flood lighting A lighting similar to *flat lighting*, which is used when a long shot is to be made. In such a shot, the flatness of the light will not spoil the detail.

floor manager The director's link with the actors during shooting. He can signal to the actors to tell them to hurry, slow, close up, spread, etc.

floor plan A scale diagram of the floor space showing the positions of the scenery and actors for various sets. It is an essential to the proper planning of a shot.

fluorescent light Mercury-vapor tubes coated inside with one of a number of materials which fluoresce, or glow, when exposed to the discharge inside a mercury-vapor tube.

flutter An annoying, continuous change in the sound reproduction from a film or mechanical recording. It is usually caused by wear in the rollers which hold the film against the sound head, or play in the bearings if discs are used.

focus The point where the rays of light passing through a lens meet and form an image on the film or *mosaic.*

following focus The process of keeping a moving object in focus all the time it is moving about during the shooting of a scene. For example, an actor may have to go from down stage to up stage and remain in focus all the time; the cameraman follows the action in his view finder and is thus able to keep the actor in focus by adjusting the focus control.

foot candle The international unit of illumination. It is the direct illumination on a segment of a sphere one foot away from a point source of one foot candle. It is equal to one *lumen* per square foot.

frame One complete picture. In movies, to form the illusion of movement and to obtain a high enough rate of speed to provide high quality of sound, twenty-four frames a second are projected.

foundation light The same as *ambient light:* a general lighting which has no character of its own but serves as a basal minimum upon which the rest of the illumination is built.

free perspective Falsely converging lines on the scenery and painting, or actual scenery constructed so as to converge much more rapidly than normally to provide a feeling of depth.

gamma The contrast degree of a picture expressed as a ratio of black to white. It is now usual to specify the degree of contrast required when sending film to be developed as "Gamma X."

gobo A screen or reflector used for sound or picture work to prevent light or sound from reaching places where it is not required, or to direct light to dark areas.

halation The diffusion of light in light areas (particularly in small areas of white in a dark surrounding), which causes a blurred appearance. Blurring is also caused by light being reflected onto the back of an emulsion from a film base after passing through the emulsion in photographing.

horizontal sweep The electron-beam scanning, from left to right, of the scene being televised.

hot background Generally a background light which is too strong and results in lack of contrast and a flat picture. Sometimes it is used to produce special effects for silhouettes.

hot light A concentrated light used to emphasize features and bring out certain contours.

iconoscope (IKE) A photosensitive tube in which the picture to be transmitted is focussed on a *mosaic* (cf.) which in turn is scanned by a beam of electrons. The variations in light and shade cause corresponding variations in the voltage picked up by the scanning beam, thus converting the scene into terms of voltage instead of light. This tube is now used only in film camera chains (cf.). It has a restricted color-response and requires high light-intensities to operate, although the picture quality is very good. It is also known as a storage type of tube because the *mosaic* will retain the picture for a considerable time.

image orthicon The latest type of camera tube. It has a very high light-sensitivity and is very suitable for outdoor work where light conditions are not under the control of the cameraman. It is also used exclusively in studio operations.

interlacing A process which consists of scanning the frame twice to reduce the amount of flicker in the received picture. The faster the repetition rate, the less flicker is produced; therefore, each of the thirty frames transmitted every second is scanned in two fields. The first one scans the odd-numbered lines and the next one the even-numbered lines. In this manner, sixty fields per minute are produced which has the same effect on the eye as sixty frames and reduces flicker to a negligible amount.

incandescent light A light produced by the heating of a strip of a conductor or the burning of an arc between two electrodes. It is usually very rich in red values.

intermediate film process A system of projecting television to large audiences in which the picture is photographed onto motion picture film, developed, and projected in less than a minute.

intermittent The mechanism in a camera or projector which causes the film to progress through it in a series of short exposures. It usually operates on the Maltese Cross principle or Cam system.

iris An adjustable diaphragm in front of the lens in a camera which can be used to reduce the area of picture recorded on the film for special effects. It is not used much today, but the early producers made much use of it. (It is also called a *vignette* when used for that purpose.) This diaphragm also used behind the lens to control the lens-opening, or *f* value of the aperture.

kinescope The trade name used by RCA to identify their cathode-ray tubes used for picture reproduction.

kleig light The general name used when referring to powerful lights specially designed for television and movie usage. These lights are manufactured by Kleigl Brothers.

leader The length of blank film attached to the beginning of a reel to provide for threading in the projector so that it can run up to speed before the first scene is projected.

left stage The side of the stage on the actor's left.

lens A device made of optical glass used to focus light onto a film, *mosaic*, or screen (for projection). It operates by virtue of its curved surfaces which bend the rays of light passing through them in accordance with the requirements of the lens.

light flare An overexposure in one part of a scene due to the improper placement of lights.

light script The chart used by the light engineer to record the position and intensity of the lights to be used in a set.

light level The ambient value of the general lighting on a scene, usually measured in foot candles.

light meter A device used to measure the amount of light on the set and also to indicate the amount of reflected light from the actors and props. The meter usually indicates in foot candles.

lip sync Sound which is in complete synchronization with the lips of the actors.

live title Titles made by televising cards with a studio camera instead of using slides or film.

long shot A shot from a distance great enough to provide a complete view of the whole scene. Such a shot is not used much in television owing to the poor resolving power of the system and the small screens presently used.

marrying Slang for the photographic combining of the sound and picture prints in the printer after editing.

medium close-up (MCU) A shot showing performers from the waist up in action scenes where faces are to be shown clearly.

medium shot (MS) A camera shot taken from such middle distance as to show characters from the knees to above the head.

miniature A set scaled down to such proportions that it can be made in the studio and used as a background for superimposition and other effects. It is very costly and not much used today owing to the convenience and availability of film inserts and the development of *process shots* (cf.).

modelling light A light used to make a subject stand out from its background. It is similar to a *hot light* and directly opposite to *flat lighting.*

montage An effect obtained by the superimposure of three or more shots. It is very valuable in creating special moods and suggestion by combining in visual form all the thoughts that a person might have without being aware of them.

mosaic The sensitive surface in a camera tube, usually made of mica with a caesium or similar light-sensitive coating. The picture is focussed onto it.

moviola A combination sound- and picture-editing device in which the editor can see and hear the separate picture and sound tracks.

narration or **off screen sound** Voice and sound effects produced by actors or objects not shown on the screen.

optical view finder A device attached to a camera which enables the cameraman to see the subject being photographed and thereby focus and frame it accurately. This is now superseded by electron view finders for television cameras.

out of frame A condition sometimes occurring during the projection of film in which a *sprocket hole* is slipped or the frame-lines are inaccurate and instead of seeing one complete picture, or frame, the top half of one and the lower half of the next is seen. The condition can be corrected by moving the framing control which moves a mask to reset the picture.

panchromatic film Film which is sensitive to all colors and which reproduces them all in their true color values in terms of gray.

panning An abbreviation of panorama shot in which the camera is moved very slowly and smoothly around the field to be photographed.

panning and tilting head A special tripod head used for mounting a camera with provision for smooth, horizontal panning and vertical movements.

perforation The small holes at the sides of film in which the *sprocket teeth* engage to pull the film through the equipment.

picture editing The very necessary action of composing the film to be presented from the conglomeration of scenes which have been shot. A highly skilled job which pays well. A poor editor can ruin a producer, and in any case a producer is only as good as his editor.

picture gate The opening in front of the projector or camera lens across which the film passes as it is exposed.

process shot The use of a scene, either still or moving, as a background for action. A translucent screen is used, and the picture projected from behind.

racking control *See out of frame.*

RCA sound system A system of sound recording in which a variable area is used to convert light to sound. The sound picked up by the microphone is caused to operate a mirror galvanometer which exposes a varying area of film to the recording light. The greater the sound-intensity, the greater the area exposed. This system has a characteristic appearance to the sound track; it looks like a series of very small triangles.

resolution The degree of detail in the reproduction after a picture has been transmitted through the system. It is related directly to the amount of information the system can transmit.

rim light A light placed in a television film camera to prevent flare in the picture due to the sudden change in the electron emission at the edge of the *mosaic*. It may also refer to a light used from behind an object to produce depth by making it stand out from its background by rimming it with light.

roll 'em Slang for the order given by the director when he is ready to commence filming; it refers to the sound and picture cameras.

scanning The action of the beam of electrons in the camera or receiving equipment in sweeping the *mosaic* or screen from left to right and breaking down the picture into units of electrical impulses for transmission.

scenery dock The place where scenery is stored when not in use.

scoop A type of lighting unit which derives its name from its similarity to a scoop; it provides a general light rather than a spot light.

script girl The assistant who accompanies a producer on location and studio shots. She handles all routine matters such as clearance, script preparation, editing, etc., as well as takes down his remarks if he is shooting on location and will be writing a commentary on the shot.

set The complete arrangement of scenery and props ready for shooting; there may be a number of sets in one act as the action moves from set to set.

shading The operation eliminating the spurious signals from the camera produced by the characteristics of the camera tube. It is of great importance when using the older motion picture films due to their high contrast and the subsequent increased production of spurious signals.

shooting script The script used to shoot the final production; it contains all cues, camera angles, and shots used.

short A film which usually runs not more than 20 minutes, used as a filler.

shot (*See take.*)

shutter The mechanism in a film camera or projector that allows the film to be exposed only at the proper time. It usually rotates in a projector and *may* be oscillatory in the camera.

silent speed The speed of silent film. All film is now shot at sound speed of twenty-four frames per second. Silent film is made at the same speed so that it can be projected on standard machines and will operate with the standard film camera chain for television.

single system sound recording The method of making sound film in which the sound is recorded on the same film as the picture and at the same time. This process has several inherent disadvantages, among which are: poor sound quality due to the impossibility of removing intermittent motion completely from film in the sound gate; the necessity of using fast picture negative stock; and difficulty in editing.

sound-over The provision of sound accompaniment by non-synchronized means such as from records or live sources.

stage directions Always given in terms of the actor's right and left when facing the audience.

sound displacement The difference in position on film between the picture and its accompanying sound. In 35 mm film the sound is twenty frames ahead of its picture, and in 16 mm it is twenty-six frames ahead.

sound editing The action of checking the sound prints and synchronizing them with the picture.

sound gate The mechanism where the sound on a film is either recorded, or reproduced, by the action of a varying light falling on a photoelectric cell in the latter case.

splice A joining between two pieces of film.

split focus A device used when it is necessary to have two objects in the picture, one of which is near to the camera, and it is impossible to focus sharply on each. A point which gives the best results is then chosen for focussing.

spotlight A light projector which concentrates the light into a beam or spot of light, used to highlight certain areas.

spring drive A mechanical drive used on some motion picture cameras. It is not used to much extent today for professional work due to the risk of losing shots because of the spring running down at the crucial moment and speed variation.

sprocket wheel A drum or wheel with a number of teeth spaced to engage with the holes in the edges of the film. It is used in film cameras and projectors to move the film through them.

stock shots Shots on film obtained from libraries or film supply houses of more or less ordinary subjects. They are very useful in process shots or for inserts to save the cost of making expensive and elaborate scenery.

superimposition The electrical or optical imposition of one picture over another, such as occurs temporarily during a *fade* or *dissolve.*

synchronization The matching of sound and picture so that the words spoken or sounds heard appear to be produced at the time the actions are performed.

synchronous drive An electrical drive for a camera or projector which runs at an absolutely constant speed. It operates from alternating current, usually the 60-cycle mains supply.

take "TAKE," when uttered by the director or producer, means to start filming or recording the action. "TAKE" in the phrase "Take One" means it is the first (or any other number) attempt at filming the scene. Sometimes as many as eight takes are made of one scene before the director is satisfied.

telecine The equipment used by the BBC to televise films. It is very much larger than the U. S. equipment but is much quieter in operation. The film moves through it in a continuous motion instead of intermittently; thus, wear on the film is reduced. A system of prisms rotates with the film and provides the optical stoppage of movement necessary for proper operation.

trailer A short film advertising a coming feature.

tripod A metal or wooden support for a camera. Generally it has three legs, although some so-called tripods have less. It is usually collapsible for carrying.

trucking shot A shot made from a moving camera on a *dolly,* such as *dollying-in* or *dollying-out,* etc. Quite frequently it is a shot made in passing along a line as in reviewing a row of chorus girls.

turret A mounting for camera lenses on which more than one can be mounted. It permits a very rapid change of lens by merely rotating the turret to place the required lens in use.

two-shot A camera shot containing only two people, usually heads and shoulders only.

upstage Away from the audience or cameras.

vertical drive The voltage which causes the vertical movement of the scanning beam in a television camera.

video The picture signal: from the Latin *videre,* to see; literally, "I see."

walk-through A rehearsal which is conducted without cameras.

western electric sound system (variable density) A system of sound recording in which the sound is caused to make the intensity of light falling on the film vary in step with it. A loud sound produces a bright light. Similar to the variable-area system except that instead of a sound track with triangular appearance it looks like a row of piano keys. This characteristic pattern is produced by the movements of two ribbons in the galvanometer instead of a mirror. As they spread apart more light passes and a heavier exposure is made.

wide-angle lens A lens for short distance work which has a wide angle of pickup so that a large area of the set can be photographed without having to get too far away.

wild motor An electric drive for a camera which is not synchronous and will not, therefore, maintain an absolutely constant speed. It is useless for lip sync work.

wipe A change of scene produced by the new picture apparently pushing the old one off the screen. The change may be vertical, horizontal, diagonal, semi-circular, etc. It is produced mechanically in the optical printer.

work print The print produced from the original camera negative. All editing work is done on it, the negative never being projected in case it becomes scratched and unfit for making the finished print.

wow A variation in the speed of the audio reproducer which causes the sound to change pitch.

zoomar lens A lens recently produced which makes it possible to follow action, keeping it in focus all the time. Its range is from very close up to the full length of a football field. It has twenty-eight optical elements in it.

CHAPTER 2

PRINCIPLES OF TV

Before proceeding any further, the manner in which pictures and *visual* intelligence are sent via the airwaves should be described. While it is not strictly necessary for those persons engaged in the program side to know exactly how television works, it is an aid to the more sensible use of the medium, for utterly impossible demands can be avoided if some of the difficulties which plague the engineer are understood.

In sound broadcasting, or recording, a microphone is used to convert sound waves to electric waves. In movies, a film camera is used to make light and shadow effect minute chemical changes in a silver emulsion on a strip of celluloid. In television, a combination of the electric microphone and movie camera technique is used to produce an electric current which varies according to the picture being transmitted.

A television station may be divided into five sections of equipment used to produce and transmit television pictures. The first is the transmitter section where signals from the studios are amplified and impressed on a carrier wave which is transmitted. Next is the antenna, which is usually 500 feet or more above the ground and often mounted on a high building by means of a steel tower on top of the building, or else on a separate tower on high ground. Then comes the studio section which contains studios in which the programs are produced and control rooms where the signals from different cameras and studios—including the film studio—are mixed.

Next is the fourth section which contains the equipment for controlling the functioning of the television cameras, and finally comes the fifth section which is comprised of the cameras themselves. Sound is transmitted also, but since we are concerned with the visual side of television, only a brief reference will be made to it.

The Television Camera A picture has to be transmitted in small parts, one at a time. The reason for this is quite involved and is controlled by the electrical characteristics of radio equipment. When the human eye observes a scene, the rods and cones which constitute the retina operate in such a fashion that the cones sense the colors and the rods are affected by black and white (this, incidentally, is the reason for a person being able to see better in the dark if he turns his head away from a direct, full-front view of the object—the rods are at the sides of the retina and consequently are able to function better than when more in front of the scene). The combination of rods and cones forms a mosaic on which the scene is focussed by the pupil. The mosaic is just what its name implies—an area of thousands of minute cells each of which is connected to the brain and receives an extremely small part of the picture. When the impressions from the whole mosaic have been received by the brain, it "sees" the whole picture (of course, this occurs instantaneously).

If it could be arranged in television so that an electric eye could see the entire picture to be transmitted and send it all at once, or nearly so, to the receiver where it would be seen on a similar screen, there would be no problems of definition. Unfortunately, this cannot so far be done since the transmitter would require literally thousands of frequencies, each one for a separate transmitter, together with the same number of cells at the receiving end as well. It has been attempted—in fact, one of the earliest research workers developed a system whereby wires connected the transmitting cells to the receiver—but it had low definition and was too complex. The illuminated signs, which consist of a bank of electric light bulbs with various of them becoming illuminated in accordance with the master key, are a form of television, but a metallic key instead of photocell intelligence controls them. There is one in Times Square which advertises Philco television; probably many readers have seen it.

Since the whole picture cannot be transmitted at once the next best thing is done, and it is sent a bit at a time. (It will be necessary to take the author's word for many of the things to follow since explanations would be too long and involved.) The live studio camera consists of a photosensitive tube known as an *image orthicon.* This tube is the heart of today's television system. Until its introduction, productions were limited by the minimum amount of light available on the set. Generally around 1200–1300 foot candles were required, but with this tube 300–400 foot candles can be used perfectly satisfactorily. The latest model of the image orth., as it is usually abbreviated, is known as the 5820 and has a better response to color than the old model as well as being more sensitive.

The tube is really only a form of the vacuum tube used in ordinary radios: that is, it has a cathode which emits electrons in all directions in much the same way as a lamp bulb emits light. By adding different electrodes—such as grids, anodes, deflectors, etc.—to the tube, it is possible to control these electrons and cause them to be deflected to any part of the tube, and to control their intensity and focus them into a ray very much in the way light from a searchlight is focussed. In the usual receiving tube, electrons are allowed to stream off the cathode in a mass flow and most of them go where they are supposed to: that is, to the anode which produces there a stronger signal than the one originally applied to the tube's grid. In television, the electrons are not allowed to go where they please but are strictly controlled by grids, deflector plates, targets, and electron guns. These latter are merely shields around the cathode concentrating the electrons into a beam which the cathode then shoots out like a machine gun.

On one end of the image orthicon tube is a mosaic, which can be likened to the retina in the human eye. On this mosaic is focussed the picture to be transmitted. As the various shades of light and shadow fall on the face of this plate, electrons are released and cause a change in the charge in another plate very close by. This plate is *scanned* by a beam of constant intensity from the electron gun. As the beam passes over the charged plate, it gains and loses electrons due to the varying charges on the plate. This varying beam which is reflected to the collector beside the electron gun has been modulated by the light content of the picture, and since everything we see is capable of interpretation in terms of light and shade only, it contains a true account of the objects in the scene.

A few sentences ago the word *scan* was used. It should be explained. By a special arrangement of coils around the neck of the image orthicon, the path of the electron beam can be deflected in any direction as freely as a stream of water from a hose manipulated by hand. However, in this case the beam is directed in an orderly fashion back and forth across the mosaic. It starts at the top left-hand corner and goes across the screen to the other side. Then it is brought back very rapidly and sweeps across not the *next* line, but the one after it. That is, it sweeps lines number 1, 3, 5, 7, etc. After it has reached the bottom of the mosaic it returns extremely rapidly to the beginning of the *second* line, which has not yet been scanned and proceeds to sweep across lines numbered 2, 4, 6, etc. Thus, by the time that the beam reaches the bottom of the mosaic for the second time, every part of the screen has been scanned once. It is seen that scanning is merely the action of causing a beam of electrons to sweep back and forth in a specially arranged pattern across and down the screen so that the whole area is swept by it.

Someone is bound to ask, "Why scan in two sections—lines 1, 3, 5, etc., and then lines 2, 4, 6, etc.? Why not merely go 1, 2, 3, 4, 5, and so forth?" The answer is tied up with flicker. The early movies were called the "flickers," usually abbreviated to "flicks." There was a very good reason for this, for they really flickered very badly. As projection lamps became stronger, the flicker became worse. Remember that in those early days all films were projected at the rate of 16 frames per second, not 24. The shutters which cut off the light during the time that the film was being pulled down had only two blades and this meant that there were only 32 flashes of light per second, which is quite a slow repetition rate. Someone had the bright idea of putting a third blade on the shutter so that there were

48 flashes per second: this meant that even with the increased light required with this extra blade (because its effect was to reduce the total amount of light), there was much less flicker.

Movies have 24 frames a second, television has 30, but that would be only 30 flickers a second if some way of breaking it up into 60 flashes were not employed, and we have just shown that even 32 flicks a second was too slow. So *interlacing* was introduced. This is simply the art of showing half a picture in the form of lines 1, 3, 5, etc., and then the other half, lines 2, 4, 6, etc. Interlacing is the technical operation of causing them (the different lines) to fall between each other. So, since each frame is split into two parts we have 60 flashes a second and there is no trouble whatever from flicker. Actually we see 60 pictures of 262 1/2 lines each every second, but because of persistence of vision they appear as a single picture.

Actually all that we see is an exceedingly fast-moving spot of light. Because of the persistence of the screen (the property which causes it to glow for a few microseconds after the spot has passed it) and the persistence of vision of the eye, the viewer actually sees about a line at a time, and because of the persistence of vision of the eye he sees a fully illuminated screen, and of course, a picture.

The word *photoelectric* was used a little way back. It merely means a device which has the property of generating an electric current when light falls on it. Some of the caesium salts and others of the rarer metals—including, of course, the great forerunner of them all, selenium—have this property. As far as the image orthicon is concerned, it might not be correct to say that it is photoelectric since it does not actually generate a voltage but merely serves to modulate the electron beam by the action of charges on the tube elements.

A device known as a *synchronizing generator,* familiarly called a *sync generator* or *sync genny,* is used to generate the two voltages which cause the beam to scan the tube. There are two such signals required. One, vertical sync, is the signal which, operating via the scanning coils on the neck of the tube, pulls the beam down after each line. The other is the horizontal synchronizing pulse. This causes the beam to fly across the screen from left to right a total of 525 times a second. This piece of equipment is highly important to the television system, for on its accuracy of operation and constancy of frequency, which consists of 60 cycles for the vertical deflection and 15,750 cycles for the horizontal, depend the integration of the picture. All the home receivers, in fact all receivers, contain miniature replicas of this generator and they deflect the beam in the kinescope tubes in precisely the same manner and at the same time as the beam in the camera tube. If the transmitter sync generator changes frequency, some of the viewers' sets may not follow it, and the picture will "roll" up or down the screen or even completely lose its horizontal synchronism and "tear out."

The sync generator may be very close to the studio where the cameras are operating or it may be as far as 500 feet away. In the latter case it may lead to complications. There is also another output from this equipment which is called the *blanking pulse*. After each line is scanned, it is necessary for the beam to return to the beginning of the next. If the beam were not extinguished, it would leave a retrace line as it swept back across the screen and consequently the picture would be spoiled. Therefore, an extra signal from the sync generator extinguishes it on its return path. This also occurs when the beam is returning to the top of the screen in preparation for the next field.

The fluctuating signal which represents the scene in the studio is now transferred to the control panel by means of a special coaxial cable. This is a cable in which the outer covering forms one of the two conductors, so that it really consists of a solid or flexible wire, running in the center of a tube which may be flexible or rigid, and kept concentric with the tube by means of spacing insulators which are like little buttons, or else by means of a solid, dielectric insulation which fills the tube and thus keeps the center wire in position. The purpose of the special cable is twofold. It prevents any radiation from the center wire (and prevents any other signals nearby from interfering with the signal on the wire) and also keeps the impedance which the wire offers to video signals constant. The latter is most important, for here is one of the first places where those troublesome ghosts can be born.

At the director's studio control panel, the video control technician is engaged in mixing picture signals. His work really corresponds to, but is much more exacting than, that done at the audio console where instead of picture signals, the outputs from several microphones as well as those from the special effects console are mixed. At the studio control panel there may be as many as four cameras operating into it, plus a slide projector and a 16 mm or 35 mm movie projector for film inserts. Very rarely there may also be remote lines coming in to it, but these commonly go to the master control board since it is not often that a remote pickup signal has to be mixed into a studio production. The smaller stations often combine the studio control and the master control functions.

From the master control, the signal is fed via either coaxial lines or cables (all signal circuits are referred to as lines in broadcasting) or a micro-wave link to the transmitter. The latter may be in the same building—many are—or it may be as much as four miles away. Usually the distance is half a mile or so. In spite of the latest equipment and the greatest attention to quality, passing a signal through a cable for any distance is one of the easiest ways of degrading a signal. Unfortunately, it is only too easy to introduce ghosts and other forms of interference in a cable, and the picture that leaves the transmitter must be the best obtainable.

At the transmitter, the signal is monitored on a small screen to be sure it has the best possible definition. It is possible to compensate to a limited extent for certain lacks in the signal. For instance, a peculiar device called a *sync stretcher* is neither a stretcher for tired sinks, nor is it a modern version of the rack beloved by the Grand Inquisition! In fact, it turns out to be a very innocuous piece of equipment which reinforces the sync pulse, if it is below a certain value. On some occasions this is invaluable, for the sync pulse has an unhappy habit of getting lost on some circuits (although it is more often a feature of long runs over coaxial cable).

After cleaning up and amplifying, if necessary—and it usually is—the signal is fed to the transmitter modulating stage. This is merely a section of the transmitter containing a number of tubes which impress the signal on the steady carrier from the transmitter. Modulation can be likened to the effect obtained when a shutter is placed over a searchlight and used for sending morse code in long and short flashes. The only difference is that the signal carrier is never completely reduced to zero as is the searchlight signalling. This is called *amplitude* modulation since the television signal changes the amplitude or strength of the carrier. This carrier, although fluctuating most of the time, is full strength, or 100 per cent modulation at the beginning of each line, for the sync pulse is always full power. This is so receivers can have every opportunity of obtaining the optimum signal for them to hold the pictures in step even in areas of low signal strength.

The home receiver is very similar to a sound radio in that it has tuning controls and is a super heterodyne, which is a highly sensitive type of receiver. However, instead of having a loudspeaker, it has the cathode-ray tube. And to operate it, there are circuits very similar to those of the sync generator in the studio. When the sync pulses are received, they are combined with the video information, so it is necessary to separate them. After this is done, the video information is fed to the kinescope and causes it to fluoresce according to whether the picture is bright or dark at the time. However, this is not enough to produce an intelligent picture, so the separated sync signals are fed to a miniature sync generator and produce driving voltages which in turn produce a magnetic field in coils around the neck of the kinescope tube. These are in exact step with those in the camera tube. Thus, when the electron beam in the camera is at the top left-hand side of the mosaic, the beam in the receiver is at the same spot on its screen and it reproduces the movement of this beam in all respects.

In America the system of negative modulation is used: that is, the darker the picture, the stronger the carrier or the more output from the transmitter. In England, positive transmission system is used and the brighter parts of the picture make the carrier stronger. Both methods have their advantages, but it seems that the negative method is better because any interference, such as auto ignition noise or interference from switches, etc., always shows up as black dots rather than white flashes which are more disturbing. The minimum value of the carrier signal between sync pulses is about 15 per cent of the maximum strength, so that the signal never goes completely off the air. At these low points the picture is brightest.

After modulating the carrier, the picture and carrier are combined and again flow through a coaxial cable, but this time it is quite different from the ones used to bring the picture to the transmitter. This one is made of copper pipe and may be from one and five-eighths of an inch in diameter to as much as six and one-eighth. The inner conductor is made of pipe or solid copper depending on the type. There are two reasons for using this type of conductor. Probably the most important is that it has much lower loss at the very high frequencies used for television than any other kind of cable. Secondly, it can carry the high power more readily. At high frequencies and with high power, very many strange effects are observed. Also, since this cable is usually out of doors and exposed to weather, it has to be able to resist its effects. Solid, dielectric cables, which have material around the center conductor, such as polystyrene which is a plastic, and an excellent insulator at lower frequencies, are more liable to break down and get hot in unexpected places than the so-called rigid cable. This cable is generally filled, under a few pounds of pressure, with an inert gas such as nitrogen, or dried air from a special dry air pump, to keep out moisture.

At the top of the steel tower is the antenna. This is a radical change from the kind one is used to associating with a radio station. True, it is on a tower which looks just like those at ordinary sound-radio stations, but the tower itself is not used for broadcasting, unless the station also has an AM station and is using the antenna for that to support the television antenna. Everyone is now familiar with the appearance of television antennas for receiving, but the transmitter antenna does not resemble these. There is really only one antenna in general use: this is the *super turnstile*. There are others, of course, such as the ordinary turnstile and modifications thereof, but generally speaking most stations use an antena of this type.

As its name implies, the antenna looks very much like a turnstile. The low band—channels two to six—generally has only three *bays,* as each section is called, while the high band—channels seven to thirteen—has as many as six bays. Each bay looks like the turnstile at the entrance to a stadium with the addition of some extra bars at the end of the arms. The antenna extends from twenty to sixty feet above the top of the tower with the bays mounted one above the other. The more bays used, the greater actual gain in power in the antenna. This makes it possible to use a low-power transmitter on the ground with a high-gain antenna and put out as much power as another station with a lower antenna gain. This factor is of great importance to the broadcaster since sometimes, due to the comparatively low strength of the tower used to support the antenna, only a light coaxial cable can be used to carry the signal to the antenna. The smaller the coaxial cable, the greater the losses in transmission in it. Thus, a high gain at the top will help to make up for the losses.

In television, height is the important thing. The FCC limits the power of television stations to an arbitrary figure of 50 kilowatts of radiated power (that means actual power from the antenna) with an antenna height of 500 feet above the average level of the ground. Because of this common denominator, there is not as much to choose between stations—on the surface—as there is in AM. In the latter, the station with the highest power and lowest frequency may reasonably be expected to have the best coverage—that's putting it in broad terms, which is what most sponsors do. In other words, they are more impressed by high power than the actual coverage obtained. The FCC figures are based on the expectation that a station on the high band will obtain first-class service coverage out to about twenty-seven miles, while on the lower channels about twenty miles is the expected limit of corresponding service. These figures are from the FCC propagation curves.

As a matter of fact, these figures are not always obtained nor are they always considered to be correct. It was said above that all things being equal, stations with the same power would cover the same area, and therefore sponsors would find all stations equally good. Unfortunately, this is not always so, and it appears to boil down to the fact that the higher the antenna, the better the signal, even though the antenna power has to be reduced to keep within the FCC limits. For instance, in the case of WNBT on channel four in New York, the antenna is on top of the Empire State Building and is about 1300 feet above the ground. The power required is only about seven kilowatts to give the same coverage that 50 kilowatts would give at 500 feet!

Also, and a most important point, the higher the antenna, the less the chances of surrounding buildings causing ghosts in the picture. Usually the ghosts are caused by nearby buildings which reflect the signal so that it arrives a few microseconds after the main signal and shows as a pale image to the right of the main figures on the screen. The distance between the antenna and the reflecting building has a definite bearing in the spacing between the ghost and the main image.

From the foregoing remarks, it might be inferred that television waves act rather like light waves. This is quite true: in fact, the two are very similar, and the higher the frequency, or the shorter the wave length, the more like light waves they behave. Although figures of 27 and 20 miles were mentioned above, it must be understood that these are *not* the limits of propagation but the distance to which the FCC says *first-class* service should be rendered and also the area which was supposed to be kept free from interference from other stations according to the old allocation plan for television stations. One of the things which caused the current hearings before the FCC was the fact that interference was being experienced where it was not expected to be. Most stations provide usable service to 50 miles or even more, but above that distance reception is usually due to abnormal conditions. It is not power which generally limits the range of television signals but the height of the antenna, for since the waves travel in straight lines they cannot very easily bend around the curve of the earth. Consequently, places only a few miles behind the horizon seen from the transmitting antenna are often out of range of the station.

The television band is divided into two parts, the upper and the lower. The lower is again broken by the introduction of a small, mobile service band between channels four and five. Shown below are the channel numbers and the corresponding frequencies.

Low Band		High Band	
Channel	*Megacycles*	*Channel*	*Megacycles*
2	54 to 60	7	174 to 180
3	60 to 66	8	180 to 186
4	66 to 72*	9	186 to 192
5	76 to 82	10	192 to 198
6	82 to 88	11	198 to 204
		12	204 to 210
		13	210 to 216

* The band 72 to 76 megacycles is used for mobile phone, thus making it possible to use channels four and five in the same city.

The Film Chain Camera The camera used to transmit films over television employs the older iconoscope tube. This was the forerunner of the image orthicon and is reputed to give better quality than the latter although it requires more light. The Pye Radio Company of Cambridge, England, has recently introduced an *image iconoscope* and has named it the Photicon. The "image" prefix usually means that a multiplier section has been incorporated in the iconoscope to amplify the very weak signals from the mosaic before passing them on to the rest of the equipment. This in turn ensures the minimum of noise being amplified in the rest of the equipment. The Photicon gives beautiful definition and resolution but requires a little more light than the image orthicon.

But let us now return to the film camera. Since the amount of light is practically unlimited in the projector (for it is a simple matter to increase the power of the illumination), the iconoscope is quite well suited, for it has a higher resolving power than many image orthicons. The film camera contains no lenses and is very simple compared with the live studio camera. The picture from the projector is focussed directly on the mosaic by means of the projection lens and is about four by three inches in size. The tube is scanned in the same manner as the live camera and is driven by

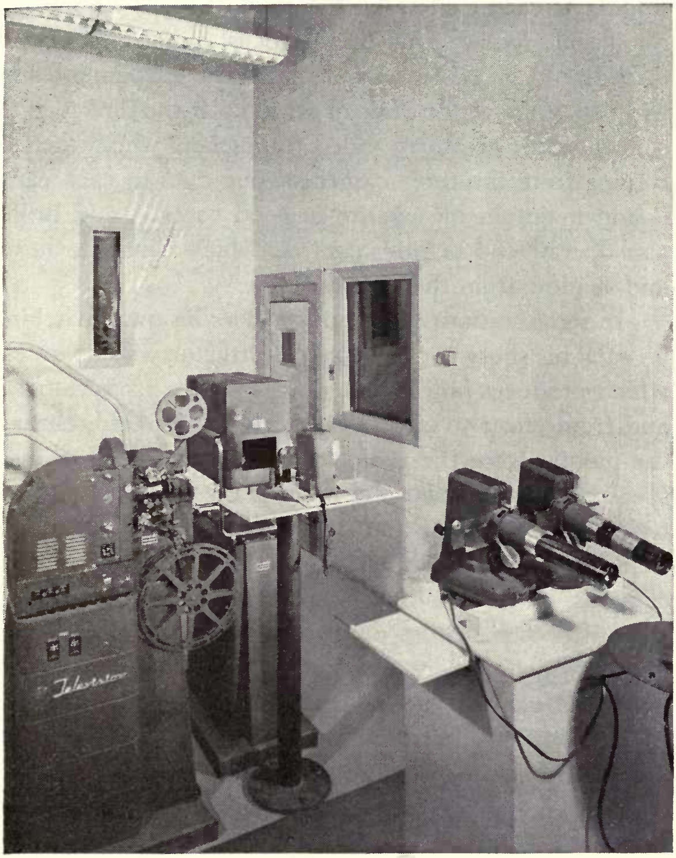


Figure 2-1. Typical film projection room in smaller independent TV station. Space is left on the right of the multiplexer for a second 16 mm projector. The two slide projectors in the right foreground are for station identification and announcements. Station WHIO was constructed by the Austin Company Engineers and Builders, by whose courtesy this illustration appears.

the same sync generator. The chapter on film equipment for television describes it much more fully and shows in detail how it operates.

In closing, a point that should be explained is the mechanics of studio operation. Let it be assumed that we have a three-camera studio. At each camera on the studio floor is a cameraman who is responsible for accurate frame, focus, and composition of the pictures from his camera. Each man is in telephonic communication with the producer or director who sits at the director's table. In the control room are three video technicians who watch the pictures coming from the three cameras—one man to each camera control—and maintain the picture in good contrast and brilliance. They also operate the shading controls which eliminate unwanted flare and shadow from the picture.

In some stations the producer does his own switching, in others he calls his shots to the technical director who operates a switcher which produces fades, cuts, dissolves, etc., from camera to camera and from effect to effect. The technical director can also bring in the picture from the projector if he needs it for an insert or other special effect. In the same room is the audio technician who controls the sound level and operates turntables for music or special sound effects. In addition to the three monitor screens for the three cameras, there is a line monitor screen which shows the actual picture chosen by the producer to be sent over the air. And no matter which camera shot he has called—it may be number 1, 2, or 3, or the slide projector or a movie insert—the picture he orders is shown over this screen as it is transmitted. Most stations also have an "off-the-air monitor" in the control room so that any changes in quality due to transmission can be corrected.

CHAPTER 3

MOVIE-MAKING EQUIPMENT

CAMERAS

A movie camera consists essentially of a holder for unexposed film, a device for moving it past the lens and stopping it momentarily while the exposure is made, a shutter to prevent light from reaching the film when an exposure is not being made, and a take-up reel for rewinding the exposed film. In other words, it is merely an adaptation of the still camera already known to most readers.

By reason of its specialized application, the movie camera requires a number of refinements which make it somewhat more elaborate than the definition above might indicate. The sequence of operations is performed by either turning a handle or providing a motor drive of some kind. For normal film making a motor drive is used to ensure that film is moved at a constant speed through the camera. Hand-turned drives almost always vary in speed due to the impossibility of maintaining a constant torque. Two forms of motor drive are in general use: these are spring and electric motors.

Most of the cheaper and more popular makes of semi-professional or amateur cameras are provided with a spring drive which is built into the body of the camera. One winding of the spring may be sufficient to expose about twenty-five feet of film at twenty-four frames a second, but, of course, this differs for each make of camera. As a general rule, spring drives are not too satisfactory for they have a habit of running down at crucial moments: the spring is not powerful enough to expose a full magazine on one winding; the speed varies despite the provision of a governor which helps to maintain a constant speed, and for lip sync work it is obviously utterly useless because it will not lock in with the sound recorder.

In spite of the imposing list of reasons why spring drives are no good, they are used a great deal and are invaluable, provided the limitations mentioned above are kept in mind and they are used for the purposes for which they are best suited. Newsreel cameramen working away from sources of power, photographers who must carry a minimum of weight, brief clips of film which are known in advance to be short, such as single-frame work for animation, can all make use of a spring motor. Since most shots should run at least seven seconds, it is normally possible to get two shots or a single, longer shot on one winding without any danger. It is always advisable to rewind the motor between each shot if possible, for in this manner the speed remains more constant through the length of the exposure.

Electric motor drives are made in three general forms, although there are, of course, variations in each class of motor drive. The first type is the synchronous motor which operates on 110 volts, alternating current, 60 cycles only (or other frequencies to special order), with a constant speed of 24 frames a second *only*. This motor is used for all types of production in general and in particular for lip sync filming, where the picture film must run with an unvarying speed at all times. The second kind is the "wild" motor which operates from 110 volts of alternating current or direct current. This is a series-wound motor and the speed can be adjusted within very wide limits: it is used for any kind of work where sound does not have to be synchronized with the pictures. The last category includes the 12-volt or other low-voltage motor which operates from batteries—either storage or dry batteries—strapped around the waist of the operator. The battery-operated cameras are used in much the same way as the spring-driven types except that they are capable of exposing many hundreds of feet of film before the batteries have to be renewed or recharged.

There are many makes of motion picture cameras for both 16 mm and 35 mm film. The complete list is too long to give here, but among those which are used for producing films for television and industrial purposes are the following:

Akely 35 mm (not illustrated)
Auricon Pro 16 mm single or double system sound
Auricon Cine Voice 16 mm single system sound
Bell & Howell "70" Series 16 mm
" " Specialist 16 mm
" " Eyemo 35 mm
Eastman Kodak Cine Special 16 mm
Maurer Professional Camera 16 mm
Mitchell 16 mm Camera
" 35 mm Camera
Paillard Bolex 16 mm (not illustrated)
Pathe 16 mm (not illustrated)

Included in the list is some high-quality amateur and semi-professional equipment which produces results every bit as good as some of the Hollywood super equipment.

It will be noticed that some of the above cameras are listed as sound cameras. Since the sound section is usable separately, however, they are included for discussion in the camera section. Only the single system sound camera has a built-in sound head; the others are picture-making devices only. Irrespective of the make of camera, there is little difference among those in the same price range. It does happen, however, that until the higher priced models are reached, it is generally impossible to find one model which includes every refinement desired: in other words, some models have certain features, other makes have the other features which the user may desire, but none of the cheaper cameras combines them all. Probably the most complete camera in the low-price silent range is the new Pathe. Not only does this camera have all the features usually found in the professional camera, but it has something not found in any other low-price model—

full-frame follow-focus. This means that it is possible to watch the scene being filmed through the lens which is recording on the film *all the time* that the scene is being filmed. Thus, the cameraman sees exactly the same things that are recorded on the film, and errors due to parallax or lack of coordination between the camera lens and the view finder are eliminated.

The Auricon cameras are very interesting additions to the 16 mm line inasmuch as all three are essentially single system cameras which can also be used for double system recording. The notes which follow shortly illustrate their versatility. For the sake of convenience, the cameras have been listed alphabetically and are treated in that order.

The Akely 35 mm Camera This is a high-grade professional movie camera. Electrically driven, it is a highly precisioned piece of equipment and produces excellent results. It is used by Paramount for recording the picture in their intermediate film, big screen television equipment and for kinescoping purposes.

The Auricon Group Auricon cameras made by Messers. Berndt-Bach of Los Angeles, California, are unique in the 16 mm equipment line (and the 35 mm, too, for that matter). They are designed initially as high-quality picture-producing equipment, but provision is also made for recording high-fidelity single system sound. The camera proper is illustrated in Figures 3-1 and 3-2. These show the camera with a three-lens turret and a single-lens mounting with the side open.

Figure 3-1 shows the view finder which automatically corrects for parallax and indicates the distance to the subject. A number of spare mattes (masks) for different lens lengths are carried in the body of the finder so that the correct field size can be obtained with any lens.

The camera is designed to take 16 mm single perforation film since it is intended for sound work. However, it is possible that double perforation film would pass through. The opened camera shows the 200-foot magazine and the film passage can be identified

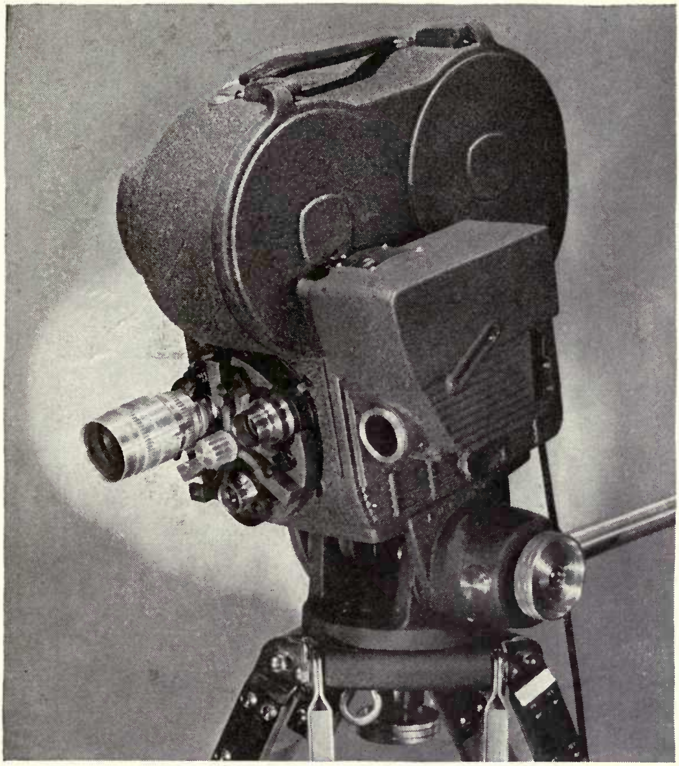


Fig. 3-1. The Auricon Pro 16 mm single system sound camera. The turret carries three lenses any one of which may be selected at will. The handle at the right is for controlling camera movement.

by the piece of film leader in the mechanism. On the lower right-hand side is the sound recording head (galvanometer). The somewhat strange shape of the camera is due to the fact that it is completely blimped: that is, it is silenced for operation in a studio in very close proximity to the microphone. The mechanism is encased in an aluminum case which is lined with sponge rubber and suspended by special mounts so that no mechanical noise is transmitted to the outer case. As it happens, the camera is so quiet that it is necessary to install a small pilot light on the case to show when it is running. At the left, moved away from the camera case

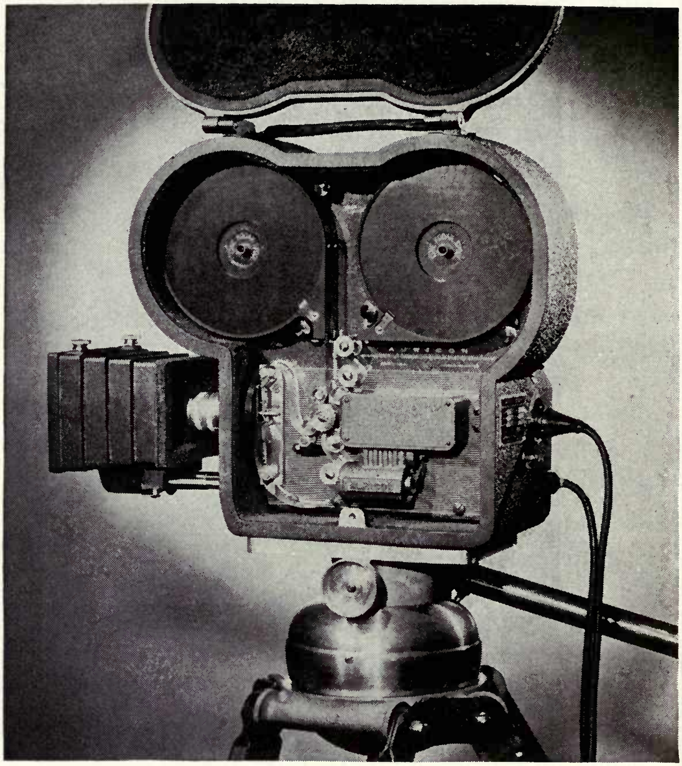


Fig. 3-2. Interior view of the Auricon sound camera for 16 mm film showing picture and sound gates. Compare this with the diagram of the mechanism and labelled parts.

to expose the lens, is the lens shade. This is used to keep stray reflections and sun out of the lens and reduce risks of fogging.

This is one of the few cameras in the group mentioned which is completely blimped for sound work. Many of the others require additional sound treatment to prevent the microphone from picking up camera noise. At the rear of the camera are two sockets for connecting the 110-volt-60-cycle, a-c power supply for the motor and the audio feed to the recorder; the pilot light can also be seen. A very handy feature is the provision of a stud on the body of the camera to which a tape measure may be attached to measure the distance to the subject for focussing.

Fig. 3-3. Auricon 1200 sound camera for continuous thirty-three minute filming. It is the same as the Pro except for the 1200-foot magazines.

Figure 3-3 shows the Auricon 1200. This is essentially the same as the other models with the exception that the magazine holds sufficient film for thirty-three minutes of continuous filming, or 1200 feet of film. This feature makes it possible to film a thirty-minute television show in one operation without having to pause every ten minutes to change magazines. The system is described later in the chapter on production.

The Cine Voice is a miniature single system camera with a film capacity of 100 feet which is sufficient for two and one-half minutes of recording. It is designed for use with television productions where short interviews are required, or for any other

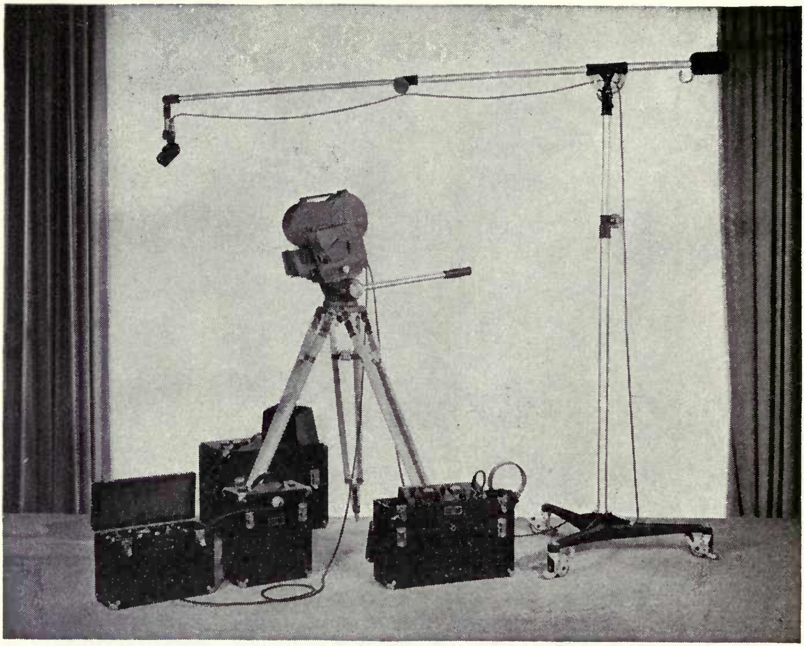


Fig. 3-4. Group of Auricon camera and sound equipment.

purpose where short shots only are used. So far, it has not been used extensively and at the time of writing is only just being released onto the market. It will probably end up as the kind of gadget to be found in every newsreel man's pocket or, to be precise, auto, since it is so small and unobtrusive.

Figure 3-4 shows a group of Auricon equipment: camera; boom microphone; recording amplifier, which is just below the pan handle on the tripod; and portable power supply. The case on the extreme left contains a miniature 110-volt, a-c generator which drives the camera motor. The case next to it contains a 12-volt accumulator which will operate it for many hours. Since the recording amplifier is battery-operated, it is not affected by the absence of standard a-c power. Of course, if power-line alternating current is available it is normally used in preference to the battery supply. Figure 3-5 is a drawing of the camera layout showing the names of various parts appearing in Figure 3-2. Although this is the layout for the Auricon specifically, most cameras are similar in principle and if this is studied no difficulty should be experienced with other makes of equipment. Incidentally, the similarity between the camera and projector is quite clear if this sketch is compared with Figure 4-17. The film loops above and below the picture gate should also be noted. The distance between the picture and sound gate is exactly twenty-six frames, the same as in the projector.

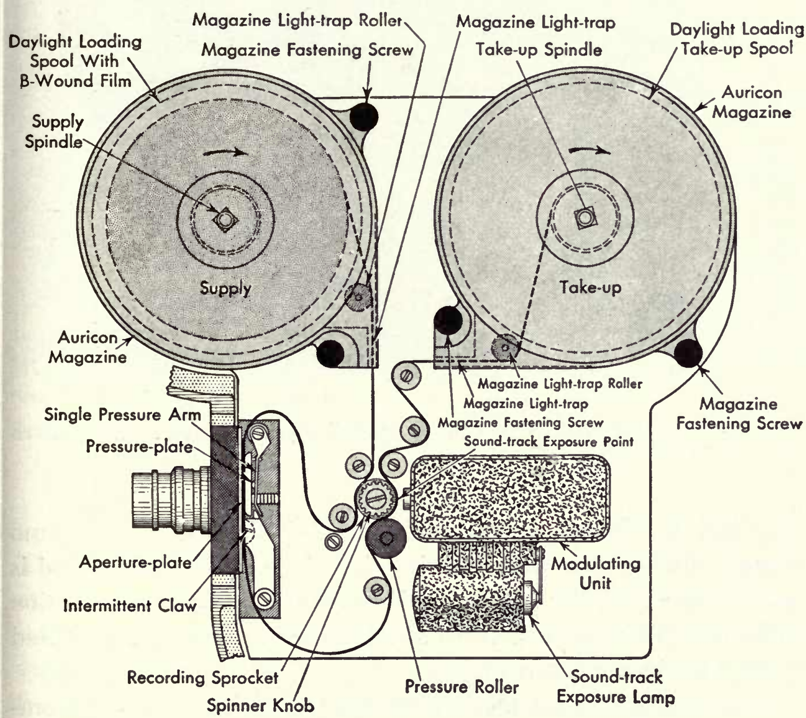
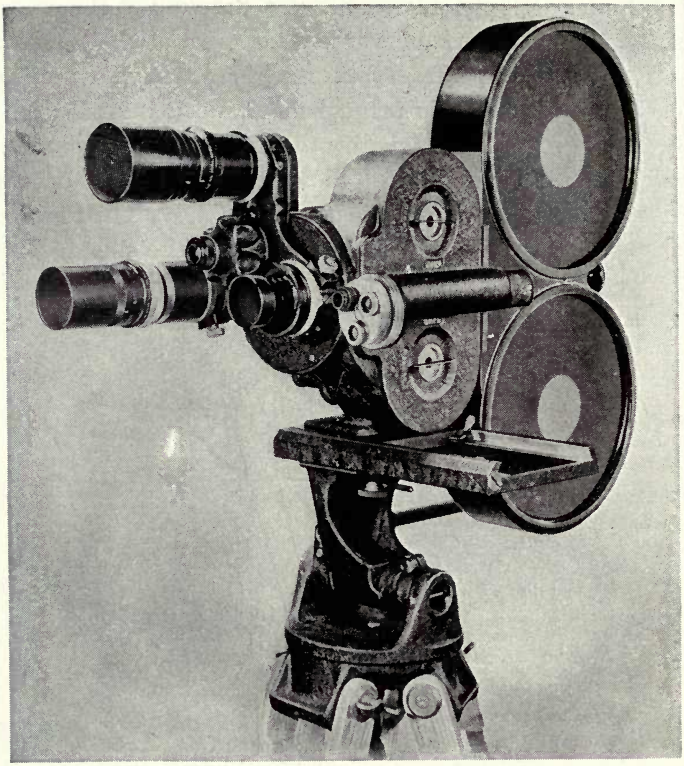


Fig. 3-5. Diagram of film path through the Auricon camera. It is clear how, by the time the film reaches the sound recorder, all intermittent movement has been smoothed out. This type of camera provides extreme economy in operation.

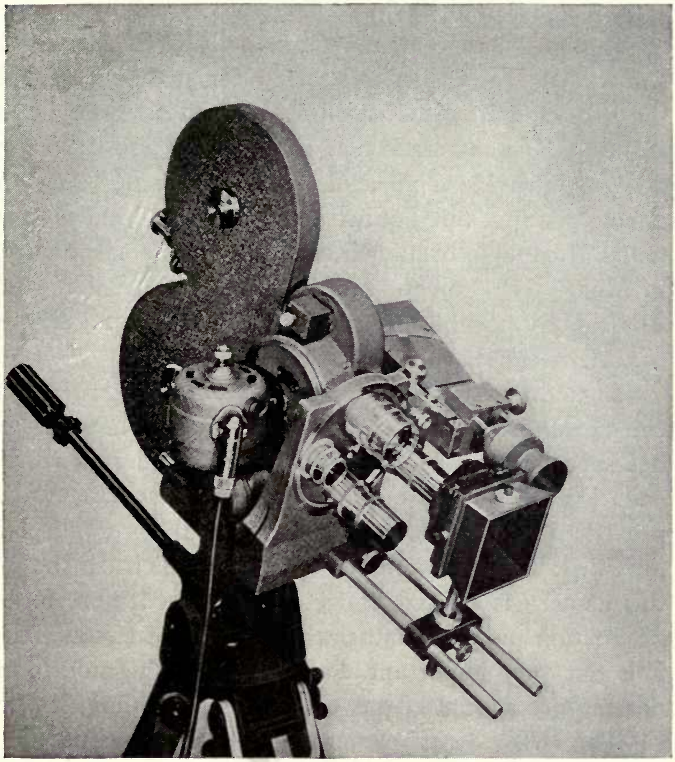


(Courtesy of Bell & Howell Company)

Fig. 3-6. The Bell & Howell Eyemo 35 mm spring-driven camera.

The Bell & Howell Series Figure 3-6 illustrates the Eyemo Camera for 35 mm film. This is driven by a spring motor and is used considerably by professional newsreel cameramen for action shots and special events where synchronized sound is not required and a-c mains are not available.

The actual camera mechanism appears to be very small compared with the magazine and lens turret. The smaller three-lens turret on the right is the view-finder turret, and the corresponding objective lens is selected for each film lens. Note how large the 35 mm lenses are compared to 16 mm lenses.



(*Courtesy of Bell & Howell Company*)

Fig. 3-7. The Bell & Howell Specialist 16 mm camera, with three-lens turret, synchronous motor for 110 volts, 60 cycles, 400-foot magazine, and sunshade.

Figure 3-7 is the cream of the Bell & Howell 16 mm crop. This is the Specialist Camera. It is very similar in body appearance to the Eyemo; in fact, all the Bell & Howell cameras are somewhat similar in bodywork. The 400-foot magazine is mounted vertically at the rear, and the motor drive—electric—is just in front of it. This motor is interchangeable and may be synchronized, 110-volt, 12-volt, or any other voltage "wild" motor. Four lenses are mounted on the turret, and a lens shade is in front of them supported on a slide arm. An automatic parallax-correcting view finder is mounted on the far side.

Focussing is done by sliding over—racking over is the usual term—the whole of the camera body and leaving the shooting lens in position. This places a view-finder tube behind the lens and the subject is focussed through the actual lens to be used for the shooting. The camera is then racked back and the scene shot. This does not provide a view of the actual scene "seen" by the lens during filming, but because the focus has been set and the view finder is capable of allowing for framing effects, it is entirely satisfactory. Even for shots of characters approaching the camera, it is usually possible to keep them in focus up a certain point according to the lens aperture used.

In addition to the electric motor drive, spring or hand drive can be used if desired. For sound work, a blimp is necessary to deaden the sound of the camera. Veeder-Root film footage counters are standard, as they are on most cameras. There is no provision for single-frame exposure, nor is a dissolving shutter provided; thus the number of effects which can be produced on this camera is limited. Since it is designed more for serious film production purposes rather than trick and effects films, however, it is not very important. For making high-grade films which do not require special effects made during filming, it is excellent.

The "70" Series cameras are really the forerunners of the Specialist, and most of them incorporate features that the latter does not have. In other words, some of them are designed for special work: one in particular is for slow motion runs at high speeds.

The Cine Special This camera, made by Eastman Kodak, is probably the most used in the whole of the television and semi-professional fields. It has been on the market longer than this writer can remember and has always been a quality product. Figure 3-8 shows its appearance with the 200-foot magazine, or film chamber as the makers call it, in place. The camera in the standard condition will hold 100 feet of film within its body. In this case, it is rectangular in shape and the sloping rear and top are absent.

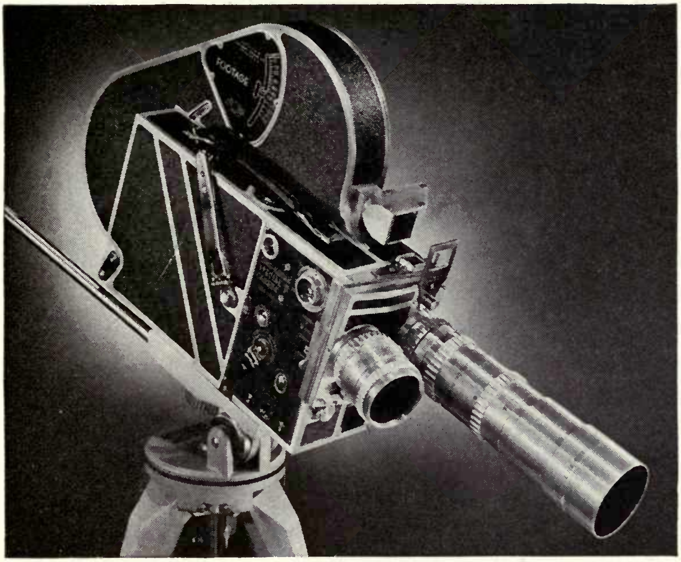


Fig. 3-8. The Kodak Cine Special 16 mm camera spring driven with 200-foot magazine and two-lens turret. This is probably the most popular semi-professional camera.

It should be noted that the lens turret carries two lenses set at an angle to each other so that neither will interfere with the field of the other. As it stands, it is too noisy for simultaneous sound recording, but special blimps for silencing it can be obtained.

Messrs. Berndt-Bach, the makers of the Auricon camera, supply blimps as well as an electric motor drive (synchronous) so that the Cine Special can be used for synchronized sound recordings at twenty-four frames per second. The built-in spring motor will expose approximately thirty-eight feet of film at maximum winding; this is just about one minute at twenty-four frames per second.

The panel immediately to the left of the shorter lens in the illustration contains the special controls and effects. Winding the spring motor is performed by rotating the large handle or crank. The smaller, lower crank is for making either single-frame exposures by placing it on the single-frame shaft at the bottom edge of the panel or for winding film backwards or forwards through the camera for special effects by placing it on the eight-frame shaft just above it.

The speed control is the knurled knob found immediately above the shutter control. This latter deserves a fairly thorough description. Some makers label this control a *dissolving shutter;* the Eastman Kodak Company calls it a *variable shutter;* but no matter what it is called, it performs the same function. Moving the lever from closed to open position alters the number of degrees that the shutter is open and controls the length of exposure (always remembering that the *speed* of the shutter movement is fixed by the twenty-four frame per second requirement of television). The normal position is "open." It sometimes happens that the light is so strong in an exterior shot that overexposure will result, even if the lens is stopped down to the smallest aperture available. In this case, the shutter may be adjusted to decrease the time that it is open and thus shorten the exposure: the speed of the film will, of course, remain the same no matter what is done with the shutter. If the control is set at one-quarter open, it is equivalent to two lens stops smaller; one-half open is equal to one smaller stop. In the same way, if the subject is desired in sharp focus with a soft background, the shutter can be set to a smaller opening: this requires a larger lens-opening if the amount of light is maintained the same. Increasing the lens aperture will reduce the depth of field which will put the background out of focus. On the other hand, if fast-moving objects close to the camera have to be photographed and the light is good, the shutter can be set to one-half or even one-quarter open and with a fast lens any tendency of the object to blur will be reduced. (Of course these things can be done with any camera having an adjustable shutter.)

Standard, double-perforated 16 mm film is used in this camera and, as is the case with all the cameras described here, either black and white or color film can be used. There are two methods of composing the picture. One way is to use the eye-level finder which consists of two lenses set in the form of a sight along the top of the camera; it automatically corrects for parallax. The

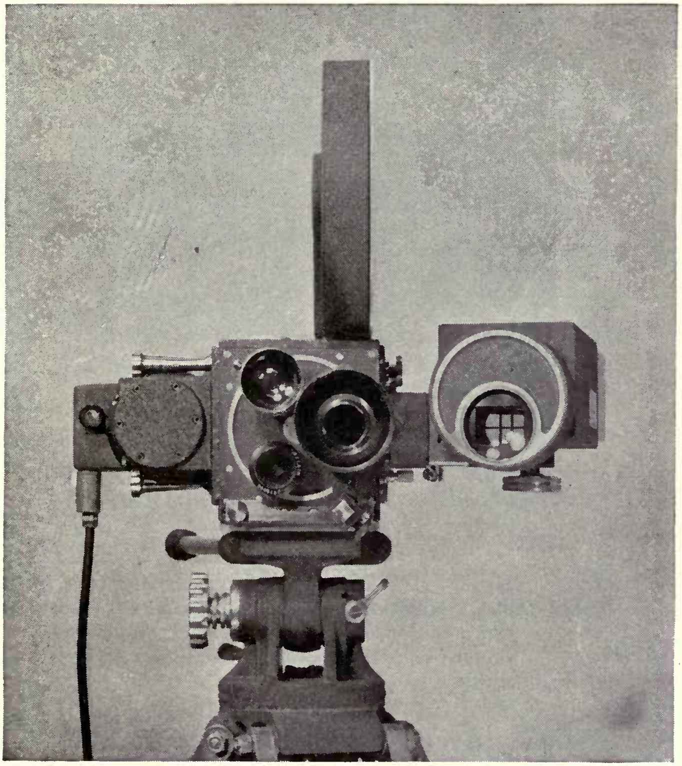


Fig. 3-9. The Maurer 16 mm camera for silent work as seen from the actor's position. Note the view finder on the right.

more exact method, however, is to use the reflex finder. This is positioned just above the film gate and is visible from the top of the camera. A small slide has to be opened to render it visible. The image produced by the lens in position appears on a ground glass screen, and by focussing the lens in the usual manner it can be set to produce the sharpest image on the glass screen. When the camera is run, the reflex finder closes automatically. If a lot of precision work is done or the finder is used a great deal, it is possible to have an image magnifier attached to it so that the finder can be used from the normal operating position at the rear of the camera.

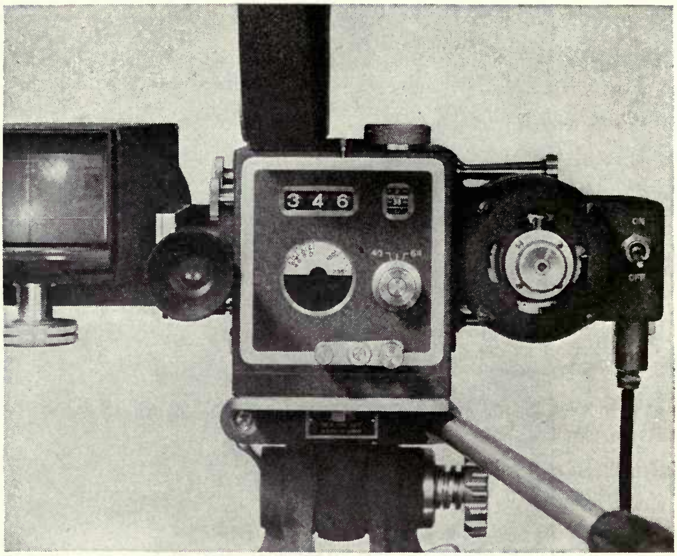


Fig. 3-10. The Maurer 16 mm camera seen from the cameraman's position. Note view finder on left, motor and switch on right, and dissolving shutter and control on camera body in center. The long handle on the lower right is for panning and tilting.

The Maurer 16 mm Professional Camera This camera is shown in Figure 3-9 from the actor's point of view and in Figure 3-10 from the cameraman's point of view. In Figure 3-9 the view finder is seen on the right-hand side. It is of the type which corrects for lateral parallax as the subject is focussed; various mattes are used to delineate the areas covered by different lenses. Critical focussing is accomplished by rotating the horizontal "T" handle just below the shutter indicator in Figure 3-10. This slides the camera body to the right and allows the telescope tube optical system to move into position in lieu of the film gate. Thus the image produced by the lens set in position on the turret will be seen by the cameraman. Critical adjustments can then be made and the picture composed. After this, the body is slid back into position and surveillance continued by means of the view finder.

The footage counter is above the shutter indicator and reads up to 999 feet; the frame counter just to right of the former goes from 0 to 39 frames and is therefore a vernier indicator. A dissolving shutter is incorporated and the condition, i.e., angular opening, is shown by the model shutter in the indicator calibrated to 235°. As the shutter condition, or opening, changes, the black area follows it, thus repeating the actual blade positions. Just to the right of this is the auto control for making fades. Turning it to the right produces an automatic fade for 64 frames, turning it to the left produces a faster one for 40 frames. In each case, if a fade-out has been made, it is only necessary to turn the knob in the same direction to initiate a fade in the opposite direction. The possibilities for effects are obvious. It is also possible to adjust the shutter to any desired angular opening by means of the fade control; thus unusual light conditions, etc., can be compensated. The synchronous electric motor for 110-volt, 60-cycle alternating current is to the extreme right and the control switch is clearly marked. A handle for rewinding film, or hand operation, is available for use just in front of the motor. The equipment is completed by 400-foot magazines.

The Mitchell 16 mm Camera This is shown in Figure 3-11. This is also a professional camera designed to take hard work in its stride. It is obtainable with all the usual fittings and refinements and is used in many Hollywood studios where 16 mm film is shot.

The Mitchell 35 mm Camera Figure 3-12 illustrates this camera. The resemblance between it and the 16 mm version is noteworthy. The model illustrated is a sound camera. It is interesting to note that in appearance and details many of the highest-quality cameras are somewhat similar in general outline. There are many cameras of this type in use in all parts of the world.

The Paillard Bolex This is an excellent camera for light television work and particularly for newsreel work if an exceptionally low-priced, high-quality camera is desired. It has a three-lens

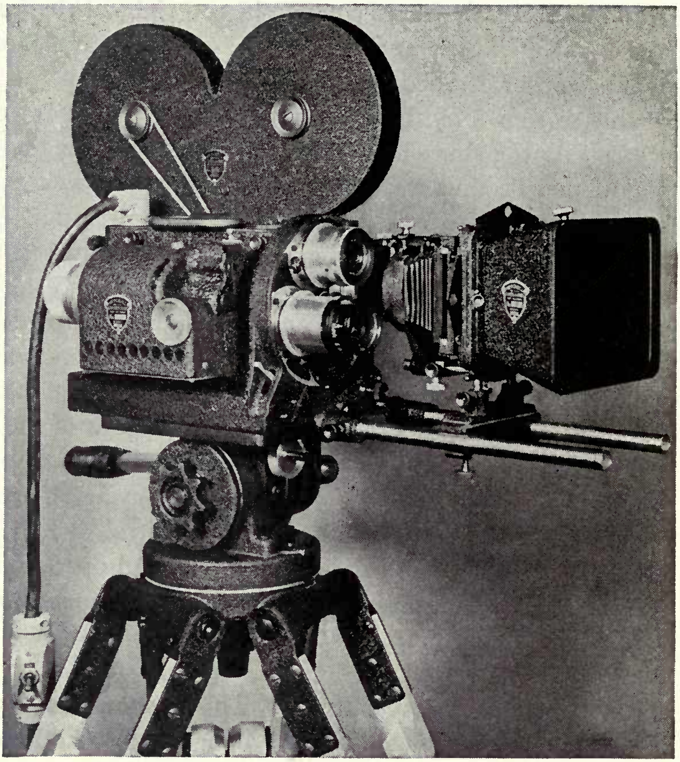


Fig. 3-11. The Mitchell 16 mm professional camera. The large hood mounted on two rails in front of the lens is a sunshade.

turret, spring and hand drives, rewind feature, single picture control, and built-in view finder. A great many are in use in the television news departments in this country.

The Pathe 16 mm Camera This is a comparatively new camera, but it shows promise of becoming a favorite. Its great feature is the full-frame follow-focus which enables the operator to watch the action through the actual lens which is recording the scene. This is made possible by the addition of a small mirror at the picture gate. When not in use, a shutter blanks off the viewfinder tube so that stray light cannot fog the film; when it *is* in

Fig. 3-12. Opened view of Mitchell 35 mm sound camera. The heavy construction and solid workmanship of this fully professional Hollywood camera are very apparent.

use the operator's eye at the end of the tube prevents light from entering.

It has all the refinements found in the other cameras including adjustable shutter for effects, hand turn, and single-frame control. A strong spring drive is included, and provision is made for an electrical drive. Both this camera and the Bolex described above take 100-foot film spools; however, larger magazine fittings are in process of introduction. It should be realized that the cameras described above do not by any means constitute the complete list of equipment available but are a representative sample of instruments ranging from around $300 to $3500. The amount spent depends on the purpose for which the camera is intended as well as the accessories required and lenses selected. But even the cheapest of these will produce high-quality pictures if properly used.

All the spring-driven cameras have speed controls which make it possible to film at speeds from eight to sixty-four frames a second. However, any film made for exhibition over television or any sound projector must be exposed at twenty-four frames a second if the action is to appear normal on the screen. Sometimes, to speed up movements which would take too long to show any appreciable change if filmed at normal speed, 16 frames or even less may be used. Thus on projection, action which took perhaps hours to take place, such as a flower opening, may be shown in minutes. Action scenes where violent movement is needed, such as trains or other moving objects, may be shot at reduced speed so as to appear faster on the screen. But it is necessary to ensure that objectionable jerkiness will not result due to filming at too slow a speed.

View Finders Every camera includes a view finder of some kind. Generally, the one included in the unit price is of only limited use for picture making, and is often in the form of a built-in telescope type. Various graticules are available which may be inserted to indicate the field covered by each lens used. But the finder is of use only for showing what is more or less photographed. It does not give any idea of the focus setting needed for the lens.

Very few of the lower- or medium-priced cameras have the full-frame follow-focus feature which is an integral part of the Pathe camera. Focussing the filming lens focusses the scene to be photographed in the view-finder eyepiece as well since the one lens serves both purposes. Thus not only is it possible to be sure that at all times the frame contains everything required, but the focus can be maintained no matter how near or far away the actors move.

Other types, which are almost as convenient, contain automatic, parallax-correcting devices which swing the view finder in so that the axis of the lens and view finder converge at the same point—on the subject. This type of finder often has a scale of feet attached so that the distance read off on it can be set on the lens-focussing barrel to adjust for scene focus. Others, as already mentioned, use the filming lens for setting up, composing the scene, and focussing and then swing out of the way for use as a telescope type while filming is under way.

Notes on Camera Care Every camera maker has his own book of instructions which should be followed by the user. However, there are certain things which must never be done and are the Ten Commandments of cameramen. The most important is *never use anything metallic* to clean the film gate or guides. Its use is bound to scratch the highly polished surfaces and ruin subsequent films. A toothpick can be used or any soft wooden stylus for removing emulsion "horns" from the gate. A lead pencil will *not* do. Some of the softer emulsions, such as fine-grain positives, should not be run through the camera since the emulsion comes off and builds up these little mounds which can ruin films if not carefully removed. Sometimes it is necessary to place a piece of opaque material in the film gate to check for accurate focus. Ground glass must *never* be used. The edges are razor-keen and are certain to cause scratches on the gate plating. Ground film should be used instead. This is easily made by placing a small piece of film on a flat surface and gently rubbing with a circular motion with finest grade sandpaper on the emulsion side. When it is completely opaque, it performs in the same manner as ground glass and reproduces a picture focussed on it through the lens.

SOUND RECORDING

Taking photographs which appear to move is only half the task; just as important is the sound which accompanies the actions and which must be timed so that both sound and sight become apparent to the observer at the same time. There are many ways of recording sound. The first talkies made use of slow-turning, 16-inch discs which were played on an awkward turntable attached to the film projector. As we know, this system, known as sound-on-disc, rapidly gave way to the sound-on-film system (SOF). And today, all sound for movies is recorded on the film which carries the photographic record: thus there is only one factor to consider when handling a sound film.

Apart from the fragility of the separate record played on a turntable, there was always the risk of losing synchronization due to needle slip or inaccurate starting position. There is now talk of using magnetic tape either in the form of a separate tape running through an attachment to the projector, in synchronization with it, or in the form of a deposit of magnetic material along one edge of the film. The latter would be handled in much the same manner as the photoelectric sound track. However, since the introduction of this type of sound recording is a long way off—for it would require modification of all existing projectors to take advantage of it—it will be ignored in the discussion to follow. For the purpose of this book, the only type of sound recording in which we are interested is sound-on-film.

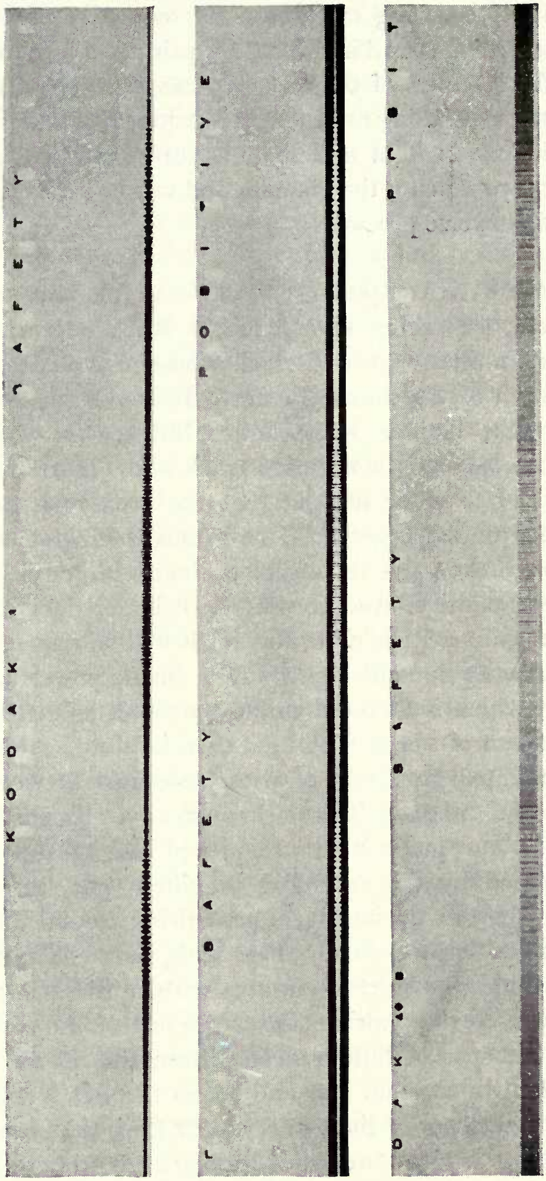
The introduction of SOF in the late twenties necessitated a change in the speed of projection then standard in movies—this was sixteen frames per second. The reason for the change was merely a question of audio quality. At the old speed, film passed through the projector at the rate of 60 feet a second: this was insufficient to provide good audio quality due to flutter and high-frequency cut-off. Consequently, the introduction of a new standard of twenty-four frames a second was necessary. This meant that at first projectors had to be capable of both speeds, since most programs were a combination of silent and sound films. As soon as sound films became universally popular, all projectors were adjusted to run at twenty-four frames a second permanently. The addition of the sound track resulted in a slight reduction in the width of the frame, and some readers may remember seeing one side of the black drape surrounding the screen move over to reduce the screen width when a SOF film was about to be projected.

Sound Recording on Film Irrespective of whichever method of recording sound is chosen, the principles are the same—a change in the loudness of the sound causes a variation in the strength of a light ray falling on the light-sensitive emulsion of the film. These variations in light and shadow correspond to the strength of the sound producing the changes and can be converted back to sound by the reverse process.

Variable-Area System The variable-area sound recording system, sometimes known as the RCA system, is just what the name implies—a sound track whose area varies according to the strength of the sound. Figure 3-13 shows the two different types of track; Figures 3-13A and 3-13B are the variable-area track. Figure 3-13A is a negative track and Figure 3-13B is a positive track. It will be noticed that the positive is an exact reversed replica of the negative. This means that when more light passes through the valve during recording, a larger clear area is formed on the positive. And conversely, a larger dark area is formed on the negative. Remember this for it will be referred to again.

The equipment consists of a small, powerful lamp, the light from which is focussed through a small triangular mask opening by means of a lens. The light then falls on a minute mirror which is mounted on a coil of wire positioned between the poles of a powerful magnet. This is known as a galvanometer. When the speech currents which are picked up by the microphone and amplified by the recording amplifier pass through this coil of wire, they set up small magnetic fields around the wire. These act in opposition to, and in phase with, the field from the large magnet. Thus the mirror vibrates with a frequency which depends on and corresponds to, the frequency of the sound being heard.

The spot of light reflected from the mirror is focussed onto the film by another lens and passes through a small, limiting slot. When the spot of light falls on the film, the latter is exposed and produces a clear area on processing. With zero modulation, i.e., without speech or music, etc., the light falling on the film as it passes causes only a very thin, clear line which should have no



A B C

Fig. 3-13. Sound tracks of variable-area and variable-density recordings. Left (A) is variable-area negative, center (B) is variable-area positive, and right (C) is variable-density.

sound modulation on it and therefore causes no sound in the loudspeaker when it is reproduced. When modulation occurs, the mirror swings rapidly back and forth and produces a characteristic pattern on the film. It looks something like a saw-tooth pattern. Actually it is caused by the light's passage through the triangular mask opening. The higher the frequency, the closer together the little triangles. The louder the sound, the wider the track.

Positive track is always used for reproducing, and a moment's thought will show why this is preferable. The frequency of the reproduced sound depends on the number of times per second that the light is changed by the valleys and peaks of the triangular-based sound track. Volume is controlled by the width of the track: the wider it is, the louder the sound is, since more light then reaches the photoelectric cell. Considering the positive track for a moment, it is seen that the loudest parts are obvious because they are quite wide and that there is a large, clear area for the light to pass through. On the other hand, a glance at the negative track will show that in the corresponding part of this track the *black* area is at a maximum, cutting off light whereas it should be passing the maximum amount of light. Thus the sound might almost be said to operate in reverse, or at least in a very distorted form.

With this type of recording, it is essential to have properly operating equipment which produces a *clear, unfogged* area on the film where the light falls. The blacks should be very opaque, and the clears should show no signs of fogging or haziness. It should be quite apparent that the less light that gets through the clear area, the less light will fall on the photoelectric cell, and consequently the less sound will be produced from the loudspeaker.

A form of noise reduction is used consisting of a voltage which keeps the width of the sound track to a minimum during periods of non-modulation so that the least possible track and photocell hiss is heard from the speaker. It is known as a *noise-reducing bias*.

The Variable-Density Method This system, more generally known as the Western Electric, or WE for short, has been in use for many years. Its principle is much the same as the RCA system inasmuch as the sound signal is used to vary the light falling on the film. In the WE system, a recording lamp is focussed onto a very small slit 0.001 inches by 0.256 inches. Across this slit are two fine duraluminum ribbons about 8/1000 by 250/1000 of an inch. The ribbons are in a very strong magnetic field, and the speech currents flow through them (the ribbons). As this happens, the speech currents cause the ribbons to move due to varying magnetic fields around the ribbons. This controls the amount of light admitted by the galvanometer. A varying light bar falls on the film, and a characteristic of this type of recording is the piano-key-like appearance of the track (Figure 3-13C). This system is not as sensitive to film-fogging and scratches as the variable-area system. In the latter, the amount of sound is determined by the ratio of dark to light areas; the greater the latter, the stronger the sound. In the case of the former, the sound signal has the same effect, but this time instead of controlling the amount of light by a shutter-like device, it is controlled by the density of the emulsion between the light source and the photocell. Noise reduction is also used in this system whereby part of the speech current is used to bias the ribbon so that it causes an extremely low background noise on quiet passages.

It appears that there is little to choose between the two systems, since each is good. In the opinion of the author, the variable area may be more suited to mobile operation and therefore to single system operation, while the variable-density system may be better suited to studio work. Whichever is better, it is really just a matter of individual preference. It is interesting to note that most of the portable and single system cameras and sound equipment use variable area for the sound head.

When it comes to reproduction, either system works perfectly on any projector without special adjustment. After all, they both work on the same principle: that is, a light falling onto a photocell causes variations in the electrical output. The *rate* at which this variation occurs determines the frequency of the sound. The photocell doesn't care how the variation in illumination is caused, provided one *is* caused.

Single System Sound Recording Sometimes, for convenience, it is useful to be able to record the sound on the film in the camera, and at the same time the picture is taken. This means that there is only one film to worry about and also cost is reduced by the elimination of the second film. The reader may be forgiven for asking, "Well, why not use that. It sounds perfect!"

It does seem perfect, *but,* there are a few problems. To photograph scenes properly, a fairly fast film is required. This, of necessity, is of coarser grain than sound, positive film. On the other hand, sound recording calls for the use of very fine-grain film, and since there is always an adequate light source, the slowness of fine-grain film does not matter. At once there is conflict, and a compromise has to be made. But whatever is used, one of the two will suffer unless the light conditions are such that an exceedingly fine-grain picture film can be used. But even this will not be as fine grain or satisfactory as the sound positive normally used for sound recording. Another trouble also may appear; this is due to the short distance, in terms of frames, between the picture and the sound. This means that in order to filter out the intermittent motion caused by the passage through the picture gate a lot of effort has to be used. Even then, it is very difficult to eliminate completely all traces of *flutter* or *wow* from the film by the time it reaches the sound head. Another trial is in editing: it is almost impossible not to lose some picture or sound in this process.

There are not many cameras on the market which cater to single system sound, but the best is the Auricon made by Berndt-Bach, Inc. The camera part of this combination has already been described; therefore, remarks will be confined to the sound recording section. The complete equipment was illustrated in Figure 3–4. It is possible, if required, for the cameraman to speak into a microphone while he is operating the camera without any noise from the mechanism being picked up. This is not often necessary, for if the sound is not lip sync it is not usually important that a narration be recorded until the film has been edited. For television work where time is money and costs must be kept low, single system sound offers great possibilities to make synchronized films for low costs. If the

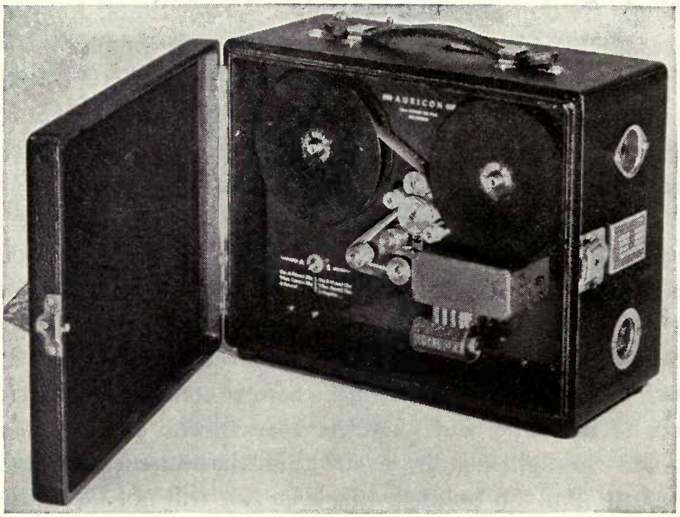


Fig. 3-14. Auricon sound recorder for portable work is very similar to a simple camera in mechanical details. With this recorder and synchronized camera full lip sync films can be made. Or it can be used for double system with the Auricon Pro camera.

action can be shot more or less in sequence and continuously, the full benefits of single system sound should be realized. Improvements are being made daily, and when a satisfactory compromise is found for the picture and sound emulsions together with a method of increasing the sound lead during filming so that there is no risk of flutter, it may completely replace double system sound.

Double System Sound Recording This is a system in which the sound is recorded on a separate film, and after the picture film has been edited the sound film is edited to conform with the picture. The editor then has two films, sound and picture. The two films are placed in a printer with the sound film "start" mark twenty-six frames ahead of the picture "start." After printing, a single film is obtained consisting of sound and picture combined. This system really is the best since the proper emulsion can be used for the specific job. However, costs are much higher since not only is a larger crew required, but twice as much film is needed. The fact that sound film such as Eastman 5372 sound recording film is about half as cheap as ordinary film saves a lot of money, but even so it is about $16 per thousand feet. And, if color film is being used the extra cost of the color film *plus* the sound film increases the over-all price considerably. As a matter of fact, single system sound recorded on Kodachrome film is often better than recording made on black and white film.

Auricon Sound Recorder Illustrated in Figure 3-14 is the Auricon portable sound recorder. This is a very small and compact piece of equipment which operates with any camera forming a double sound system. Any of the cameras already described will work with it, provided a synchronous electric motor is used to drive it and both it and the camera are blimped, so that the sound of its mechanism will not be picked up by the microphone.

Lab Test Most recording amplifiers similar to the Auricon have a *lab test* button. This is used to reverse the noise reduction bias and open the galvanometer to make a wide sound track. The microphone input is turned to zero during this test. The sound track becomes twice as wide and should be clear from side to side. It is used by the processing laboratory to measure emulsion density so as to enable the operator to determine the proper developer strength and time. It is only of value in the case of negative sound tracks. The container must be marked to inform the laboratory that a sound test exposure has been made. It usually occupies the first eight feet of the film.

An interesting point arises in connection with double system sound recording on film. If the camera film is negative, then B-wind film, i.e., film wound so that the emulsion side faces to the center of the spool when the perforations are on the right side and the outside end is at the top, is used. If direct-reversal film is used, then A-wind, with the emulsion on the inside when the perforations are on the left and the outside end at the top, is used. If this precaution is not taken, it will be found that when the two films are married the sound track will appear on the wrong side. The use of film with a single perforated side, while making possible the application of reasonably good sound to 16 mm film, has added an additional hazard by making it possible to become confused regarding the perforations' position.

The interior view of the portable recorder shows how similar it is to a camera in appearance and operation. Film is loaded on the magazine reel and runs *continuously* (there is no intermittent) through the sound gate. The output from the recording amplifier is fed to one socket on the case and a-c power to drive the motor, which, of course, is synchronous, to the other (constant speed controlled precisely by the frequency of the supply mains). The cover is, of course, kept closed during recording and is only opened in a darkroom—except for loading and unloading.

When shooting with this type of equipment, it is essential to realize that although the camera and recorder are kept in step by the operation of the common switch which stops and starts them and by the fact that both motors are synchronous and run at 1800 rpm, they are not "interlocked." Therefore, during starts and stops, the amount of film exposed may vary from time to time, and it is impossible to maintain synchronization by merely counting footage from the "start" mark. Since it takes a second or so for each to get up to synchronous speed, it is necessary to provide a synchronizing mark at the commencement of each scene. This is done by clapping two pieces of wood together a few seconds after the machines have been started. The sound produces a characteristic mark which can be recognized and matched to the frame showing the two pieces meeting. Of course, all the action occurs after this "clap," and so once the films have been matched the "blob" can be cut out.

Another point which causes many beginners unhappiness is running cameras and recorders off the same power line which operates the studio lights. The heavy drain taken by the lights causes a voltage drop in the 115-volt lines and this causes the synchronous motors to run erratically, and thus lose synchronization. Also, if extra lights are turned on during shooting under these conditions, the extra load may very easily cause a sudden, temporary

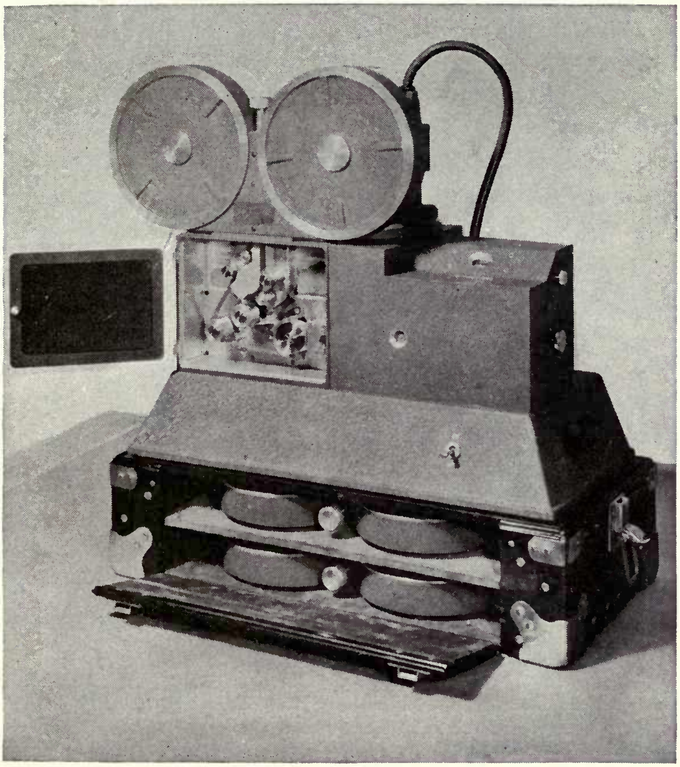


Fig. 3-15. Maurer sound recorder for 16 mm film showing spare magazines which are interchangeable with the camera magazines. The magazines shown hold film for eleven minutes (400 feet).

drop in the speed of either or both motors, resulting in wows in the sound or loss of synchronization. It is impossible to compensate for these effects when editing unless the whole section is cut.

The Maurer Sound Recorder Figure 3-15 shows the Maurer recorder for 16 mm film. The magazine which consists of the two upper film drums holds 400 feet of film, enough for eleven minutes of continuous recording which is ample for most purposes. Seen below, in the base, are two spare magazines. The wire curling up to the right is the cable supplying power to the motor which is

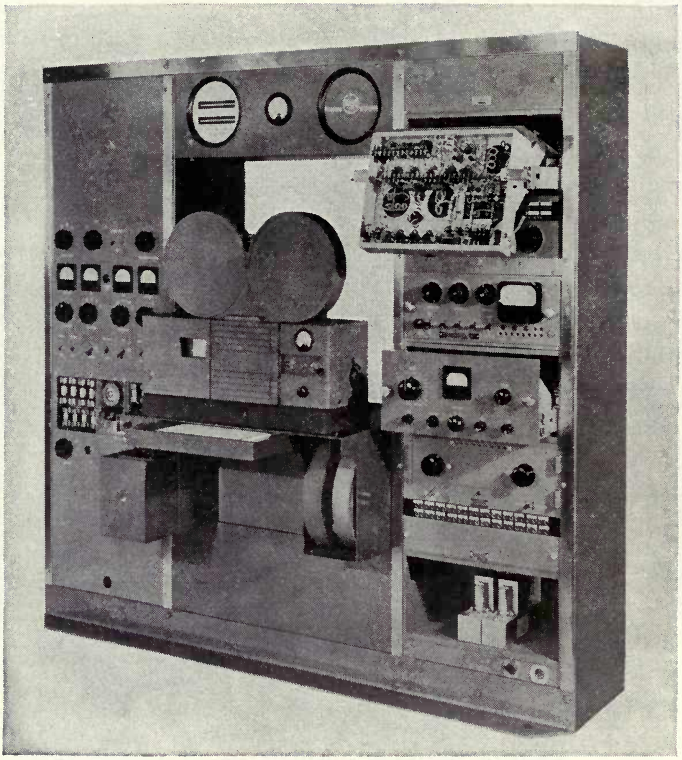


Fig. 3-16. This view of the new RCA unit construction film recording rack at Chicago shows how each of the individual chasses are mounted on pivots in pull-out slide tracks to facilitate servicing. Each chassis can be pulled out like a drawer to provide easy access to elements on the upper side and may then be tilted, as shown in this photo, to expose circuit connections and components on the underside.

mounted vertically behind the magazine. It is possible to use variable-area or variable-density tracks, whichever is desired. Some idea of the precision work which goes into sound recording equipment and which is required to obtain high-fidelity results may be gained from the fact that the image is only 0.00011 inch high—*less* than one eighth of one thousandth of an inch!

An interesting feature is the fact that the film magazine will fit the recorder as well as the camera, thus making an extremely handy

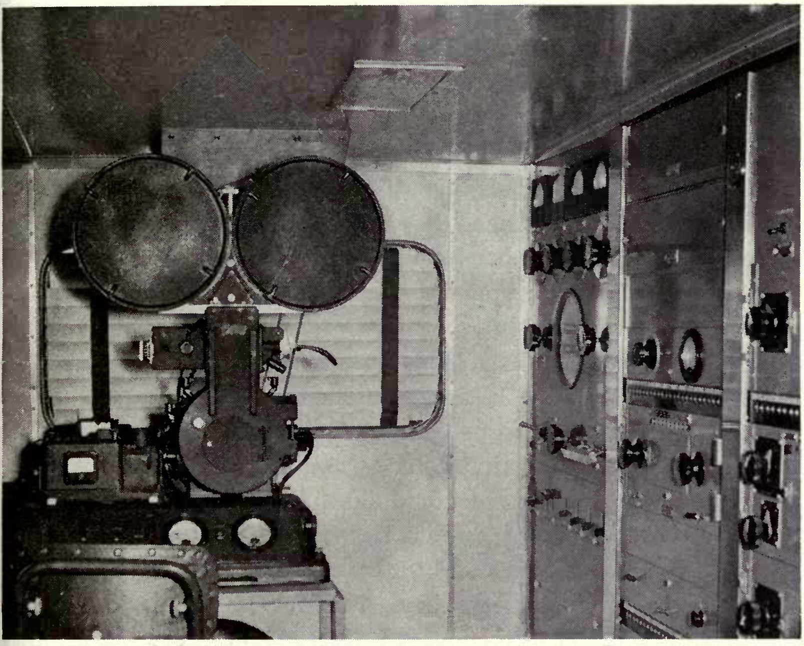


Fig. 3-17. The blend of compact construction and convenient arrangement of equipment achieved by the RCA film recording section in its design of the first mobile unit for 16 mm film and disc recording is indicated in this view of the interior of the "recording studio on wheels," custom-built by RCA for the Coronet Instructional Film Company of Glenview, Illinois. The optical system and film path of the standard RCA Model PR-23 film recorder shown at the left was specially modified to permit recording of direct-positive as well as negative variable-area sound track. The power control panel and amplifier racks are seen at right of photo.

unit. While the Maurer camera and sound recorder are naturally complementary, either may be used separately, and in fact they very often are.

RCA Sound Recording Rack This is a permanent installation for studio work and is of the highest possible completeness as well as being quite expensive. It is seen usually only in professional film and/or sound recording studios where a large volume of work is done. The equipment shown in Figure 3-16 is for 35 mm film.

All the necessary amplifying equipment and equalizing circuits for correcting the frequency response of the signal are contained in the racks on each side. The large meter on the upper left-hand side is a frequency meter for checking low frequencies when adjusting the equipment. It will be seen that most of the film recording units bear a strong resemblance to each other, or to camera design, which is not surprising since they are all designed for a similar purpose. The recorder proper is mounted in the center with the two film magazines on the upper surface.

Mobile 16 mm RCA Recording Equipment In Figure 3-17 is shown the latest RCA 16 mm equipment for mobile use. It was built into a truck and forms part of the studio on wheels which is used by Coronet Instructional Film Company of Glenview, Illinois, for the production of instructional films. The recorder is a standard RCA PR-23 film recorder modified to permit the recording of direct-positive sound tracks. This may not seem much of a problem, or very necessary, especially since direct-reversal film can be used. But, since the use of direct-reversal film sometimes introduces other difficulties, its use is not always desirable. It is not a simple matter to design a light valve which will produce a positive picture, for the valve operates by allowing more or less light to fall on the film. The stronger the signal, the stronger the light, (the positive film is like that but the corresponding part of the negative has a large, dark area in the identical spot where the positive is clear). Therefore, the problem is to get the same dimensioned areas, but with the colors reversed, as in the positive and negative films in Figures 3-13A and B. Variable-area RCA recording is, of course, used.

As far as the costs of double system versus single system are concerned, the extra film for a double system recording costs about $15 to $16 per 1000 feet, which is the cost of positive film. In the case of single system, the only cost is for picture film. It is possible that use of the double method might require the services of extra technicians to operate the sound recorder since it is separate from the camera proper. The advantages of single and double systems are discussed later.

Sound, or acoustics, to give it its proper name, is an important and somewhat complicated subject. Fortunately, the principles of sound waves are much more easy to understand than those of electro-magnetic waves since it is possible to feel the physical effect of a loud, bass note from the draught it produces. When sound is produced, it is caused by the very rapid movement back and forth of some form of string or diaphragm. The movement of the vibrating object causes the air surrounding it to be alternately compressed and rarefied. This starts a series of waves radiating from the object in all directions. Each wave is one complete compression and rarefication, generally known as a cycle. If a stone is dropped into a pool of water, waves are seen to diverge in all directions in the form of concentric circles from the point of impact. These waves also travel through and under the water, but with less strength and cannot be seen. But the water behaves in the same way as the air. If there were no air surrounding a vibrating object the "noise" it made could not be heard. In the same way, if there were no water in the pool, there would be no splash! Obviously!

These waves can be reflected in the same manner as light rays, or water waves. Most acoustic measurements are predicated on free space conditions: that is, an infinitely large area where there are no objects to cause reflections, and therefore all the sounds heard and recorded are caused by the original vibration only. When a sound is reflected, it sometimes arrives at the microphone in or out of phase with the direct signal and blends with it in such a manner that it reinforces and improves it or else has a deleterious effect. Thus, although studios are designed to be acoustically "dead," the addition of scenery often causes unwanted reflections of sound which ruin the quality of the recording. As a rule, it is advisable to avoid having glossy or hard surfaces, or actors themselves, close to the microphone, for these are among the best reflectors known.

The actual power produced at the microphone diaphragm is almost infinitesimal, but it is sufficient to move the diaphragm enough to produce a variation in the electrical circuit to which it is connected. It is impossible to see the diaphragm move when in normal use. There are many types of microphone. Among them are: the velocity or ribbon microphone which has a thin, metallic ribbon suspended between the poles of a powerful magnet; the dynamic type which is more like a miniature speaker in reverse since it has a moving coil attached to a miniature diaphragm and is very robust; the crystal microphone which has one or more small crystal elements mounted in a perforated case so that the sound waves can reach them, movement of these crystals by the sound waves generating minute voltage in the associated circuits which correspond to the sounds causing them; the condenser microphone, which has had a recent return to popularity in the Altc Lansing miniature, consisting of two closely spaced plates with a high voltage connected to them, and as the sound waves change their relative position, the charge due to the capacity of the condenser (for this is what it is) varies, the variation corresponding to the amplitude of the sound waves thus causing the voltage in the input to the amplifier to vary in exact accordance; the carbon microphone (not used today for recording purposes). "Mikes" are usually suspended from a boom that can be moved around by an operator to keep it within pickup range of the actors and still out of the camera field.

As a rule, high frequencies are less easy to record than low frequencies because they are more easily attenuated or weakened. Soft, rough surfaces tend to cause high-frequency losses, and long, narrow chambers cause reverberation. If in making a film a set has to be used which is very "live" (that is, it has a lot of echoes), it can often be improved tremendously by hanging old blankets over the walls and particularly over the entrances to any passages or hallways. Before commencing to record, it is important to listen very carefully on the monitor earphones to ensure that the set really is quiet—subway trains may be running under it and causing noises inaudible to the naked ear. There may be odd noises which are only audible on the microphone equipment. The acoustics may need correction due to excessive echo. It may even be that an unwanted radio station is being picked up. This quite often happens today, for with so many powerful stations pouring electricity into the air it is quite likely that the film set may be near an antenna. If this happens, any number of effects can be produced in the recording equipment, and it is easily possible to record the radio program as well as—or *instead* of—the desired dialogue. And a run-through with the actors to test for sound is a matter of course.

Magnetic tape is being used more and more in exactly the same way as film for double sound systems: that is, a magnetic tape recorder running at a constant, synchronous speed is set up. Sound is recorded on it in the usual way, and it can be edited as easily as film. It offers two advantages over film: one, no processing is required so one source of distortion is eliminated; and two, it is possible to play it back as soon as the shooting is over, so that dialogue can be checked and if a reshoot is needed because of sound it can be done while the set is still up. It is much cheaper, too, for the tape can be used over and over again.

FILM STOCK

The major sources of film are Eastman Kodak, Du Pont, and Ansco. The actual choice is usually a matter of personal preference since most of the manufacturers offer films whose characteristics are quite similar.

The only important point to consider in selecting film for a specific job is to make sure that the emulsion speed and definition are suitable for the purpose. In other words, if a shot in the Rockies is to be made at high noon Super-XX Panchromatic film would not normally be used. It should be apparent at once that this emulsion is many times faster than is required and would necessitate stopping the lens down to a very small aperture. The net result would be a film which might be overexposed and which would certainly be more grainy than need be. The proper film to use would be a fairly slow, fine-grain film, the actual type depending on the local conditions. Probably a Background-X type could be used—type 1230 in 35 mm and type 5420 in 16 mm, both Eastman Kodak. If Du Pont film is used, it could be Du Pont Superior 2 type 126 for 35 mm work. All the films mentioned are negative type films.

On the other hand, if a scene had to be filmed at night at the station with an express dashing through in a blaze of lights, smoke, and flame, it would be natural to use the fastest film obtainable—assuming that faked shots using infra red light would not be possible. Du Pont type 314A would be a good choice for this, or a Kodak Super-XX Panchromatic type 5242 or Ansco Triple S Panchromatic.

For reversal processes, Kodak has four types. These are listed in the table below. Of these, super-XX Panchromatic is the fastest. A number of cameramen consider that direct-reversal film has less graininess than negative-positive operation. In some cases, this is probably true, it is quite often better for single system sound since there is less risk of dirt fouling the track during the extra processing and printing sequences for positive operation.

Sound recording calls for special emulsion. If it is for double system, there is no particular problem as any of the fine-grain sound recording films can be used. They are generally somewhat blue-sensitive.

Eastman Kodak makes the following recommendations:

Variable Area	Fine-Grain Sound Recording Film	Type 1372 (35 mm) Type 5372 (16 mm)
Variable Density	Fine-Grain Sound Recording Film	Type 1373 (35 mm) Type 5373 (35 mm and 16 mm)

35 mm Negative Film

Background-X Panchromatic Negative Film, Type 1230
Plus-X Panchromatic Negative Film, Type 1231
Super-XX Panchromatic Negative Film, Type 1232

16 mm Negative

Panchromatic Negative, Type 5240
Super-XX Panchromatic Negative, Type 5242

Reversal

Plus-X Blue Base Reversal, Type 5276
Super-XX Blue Base Reversal, Type 5277
Cine-Kodak Super-X Panchromatic, Type 5256
Cine-Kodak Super-XX Panchromatic, Type 5261

Color

Kodachrome, Daylight Type, 5263
Kodachrome, Type A, 5264
Kodachrome Commercial, 5268

FILMS FOR KINESCOPING

Size	*Camera Film*	*Film Type*
16 mm	Panatomic-X Negative Film	5240
16 mm	Cine-Kodak Super-X Reversal Panchromatic Film	5256
16 mm	Cine-Kodak Super-XX Reversal Panchromatic Film	5261
16 mm	Plus-X Blue Base Reversal Film	5276
16 mm	Super-XX Blue Base Reversal Film	5277
35 mm	Fine-Grain Release-Positive Safety Film	5302
16 mm	Fine-Grain Release-Positive Safety Film	7302
35 mm 16 mm	Fine-Grain Sound Recording Safety Film	5373
	Duplicating Film	
35 mm 16 mm	Fine-Grain Duplicating Panchromatic Negative Safety Film	5203
	Sound Recording	
35 mm 16 mm	Fine-Grain Sound Recording Safety Film (for variable-area recording)	5372
35 mm 16 mm	Fine-Grain Sound Recording Safety Film (for variable-density recording)	5373

Du Pont makes similar emulsions, such as the Superior 2 type 126 and Superior 3 127 for 35 mm general use, and 314A for 16 mm. The type 330 is a favorite for reversal newsreel work. In sound recording, type 201 is used for 35 mm and 602A for 16 mm. For kinescoping, Du Pont types 602 and 605 are very popular: the former is a fine-grain film suitable for single system sound use, and the latter is a fast emulsion for regular picture use. Types 323 and 324 are also very popular for the purpose. Du Pont types 314, 324, and 301 are used for general film work for movies and television, the actual choice depending on the use contemplated, i.e., interior, exterior, or background work.

Both the companies issue comprehensive booklets containing all the information needed about their film products; the reader is advised to obtain copies if he finds that he is actively in need of technical data.

Safety Film The introduction of safety film has sown the seeds of possible danger in the projection booth! This appears to be a paradox, for is it not non-inflammable and therefore as harmless as water? Yes—and no! The original is, *but* the name "safety film" is printed along the side of the perforations and unless this description appears it must be regarded as nitrate base and therefore inflammable. That sounds very safe, but—when a print is made the legend is also printed onto the new film edge and "safety film" can be read on the edge *even if* it is inflammable! So, even if the label does say "safety film" if it is 35 mm stock tear off a fragment, *take it out of doors,* and try to light it. If it burns violently, it is nitrate-base stock and hence must be treated like the explosive it is. Part of a safety film may be damaged and replaced with nitrate base. If the operator is not aware of this it might be used under dangerous conditions for inflammable stock. Also, until safety film is used everywhere for every production, it is important to regard all film as being inflammable and treat it as such, for it is at a time when people become careless that the wrong film gets into a position of hazard, and tragedy results. Even the fumes are highly toxic, and if a roll really gets burning well, even water or fire extinguishers have a hard job extinguishing it since oxygen to support the flames is produced by the very action of burning.

Care of Film The life of a reel of film depends entirely on the attitude of the people who use it. One projectionist can run a new film half-a-dozen times and not have a mark on it, another can take the same film and before he has even started his projector have it all marked up. The first man treats it with reasonable care, the other man just dumps it into the projector and doesn't care how much he handles it or scratches it doing so.

The first point to watch is the projector. It must be clean; this does not mean only the outside, but the mechanism as well. If the mechanism is dirty, it may run unevenly and bind in sections, then run free with dangerous jerks or allow the film to build up in areas and spill into gears which can tear it. If the film guides are oily or greasy, oil will be transferred to the film, a blurry picture will be produced, and no amount of effort with the focus control will clear it.

If grease and oil do get on the film, clean it at once with one of the many cleaners on the market. A special cleaning machine, such as is made by Neumade Products, is a great help in keeping film in good condition; but if this cannot be arranged, one of the many small, hand-cleaning outfits may be used. If really dirty film, apart from grease and oil, is used, there is a danger that it may not only result in scratches and blemishes on the film itself. but it may leave behind a condition which will injure the next film to be projected. The answer to this is to clean the projector thoroughly after every projection. This includes the press pads, rollers, sound and picture gates, sprockets, film guides or channels, and the magazine containers, for here dirt is sometimes left in the form of grit which is picked up and worked into the emulsion of the next film.

Some outfits prefer to have all the film produced by them treated by one of the special hardening processes which are supposed to toughen the emulsion and enable the film to slide more easily through the projector. It also makes it easier to wipe off finger marks.

Film should never be allowed to remain in the projector. If it is part way through, the section in the equipment will be affected by the heat of the mechanism and cams. Put it in a can after every use. Don't use reels which have bent flanges. Reels are very cheap, and it is false economy to put off the purchase. If the edge binds on film, it can prevent unwinding and cause the drive sprocket to strip the perforations; if it is on the take-up sprocket, it may cause film to spill into the magazine and tangle with the take-up drive.

Sprocket teeth must be properly engaged before closing any pressure pads; otherwise it is possible to cause holes in the picture or the sound track. Improper threading can also cause the loss of upper or bottom loops—the bane of every projectionist.

Films must be kept at an even temperature and away from excessive heat. It is best to keep a moist pad in the can to maintain a slight amount of dampness in the film if it has to be stored in a very hot, dry place.

New film, or "green" film as it is sometimes called, is always a bother to project. Although it may feel dry, it is actually not so and is still in the process of returning to its previous size. In a reel of 100 feet, there may be as much as one foot stretch. It may not seem much—only 1 per cent—but 1 per cent can make a lot of difference between a smooth, well-fitting film passage and a sticking gate.

Focus Troubles *Focus drift* is a phenomenon which occurs during projection and evidences itself by a gradual change of focus throughout the showing of the film. It can cause headaches for the shading technician as well as the master control engineer, for it leads them to attempt electronic focus adjustments in the belief that drift in the electronic equipment has occurred. It often happens that a film is in perfect focus at the commencement of projection, but if it is not watched very carefully it may slowly change. The error is not usually sufficient to be extremely annoying, unless it becomes very bad, but it will produce eyestrain for the audience. It is probably more noticeable in theatre projection than in television since most television screens are not too sharply focussed anyway.

This defect is found in two forms: random focus drift which happens for no apparent reason in a release print which is presumably new, or at least in good condition (of course, when it occurs in a reel made up of odd trailers or shorts the reason is obvious); and the regular drift already discussed.

It is not caused by buckled film, for this defect is caused by projection, and focus drift can occur in a brand new reel straight from the film laboratory. One cause which seems the most logical and reasonable is film curl. Once it has formed, there is not much that can be done to correct it in the case of long reels. However, for short lengths of film the cause provides the solution. Film curl is caused by film being continuously wound in the same direction so that it becomes set. Thus even on an apparently straight section such as one frame, in the gate, there is a very slight radius. A short length can be cured by rewinding very tightly in the *same direction* as originally wound but with the emulsion direction reversed. If fastened securely and left for a week or so, the curl will be reduced.

Incidentally, the safety films are considerably more prone to this effect than the inflammable film and it is one of the most prevalent faults found. Moreover, since 16 mm safety film comprises most of the film stock used on television, this becomes a point to which more attention could well be paid by users as well as processors.

As was mentioned previously "green" or new film, undergoes considerable change in the first few weeks after it has been processed. Although it is apparently thoroughly dry when received, it contains, in reality, a large amount of moisture absorbed during its passage through the various developing, fixing, and hardening baths and the numerous washings it receives. The passage through the processing equipment is also fraught with tension changes, for speed variations plus differing adjustments of the rollers all act to apply varying tensions to the film. These affect the film more easily when it is warm and wet and only slowly are discarded as it finishes the drying out process.

Film in storage, especially new film, should be rewound periodically to prevent the acquisition of curl through being wound tightly on cores or small reels.

Whatever the cause of focus drift it should be watched for by the projectionist and corrected as necessary. The practice of some operators of lacing a projector, switching it on, and forgetting it until time for change-over cannot be too strongly deplored. It is people like these, maintaining a consistently low standard of operation, who give both television and movies in some of the smaller houses, a bad name.

Fluttering, or unsteady images on the screen, is due to buckled film. The intense heat to which the film is exposed causes it to shrink, and because the edges of the film are the only parts in contact with the projector they absorb more heat than does the frame area which has only momentary flashes of light and heat on it. Consequently, the excess shrinkage of the former pushes the frame out of shape and results in buckling, with its attendant fluttering in and out of focus of the screen image.

It is possible to restore short lengths of buckled film. Nitrate-base film is more likely to suffer from this trouble than the 16 mm safety film used in television, although of course the 35 mm projectors used in some stations may use either nitrate- *or* acetate-base film. However, TV stations will probably not suffer extensively from this trouble for the lower heat developed by the television projectors—since they require less light—does not have much effect on the film. Unfortunately many of the release prints in circulation on this circuit have been made from old negatives, or even from old positives in the case of foreign films where only positives are available. The 16 mm print made under these conditions will, of course, have the same flaws as the original. Sometimes the 35 mm print supplied to the station will be in such poor condition that it is buckled and curled.

To restore nitrate film it is wound emulsion side out, and placed in a humidifier film can with an absorbent blotter which has been impregnated with camphor and lightly moistened with water and glycerine to maintain the moisture content. It is left in this atmosphere for one or two weeks. Absorbent material can be

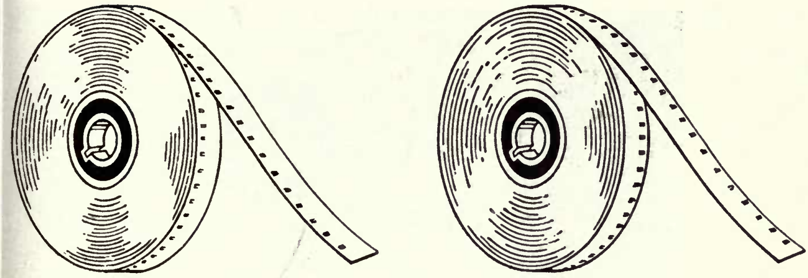


Fig. 3-18. Use of single perforated film introduces complications when different systems are used such as reversal, or positive/negative printing. In order to have sound and picture emulsions on the same side when printing A- and B-winds are required. An "A" wind has perforations towards the observer with the film coming off the top, and round reel hole towards the observer. "B" wind has the perforations away from the observer under the same conditions. Emulsion is in in each case. (Based on a proposed American Standard.)

impregnated with camphor by dissolving a block in some quick vaporizing liquid such as amyl acetate, acetone, or alcohol. If poured on the pad, the liquid will evaporate, depositing camphor. A water and glycerine solution in the proportions of about twenty to one is then sprinkled on the pad to moisten it.

Safety film may be treated in the same way except that only the water and glycerine solution is needed. If one treatment does not cure it, it may be repeated.

One would think that a simple little thing like winding a film could not be complicated—but it is. Of course, for 35 mm film there is only one way—the emulsion on the outside. The same thing applies to 16 mm silent film. But when 16 mm sound film is considered, it is found that there are two methods of winding it —the A-wind and the B-wind. These are illustrated in Figure 3-18. These two methods exist due to the various modes of operation of current equipment. Due to the use of reversal film, care must be used when recording by the double system to ensure that the type of film-winding used matches the position of the emulsion of the picture film. Some idea of the complications which arise may be obtained from this: if a negative picture is made the

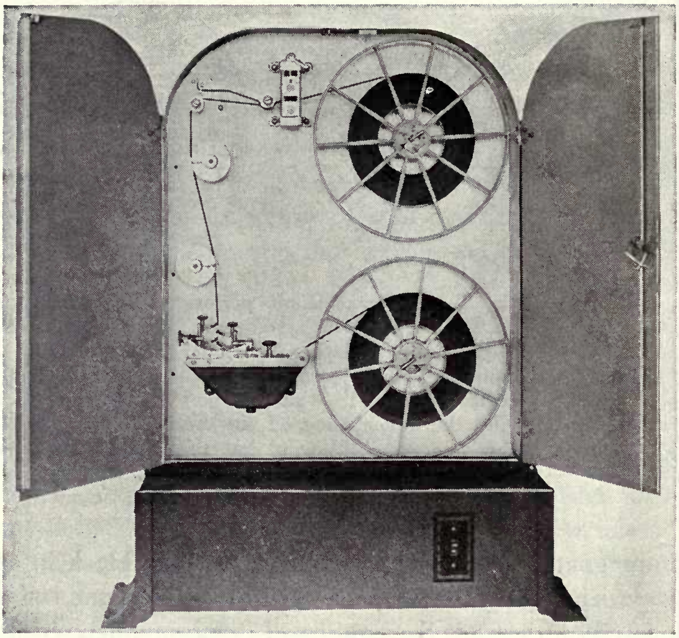


Fig. 3-19. Neumade film cleaner for 16 mm film.

sound can be recorded on B-wind film and the negative sound track combined directly with the picture print to form a composite print. However, if a reversal film is used, either black and white or Kodachrome for duplicating, the sound track has to be reprinted as a master positive. This positive sound track is then printed onto the reversal projection print. Thus two extra operations have to be carried out to accomplish the combining of the two films.

Eberhard Effect One of the causes of high-frequency loss in film recording is the Eberhard effect. This is the spreading of the photographed image in the emulsion. The heavier the exposure, the greater the effect. If this occurs the "peaks and valleys" of the higher frequencies which are naturally minute tend to even out and reduce the amplitude of the signal. If the original is heavily exposed and the print made from it is more lightly exposed, there is risk of the normal correction not taking place (since the effect is to spread the edges of the exposed areas, the effect will be reversed when an opposite print is made of the same track, and the parts which before were exposed are now not exposed and the effect when it occurs operates backwards to cancel the first spread). Therefore, it is important to use the same amount of exposure for printing as for exposing.

CHAPTER 4

FILM TRANSMISSION EQUIPMENT

The films seen over television are only as good as the equipment used to present them. A poor film will not look first-class over first-class equipment, but a good film *will* be poor over second-rate apparatus. This is a point which unfortunately none of the station operators, or even many of the equipment manufacturers themselves, appear to appreciate. Some of the engineers concerned with designing equipment for projecting television films are greatly concerned with the general lack of interest displayed in this problem. Unfortunately, projection equipment for television which would be of the same standard of excellence as theatre projectors runs to quite a lot of money. The majority of mechanisms presently used are only adaptations of high-grade amateur equipment and while very good for that purpose are not particularly suited to professional work.

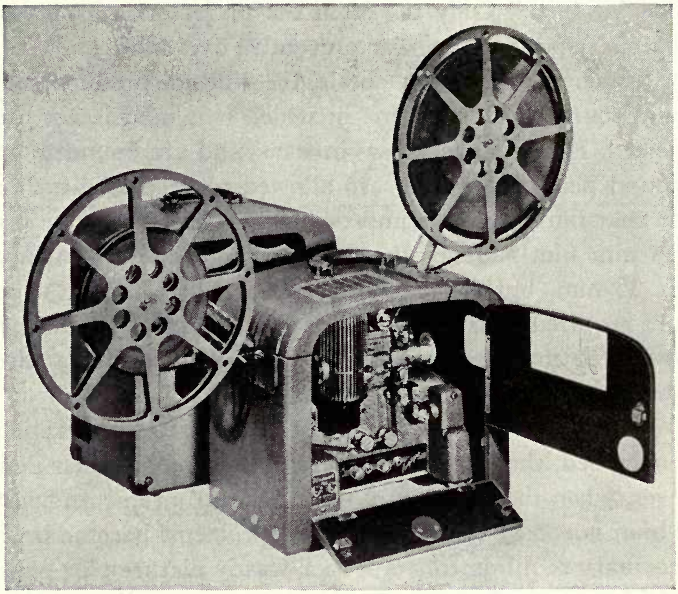
While it is the purpose of this chapter to discuss film projectors in general and most of what is said can be applied to both 16 mm and 35 mm equipment, it should be noted that most of the criticisms are directed to *16 mm equipment*, not the system size. Properly designed, built, and *maintained* 16 mm equipment can provide from a first-class print pictures of almost the same picture quality on television as can 35 mm machines. Even sound, so often criticized, can be as good. But notice the emphasis on the word "maintained." Only too often the projectors are not properly inspected and given regular preventive overhauls.

Even the best print obtainable will not produce good pictures and sound if the machine in which it is used is not properly adjusted. For instance, wows in the sound are bound to occur if the sound head and guides are allowed to become dirty or distorted so that film motion is impeded. For relatively simple productions, 16 mm film is generally cheaper, more convenient, and as good as 35 mm, but for elaborate affairs where many "super effects" are required, it is better to use 35 mm, merely because the equipment for making these effects is available and has already been developed to a high pitch of perfection.

As far as projectors for theatre or semi-professional use are concerned, there is nothing very difficult about their design. However, when the question of using them to project movies over television is considered, a number of problems become involved. The ordinary requirements of a rock-steady picture plus perfect clarity of focus and adequate illumination are complicated by the necessity of converting the frame repetition rate from twenty-four frames a second for movie film to thirty frames a second for television scanning while still producing superlative picture quality. Before proceeding to discuss the television problem in greater detail, it would be advisable to show how the average projector operates.

Actually, the operation is the reverse of the camera function with the difference that instead of using an *exterior* light to form a picture which is focussed onto film, an *interior* light is used to shine *through* a film and produce a picture on a screen.

It will be recalled that the film taken in the camera consists of a series of pictures taken at the rate of twenty-four frames (or pictures) a second, each one being very slightly different from the preceding one. The film does not pass continuously through the camera but pauses for a fraction of a second while the exposure is made. In the projector the film passes through in the same intermittent manner, and a shutter cuts off the light between each picture as it is moved down. If it were not for this shutter, a blur



(*Courtesy of Bell & Howell Company*)

Fig. 4-1. Filmosound (Bell & Howell) New Academy 16 mm projector.

would be seen as the picture moved during the time that it is on the screen.

The film in the projector is usually on larger reels than those used in the camera since projection is normally continuous and the bother of changing reels every few minutes if camera size 200- or 400-foot reels were used, would be too great (of course this size is very popular for home and educational films, but for professional work, which is what we are interested in, that size would be rather inconvenient—especially for 35 mm film).

Figure 4-1 shows the Bell & Howell Filmosound New Academy Projector for 16 mm sound film. This is a portable machine and very popular for home and semi-professional use. The equipment is contained in two carrying cases, one for the speaker and one for the amplifier and projector. Although 16 mm film is seldom used in public theatres, it is often used for institutional work and in schools. In cases where a longer throw than that obtainable with an incandescent lamp is required, a small arclamp can be attached in its place and any length of throw within reason obtained. The illustration shows two 1600-foot reels in position. With this amount of film, a program of forty-four-minutes' duration can be obtained with sound film without changing reels. There are larger reels which hold sufficient film for a one-hour show and which are generally used on television.

Another type of portable 16 mm projector, the RCA Model 400, is shown in Figure 4-2. This is designed for similar uses and is similar in film routing to the TPI6A television projector. It also is supplied in two carrying cases. It will be noticed that the lamphouse is also similar to that of the television projector.

Finally, the head section of the RCA Brenkert projector is shown in Figure 4-3. This, of course, is a 35 mm model. The light gate is described later in the section on television projectors.

Sound is reproduced in the sound head in the section below the oil level gauge on the lower right of the picture

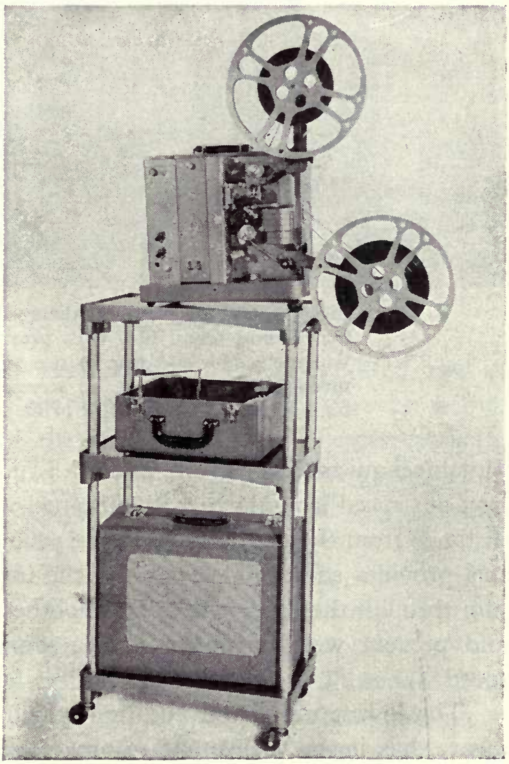


Fig. 4-2. RCA Model 400 16 mm projector.

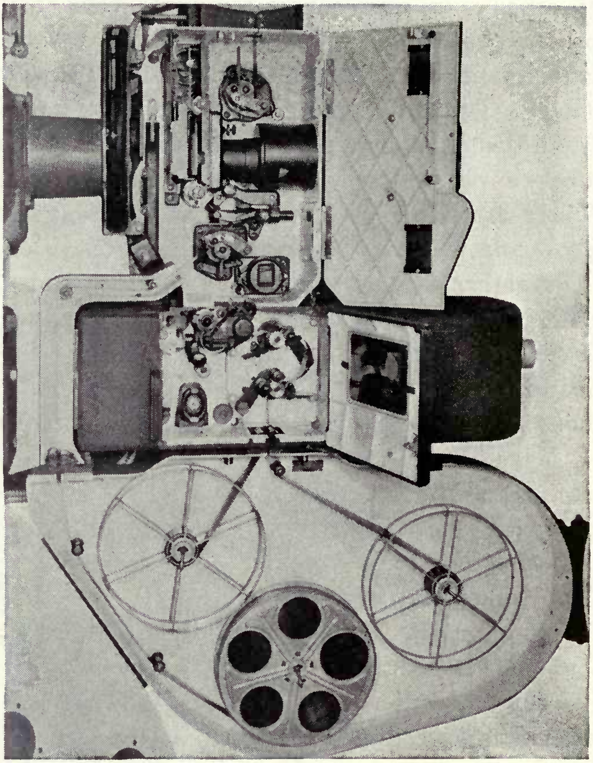


Fig. 4-3. Open view of Brenkert projector and RCA sound head for 35 mm sound film with preview attachment (lower unit) which permits operator to run separate sound track, synchronized with picture film, for screening of "rushes" prior to combining them on composite print.

film mechanism. The drum around which the film circulates to iron out speed irregularities is combined with the sound head. The distance from the picture gate to the sound head is twenty frames; this provides sufficient leeway for the intermittent motion of the film through the light gate to be smoothed out into constant speed and prevent wow or flutter in the sound pitch due to varying speed.

The lowest unit is an addition which, as far as the author is aware, has never been made to any television projector although

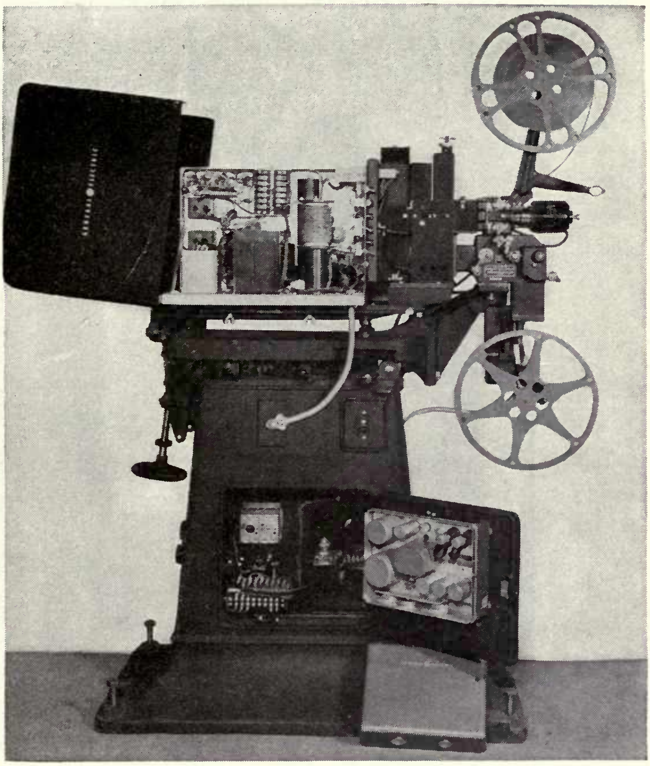


Fig. 4-4. The GE 16 mm projector for television.

there is no reason why it should not be done. It is often used in motion-picture studios to enable the producer to see rushes before they are combined with the sound track. It accepts separate sound and picture films; the former circulates through the sound gate only, the latter through the light gate only. After synchronizing the two start marks, the machine can be run as a standard, single film projector. It will be noticed that the preview attachment feeds through the lower magazine opening and the magazine is removed to make room for it.

The only purpose of a film projector is to illuminate film, focus the picture on the film onto a screen of some kind, and move the film through the apparatus at the proper speed so that the

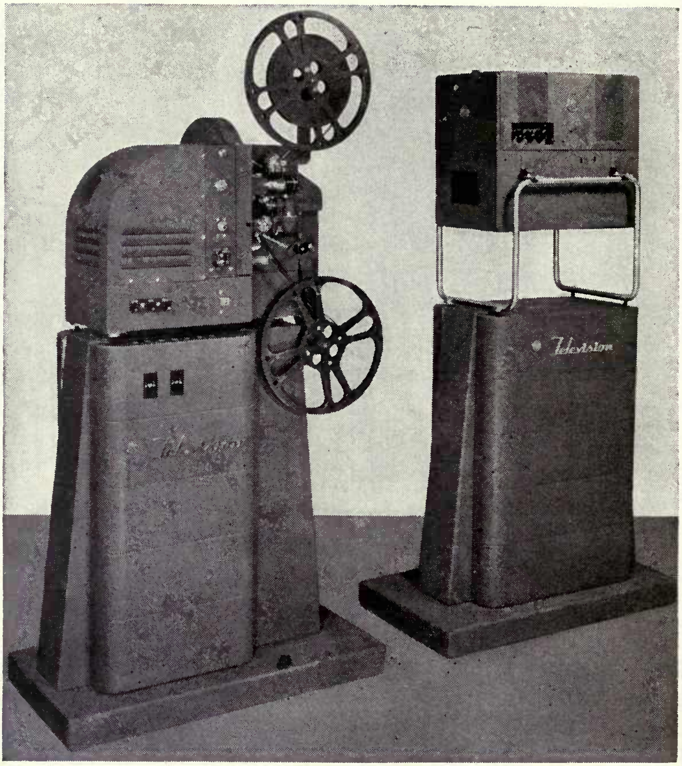


Fig. 4-5. RCA 16 mm projector for television use; film chain camera is at the right. Note the absence of a lens on the camera.

correct illusion of animation is maintained. The reproduction of sound via the sound head is only incidental to the progress of the picture film through the equipment. The sound head is in reality a phonograph system which, however, is not separate from the picture.

Projectors for television are made by many companies among which are General Electric (GE), RCA, and Dumont. Each company makes projectors for both film sizes. The general appearance of the GE and RCA projectors is shown in Figures 4-4 and 4-5. Irrespective of the make of projector, the principle of operation remains the same.

GE and RCA each offer a pulsed light projector which eliminates the need for a shutter and reduces the chances of poor sychronizations by using the standard, vertical sychronizing pulse to flash the projection lamp at the proper time. This illuminant is available for both 16 mm and 35 mm projectors.

Probably the question of converting the twenty-four frames of movie film per second to thirty frames of television is one which is puzzling most readers. So before embarking on a description of the equipment, the method used to synchronize the two will be outlined.

Pulsed Light System As already mentioned, projectors using this form of illumination are made by GE and RCA. The former calls it the Synchrolite, and the latter the pulsed, or switched light. Synchronization using the Synchrolite will now be described for the GE 16 mm projector. The film is moved past the lens or picture gate in an intermittent movement by a claw which engages the perforations in the edges of the film and pulls it down one frame at a time. There are a number of ways of making the claw operate; the oldest in general use is the Maltese Cross or Geneva movement. In this, a cam with four slots and curved sides (so that it does actually look like a Maltese Cross) engages with pins which drive the film pull-down mechanism. Cams embodying some modifications of this movement are used in the modern television projector to perform a rapid change of frame between successive exposures.

The Synchrolite unit itself is a gas-filled discharge lamp which is automatically ignited by a pulse from the synchronizing generator which trips a high voltage circuit and flashes the lamp at intervals of one-sixtieth of a second. The actual conversion is accomplished by exposing one frame twice and the next one three times. Reference to Figure 4-6 shows this more clearly and indicates the manner in which regular pulses one-sixtieth of a second apart are designed to provide the catalyst which causes the conversion. Examination of the right-hand section shows that during the time that film frame number one is in the gate there are three

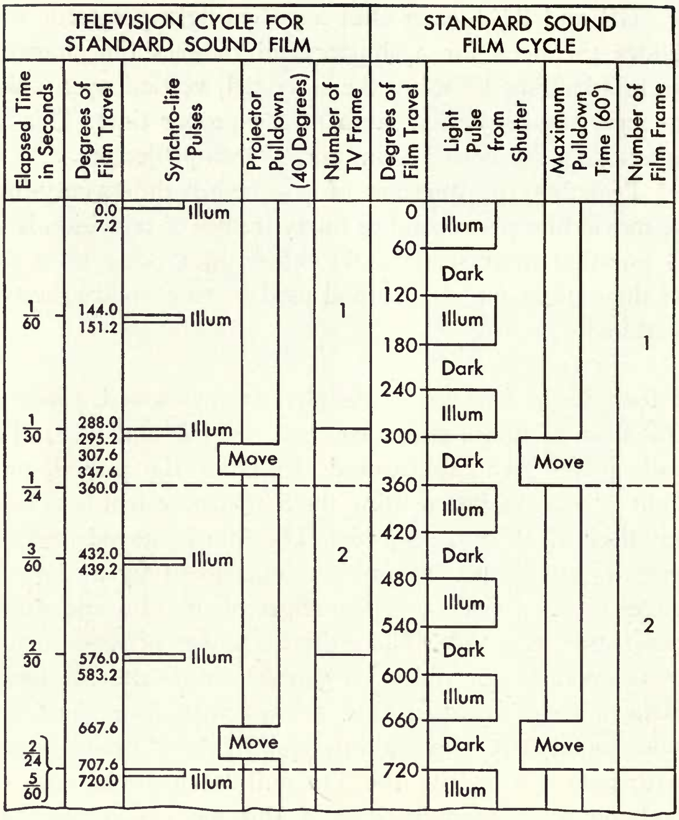


Fig. 4-6. GE synchronizing cycle for film projector operation over television.

flashes of light from the Synchrolite, and while frame two is in the gate there are only two flashes from the light source. Thus, by the time that 720° have elapsed, two film frames have been exposed a total of five times, providing the equivalent of five fields. This leaves twenty-two frames (film) to be exposed during one second. Since two frames are exposed for every five flashes, this means there are fifty-five more flashes due. Adding these to the five already generated for the first two film frames, we have a total of sixty flashes (or fields), or thirty frames. The use of de-

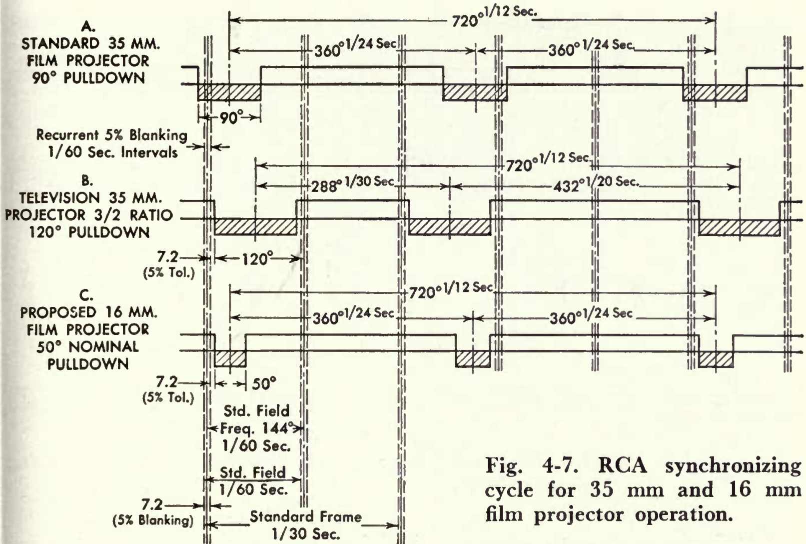


Fig. 4-7. RCA synchronizing cycle for 35 mm and 16 mm film projector operation.

grees to measure the amount of travel or time elapsed is merely a convenience for reference purposes, since irrespective of the time elapsed, or work performed, one cycle is always 360°, and in this way it is possible to describe periods of operation in abstract notation.

This method is also used for the GE 35 mm projector and in a similar manner in the RCA 35 mm projector. Figure 4-7 shows the time cycle for the RCA TP 35 B, and also the proposed time cycle for the RCA 16 mm projector using this system.

RCA 16 mm Projector with Incandescent Lamp In this type of projector, a scanning sequence of twice and three times is also employed. Because an incandescent lamp is used, it is not possible to flash it electrically since the filament would not have time to extinguish between flashes. Therefore, a mechanical shutter is used. This is an eighteen-inch disc with a small slot cut in the circumference. Since it is rotated at a speed of 3600 revolutions per minute, there is one flash every sixtieth of a second.

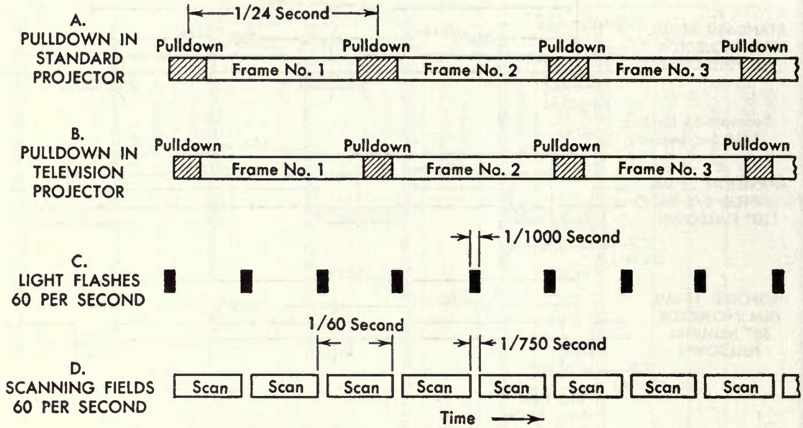


Fig. 4-8. RCA synchronizing cycle for 16 mm projector using incandescent light.

It is necessary to scan a television pick up tube mosaic continuously to obtain a picture. The only break in scanning is the time during which the beam returns to the top of the picture after every field. This takes 1/750 second. *If* the pull-down could be accomplished during this time there would be no need for all the complicated devices used to perform the conversion. Unfortunately it is very difficult to accelerate a piece of film from a standstill, move it about half an inch, and arrest it again in this short time. The flash obtained from the rotating shutter is designed to occur during the interval that the blanking signal is applied to the receiver and the scanning beam in the camera is returning to the top of the mosaic. This is an instance where once again storage properties are involved, and the fact that the iconoscope is a storage tube means that the image impressed on the mosaic during the brief 1/1000 second exposure is retained on it until the scanning beam sweeps over it and transmits the picture. The diagram in Figure 4-8 illustrates this clearly and shows the relative positions, in time, of the pull-down, light flashes, and scanning sequences.

From the foregoing it will be realized that the projectors used for television are somewhat different from those used for home

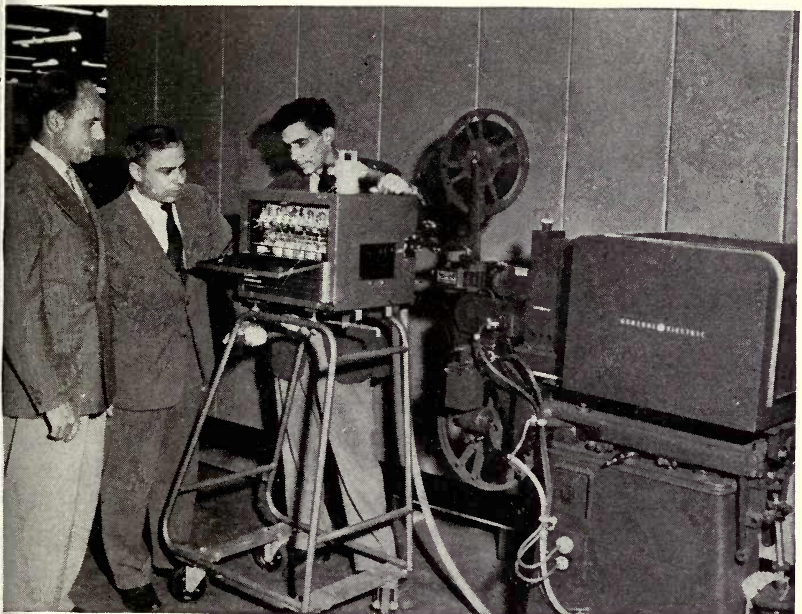


Fig. 4-9. The GE 16 mm film projector is shown in position with the GE film camera on the left. Note that a camera lens is not used.

or school use, or in movie theatres. The chief difference, of course, is in the exposure times and shutter speeds. The pulsed light type of projector does not require a shutter but as we have seen the incandescent lamp projector does, of course. It may not be apparent from the description that the picture observed on the mosaic of the camera, or a piece of white card in front of the lens will look the same as that from an ordinary projector, but as far as the eye can tell it is. However, the amount of light available will, of course, be less, since in one case the screen is illuminated through a very small aperture and for only 1/1000 of a second sixty times a second. Actually there is more than enough light to operate the iconoscope properly but not to reproduce a picture at any distance. In the same way, the illumination from the pulse light is only just sufficient for good television projection.

One of the weak spots in film projection from 16 mm machines is the lenses used. Only too often this is a standard home-movie type, of limited resolving power. As soon as a first-class, high definition model replaces it, the picture quality improves immensely. The lens has to illuminate a very small area on the mosaic, but it should be uniformly clear and well lit with critical focus at all parts on the mosaic.

A brief description of the film camera may be of interest here. Figure 4-5 shows the RCA projector and camera, and Figure 4-9 illustrates the GE film camera. The similarity is quite noticeable. In each case, an iconoscope tube is used for the light conversion unit. Since the film picture can be focussed directly on to the mosaic by the projection lens, no camera lenses are required. Thus, the effect of the widest possible aperture is obtained. The iconoscope is not an image multiplier tube; therefore, the sensitivity is less than that of the image orthicon, but because the light available is virtually unlimited—a stronger lamp can always be inserted in the lamp-house—this does not matter, and the tube is capable of excellent definition.

Unfortunately the film camera tube suffers from a defect which results in the appearance of unwanted shadows and whitish areas on the picture. This is known technically as *shading*. The production of these spurious signals is caused by dark spot signals in the camera tube. These are extra electrons emitted by the mosaic which have random emission and tend to fog the picture in the same way that unwanted light on a photographic plate will fog it.

Readers who have seen a television film camera will have noticed that there are two small lamps mounted inside the camera housing. These are for the purpose of providing *edge* and *bias* lighting. The edge lighting is used to balance flare at the edge of the mosaic where the picture closes. The flare is caused by the scanning system and the sudden change in electron emission due to the scanning beam overrunning the picture. Flare usually shows up as a bright band at the right edge of the picture and is reduced by shining a strong light on the mosaic just off the side of the projected picture. Bias lighting is used in much the same way as grid bias in a vacuum tube and changes the sensitivity of the tube to prevent grid current in the amplifier. (These controls are not generally adjusted during transmission.)

While a program is on the air, a technician, known as the shading technician, sits watching a monitor on which is shown the picture from the camera. He has similar controls to those used by the studio camera control operator; in addition, he has four shading controls. These are two forms of vertical shading—saw tooth and parabolic. The names refer to the shape of the wave forms produced. The former corrects top or bottom shadows or flare and the latter similar faults in the middle of the picture. The horizontal shading controls are similar except that they correct for right- or left-hand side and center shadows and flare.

While this job does not call for a lot of engineering knowledge but merely the ability to make rapid decisions and to act on them at once, it is one of the most important during the time that a film is on the air. A skilled shading technician can make all the difference between a good and a poor film show. Almost every scene in a film has a different light value and causes different spurious emissions from the previous scene; therefore, the shading man has to be wide awake all the time to correct the picture continuously. An added feature of the film camera is the fact that it is possible to reverse film electronically. This means that if a negative film is the only one available it can still be used by setting the polarity switch on the top left-hand side of the camera to "negative." This will now produce *positive* pictures over the television system. In the "positive" position, it operates normally. For special effects, a reversed, negative picture results from positive film and the switch in the "negative" position.

The illustration of the RCA film camera shows the projector working directly into the camera, but this does not mean that there has to be one camera for every film projector or slide projector. RCA has introduced a device called a Multiplexer which makes it possible for two film projectors and one slide projector

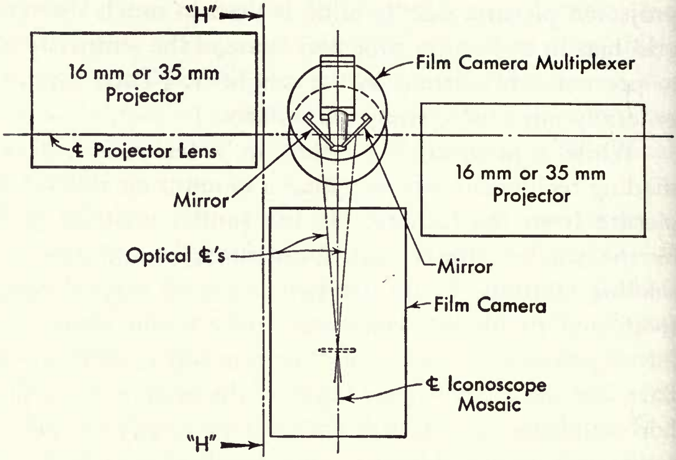


Fig. 4-10. Floor layout for two projectors operating with multiplexer.

to operate into one camera. The plan view is shown in Figure 4-10. It will be seen to consist of a pair of mirrors arranged on a pedestal, one in front of the lens of each film projector. The light beam from the lens of the projector strikes the mirrors and is reflected onto the camera mosaic. The slide projector is mounted over the mirrors and shines directly into the camera. Merely switching on one projector and turning off the others is sufficient to make a change from one to the other.

However, it will be apparent that at times the film will be longer than can be accommodated on one projector reel, and therefore it will be necessary to change over between reels. It is, of course, possible to do this by hand by noticing when the signal to change over occurs and covering the lens of the old projector by hand to prevent a double image when the second projector is started; but it is much easier to use a douser to effect the changeover.

There are many kinds of dousers: some are home-made and consist of a mechanical cap which covers one lens while opening the other; others are more elaborate and consist of electrical controls which move a shutter before the lens. The electrical arrangements are usually much the same in the various makes and consist of two solenoids, one of which is energized by a normally "off" switch which has two "make" positions. One position covers the run-out projector lens, the other position uncovers the lens of the fresh projector. Thus, one projector is always "open" and one "closed." Operating the switch reverses the situation and allows the other projector to function.

It is apparent now that the projectionist must know just when to make the change; otherwise he will have to guess at the proper time. The Society of Motion Picture and Television Engineers which sets up standards for almost everything pertaining to motion pictures has established a standard, or academy leader as it is called. Figure 4-11 shows this in detail, and the points where the motor and lamp of the new projector are to be energized are clearly marked. When the operator sees the first mark, he starts the loaded projector, when he sees the second mark, he changes over by pressing the douser switch. The audience should not be aware of the change from one projector to the other. Observers will sometimes notice a small white circle in the upper right-hand side of the picture, followed shortly after by another one. These are the signals for starting and changing over. It is necessary to have two, since warning is required to get the fresh projector up to speed before the change-over (otherwise both sound and picture would suffer as the machine runs up to speed).

The leader shown is for 35 mm; up to this date no standards have been established for 16 mm film, but it is expected that before long they will be. At present, the 16 mm leaders are not all the same, nor are the change-over marks; therefore, it behooves the projectionist to examine all reels received by him before the show goes on the air to ensure that all are marked and that he knows what the marks are! It is very embarrassing to run to the end of a reel while waiting for change-over marks which are not there and to present the audience with a blank screen or a glare of white light!

American Standard

Specification for 35-Millimeter Sound Motion Picture Release Prints in Standard 2000-Foot Lengths

1. Protective Head Leader

1.1 The protective leader shall be either transparent or raw stock. When the protective leader has been reduced to a length of 6 feet, it is to be restored to a length of 8 feet.

2. Identification Head Leader (Part Title)

2.1 The identification leader shall contain 24 frames as specified below:

(a) 6 frames on which are plainly printed, lengthwise with the film, in white letters on a black background: (a) reel number, (b) picture title.

(b) 18 frames on each of which are plainly printed in black letters on white background: (a) type of print, (b) reel number (Arabic numeral not less than 1/4 of frame height), and (c) picture title.

3. Synchronizing Leader

3.1 The synchronizing leader shall consist of 20 frames ahead of PICTURE START mark, then 12 feet, including picture start mark, to picture. This leader shall be opaque except as specified below:

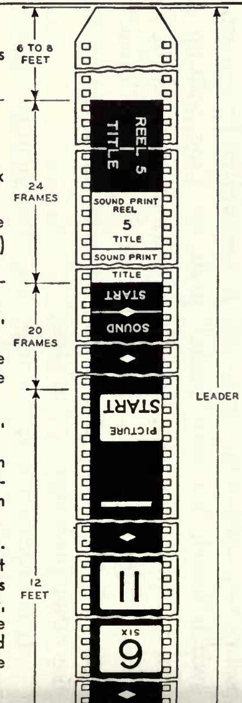
In the center of the first frame there shall be printed across the picture and sound track area a white line 1/32 inch wide upon which is superimposed a diamond 1/8 inch high. In this same frame shall be printed "SOUND START," in white letters on a black background.

The next 15 frames may be used by the studio for sensitometric or other information. If not so used, this leader shall be opaque.

The picture start mark shall be the 21st frame, on which is printed "PICTURE START" (inverted) in black letters on white background. The standard camera aperture height (American Standard Z22.59-1947) of 0.631 ±0.002 inch shall be used in the photography of this frame and all others between PICTURE START mark and beginning of picture.

From picture start mark to picture, leader shall contain frame lines which do not cross sound track area.

Beginning 3 feet from the first frame of picture, each foot is to be plainly marked by a transparent frame containing an inverted black numeral at least 1/2 frame height. Footage indicator numerals shall run consecutively from 3 to 11, inclusive. In the frames in which the numerals "6" and "9" appear, the words "six" and "nine" (also inverted) shall be placed immediately below the figure, to eliminate the possibility of misreading in the projection room due to the similarity between the inverted numerals. At a point exactly 20 frames ahead of the center of each footage numeral frame, there shall be a diamond (white on black background) 1/8 inch high by 3/8 inch wide.



1.

2.

3.

4.1 Picture. It is recommended that picture action start and finish on fades wherever possible, otherwise significant sound should be kept at least 5 feet from the start and finish of the picture. The length of a standard reel shall be between 1750 feet minimum (except when absolutely unavoidable) and 2000 feet maximum.

4.2 Motor Cue. The motor cue shall be circular opaque marks with transparent outline* printed from the negative which has had 4 consecutive frames punched with a die 0.094 inch in diameter. The center of these holes is to be halfway between the top and second sprocket holes 0.281 inch from the right-hand edge of the film with heads up and emulsion toward the observer. Following the 4 frames containing the circular opaque marks there shall be 10 feet and 12 frames to the beginning of the changeover cue.

4.3 Changeover Cue. The changeover cue shall consist of 4 frames containing circular opaque marks punched similarly to and of the same dimensions and position on the frame as the motor cue. Following the changeover cue marks there shall be 18 frames to the beginning of the runout trailer.

4.

5. Runout Leader

5.1 The runout leader shall be opaque and 3 feet in length.

5.

6. Identification Tail Leader (End-of-Part Title)

6.1 The identification tail leader shall contain 24 frames as specified below:

(a) 18 frames on each of which are plainly printed in black letters on white background: (a) end of reel, (b) reel number (Arabic numeral not less than 1/4 of frame height), and (c) picture title.

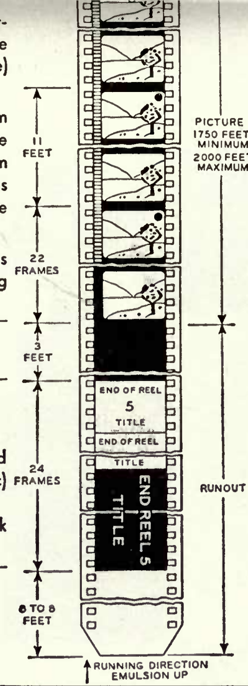
(b) 6 frames on which are plainly printed, lengthwise with the film, in white letters on black background: (a) end of reel, and (b) picture title.

6.

7. Protective Tail Leader

7.1 The protective tail leader shall be the same as the protective head leader.

7.



*NOTE: To obtain the transparent outline, the use of a serrated die has been recommended. However, the following alternate method may be used: Insert in the base side of the cue mark hole in the negative a skewer of hard rubber or hard wood which has been dipped in coding ink, and rotate the skewer slightly in the film in order that the ink will form a thin ring around the edge of the hole. Only a very small amount of ink is necessary.

(Courtesy of American Standards Association, Inc.)

Fig. 4-11. American Standard leader and release print specifications.

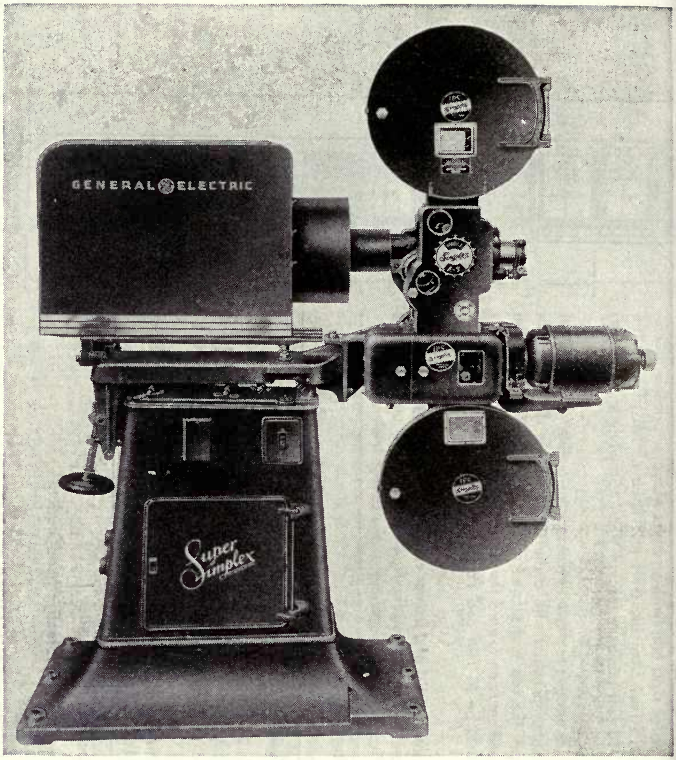


Fig. 4-12. GE 35 mm projector for television use.

While all projectors are similar in principle, the individual makes vary, of course, and since there are comparatively few manufacturers making television projectors, there are not many to illustrate. Therefore, representatives of some of the popular types will be shown and briefly described. In this way the reader will not be completely unprepared when he comes face to face with one in his first visit to a television station.

The GE 35 mm Projector Figure 4-12 shows the GE projector. The mechanism for transporting the film is made by the Simplex Company which is probably the largest maker of projector mechanisms in the world. (In most equipment the projector is made by a motion picture equipment company and modified according to the designs of the television manufacturer.) The upper and lower magazines, which are the round drumlike affairs above and below the mechanism, hold 2000 feet of 35 mm film which runs for twenty-two minutes. This is the maximum allowed by many local fire laws to be in any one magazine at a time. The large motor on the front drives the projector at the standard theatre speed of twenty-four frames per second. The lamphouse on this particular model will house an arclamp, but the Synchrolite unit may also be supplied. The massive base is a feature, and the general appearance of solidity is in keeping with the need for steadiness in operation. The projector is not very different in appearance from those used for theatres. The glass windows in the magazines are to allow the operator to check on the condition of the reels since it is illegal in some states to open the magazines when the projector is running (for the film, it will be remembered, is highly inflammable). This projector is a straight television model designed solely for that purpose.

The RCA 35 mm Projector Figure 4-13 shows the standard RCA television projector and Figure 4-13A the film mechanism with the film in the process of being threaded (the film in the illustration is blank leader). Those readers who are familiar with the equipment regularly employed in movie theatres will notice at once the small size of the television projection machines. This is brought about chiefly by the need for less light in the television film camera chain which immediately reduces the need for extensive cooling arrangements and the absence of the shutter.

The illustration shows how simple threading or "lacing up" as it is sometimes called, really is. After placing the loaded reel with the emulsion side towards the lamp in the upper magazine and locking the axle lock to keep the reel in position, film is threaded through the upper magazine slot. The film pad rollers, which are the rollers with the knurled knobs seen immediately above the open film gate and just to the right of the back of the hand at the bottom, are raised from the sprocket wheels which drive the film through

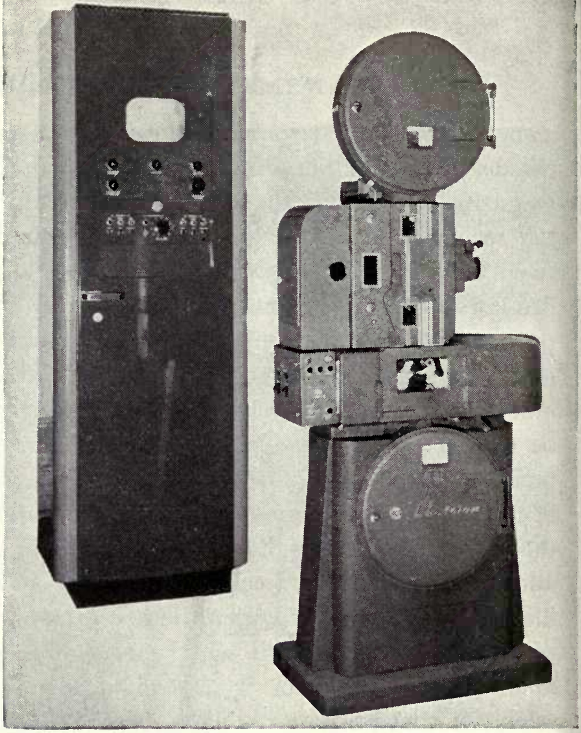


Fig. 4-13. RCA 35 mm projector with Synchrolite on right and control rack and monitor with remote controls on left.

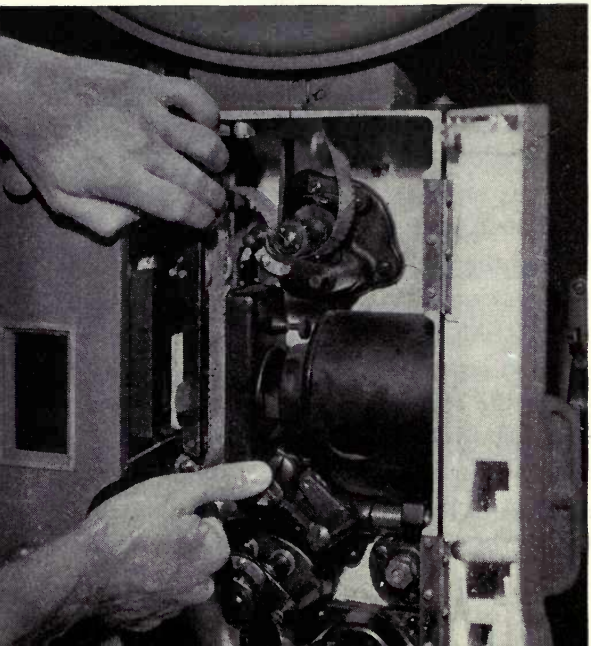


Fig. 4-13A. Threading RCA 35 mm projector.

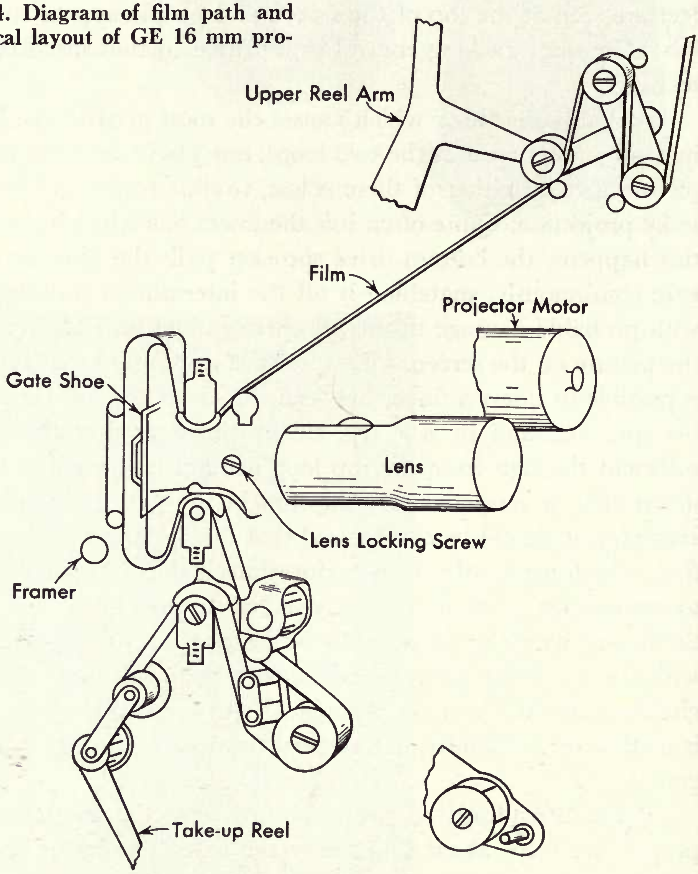
the projector. The film is then pushed into the space between the sprockets and the pad rollers and then into the film gate opening. It is important to ensure that the film is not caught between the pressers and the sprockets and also that it *is* properly engaged with the teeth on the sprocket wheels. After the film has been centered in the gate (that is, when it is squarely in the center of the light opening), the gate may be closed. If the film is not centered properly, the frame lines will show during projection and this will necessitate *racking*. This is an adjustment which centers the frame in the mask opening at the gate. It is possible for the picture to get out of adjustment during projection. Then the bottoms of legs and feet are seen at the top of the screen and people appear to be footless! The same racking control is also used in that instance to correct it.

Probably the thing which causes the most grief to the beginner in a projection room is the two loops, one above and one below the picture gate. If either of these is lost, trouble results in the form of jerky projection. Quite often it is the lower one which is lost. When this happens, the bottom drive sprocket pulls the film through the gate continuously, snatching it off the intermittent pull-down claw with probable damage to the film perforations and certain ruin for the picture on the screen. Often, to save a show from a stoppage, it is possible to insert a finger between the lower edge of the gate and the sprocket, and by a sharp, steady thrust against the film pull sufficient through from the top loop during the time that the pull-down claw is retracted and the film in the gate is therefore free. However, it should be emphasized that this is dangerous both to the film, which may suffer torn perforations if the claw should happen to emerge just as the film is being pulled through in this way, and to the fingers which could be badly lacerated if they came into contact with the revolving sprocket teeth (these teeth are rather like small, circular saws and can cut through flesh very easily). This method is neither recommended nor advised but used to illustrate an emergency cure.

When threading the projector it is essential to maintain the proper size loops above and below the gate. The lower one which has already been mentioned should be seven frames between the tension shoe and the pad roller. The upper should be the height of two fingers above the gate top. If it is larger than this noisy operation may result as well as jerky pictures on the screen.

The GE 16 mm Projector Figure 4-4 shows an "opened" view. Most of the electronic equipment on display is concerned with the pulsed light supply and the sound pickup preamplifier. The film mechanism is made by Bell & Howell for GE. Synchrolite operation has already been described in detail and can be ignored. However,

Fig. 4-14. Diagram of film path and mechanical layout of GE 16 mm projector.



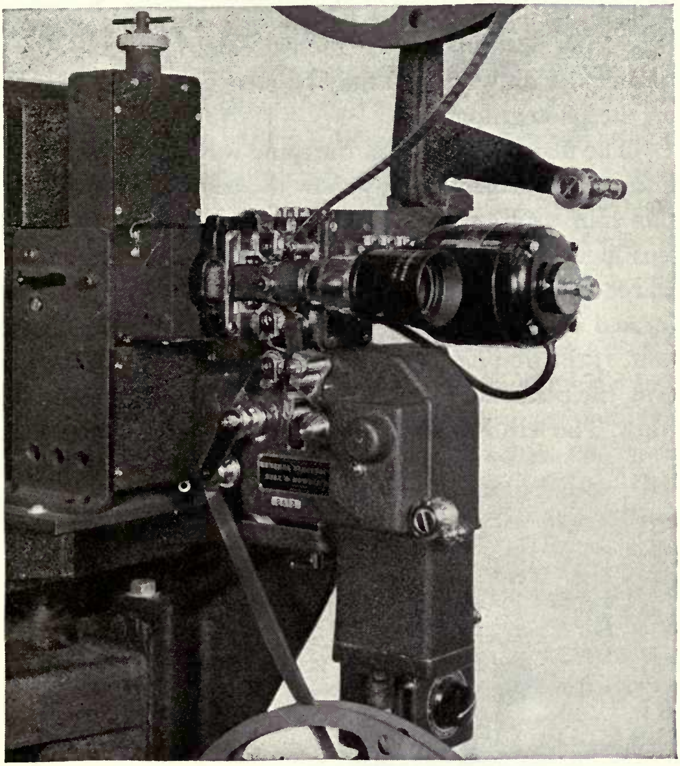
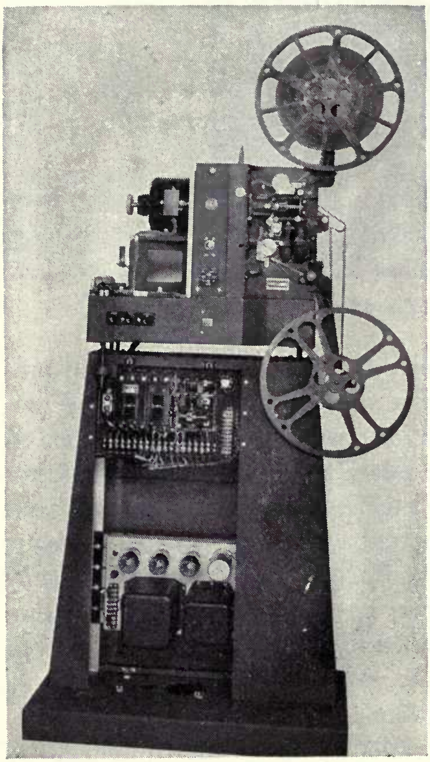


Fig. 4-15. Close-up of GE 16 mm projector mechanism.

there is one particular feature of the GE which is unusual in professional equipment. This is the rewind feature built into the projector. It is normally the custom for rewinding to be carried out on a special rewind and inspection table rather than on the projector itself. This is because the projector is often needed for the next feature and to enable a close examination of the film to be made during rewinding. Of course for 35 mm stock, which is usually nitrate base, rewinding must never be performed in the projection booth. A separate motor is provided for rewinding and can be seen immediately behind the lower take-up reel in Figure 4-4.

A schematic diagram of the film path is shown in Figure 4-14. It will be easy to identify the various parts of the equipment by comparing them with the photograph Figure 4-15. The sound reproducing head appears at the extreme right-hand side of the bottom of the drawing and may be seen in the same relative position on the photograph.

The film is threaded in the same way as other projectors (raised lines on the projector body show the route), but this time the emulsion is in a different position; it is on the side of the film nearer the lens in using direct-reversal films and Kodachromes; for others, towards the lamp. The fact that the film normally used will be perforated on one side only should be noted since this is most important. If the film has been properly rewound and placed on the spool arm, the perforation will be on the correct side and so will the sound track. The lens is focussed by rotating the lens barrel after loosening the retaining screw. In the case of all 16 mm projectors the sound leads the picture by 26 frames.



The RCA 16 mm Projector Figure 4-16 shows a "blown up" view of the equipment with the covers removed. The electronic equipment in the base is the power supply for the direct current to the three-phase motor field to ensure accurate synchronizing

Fig. 4-16. RCA 16 mm film projector with covers removed showing motor on left and power supply for the motor field in the base.

with the camera scanning. To the left can be seen the driving motor; the knurled knob on the left end of the motor shaft is to turn the mechanism by hand after threading the film to check its correctness.

The 1000-watt projection lamp is housed in the narrow section between the motor and the projector mechanism. It burns continuously and a separate motor-driven blower serves to keep it cool. A condenser and reflector system focusses the light onto the film in the picture gate. The white lines indicating the film path also used by RCA can be seen in the picture.

Immediately below the shiny black lens barrel can be seen the exciter lamp-housing which contains the lamp that shines through the sound track and with the aid of the photoelectric cell converts light to sound. In the RCA projector, the lamp does not shine directly through the film and lens system onto the cell but is reflected by a mirror behind the sound drum (the white disc just to the left of the lamp-housing) onto the photocell.

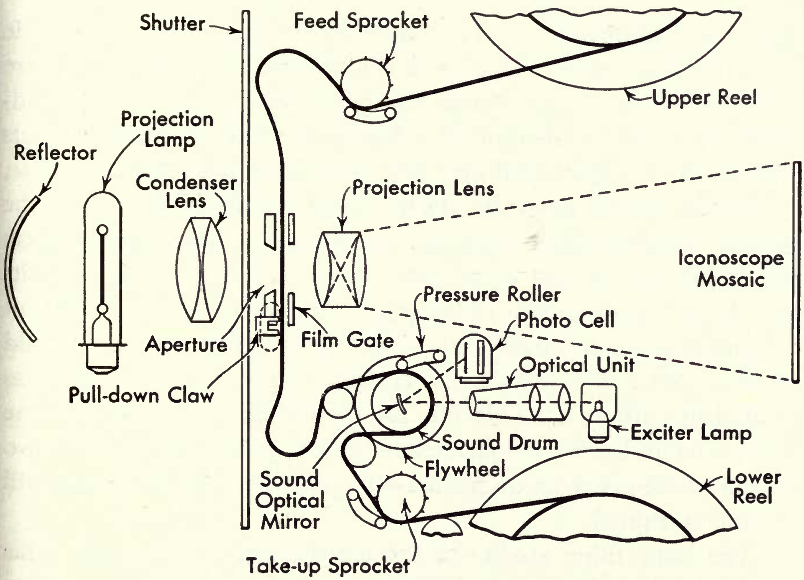


Fig. 4-17. Diagram of film path and mechanism of the RCA 16 mm projector.

Figure 4-17 is a line drawing showing the placement of the various parts and the path of the film through the light gate and sound head. If this is viewed in conjunction with the illustration, a very good idea of the mechanical arrangement can be obtained.

The reader may ask, "Why, if it is possible to eliminate the shutter by using a pulsing light, is it not possible to eliminate the intermittent movement also?" This has been done already in the British Telecine and results in infinitely quieter operation than in movements using the standard intermittent. It is also, of course, preferable for the film to be moved continuously instead of in a series of jerks which tend to tear the perforations, and it would result in less wear and tear and longer print life. This problem is being worked on by a number of television manufacturers, and doubtless before long a model employing this system will be designed. A projector using this system was suggested by J. A. Maurer in 1939. In 1949, the Akeley Camera Company of New York built one for experimental use. It was described in the July, 1949 issue of *Tele-Tech.*

Care of Equipment The individual manufacturers provide very thorough information and suggestions concerning the care and maintenance of projection equipment in their respective handbooks; however, a mention of a few of the most important points will not do any harm and may help to prevent grief at a later date.

Lenses should never be cleaned with anything other than the makers' recommended solutions. In general, a camel's-hair brush should be used to dust lenses, *not* cloth, or fabric, for this deposits lint. A very mild solution of Ivory soap in distilled water is excellent for removing finger marks, etc., from the lens. Nothing else should be used. Never use any kind of rapidly evaporating liquid such as alcohol or carbon tetrachloride, for these fluids may seep into the lens barrel and cause the elements—which are usually made of two or more lenses cemented together—to come loose, and the lens will in time be ruined.

The same thing applies to the use of soap powders, etc. This type of treatment will *invariably* cause the formation of numerous very fine hairline scratches which in time will blur the picture by diffusing the light to the dark areas and preventing sharp focus. Strange as it may seem, one or two deep scratches are much less detrimental than the multitude of small scratches produced by the methods mentioned above. Never handle the lens elements and keep fingers off the lenses.

If the film channels are not kept clean, little mounds of hard emulsion scraped off the film by its passage through the projector begin to build up. Often called *horns*, these can ruin a new film in one projection by causing deep scratches.

CHAPTER 5

KINESCOPE RECORDING

The term *kinescope recording* is one which lends itself very conveniently for use as the descriptive word for a film made of the picture appearing on the screen of a picture tube, or kinescope, in a monitor or receiver. Other words have been, and are, used to describe such films, among them being *video recording*. But although the latter is certainly very concise, the author prefers kinescope recording. Use of the word kinescope in this connection makes it available as a verb, as in "kinescoped." Thus television is responsible, as was radio, for the creation of a new word. Whichever one *is* used does not matter as long as the intention is the same.

Phonograph records appeared long before radio was heard: similarly, films were in use long before television; in fact, it can really be said long before radio telephony. Thus, in the early days of radio, programs of "preserved" music were available. True, they were recorded on the early acoustic machines in which the artists had to shout into a tin horn, but the advent of radio also brought improvements into the field of phonograph recordings and made possible the electrical recording or transcription. Today all phonograph, as well as special records for radio, are made by electrical means. It is common practice to make a recording of a radio show and play it back over the air at a more suitable time; this is called a delayed broadcast.

Not so long ago the New York studios of the national radio networks used to have two performances of each of their most popular shows because the time on the west coast was three hours behind

New York time. This meant that the performers had to do the same thing twice in one evening, and very often the two shows were not exactly similar. Also, they were tired by midnight, or later, when it was time to go on the air again. With the advent of magnetic tape for recording, the repeat performances ceased and a record made at the time of the broadcast is now played over the network lines at the proper time. Sometimes it is made in New York, (or the city where the show originates) sometimes it is made on the other side and the middle of the country as well. Thus, the central standard time region can have its own recording to play at the proper time and so can the other two time zones. This often helps to reduce line costs.

So far television has not been in a position exactly paralleling radio since the coaxial and micro-wave relay circuits do not yet link the east and west coasts. There is a parallel in the extension of the cable to St. Louis and Omaha, but because the time difference is not three hours, the disparity is not as great. Most of the kinescope recording systems installed to date, with the exception of that of Paramount, do not provide instant, or even particularly rapid processing, so that only with the Paramount system is it possible to show a film within a few minutes of the time that it was recorded.

The requirements for a film recorder are more severe than for a sound recording machine. As we have seen the eye is considerably more critical than the ear and will reject pictures which are not first-class. In addition to which, it tires much more readily. The conditions under which the film is recorded do not lend themselves to optimum results, and since the recorded picture can never be better than the original, a poor reproduction will obviously be produced if the latter is not of first-class definition and clarity.

To start with, we have a maximum of 525 lines per frame; of these about 350 actually are usable in the picture. There is loss of definition in the spreading of the lines in the fluorescent coating of the screen. There is an additional loss of definition in the very slight spreading of silver in the film emulsion. When the film is reproduced, there is another loss in the resolution of the film camera mosaic, and in the final presentation on the screen of the receiver, a further loss occurs. It would seem to be a miracle that a picture of any kind is obtained! Actually, the losses are so small that they do not amount to much once the film has been recorded, and in fact sometimes the actual process of reproducing the film introduces effects which tend to cancel these losses.

Before describing an actual installation, it would be well to consider the problems involved in taking a picture of the television screen. At first sight it might appear that what would be required is a camera focussed on the kinescope. Most receivers do have a bright enough picture to enable photographs to be made. But since the complete picture is on the screen for only one-thirtieth of a second (remember thirty frames per second) it means that the maximum lens-opening time is only one-thirtieth of a second. This at once introduces a fixed constant into the calculations; the shutter speed has been determined. Now for the amount of light available. In home receivers, this would easily become a problem and the various designers have solved it in two ways. One system, Paramount's, involves the use of a standard ten-inch tube producing a picture about three by four inches. The other uses a small, five-inch projection tube with a very brilliant blue picture. Each method has advantages and each provides sufficient light. This gives us two figures to work with; we know the shutter opening and the amount of light available. From this it is possible to determine the size of the lens opening—*f* or *T* value—by taking into account the speed of the emulsion. So we're all set to go—or are we? What happens if we shoot at thirty frames a second?

The television frame and the camera will be in synchronization because they are running at the same speed, and the program will be properly recorded. (Yes?) Now, what happens when the film is processed and sent to station XXXX-TV in the wilds of Wisconsin? It is placed on the projector and exhibited. But wait a minute, there is something wrong! What is it? Why, the people are all very tired, they move so slowly. Perhaps the projector is running too slowly? No, that's the proper speed. Ah! The film was *made* at *thirty* frames a second and projected at *twenty-four,* so of course it is running more slowly than when it was made and the characters have slower actions. (If it had been taken at a slower speed than twenty-four, the action would have been speeded up.) So what can we do? Now we know the problems involved and it is comparatively easy to solve them—when you've been told how!

The problem boils down to converting thirty television frames to twenty-four film frames each second—just the opposite of converting twenty-four frames of film to thirty frames of television when we are *exhibiting* films. In the latter case the conversion was made by the simple trick of exposing one frame twice and the next one three times. In this case it is not quite as simple, but the technique is very similar.

There is one other factor which has to be considered, and this is most important; it is the sound which accompanies the program being recorded. Either of the two methods of sound recording already described may be used: that is, double or single system. So far, it seems that the single system in which the sound is recorded on the same film as the picture is more popular. Provided that the quality can be maintained, and there is a way in which it can be, there is no objection to this method.

Three paragraphs ago it was pointed out that merely speeding up the camera would not produce satisfactory results because the actions would be too slow when the picture was projected. Also, the sound would, of course, be affected and reproduce in a low pitch. But even if the projectors in television stations were speeded up so that a film made at thirty frames per second could be used, the problem would be nowhere near solved since then the projectors would not be usable with ordinary theatre film—and this makes up the bulk of the television programs at most stations. It would also restrict the use of kinescope recordings for audition purposes. Thus it is seen that the normal figures of twenty-four and thirty frames must be retained and the conversion performed during the action of recording on the film. Another aspect which may escape cursory examination is the necessity to retain interlace. If film ran at thirty frames, i.e., there was one exposure for each frame, the flicker-reducing effect of interlacing would be lost.

A number of different methods have been evolved, but they all

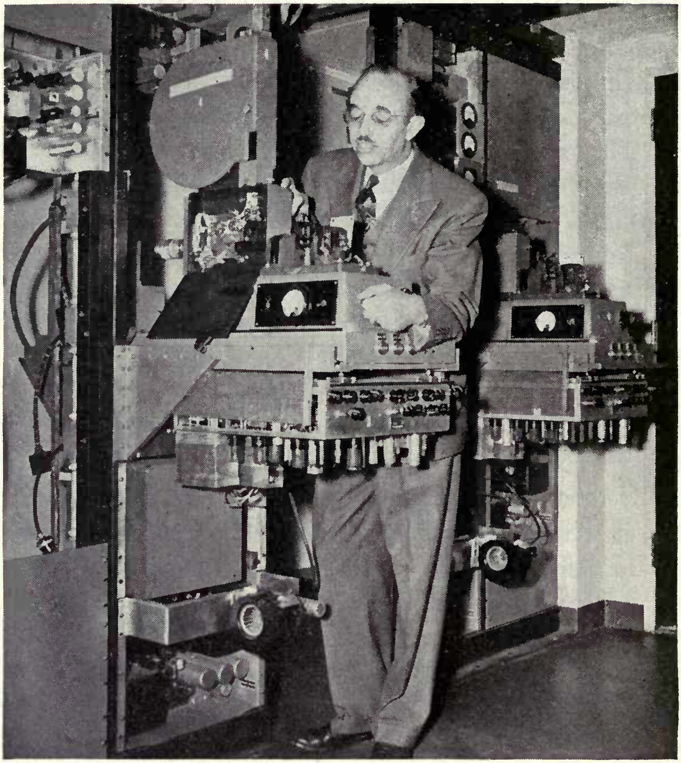


Fig. 5-1. NBC kinescope recording equipment being adjusted by O. B. Hanson, Vice-President of NBC.

depend on some form of device, either electronic or mechanical, to shut off the light at certain times, i.e., an electronic or mechanical shutter system. The Eastman Kodak Company has developed equipment for NBC and the Dumont network which does a very satisfactory job. In this case, a mechanical shutter is used. In the author's opinion the electronic shutter requires more work on cathode-ray tube phosphors. No mechanical shutter is used to cut off the light after each desired exposure in this system. Therefore, if the phosphor has a long decay time instead of the light being sharply cut off every time, it will fade and leave a faint blur on the film. Of course, as progress is made in phosphor composition, the situation will improve. Another requirement is that the magazine be capable of holding enough film for a half-hour show. Most of the cameras used for 16 mm recording hold 1200 feet of film which is sufficient for thirty-three minutes of continuous running. In the event of a show lasting more than this time, it is a simple matter to arrange to switch to another machine at the end of the first reel in the same way that a motion picture projector is switched during projection.

But even now it is too soon to discuss the methods used, for there are two more small matters to consider. First, due to the small amount of time available for film pull-down, it is necessary for it to be moved very rapidly. This means that the wear on the film is higher, and it also calls for greater precision in the mechanical details of the movement. Secondly, if 1200 feet of film are used for one *take* rewinding it presents a slight headache. The size of a roll of this length is about ten and one half inches in diameter. Yet when rewinding commences, the core or the spool center is only approximately two inches. It is at once obvious that the peripheral speed will increase as the film winds onto the take-up due to the unavoidable increase in diameter. Some form of slipping clutch is therefore required to provide a varying speed from start to end.

Practical Conversion Since a field is 1/60 of a second, it follows that half a frame is 1/120, or 72° if expressed in terms of shutter action or blanking. A shutter which is open for 288° or 1/30 of a second is not hard to design; this leaves half a field, or 72°, for closed time. If the sequence commences with the shutter open and an odd field is followed by an even, both will be recorded on the first film frame. Then the shutter closes for 1/120 of a second and the first half of the next odd field is lost, the whole of the even field is recorded and also half the following odd field (two film frames). The shutter then removes half of this odd field and records a full even field plus half an odd field before it closes again (three film frames). The fourth *film* frame records in this order half an even field, a whole odd field, and half an even field—the second half being lost under the shutter. Now the whole cycle repeats itself.

It will be found that four film frames have accounted for five television frames, this is a ratio of 4:5 or 24:30. Of course, in the process, something had to be removed and so it is that part of each frame is lost; however, owing to the overlap, this is not noticed by the viewers provided due precautions are taken.

In some of the poorer film recordings, viewers will have noticed a narrow light or dark bar which moves up or down on the screen. This is known as a *shutter bar* or *banding*. It is caused by lack of synchronization between the sync generator in the studio and the recording camera. Since this is effectively joining the point in each frame where the old and new picture contents begin and end, it is generally known as a *splice*. This should not be confused with a film splice in which a physical joining between two pieces of film stock is made.

It is one of the features of the system that a splice appears unavoidably in each frame. Therefore, since it cannot be removed, the only thing to do is to minimize it in the best way possible. This means, quite clearly, that the kinescope picture which is being photographed must be perfectly steady with extremely accurate registration; otherwise there will be a change in brightness or content at the splice. This in itself will be sufficient to draw the attention of the viewers to it.

From the foregoing, it will be seen that kinescoping is not as simple as it might have appeared at first sight. But the reader of this book will not normally be expected to have much to do with the technical side. However, the sound question has not yet been cleared up, so further discussion is indicated.

In the chapter on sound equipment and recording the single system was mentioned as tending to suffer from poorer quality sound as well as difficulty in editing. The latter objection is of no importance since editing is not needed (or should not be) in a recording off the air. The former is of great importance. It was shown that single system's sound troubles arose from the fact that it was necessary to use fast emulsion for picture-taking and slow, fine-grain emulsion for sound recording. Since the two were not completely compatible one had to suffer, and it was sound. Even the mechanical arrangements were against good sound quality in the single system camera since there was always the risk of introducing flutter and wow due to insufficient headway between the picture gate and the sound head. In the kinescope recording equipment designed by the American Broadcasting Company, this trouble has been completely eliminated.

This system, which may be said to combine the best features of all those in operation, utilizes a projection type cathode-ray tube with 30,000 volts on the anode. This produces on a five-inch screen an intensely bright, blue picture about two by three inches. In the process, some X-rays are produced which are adequately absorbed by lead glass and other shields; thus there is no risk to personnel. This picture is focussed onto the film in a special Wall camera. Below this camera is a Maurer sound recorder; each is driven by a different motor—in fact, four are used in all. The sound gate is *eighty-two* frames ahead of the picture instead of the usual twenty-six. This means that there is no chance of wow or flutter from the intermittent since all irregular movements have been eliminated long before the film reaches this point.

Of course the problem is, what happens to the projector standards mentioned previously when it was stated that the film from a recorder must be standard? The film is developed as a negative, complete with sound, then the sound is re-recorded on tape, disc, or another film. A print is made (positive) and the sound added in synchronization the usual twenty-six frames ahead. Thus a normal release print is obtained with first-class sound and picture quality.

The film used in the recording system is sound positive. This has a slow emulsion which is blue-sensitive and has an exceedingly fine grain. The light from the recording lamp is, of course, ample for sound work, and the blue light from the projection kinescope is not only very bright but suited to the spectral characteristics of the film so that a reasonably small aperture can be used with consequent better focus. Another and not inconsiderable reason for the use of sound positive stock is its low cost. One thousand feet of it cost about $15 or less in quantity. Thus the only costs for

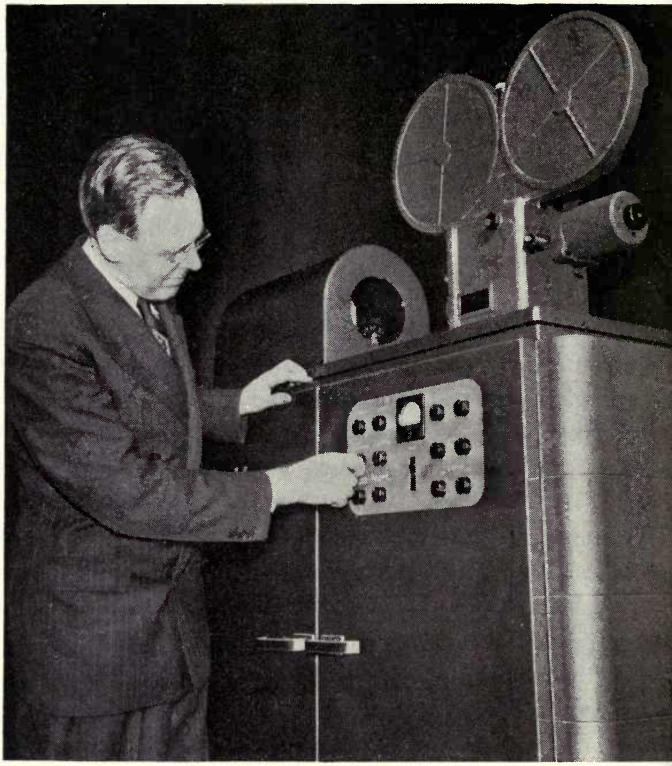


Fig. 5-2. RCA film recording equipment. A high voltage projection type cathode-ray tube is housed on the left-hand top cover, a film camera—either 16 mm or 35 mm—is on the right, and below are the controls and auxiliary equipment.

a kinescoped show are wages, overhead, and film. Compare this with a repeat show with all the extra costs for talent and studio technicians as well as stage hands, etc. The film costs might be as high as $50 for a half-hour show plus overhead but this is nothing compared with live repeat costs.

The program-in-a-can feature is also extremely convenient. As has already been shown, the coaxial network and micro-wave relays have not yet covered the country, and it will be a long time before all the smaller towns receive service. Even today, it is impossible to get outside programs in Los Angeles, the home of movies, or San Francisco. Everything not locally produced has to come in on film. Similarly, in New York, one of the first cities in the United States to have regular television programs, it is impossible to present programs from Hollywood by any other means than film recordings. Since the New York audience is pampered by seeing live shows only, either by cable or from local studios and remotes, they do not take too kindly to low-quality recordings from other regions; the difference is too obvious.

The other networks, NBC, CBS, and Dumont, make use of various methods of kinescoping, but in all cases the principle is the same with individual variations. Some of these operations use double system, however, in preference to the single. Some use a ten-inch screen for recording with a whiter picture color.

The Paramount intermediate film system has already been mentioned, but it may not be realized just how specialized a kinescope system it really is. It is possible to record, develop, and project a picture within sixty seconds, and the latest equipment, designed primarily for theatre work, can do it in fifteen seconds. This system uses 35 mm film exclusively. For the slower, sixty-second operation ordinary nitrate film is used, but for the high-speed, high-drying temperature system acetate base has to be used to overcome the fire hazard.

In this apparatus a magazine of 12,000 feet capacity provides sufficient film for a two-hour program. Film from the magazine runs through special lightproof guides to the camera and from there to a series of developing, fixing, and washing baths. After this it is dried and either wound onto a reel or conveyed below to the projection booth and into a projector if it is to be used for large screen projection. An Akely camera is used in this system.

It would seem that until the quality of the recorded image improves, kinescoping has much more appeal to the isolated station than to the station which is on the coaxial line or micro-wave relay link. General reports at hand state that this is indeed the case, and while the multi-station markets are not making much use of them, single-station, off-coaxial-cable towns find kinescoping not only a God-send but also very popular for they enable these stations to provide the cream of the four networks' service as well as easing some of the financial load. Until some practical method of recording live action directly on film has been developed, kinescoping appears to have a very important place in the television circle; and even when, and if, direct filming is possible the kinescope recording will still be valuable. Once the union problems are cleared up, its usefulness will increase considerably.

CHAPTER 6

LENSES

In this chapter the principle of the lens and its use will be covered together with the need for it. Discussing the last point first, it is seen that the purpose of the lens is to focus the rays of light and picture information on to the sensitized film in the camera (or, in the case of a projector, to direct the rays of light from the film in the light gate onto the screen).

Strictly speaking, a lens as it is known today, consisting of two or more pieces of curved glass, is not needed. The first camera made use of the pinhole lens. This was merely a hole pierced by a pin in a sheet of metal foil a few inches in front of the photographic plate. The extremely small size of the hole allowed the rays of light to enter the film compartment and impinge on the plate and still remain in their respective positions.

Perhaps some readers may remember the direction given in old children's wonderbooks on how to make a camera? The instruction read "pierce a hole in one end of a box and cement a piece of very thin tracing paper over the other end. An inverted image of the scene in front of the lens will be seen on it."

As a matter of fact, this type of lens gives excellent definition and sharpness of picture, but unfortunately it suffers from the unpardonable sin of being *slow*. The matter of speed in a lens has nothing to do with actual movement but refers to the amount of light admitted at its widest opening. As will be seen later, the speed of the fastest action which can be photographed with a given emulsion speed and shutter depends on the greatest quantity of light which can be placed on the film in the time that the shutter is open. The greater the lens opening, the more light will reach the film while the shutter is open. This means that if the action is very fast in order to "stop" the motion (that is, arrest it so that there will not be a blur due to movement being recorded while the shutter is open), the exposure must be short. To get sufficient light to record the picture a large or "fast" lens is required.

On the other hand, sometimes there is too much light in which case it becomes necessary to reduce the amount of light passing through the lens by closing a small diaphragm in front of it which is known as an *iris*, so called because of the very large number of leaves of extremely thin metal which close or open in a circular motion as the control is operated. The action is very similar in appearance to the action of the iris of the human eye, or pupil as it is sometimes called. This brings up the next point which is care of the lens and its characteristics.

It should be regarded and treated in the same way as the human eye, or at least sometimes as the human pair of spectacles. A lens must be kept scrupulously clean; the faintest bit of dirt on it will reduce the amount of light being transmitted and since this is one of the main functions of a lens great care must be exercised in handling it. A handkerchief should never be used to clean a lens, for one of two things will result; it will either scratch it or leave lint on the surface. This is even more important in the case of coated lenses, for careless cleaning can result in removing the surface in small areas and so cause shadows on the finished picture.

The coating mentioned above is a comparatively new development designed to reduce the amount of light reflection by the glass of the lens. It operates by preventing the reflection of light and thus permitting more of the light rays which strike the lens to enter instead of being reflected by the surface of the glass. A number of different substances are used, each operator having a different "secret" formula. Any lens can be coated even if it is an old one. There is not much point in having projector lenses coated unless a particularly long throw is involved and the light on the screen is poor, for in many cases there is too much light on the screen in the case of small pictures.

When purchasing a secondhand camera or lens, it is essential to insist that a picture taken with the lens is available for inspection and to have the right to try it out on a return basis. This is even more important if the camera has been used, or is bought in sandy areas, such as the western deserts or even in Africa. During the war, many people bought perfect-appearing cameras for next to nothing from Arabs in Cairo and later found the lens was useless due to sand blasting by the wind and sand in that area. For this reason, it is essential to keep a lens capped with a leather and velvet cap when the camera is not in use. Because the glass seems so hard many people neglect this precaution with the attitude, "Oh, it's so hard, nothing can hurt it." Then a picture is made and it is blurred and dark due to sand erosion. If the lens is coated, then this is doubly important for the coating is comparatively soft. Sometimes when a turret is used for mounting the lenses, one lens which may not be used very much gets badly worn through lack of attention to this point.

The immediate effect of coating a lens is to increase its *f* value by one stop. This sounds very complicated but it is not, for it is only a measure of the amount of light passed by the lens. The foregoing statement is not strictly true but it is commonly stated that way, and for the moment it can suffice. Later the newest method of measuring lens transmission by *T* stops will be mentioned.

The designation *f* stop was standardized in France early in the twentieth century to calibrate the openings of the camera lens. There are two methods of expressing this factor, angular aperture and aperture ratio. The latter is always used for photography and the former more for optical work. Angular aperture is given as a measure of the angle between two lines from the focus of the lens to two points at the end of the lens; this is more difficult to apply and understand for photographic work. The aperture ratio is just what it says; the ratio between the diameter and the focal length;

thus the greater the diameter of the lens, the smaller the number representing *f* and the more light that is admitted.

Each *f* value or stop ("stop" is a derivation from the early lenses which actually used stops to prevent the lens' adjustment from being changed inadvertently), progressing in decreasing numerical value increases the amount of light passed by 100 per cent, so that the smaller the *f* number, the larger or faster the lens. About the smallest aperture used in normal operation is *f* 22 and at the other end of the scale we find lenses as large as *f* .9. A standard lens may be called an *f* 2.8, i.e., maximum opening, and be calibrated in a series of stops as follows: *f* 2.8, *f* 3.5*, *f* 4.5*, *f* 5.6, etc. Note that some of these numbers are half stops: that is, they do not increase the light by 100 per cent. The half stops are marked with an asterisk (*). There are, of course, many of these but those shown are perhaps the most used. The speed varies inversely as the square of the stop number. This means that *f* 8 is just about four times slower than *f* 2.8.

Thus it is seen that for any type of lens, be it telephoto, close-up, or wide-angle, the amount of light passed by the lens may be expected to be the same for the same *f* number. This makes matters very easy for the photographer and maker of light meters since it eliminates a variable. However, as usual, people became tired of the good old system of *f* numbers which served for so long and with the advent of television it was decided that the light transmission figure was of more value than the ratio of diameter to focal length. There is a lot of merit in this proposal, and though it is always difficult to change to something new and not very well known, it is likely that in the future *T* stops will come into general use. At present many lenses are made with both calibrations marked on the barrel.

Since the *T* series is essentially a light transmission measure, it is based on the amount of light that will pass through the various elements of the lens. Quite briefly, the idea behind the new system is that with the advent of new multi-element lenses there was so much error introduced due to irregular light transmission and refraction and reflection losses that the ratio no longer was a reliable indication of the *amount* of light which passed through.

In addition the older film emulsions and exposures were quite inaccurate so that the error in the *f* value was not important. Now, however, emulsions are controlled very precisely and exposures are determined by photoelectric means so that the margin for error is much less. Therefore the *f* value error is much greater by contrast, and a better means of measurement was requested.

Probably the greatest error occurred in the assumption that there was 100 per cent light transmission in every lens with the same *f* stop. Every time there is an air to glass surface, light is lost by reflection; some glasses absorb more than others, and the more elements there are in a lens, the more light will be lost. The Bell & Howell Company brought out the *T* system: it seems to the author coincident with the upsurge of television in 1948. The *T* stop is a pure measurement of the amount of light transmitted and is calibrated by an electronic measurement at the time the lens is manufactured so that the *real* transmission is recorded. Because the *T* system takes losses into account by the very action of measuring the light transmitted, it is obvious that it will be very slightly slower than the *f* rating for the same lens. Probably a new generation of photographers who have never heard of the *f* stop and rely only on the *T* figures will arise. What does it matter? They will still forget to remove the lens cap on occasion!

One last note on *f* and *T* stops; for every aperture there is a minimum distance that must be maintained between the subject and the camera. This varies according to the setting of the speed-controlling diaphragm; as this opens so does this minimum distance increase together with a decrease in the depth of field. This means that in conditions of poor light when it is necessary to use a wide-open lens, focussing of the lens is more critical and greater care must be used to ensure that all areas of the frame are in focus.

These are all problems which will apply more to the cameraman than the producer and there are any number of excellent books written on the use and operation of cameras and lenses which explain in greater detail exactly what to do about these effects.

Focussing the Lens In all types of lenses, focussing is accomplished by rotating the lens barrel. This has the effect of changing the spacing between two or more lenses and thus bringing all the rays of light to converge at one point and produce a sharply defined image on the film.

Quite obviously focussing is even more important than film movement speed for if a fuzzy out-of-focus image is produced it is of absolutely no use whatever, while a series of frames taken too fast or too slowly may be usable by the employment of one or another of the methods used to change frame speed. Probably the most important effect of focussing is the effect on depth of field. This is the "working distance" of the lens. In other words, it describes the limits of closeness to, and distance from, the camera between which the set will be in focus. This figure changes with every change of *f* opening: the larger the opening, the more critical and smaller it becomes. Thus for close work it is always advisable to "stop down" to increase the depth of field so that all featuress of a face may be in focus. It is quite possible when using close shots and large apertures for the tip of a nose to be in focus and the rest of the face blurry due to extremely short depth of field.

There are three general methods of focussing in use; the last one to be described is the best, but it requires a more costly camera. For normal use, the calibration on the lens barrel or focussing ring is sufficiently accurate, so the distance from the lens to the subject is measured with a long steel tape. The measured distance is then set on the lens barrel. This is quite satisfactory and is used by many excellent producers and cameramen. However, it does not produce the exact focus demanded by perfectionists and sometimes through carelessness gives very poor results.

The second method is the rack-over system in which the camera body slides to one side and a viewing eyepiece comes into position so that the picture which will be recorded can be seen through the same aperture and lens which will be used for filming. This has a number of variations: in the Bell & Howell Specialist the whole camera body moves over to allow the viewing eyepiece to come into position; in the Maurer, the camera also moves and the scene is seen through the taking lens by an ingenious arrangement of mirrors. There are many variations of this. In many turret cameras a small eyepiece is positioned at the front of the camera; when the lens to be used next is in front of it, the lens can be focussed by squinting through the eyepiece and adjusting the lens.

With this method, there is always the danger that the turret may rotate unevenly and be out of focus by the time that it reaches the proper filming position. These methods are preferable to measuring in any instance where precise work is required, and the lens opening has to be large with short distance between the lens and subject.

The last method to be described is known as the *full-frame follow-focus* system, and is employed on many professional cameras. The scene to be filmed is viewed through the actual lens which is used to photograph the scene at the time the scene is being filmed. In this case it is done by an arrangement of mirrors, but for good results the design is expensive and for that reason it is not often used on the cheaper 16 mm cameras. A new camera has been introduced by the Pathe Company of France which sells for less than $400 and has this feature. But so far this is the first in the cheap line to use it. Even the expensive models do not always have it.

The Auricon Auto-Parallax View Finder. A combination view finder and range finder is made by Berndt-Bach Inc., the manufacturers of the well-known Auricon single and double system cameras and recorders. This can be seen on the near-side of the Auricon camera in Fig. 3-1. By an ingenious cam device parallax is corrected and the proper focus distance indicated on a scale. The view finder image is seen the right way up and the correct way around. The auto-parallax feature ensures that no matter what lens is in use, provided the proper matte (frame) is used in the finder, exactly what appears in the finder will be photographed, since the aperture is the same as a standard 16 mm sound film aperature.

The view finder coupled to the lens has been left until now since it is in a way part of the full-frame follow-focus system. There are many types of view finders. Since each one has its disadvantages as well as advantages and the model chosen usually depends on the finances of the purchaser, only a general description will be given. It will be obvious that each lens will require a different objective and frame indicator since the field of view will differ with each. Some achieve this by inserting a different mask into the finder, others by hairlines or lens' changes. In the coupled type, parallax has to be overcome since the two lenses are on two separate axes and as the subject approaches the camera the finder will have to converge toward the axis of the filming lens to ensure that the same field is covered by each. This produces another complication.

The purpose of the shutter in the camera has already been discussed, and it only remains to describe the methods whereby its speed may be effectively varied. It might be thought that because the speed of the film is constant at twenty-four frames per second and therefore the mechanism operates at a constant speed it would be impossible to vary the shutter speed. The movie camera for 16 mm use normally has a 170° shutter: that is, it is open for 170° out of the 360° of a full rotation. In this case, at twenty-four frames a second the exposure is 1/50 of a second. Therefore, all normal exposures are calculated at this exposure speed. For most purposes, this is fast enough to prevent blur when photographing moving objects. Some cameras have a dissolving shutter which makes it possible to control the amount of shutter opening without varying the speed of the camera mechanism. For instance, in the Maurer camera the dissolving shutter will open to as much as 235° giving an exposure time of 1/35 second. This means that in conditions of poor light the equivalent of an extra half stop is obtained. It will be apparent that changing the shutter speed will change the aperture required in most cases; the instruction book for the individual camera will indicate the necessary corrections to be made to maintain proper exposure.

It is very seldom that one lens will cover all the different shots called for in a production; in fact, one might almost say "never." Therefore, a selection of lenses is required. It is possible, of course, to have a number of lenses and merely change them by unscrewing after each shot. This would be very impractical and slow, as well as hard on the lenses; with the constant handling, the elements might jar loose or become scratched. Therefore, a lens turret is used which, as its name implies, is a rotating holder which instantly places the desired lens in front of the film-gate opening ready for filming. As many as four lenses may be accommodated on one turret, although the usual number is three; for most cases this is plenty. Four are usually provided for television cameras where the number of shots in one live show may be very great and actually require that many lenses.

The Cine Special camera which is considered by many to be the backbone of the semi-professional cameraman's kit, has a two-lens turret. This makes for extremely compact design and ease of handling. Quite often when lenses are spaced very close together, they are mounted at an angle to prevent interference between them in the form of intrusion of the unused lens in the picture.

Most of the other cameras in general use for substandard work have three lenses placed on a circular turret and instantly available for use. With a proper selection of three, or even two, lenses almost any normal production can be handled.

The "common" or "garden" lens of all work is the 25 mm or one-inch lens, *f* 1.4. This focusses from one foot to infinity, and at 15 feet covers a field of 5 feet 7 inches by 4 feet 2 inches. If it is set for 18 inches, it covers a field 6⅛ inches by 4½ inches. Thus it will be seen to be quite versatile; however, at 15 feet the subject is comparatively small, and for some purposes it is necessary to have a magnified view of the subject and still remain at a distance. In this case a lens of a greater focal length is used. (The reason for the great popularity of the one-inch lens is the fact that it is very similar to the human eye in its interpretation of perspective and general size in 16 mm work.)

The next size is a 50 mm lens which corresponds to 2 inches. This has a speed of *f* 1.6 in the Cine Special range. At the distances previously mentioned, the field covered would be halved; this means that at 15 feet the field is now only 2 feet 10 inches by 2 feet 1½ inches, and at 18 inches it would be a little more than half the previous size. It will at once be seen from this that an object photographed with a two-inch lens will be twice the size of one photographed with a one-inch lens at the same distance.

These two are often sufficient to take care of all studio requirements, but on occasion it is very nice to have a really long-focus or telephoto lens available. This is generally a 152 mm, or six-inch lens with an *f* value of about 4.5. (All the figures mentioned are for Kodak lenses; other makes may differ slightly.) There is a four-inch lens with a rating of *f* 2.7, but this is hardly more than a very long-focus lens without the advantages of a telephoto lens.

It will be noticed that as the focal length increases, the speed decreases. A moment's consideration will show that as the number of elements increases, so does the amount of light lost in transmission so the *T* rating will be higher together with the *f* value. Since *f* is the ratio of diameter to focal length, it is obvious that when the focal length increases, the ratio is bound to become larger. This also accounts for the fact that telephoto lenses and all long-focus lenses are larger in diameter than the smaller ones.

There is another type used very often in the studio for shots where there is not much room to get far back from the subject and yet it is essential to obtain a wide view of it. These are called wide-angle lenses, and one is often included in place of one of the types previously mentioned; the one discarded depends on the purpose at hand. The Kodak 15 mm or ⅝-inch lens has an opening of *f* 2.7 and at 18 inches has a field of 10¾ by 8 inches. This is almost twice that of the one-inch lens. It will be noted that this is not exactly in proportion; the wide-angle feature necessarily introduces some spherical aberration at the sides, but this is kept to a minimum by careful design.

In addition to the magnification and field variations in the lenses, there is another property which changes with change of lens and is most pronounced in telephoto lenses; this is perspective. Everyone must have noticed with amusement sometimes those race track shots made with a telephoto lens in which the horses gallop away for dear life and never seem to grow any closer to the camera. This is caused by the apparent perspective, which will not be gone into here since it is somewhat beyond the scope of this book, but anyone interested in technicalities can find many good reference books at the local library.

Insofar as wide-angle lenses, and keeping objects in focus as they approach the camera, are concerned, the effects are somewhat different. With a wide-angle lens some highly interesting effects can be obtained; although there is some distortion around the edges, the rest of the picture is well in focus. For instance, any object moving toward or away from the lens changes size much more rapidly than it actually appears to, to the naked eye. Some extremely interesting effects can be obtained by the judicious use of the wide-angle lens. If it is desired to achieve a psychological effect by a sudden pan shot of some horrible object with the climax at the end of the pan, it can be done by arranging the camera at the end of a row of gargoyles, or whatever is required, and slowly panning up this row until the last one, at the end nearest the camera, is framed. The last few images will grow rapidly and by increasing the speed of pan, or decreasing the film speed, a very sudden growth can be shown. This type of lens is invaluable when there is little depth of set in which to work.

The standard one-inch lens, i.e., short focal length type of lens, makes close objects larger and pushes the background further away. A long focal length, such as a telephoto type of lens on the other hand, will tend to show less linear difference between distant objects and will push them closer together. If due care is used in the choice of lenses for each scene, a considerable saving in scenery costs can often be made.

The term color correction is often heard in connection with lenses. This does not mean that different colors are photographed in their identical color values. It only indicates that the lens has been corrected to ensure equal speed of light transmission for every color. Since every color has its own individual wave length measured in Angstrom units, it is necessary to realize that some colors will pass through certain areas of glass more readily than other colors and as a result will cause the focus point to occur at a different place from other colors in the picture. This may mean that a fuzzy or blurry picture will result since some colors focus at the same point and others at different ones. This will mean some of the colors will be out of focus while the others are focussed properly. Some cameras will produce very poor pictures, while others, identical except for the lenses, will produce excellent ones. In the latter case the lens had been color-corrected and all colors focussed at the same place.

Speaking of colors and correction leads into a consideration of filters. This is really an area for the cameraman, and anyone desiring to make use of filters should purchase one of the many excellent books on the subject. The Kodak Company has a really ideal booklet which covers this field very thoroughly. The infrared filter has already been mentioned in connection with night effects; however, it is also much used for day work when it is necessary to cut through a haze. In this case a red or amber filter is used for panchromatic film, and for Kodachrome a special color filter is advantageous. In every case, an increase in the exposure is required to compensate for the loss in light due to the insertion of the filter.

The Wratten filter is probably the most widely used and known and for that reason will be described. In general, filters are not required for interior work since the light conditions can be adjusted to suit the emulsion used; however, on occasion it becomes necessary to use one or more to get a special effect or compensate for some lighting condition which is beyond the control of the cameraman. A filter consists of a colored film placed on glass, or gelatin, depending on the make. It is placed over the

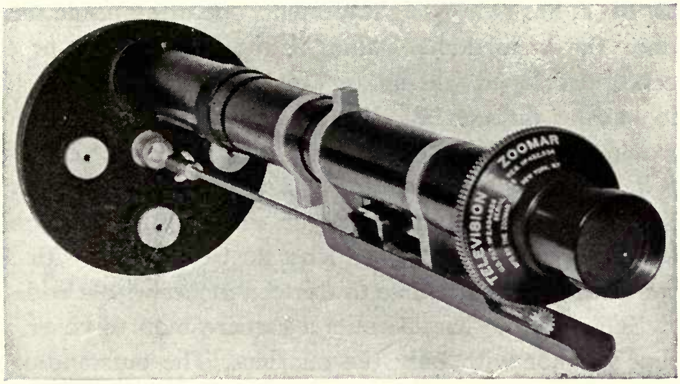


Fig. 6-1. Zoomar long distance, variable focus lens.

lens of the camera by pushing it over the lens barrel. In addition to the colored filters for special color-correction effects, there are other filters for improving quality under substandard conditions. The neutral-density filter, which is often seen on television screens on the home receiver to increase the apparent contrast and definition by making the blacks blacker, does not affect the spectral quality of the transmitted light. It is used on a camera to make possible increased exposure at a wide aperture so that short depth of field is produced; this accentuates the crisp focus of the foreground and yet allows the background to be in soft focus or even out of focus while still using normal light on the subject. They are also used when tremendously bright lights have to be photographed and even the smallest stop is still too large to cut the light down enough to prevent fogging, overexposure, or halation.

A polarized filter is also made by Kodak. This is used to reduce glare and reflection from surfaces in the same way that polarized filters are used in sun glasses to prevent eyestrain. The filter can be rotated to obtain a number of effects. It at once becomes apparent that a number of special effects are possible using different polarized sources of light. Filter correction charts are always provided with the filter.

No chapter on lenses would be complete without a description of the famous Zoomar lens. This lens, developed by Dr. Frank

G. Back, has twenty-eight elements operating inside the barrel. At once the tremendous value of the lens-coating process so recently developed will be apparent. Without this, the loss of light in passing through all these lenses would be tremendous, and it would not be half as effective. As it is, the *f* value is a maximum of *f* 5.6 with a minimum of *f* 22. It is thirty inches long and weighs eleven pounds. It has an almost infinite number of focal lengths varying from five inches to twenty-two with a telephoto front lens and from three to thirteen inches with a wide-angle lens.

This unique lens permits a camera man to cover almost any type of shot with only the one lens. The outstanding feature is the ability to change focus and follow action without losing sharpness of focus of the subject. In other words, it is possible to follow action all over the operating area without presenting an out-of-focus picture and always with a satisfactorily large image in the frame.

CHAPTER 7

LIGHTING

If the technical problems involved in transmitting a picture over the air are ignored and it is considered that everything behind the camera lens—either live or film camera—is perfect, it still does not make life any easier for the producer. He has just as many problems which include scenery, color balance, costumes, actors, sound, and lights. Neglecting the rest for the moment, but only for the moment if we wish to retain our jobs, let us think about lights.

Television, and movies, for that matter, are only light and shadow on a screen. Therefore, it would be expected that great attention would have been paid to lighting. In movies for the theatre this is true, but in television producers are still stumbling in the dark. To be sure there are some men who have studied the subject and are as competent as any Hollywood lighting engineer. But these producers are very few. There are some lighting experts very active in the television field. George Stoetzel is one of the greatest of these television lighting experts. His techniques are brilliantly different from other lighting arrangements and give an individuality to any show prepared by him.

But even with the knowledge and experience gained already by the film world, not enough attention is paid to proper lighting in television. Techniques which are the result of fifty years' experience cannot be ignored; on the other hand, they cannot be completely absorbed into television, for television demands a different approach from the theatre screen since the behavior of television cameras is inherently different from standard emulsion of a film base.

First the live camera requirements will be discussed briefly, then the problems confronted by the maker of films for television, and finally the special lights placements which seem to be needed for productions which are to be recorded by kinescoping or video recording.

The image orthicon tube, although a marvel of technical ingenuity and precise construction, is still not the human eye, and although the new type 5820 has a response which is a very good approximation of the eye response, it is still rigidly controlled by the inflexible design which created it. For example, the eye may see two or three lights and one of them may be, and appear, considerably brighter than the rest. However, to the image orthicon tube they may all seem the same or a different one may seem brighter. This is due to the different spectral responses of the camera tube and human eye. The human eye is more or less linear in its reaction to colors in that to it all colors seem to have the same approximate value. When taking a color film it is not necessary to match the eyes of the cameraman carefully to those of some other standard, but for television it is necessary to match the tubes used in each camera before starting the show, even for plain black and white transmissions. If this is not done, colors produced by one camera will differ from those produced by the next, and this will tend to confuse the viewers since one object may be seen in three different colors.

Of course, this entails checking all tubes in stock and marking them so they can be selected on the basis of common color response. But even here the problem is not solved, for during the course of a production the story may call for changing light arrangements. This may include the use of some fresh types of illumination which were not employed during the calibration tests. So again it is found that there is a camera difference existing during certain parts of the show.

In order to arrive at a common basis for judging and comparing light values, it has become usual to refer to lights by their temperature, and sometimes by their wave length. In this manner, irrespective of the type of light-producing unit, it is simpler to obtain an idea of the actual effect of the lights proposed to be used. In addition, the old system of referring to the wattage rating still exists and probably will for a long time yet because the latter is so convenient when it is necessary to calculate the amount of power required for any given production. If the watts consumed by each unit are known it is the easiest thing in the world to add them up and produce a figure which will give the total amount of power required to provide the set with the maximum lighting required during the show. Then the cable sizes can be determined for the lighting and power supply.

But for planning the lights to be used, wattage alone is no help. Some of the lamps may be the *cold* light type; that is, fluorescent lighting. This has a very high efficiency and is much more convenient than the arc or incandescent for it generates considerably less heat. With less heat generated, the air-conditioning system has less work to do, power is saved, and the working conditions for actors where there is no airconditioning are improved.

The color response of the lenses used is important. Color correction has been mentioned elsewhere, but it should be discussed again. If a light has a large number of different colors in it and the lens is not corrected for color, each color will cause its own color image to focus with a different setting of the lens control. This means that while red is in focus, blue may be slightly out, together with green. Another way of putting this is to say that the lenses used in television work are not corrected for both normal, visible light and infrared or invisible light, and if we mix the light types trouble is likely to result due to double or split focus. (Split focus is an average focus in which the cameraman tries to do justice to each image and generally results in a fairly soft, not very sharply defined image.)

Any type of light can be mixed *if* the *hot* lights (incandescent) are fitted with infrared screens to filter out the infrared rays and leave the cold light to pass through and affect the tube in the camera. Also special filters are often placed over the lights to correct the color; arclamps in particular are often filtered for ultraviolet elimination as well as color correction. In setting up the lights for a studio, a color test is often made as follows: A color test chart obtainable from most photographic stores is fastened to a stand in front of the camera and illuminated by the combination proposed for the show or set. After properly adjusting the camera and focussing, the image on the monitor—not view finder—is compared with the original on the board. Since the steps of color are numbered, it is possible to compare them directly and form a very good idea of how different colors will appear on the screen with the same lighting. If the results are not what is required, it is possible to reselect the lights to achieve the best balance.

The chief drawback with cold or fluorescent lighting is the fact that it is still quite bulky, and as a result the fittings are not easy to move and take up too much space in the studio. It is almost impossible to focus in the same way as light from incandescents; therefore, it is used mostly for fill or general illumination, with incandescents, properly filtered, for other sources. An added reason for using fluorescent light is that it is shadowless and therefore reduces the risk of putting microphone shadows in the picture.

The habit of flooding the set with light, usually flat fill light, has prevailed for a long time, but now gradually this is giving way to a more rational approach with the realization that television does not depend on how much light is used but in what way the producer places the amount he does use. The early difficulties of getting sufficient light for any kind of picture have formed habit patterns which are hard to eradicate, but the modern producer is learning fast, and everyday more and more use is being made of lights to set the mood of the scene.

Immediately the film producer switches from theatre film work to making films for television, he encounters conditions which take a little effort to comprehend. In motion picture production for the theatre screen—and this includes 16 mm as well as 35 mm films—the screen brightness in a good theatre with first-class equipment is of the order of at least ten foot lamberts (a foot lambert is the measure of a perfectly diffusing surface which emits or reflects a light of brightness one lumen per square foot). This light intensity provides a contrast ratio or screen brightness of forty to one between light and dark areas.

On the other hand, the average television receiver screen is considered good if it can reproduce the picture with a range of twenty-five to one. This leads to the only too well-known requirement that long shots be reduced to an absolute minimum for television films in order to maintain a high proportion of good resolution and definition shots. It is common knowledge that the theatre screen provides greater detail in both shadows and highlights than the television screen. This is, of course, due to two things. The limited brightness which can be reproduced on the television screen limits the tone range reproduction of the original film being transmitted, and due to the comparatively small number of picture elements transmitted by the 525-line system, there is a further degradation of the image definition. Because of this, as has already been shown, it is advisable to use films which have a lower density contrast range than those made especially for theatre projection.

Many, in fact probably most, of the home television receivers have contrast ratios of no better than twenty to one: in some cases, this is caused by poor design; in others, by the conditions of high ambient light level in their surroundings. Although in many cases black does look black on the screen, it is really only by comparison with the whites in the picture. This means that if there is much light on the screen the highlights will have to be extremely bright to show any effective black shadows or detail by contrast. The result is that the highlights will burn out any detail which they contained and not only detail definition but contrast will be lost. This problem, of course, is outside the control of the production man, but it is one which he has to bear in mind when creating a product which will be presented via equipment with the characteristics described.

A film for motion picture theatre work probably has a maximum gamma of about 2.3 with a maximum forty to one screen light contrast ratio. If the television picture contrast ratio is taken as half this to allow for variations, it means that the contrast, or release print gamma, should be reduced by about .3 for television films. This effect can be obtained by setting up the proper lighting system in the studio during filming so that a negative of the desired density is exposed, or by reducing the time of exposure and/or development when making the positive so that a print with the desired lower contrast is produced.

It is obvious that the former is more desirable since it is easier to make a print with the proper contrast if the original is perfect; however, sometimes it is necessary to reprint old release prints which have higher contrast ratios. In this case, the television print is corrected by varying lighting development conditions.

Although there are many individual ideas as to the proper manner in which to use light, there are only a few types of light used with, of course, minor variations. The different main types will be discussed separately.

Fill or Balancing Light This is used to provide the general over-all light and in particular to control contrast by softening shadows which are too harsh or bringing up the illumination on background objects so that the principal features do not stand out as much.

Modelling Light The modelling light is used to bring out some special feature of the subject which is not properly accented by the remainder of the lighting. It need not be a very strong light but is usually fairly sharply focussed to ensure that only the area desired is illuminated.

Key Light This is used to point up the highlights of the subject or main feature of the shot. It is usually placed higher than the camera to give better differentiation between the upper lip and nose shadows which so often are present there. The exposure is generally determined by the requirement of the key light since it is this light which illuminates the focus of interest for the scene.

(*From Alton,* Painting with Light. *Copyright, 1949, by The Macmillan Company*

Fig. 7-1. A selection of lighting equipment used in television and motion pictures.

Foundation Lights These are sometimes classed with the fill lights for they serve the same purpose in many cases, although strictly speaking they are used for different purposes. The foundation light sets the level of general illumination for the whole scene in many cases. There must be sufficient light for the players to be able to see to move around on the set. The foundation light helps to provide this, for it covers the whole set.

Rimming or Outline Light This is used behind the main subject or subjects to provide a means of separating them from the background. If the two colors are similar, there is a strong risk of their failing to separate, with subsequent eyestrain for the viewer in trying to separate them visually. This light, therefore, is established at a very high intensity from above and behind so that the edges of all the objects it is desired to emphasize are rimmed in light. Hands, for example, sparkle due to the light from behind being picked up and reflected by tiny hairs as well as the refraction due to the skin surface channeling the light rays to the front. In general, it may be said that this type of light is almost always necessary unless the background is of a definite pattern which contrasts with the subject.

Kicker A name which is not presently used much in the television studios but which will certainly be imported from the movies as more and more movie personnel migrate to television is kicker. This is a small light used as a rear crosslight which may shine upwards or downwards depending on the effect required.

The use made of lights in Hollywood is greater than in television to date merely because of the limitations of the continuous shooting type of work done in the television studio. But as film methods are followed to a greater extent and more television programs are put on film, it is probable that Hollywood's techniques will be adopted.

Eyelight This is a device which merits a place in the television repertoire. It is a small light which adds nothing to the light used to make the exposure, but it brightens the eyes and causes them to glint and show with a brightness which is never obtained with the lighting normally used on the air. The nearest approach to this light is that used by the BBC on the front of their cameras to brighten the face of the subject as the camera dollies-in. Unless the light *is* attached to a camera in this way it may appear in a shot from another camera on the set when it is moved for other shots.

The tools of the trade are many, but they fall into four main categories; the arclamp, incandescent lamp, fluorescent lamp, and gas discharge lamp. The latter is not used very extensively so far due to high cost and extra equipment required to operate it. But experiments are continuing with the object of producing a reliable gas discharge lamp which will have a high efficiency and low heat dissipation.

Generally speaking, arclamps are not employed to any great extent in television studios. For one thing, the complicated and highly artistic lighting arrangements are not economically feasible for a one-shot show, and secondly, the medium is not ready technically for them. There is another reason which may also have a slight bearing on the matter. Arclamps emit rather toxic fumes from the burning carbons and metal-salt cores which are employed to make flames of different colors for color correction purposes in addition to the filters which are also used for this purpose. Some cities have regulations concerning the venting of arclamps to avoid injurious effects on personnel, and television studios would obviously be somewhat difficult to vent properly for every use since lamps are not static like movie projectors.

Incandescent lamps are the most used and most convenient. There are no carbons to adjust and change every few hours. Also, they do not require the continual feeding of carbon that the arcs do. (This is done by an automatic motor, of course, but even these fail sometimes.) Bulbs with a power rating of up to 5000 watts are now available, and although these are not used in many lamps at a time in a studio, they give the producer a wonderful new tool. One of these can be used as a key light, with two or more

2000- to 3000-watt lamps for fill purposes. When using incandescent lamps, Fresnel lenses are used in front of the lamps for directional purposes. These lenses are of the type used in lighthouses and in aero-beacons. The lens is made of thick glass and is similar to the type known as the plano-convex, but instead of being plain it has on the lens a number of raised rings which help to produce an evenly illuminated area at the end of the beam. In some types, it is possible to adjust the beam within limits from a spot to a flood. There are many types of incandescent lamp, each with a different name and made by different companies. Each does about the same job, however, and it would not be fair to describe any by name without mentioning them all, and there is not room for that. The popular name *inky* is an obvious abbreviation of incandescent, and the dinky-inky is the smallest of the spotlights, using a 100- or 150-watt lamp. It is very useful for eyelighting.

In the incandescent field, there is another class of lamp known as a *broad*. This is not a term which should be confused with other applications of the name! And if the reader while on a set hears a remark about "lighting a couple of broads" he need have no fears for his morals! They are merely single or double 500- to 1000-watt bulbs in a sheet metal reflector without a lens, covered with a diffuser, and used to provide a general lighting effect without any sharply defined shadows. They are also used to remove shadows because the unfocussed light from two (or more) bulbs will often flatten and soften shadows on the set.

The fluorescent lamp is only now coming into general use. For some time it was too bulky and incapable of dimmer control, but the new Slimline lamps can be regulated by a form of dimmer control and are very flexible. It has been the practice in many studios to cover the ceiling with this type of light fitting and use it for a sort of combined fill and key light. But this flattened the picture and reduced contrast. Fortunately this trend is now fading and they are being used more intelligently. Dr. Frank Back has introduced a unit in this light range which should assist the producer considerably. This is a cold cathode light which is corrected to the color response of the television tubes and will function equally well with panchromatic film. The main objection to cold lights in studios for other than fill lights is the fact that the light source is so large that it is impossible to design an efficient optical system to direct the light emission.

Gas discharge tubes such as the mercury-arc light may help to overcome this trouble. The Western Union Zirconium arc light, which is very small and burns zirconium electrodes, is capable of very high light emission and is almost heatless and fumeless. Its small size and convenience should make it a natural for small and baby spots.

When photographing sets containing light fittings, i.e., reading lamps or overhead fixtures, etc., it is a problem to make them register on the film if the lens is stopped down and a large amount of other lighting is used, or if it is necessary to have a shot where the light from one of these fittings illuminates the subject. In cases like this, it is a simple matter to replace the ordinary light bulb with a photoflood bulb. This is the bulb used by amateur photographers to provide the light they need for indoor shots without the expense of professional lighting equipment. As a matter of fact, it is possible to use this type of bulb for many incidental shots especially if the film is being made for an insert and it is a very short scene which has no difficult lighting requirements. The photoflood bulb is similar to the normal type in appearance and screws into the standard light socket. This means that it can go straight into any fixture that is handy. The high light output is obtained by overrunning the filament so that the life is quite short; it varies according to the length of use, but a minimum of two hours is almost always obtained. Because of this feature, it is a good idea to use the ordinary bulb in the fixture when setting up the shot and to replace it with a photoflood just before shooting. The lights can remain extinguished until the time of filming. It is good practice to maintain a record of the number of hours each bulb burns to avoid the nuisance of having one burn out in the middle of a shot. They are quite cheap to purchase and since they fit into any type of holder—with a standard screw base, of course—the user can make his own to suit himself.

In addition to the light fittings already mentioned, there is one which is neither one type nor the other. It resembles a microphone boom arm, but in place of the microphone is a lamp which can be swivelled and tilted by means of a control on the rear end of the arm. It can be used to follow action or for unexpected additions to the lighting. This is known as a boomlight.

Light Application The subject of light control, i.e., techniques of lighting, is entirely too long to be capable of adequate presentation in a single chapter; in fact, a whole book is required. However, there are certain basic rules which are applicable to every situation. With a sound grasp of these, the reader can build on them for any situation which he may encounter.

The producer uses light in much the same way that an artist does, except that the producer has a greater stake in its proper use, for while the artist uses the play of light and shade of light to accentuate and bring life to his canvas, the television or film producer uses light as his *medium,* and unless he has light there is no picture! So in effect he is painting with light. This is so true that a highly experienced cameraman in Hollywood was moved to write a book with just that title (Alton, John; *Painting With Light.* New York, The Macmillan Co., 1949) and all readers, advanced or beginner, are advised to read it if they are interested in a comprehensive story of lighting.

To shoot a scene, there must be enough light to cause a chemical change to occur in the emulsion of the film. That is usually quite easy to arrange by simply switching on four or five flood or fill lights. True, it will produce a representation of the scene on the film, but it will not be a picture. To the naked eye of the observer in the studio it might appear to be adequate, but when seen on television or film, it lacks detail, depth, contrast, and sparkle; in other words, it is *flat.* What went wrong?

The answer to this is in the first sentence; there was enough light to cause a chemical change to occur in the emulsion, but it was uncontrolled. The "four or five" floods or fill lights did their job; the set was *flooded* with light, and shadows instead of being shadows were *filled* with light. Thus, everything that constitutes a picture was missing and only light remained. The old adage of the amateur photographer—shoot with the sun behind you—ensures plenty of light, but it also ensures a very flat picture which seldom has character and life of its own. The advanced photographer experiments with light effects and even on occasion commits the so-called cardinal sin of shooting into the sun!

Modern television tubes do not require very much light to produce an excellent picture, nor does the modern movie film emulsion. But neither produces its best results when the minimum light is used and the lens is at its widest aperture since the result is short depth of field. Therefore, a certain minimum light is established and on this is based the exposure to be used; in fact, the remainder of the lights are calculated as a ratio to this light. For film work, a ratio of three to one for the front fill is normal, although more or less can be used depending on the mood of the story. The amount of light used to illuminate the background should be about one-third of the light used for fill. For live television work, it is probable that about two to one for the key to fill light ratio would be better. In any case the rimming light, if used, has a high intensity and is as strong as, or even stronger than, the key light.

Establishing the light conditions required calls for a lot of skill on the part of the producer. A trick which may be borrowed from Hollywood is to use a testlight. This is a low-powered lamp mounted on the end of a long stick. The set illumination is killed, and the producer surveys the subject with the aid of this light. By holding it at different positions and angles, he can decide which direction he wants the light to come from to form the key light. After this it is comparatively simple to arrange the disposition of the lights to his satisfaction. Of course, in live shows it almost never is possible to do this because the show is continuous and does not offer the possibility of establishing conditions exactly the way the producer wants them for a shot in the middle of the show. But this can be used for shots which come in on a separate camera and for film work where the show is made in short sequences.

Since television work consists mostly of close-ups and two-shots, it is probable that some notes on this aspect would be more useful than a general discussion. The continuous nature of live television may make many of these suggestions impractical, but even so they will be usable in film work and in any case will present germs for ideas which may find their way into modifications of the original.

The following applies equally to exteriors as well as studio shots, the only difference being that for exteriors it is necessary to use the sun for the combined light source—unless the organization copies Hollywood and has its own exterior lighting equipment. Therefore, a device known as a *gobo* is used (they are also useful for interiors). A gobo is used either to prevent light from reaching certain places or to assist it to do so (although in Hollywood it is more often used for the former purpose). In general, it is used to eliminate unwanted shadows and increase light on subjects that are in danger of being shadowed out through the strength of light on other parts of the set. For instance, in some outdoor sets where the scenery is authentic background, the light from it may be so strong that it prevents the details of faces of people in the foreground from showing because the lens has to be stopped down so much that it reduces the amount of reflected light from the foreground faces to a level insufficient to register on the film. In this case, reflectors are used to reflect additional light to bring the illumination of the faces up to the same level as the rest of the scene.

The reflectors used may be either *hard or soft;* the terms describe the kind of light reflected. Hard light is sharply defined and usually concentrated in one spot, soft light is diffused and tends to smooth out the features of the object illuminated. The former is produced by *hard* reflectors, such as a mirror or a sheet of polished aluminum. Aluminum paint may be used on a sheet of smooth cardboard or wood; sometimes gold paint or leaf is used in the same

Fig. 7-2. Lighting equipment in use in film production.

way, although this is more often done by Hollywood than by television producers. Gold gives a softer, brassy reflection and is useful for color work if setting sun or fire glow effects are required. The *soft* reflector is usually made of rough cardboard or similar material painted with white or silver paint (aluminum). Since the reflecting surface is so irregular, the light is neither concentrated nor focussed and is produced more as a "cloud" of light than a spot.

At this point it might be well to mention that Hollywood's use of the term "reflector" implies a power-operated light *or* an actual reflector. The word reflector was adopted because the early lamps used very large reflectors, and before them reflectors really were used in the days when the sun was the only form of illumination for film production.

Some of the other tools of the television and motion-picture trade are variations of the gobo used to control the amount of light falling on the subject for close-ups and general shots; of course, the greatest refinements are found in close-ups. Terms such as cookie, ear, scrim, teaser, etc., abound, but in essence they are all gobos. The shape of each is different to make it suitable to perform some particular function. They are smaller than a standard gobo; some are clipped onto the camera, and/or the lighting equipment, others are mounted on a stand and placed between the light and the subject to produce some special effect or a desired shading.

Only too often the story has to go to a close-up directly from a medium shot or another close-up. In cases of live production, it is impossible to set up the usual lights and arrangements; this accounts for many of the rather unartistically illuminated shots seen on television. But when greater use of film is made for productions, quality will improve.

The continuous action of television makes it necessary to arrange the lights on a set so that the proper balance of light falls on characters as they move around the stage. This could be done by flooding the stage with light so that no matter where the players were there would be enough light. Unfortunately, however, the effect would be miserably flat, without sparkle or contrast. The actors' movements are usually planned in advance and definite light paths set up so that added interest can be obtained from the passage of the actor through the pools of light and shadow across the set. For film work, a similar plan is necessary, for fighters cannot pause while lights are changed in the middle of a tussel on the floor. When there are sufficient lighting units available, it is possible to plan definite setups and cue the lighting engineer to operate his light controls at the right time. In fact, in modern television studios the lighting engineer is a very important member of the production crew and is in telephonic communication with the producer all the time.

For some special productions it is necessary to have a man on the control end of the boomlight or similar fixture to adjust the lights for changing positions. Kleigl Brothers of New York make a very useful motor-driven, suspended spotlight which can be erected over the center of the set and by remote control can be set to illuminate any area desired.

In setting up stage lights, there are certain rules which have already been given. In order to implement these rules, it is necessary to measure in some manner the light which falls on the subject. There are a number of ways in which this can be done; the oldest and most useless is by guesswork on the part of the producer. When emulsions and equipment were cruder, more could be blamed on them and the laboratory which did the processing. But today, in spite of the increased latitude of film, much more care is required both for television and for film work. A preciseness has come into the field which leaves no room for "guesstimation." Production costs are so high today that a man who uses that method will soon find himself without a payroll provider.

Fortunately the requirements are not so exacting that it is necessary to use laboratory equipment to do a good job. Therefore, simple photoelectric meters can be used to determine the light present. This meter works on the same principle as the television camera tube: that is, it is photosensitive. When light falls on one of the electrodes in the meter, usually a flat strip of metal coated with one of a number of different salts which are affected by light, it generates a voltage. This voltage is proportional to the intensity of the light falling on it. Hence, the stronger the light, the greater the deflection of the needle. The meter may be calibrated in a number of ways: some show the stop to use for a given film emulsion, others the American Standard number to be used in further calculations. Still others give a direct reading of the light intensity in candle power.

Whatever method is used, the application of the information is not difficult. For live work, of course, there is no emulsion to worry about, only the lens aperture and ratios of one light to another. The meter itself is quite small—about the size of the old-fashioned "turnip" watch, and perhaps a little thicker. It is usually suspended around the neck by means of a black cord; it has the effect of making the wearer look important, if nothing else.

There are two ways to use the standard meter, the direct and the reflected method. The former is newer and appears to be coming into favor with more people every day. Its use necessitates

COMPARISON OF VARIOUS EMULSION SPEED VALUES*

A S A Exposure Index	*General Electric*	*Weston*	*H&D*	*American Scheiner*	*European Scheiner*	*Din*
0.6	0.6	0.5	12.5	4	10	.....
0.8	.....	0.6	15	5	11	1/10
1.0	1	0.7	17.5	6	12	2/10
1.2	1.5	1.0	25	7	13	3/10
1.6	2	1.2	30	8	14	4/10
2.0	.....	1.5	38	9	15	5/10
2.5	3	2.0	50	10	16	6/10
3	4	2.5	63	11	17	7/10
4	.....	3	75	12	18	8/10
5	6	4	100	13	19	9/10
6	8	5	125	14	20	10/10
8	10	6	150	15	21	11/10
10	12	8	200	16	22	12/10
12	16	10	250	17	23	13/10
16	20	12	300	18	24	14/10
20	24	16	400	19	25	15/10
25	32	20	500	20	26	16/10
32	40	24	600	21	27	17/10
40	48	32	800	22	28	18/10
50	64	40	1,000	23	29	19/20
64	80	50	1,250	24	30	20/10
80	100	64	1,600	25	31	21/10
100	125	80	2,000	26	32	22/10
125	150	100	2,500	27	33	23/10
160	200	125	3,120	28	34	24/10
200	250	160	4,000	29	35	25/10
250	300	200	5,000	30	36	26/10
320	400	250	6,250	31	37	27/10
400	500	320	8,000	32	38	28/10
500	600	400	10,000	33	39	29/10
650	800	500	12,500	34	40	30/10
800	900	650	16,250	35	41	31/10
1,000	1,000	800	20,000	36	42	32/10

* Reproduced by courtesy General Electric Co.

employment of a meter which can be read directly in candle power. If the meter already possessed does not do this or does not have a high enough scale, it is possible to get a mask which will enable the scale readings to be increased in value many times so that the desired range is obtained. The manufacturers will also supply a conversion table to change the readings to candle power.

In the direct method, the meter is pointed directly at the light source. In this way, the actual light being projected onto the subject is measured. It is a more reliable method since it does not depend on the distance it is held from the subject as does the reflected or indirect method. The only point to watch is that the meter does not have a very wide-angle aperture opening or it may give misleading results unless all other lights are extinguished while making measurements.

The reflected method uses the same type of meter but with lower scale readings. It is held a short distance away from the subject and reads the amount of light reflected from the surface. It will be seen that this is subject to human errors in that the reading depends on the distance between the meter and the surface. Also, it tends to shade part of the light from reaching the subject and gives a false impression. It is all but useless when setting up lights according to the outline given previously for establishing ratios of the various light types. Usual practice is to hold a neutral color card in front of the subject and measure the light reflected from it.

CHAPTER 8

COLOR

When movies were first conceived, and it is a moot point as to who was the real father, doubtless the inspiration behind the thought was to see and hear recorded pictures in true-to-life appearance with color and speech which successfully represented the real thing. Talkies have brought movies to a high pitch of perfection, and the modern camera and optical printer can do things that the legitimate theatre cannot even start to copy. Color in movies is not quite as successful. It is wonderful and beautiful to behold and the author for one would rather view a color movie than a monochrome production, *but* color movies are not usually natural. The colors are too brilliant, the many-hued clothes which the actors wear are not generally seen away from Hollywood or the beach, and there is an indefinable air of unreality about them.

If this is what is intended—well and good. We go to the movies to be entertained and float away on multicolored clouds from the drabness of everyday life so a complaint is not justified on the grounds of color unreality. But many people do not like color pictures, and some give that as a reason. It is true that once a picture is shot in color nothing can be done to change individual colors; only separate scenes can be tempered. The question to be answered is, Does the public want color in their pictures and their television?

Quite obviously a football game or any sporting affair requires color to help to distinguish between players. The limitations of the monochrome system show up only too badly in this kind of shot. But many television programs are not particularly suited to color transmission simply because they are not colorful enough. The Macy Thanksgiving Day Parade and the Easter Parade would be naturals, but a quiz show would gain very little from the use of color. Note how few movies are produced in color, and note also the usual type of color production; it is always reserved for either the extravaganza or overwhelming production. One reason for the scarcity of color movies is the great cost of the film used; it is nearly 50 per cent greater than black and white.

In television, the addition of color would cost very little more and would not require any of the additional running expenses which keep color movies up in the high cost bracket. Once installed and paid for, the maintenance costs would be the same as for black and white. There is a hurdle to overcome in educating the public to buy color receivers and during the interim period problems of dual transmissions would have to be solved. But those are problems for the industry, not this book. Here we are concerned with ways in which these colors are produced and applied to the art. The author, having had the privilege of working for a short time on the CBS color system and seeing color television, can only ask, "How long, Oh Lord, how long?" There are many color processes and each one has different features, but there are only two methods of obtaining color. These are the additive and subtractive methods.

The former method consists of adding colors to make white light, the latter of removing certain colors from white light to leave the required color. In each case, filters made of gelatin or glass are normally used to control the colors.

Many systems have been proposed for the creation of television pictures in color, but very few have actually been known to work even passably. So far, the Columbia Broadcasting System and the Radio Corporation of America have been the contenders for the color honors. Color Television, Inc. of San Francisco is due to demonstrate its system and by the time this book is published, it is probable that the decision on which system to use, if any, will have been reached. At that time, of course, it will be desirable for the person engaged in television or the associated arts to learn all he can about the one chosen. For this reason, therefore, only brief descriptions will be given.

CBS Color Television System The system with which the author is most familiar is that developed by Dr. Peter Goldmark of CBS. This has been demonstrated in many parts of the country with highly satisfactory results. The colors are vivid and lifelike and add tremendously to the value and appeal of the picture. The apparatus is extremely simple and easy to construct and would not be beyond the scope of any person of average intelligence. In describing the operation of the system, it should be noted that the resolution, i.e., the number of picture elements, or lines for ease of discussion, is much lower than that for black and white television using the same transmission characteristics. However, the eye accepts color much more readily than it does monochrome and, hence, is more easily able to separate objects than it would with black and white television and the same degree of definition. Color fidelity is excellent and is actually better than color in motion pictures because it can be controlled from second to second even while on the air. The number of lines in the standard system is 525 while in CBS color it is 405. This is a difference of only 120 lines, but the *apparent* definition is quite as good as a black and white picture, even though the *actual* definition is less. After all, it is what the observer *thinks* he sees that counts most!

The mechanical system proposed by CBS uses a filter disc consisting of segments of red, blue, and green filters revolving in front of the camera tube at 1440 rpm. This results in the transmission of three separate, incomplete images for each picture or frame since the filters pass only one color at a time. At the receiving end, the colors are re-inserted by the addition of a similar disc before the tube. This disc has to be in phase synchronization with the transmitter so that when the red filter is in front of the camera tube a red filter is also in front of the receiving tube. With a field repetition rate of 144, or 72 frames per second, 405 lines are transmitted. The system is sequential in that only one color at a time is presented. Persistence of vision and screen afterglow cause the colors to combine and produce the various shades.

Color Television, Inc. This system shows promise but as yet is an unknown factor in the color stakes. Theoretically, it is capable of excellent results. In essence, the main features of the system are the use of stationary filters in conjunction with a three-lens optical system at the camera and receiver. At the receiver, superposing lenses are used to register three images, each through a different primary color on the screen of a single cathode-ray projection tube onto a projection screen. Standard black and white equipment is modified in one major respect—the horizontal scanning frequency is only one-third of the normal frequency, since each scanning line traverses three edge to edge fields in succession. Such a change is a simple one. Three equi-spaced synchronizing pulses are applied during the interval of one horizontal scan, arranged to lock into operation so that each color is flashed at the correct time, and the pictures will show up as black and white views on an ordinary receiver without difficulties. Horizontal linearity must be precisely attained.

The camera system consists of a standard black and white single image orthicon camera with a multiple image lens and filter system. Three optical images are focussed side by side and scanned as though they were a single image. The video signals generated are transmitted in the normal manner to standard black and white amplifier and mixing equipment. Standard black and white, line, frame, and super-synchronizing pulses, are used to control the system. The colored pictures are reproduced from 525 line images in each filter color, with 10 color pictures per second and 60 color interlaced fields per second.

Radio Corporation of America This system utilizes the full width of the television transmission band and puts out a signal of 525 lines, the same as the present black and white transmission. This means that the theoretical quality is of a very high order.

The functioning of the circuit is extraordinarily ingenious and provided that a number of serious physical difficulties can be overcome it may offer a practical solution to the problem. So far results have been rather unsatisfactory compared with colored motion pictures.

Time multiplex transmission is used with a band-width of four MC for full modulation. The color camera at the transmitting end produces three signals, green, red, and blue. These signals are sampled electronically in rapid sequence, combined, and broadcast as a single signal.

At the receiver, separation is performed, so that the signal representing each color goes to an electron tube which produces a picture in that particular color. The green, red, and blue signals are applied to their individual kinescopes. The three colors are then projected simultaneously and produce the complete picture.

One of the fundamental characteristics of the system is the application of time multiplex transmission, which has been adopted and applied to television from radio telegraphy. Other innovations are the electronic sampler and picture dot interlacing.

The electronic sampler has to function with microsecond precision in sampling the colors. From the sampler the signals, representing the three primary colors, are fed to an electronic combining device. Standard synchronizing signals from the synchronizing generator are also applied at this point, and the principle of mixed high frequencies is also utilized.

Each color is sampled 3,800,000 times a second—for the three colors a total of 11,400,000 samples a second. The green signal is sampled and less than nine hundred-millionths of a second later the red is sampled, and then the blue. This means that the signals of each color are transmitted at an approximate rate of one every four-millionth of a second. When viewed on the screen of a receiver, the recurrence of the signal is so rapid that the color appears to be constant.

The three color signals from the camera are combined in an electronic adder and then passed through a band-pass filter. The output of this filter contains frequencies between two and four megacycles, with contributions from each of the three color channels. Appearing at the output of the band-pass filter is "the mixed-highs signal." These mixed-high frequencies are fed to an integrator, which is already receiving signals from the sampler and from the synchronizing generator. The composite signal which comes out of a filter is applied to the modulator of the transmitter.

At the receiver, the signal from the second detector also enters the sampler. It is a composite signal. An electronic commutator samples the composite signal every 0.0877 microsecond, producing short pulses. The amplitude of each of these pulses is determined by the amplitude of the composite wave at that particular instant.

The problem has been to convert these signals into color at the receiver; however, now that RCA has announced and demonstrated the color tube this last fence has been overcome. Two types of tube have been developed, a single-gun, and a three-gun model. In the three-gun tube more or less conventional scanning is employed, but in the single gun tube the electron beam in addition to scanning the screen from left to right also rotates in a spiral, so that the angular position of the beam as it enters the mesh in front of the screen determines the color to be illuminated.

The commutator feeds pulses into three separate video amplifiers which in turn control three separate guns in the three-gun tube. In the case of the one-gun tube mixed signals are fed to the single gun in the tube and color is introduced by modifying the path of the beam, as mentioned above.

In each tube the phosphor and internal construction are similar apart from the number of guns. The screen proper consists of 351,000 dots of red, blue, and green arranged in little triangles of three colors numbering 117,000. Just in front of this screen is a mesh with 117,000 holes in it. The angle at which the electron beam approaches this mesh screen determines the color spot which will be activated by the beam since only one spot can be illuminated at a time by the beam.

Normal black and white receivers will produce monochrome pictures from this transmission and a black and white signal will produce black and white pictures on the special color tube, so the system is truly compatible. Thus no modifications are required to permit present-day monochrome sets to continue to receive pictures if owners do not wish to spend any more money on their receivers.

Lighting for Color In the television studio, lighting for live color pictures has not yet been very thoroughly studied since there has been little or no demand for it. The only large scale use of color on television so far was the Smith Kline and French medical usage. In the case of operations demonstrated over this equipment, *normal* operating room lighting was used for the telecast. This means that the precautions required for making color films are probably not as rigidly imposed. One reason for this is the fact that the color balance is under the control of the technician at all times, and he can see exactly what each color looks like as it is transmitted. In making movies, the color values are not known until the developed reel is returned from the laboratory. Of course, certain precautions are necessary; for instance, the addition of an incandescent spot can change the color of a face or hair almost unbelievably. It is just as well not to mix lights of different Kelvins indiscriminately; otherwise colors may change as an actor walks across the set. No rules have been made yet for color television lighting for no one knows which system will be chosen and as a result it is impossible to make any suggestions which may remain valid.

Lighting for color film, on the other hand, is now thoroughly understood and has been reduced to a fairly simple science. Light is described in degrees Kelvin. This is the standard of comparison, since color temperature is an exact measure of the light emission of an illuminant, and the lower the temperature of the source, the redder the light emitted. It may be defined generally as the number of degrees measured on the Kelvin scale (which is zero at —273°) at which a black element, or body, produces light of the required color. Black is specified as the color of the element since it is assumed to have no light emission or reflection properties.

Thus a light with a low color temperature would have a red tinge as far as color film results are concerned, while a high value might produce a bluish cast to the scene. It is amazing how critical the various types of color film are to Kelvin values.

Kodachrome is probably the best known and most used of the semi-professional stock; therefore, in the paragraphs which follow the two types of Kodachrome will be described together with the lighting required. Other makes of film are coming into use and increasing in popularity, but Kodachrome was first to be successful in the field and has remained there ever since. At various times, and with varying degrees of success, other makers have introduced color films. Some are still in production and in more or less demand. Among those already tried are the following: Dufay Color, Thomascolor, Gaumont Color, Technicolor, Cinecolor, Multicolor, Magnacolor, Ansco Color, Kinemacolor, Prismacolor, Agfa Color, Kodacolor, and Kodachrome. Technicolor, of course, is *the* best known and most used, but its use is confined to 35 mm stock.

In color work, duplicating prints is not as simple as in black and white where it is only necessary to have a good original and with average care in processing an eminently satisfactory positive will result. In color work the final use for the film, i.e., whether it is to be used for duplicating a number of release prints or for use as a direct reversal, determines to a great extent the type of film used in the camera. Another source of difficulty arises if the film to be duplicated is a sound film. It is difficult to reprint a sound track on color film in many cases, due to the colors appearing in the emulsion around the sound track. If red appears, as it often does in some types of emulsion, it can cause some unpleasant effects which occur because the photoelectric cell used for sound reproduction usually has a caesium salt as its active element.

The chemistry of color is rather involved; therefore, only one type of film will be dealt with. The others are similar in most respects. It should be noted that there are two major means of making a color reproduction; one is known as the bipack, and the other the tripack, method. The general features of each are similar, but each is again divided into two minor divisions: the integral bipack and the bipack magazine; and the integral tripack and magazine tripack. The magazine tripack will be ignored for it is used for 35 mm equipment only, is highly complex, expensive, and completely unnecessary for television work. The integral tripack, on the other hand, is used all the time—it is the well-known Kodacolor and Kodachrome. Bipack film is used a great deal today; the Cinecolor process uses it. Its only disadvantage is that it is a two-color process and inevitably lacks some of the realism of the three-color methods. The bipack processes are not used for television work, and the integral tripack is the only one in general use.

It may be of interest to examine the bipack operation. A special type of magazine is used to accommodate the two separate films which are used simultaneously. In most cases, a standard camera can be used without more than a simple change in the lens and view finder systems. Two films are fed through the lens gate simultaneously. The film nearer the lens has an orthochromatic emulsion which is sensitive to blue and green light, and the second is panchromatic emulsion which is red- and yellow-sensitive. The films are inserted with the two emulsions in contact: thus, there is only a very slight difference in focus between the two images. The orthochromatic film is coated with a light red varnish or lacquer. This prevents green or blue light from reaching the panchromatic film. It is important to use only cameras in good condition for any play or slackness in the lens gate would at once result in an out-of-focus frame. The tripack magazine is similar but uses three films.

Prints are made from bipack film by dye-toning the two negatives and printing them on a special positive film known as duplitized stock. The emulsion is on both sides of the film and contains yellow dye to prevent an exposure on one side from working through and affecting the other emulsion. The emulsion is, as might be expected, blue-sensitive. However, this type of color film is seldom used for television or semi-professional 16 mm work. The integral tripack film is so much more convenient and easy.

Kodachrome

The best known film for color work is probably Kodachrome, followed closely by Ansco Color. Both films can be obtained for daylight and artificial light use. Kodachrome "commercial" positive film is described as "commercial" stock because it is used for making films which have to be duplicated a number of times; it produces a low contrast positive color image. Kodachrome and Ansco Color both are reversal films and work the same way as do the ordinary black and white reversal film except that they are more complicated.

"Commercial" film consists of three layers of emulsions, the bottom is red-sensitive, the top blue-sensitive, and the middle green-sensitive. Between the blue and green emulsion is a yellow filter to prevent blue from reaching the other layers. Due to the built-in filter effect, three images are produced, each one lacking some colors: the bottom image, on the red-sensitive emulsion, is cyan (minus red); the middle is a magenta (minus green); and a yellow image is on the top layer.

Reversal Kodachrome Type A and daylight films are similar in principle. The only difference between the two emulsions is in the fact that daylight is balanced for sunlight exposure and Type A for use with photoflood lamps and other forms of artificial light. These films also use the subtractive method for color production. The emulsions are the same as for "commercial." The treatment during development is also similar. After the initial development when some fine emulsion grains still remain undeveloped, the film is exposed to white light in the same way as black and white reversal film. A special dye is present in the developer for each layer in this second development. This forms three different colored layers. The same sequence of color layers is present and when light is projected through the film the various *minus* colors, cyan and magenta, absorb red and green respectively, while yellow absorbs blue. Therefore, on projection, the reversed film provides its own filter system to reproduce the colors correctly.

Du Pont

Du Pont has now entered the field with a color release positive film. It is not intended for use in cameras but only for making prints from three black and white negatives of the color separation type. It is a standard, integral tripack film, but it differs from others on the market in that the emulsion color layers contain only two components—silver halide and a synthetic polymer which is water-sensitive. The latter takes the places of the gelatin as well as the color former. The new color former is insoluble in water, and the polymer prevents contamination of other colors by it. The layer arrangement is different from standard practice, the color-sensitive layers being placed as follows, descending from the surface to the base:

Emulsion Sensitivity	*Polymer Color*
Blue	Magneta
Red	Cyan
Green	Yellow

Film Base It will be noted that the yellow layer is on the bottom instead of the top. This is possible since printing is done on a registration printer and whichever color master film is desired can be directed to the proper layer by machine adjustment. It is interesting to note that this system is based on the fact that yellow is the least important color as far as definition is concerned, and the diffraction and diffusion effects produced by the passage of light through two layers are of no importance.

A point of interest to the sound engineer is that the layer arrangement makes it possible to use a blue-sensitive photo-electric cell in the sound head with a dyed sound track. This improves both volume and quality.

If daylight film, which has been balanced chemically for daylight, is exposed by artificial light, the correction which may be toward red for day use is wrong for tungsten (Ansco artificial light designation) use (so-called from the old tungsten filaments) and will produce a reddish image. It is possible to use daylight film at night, provided a bluish light is used from a blue photoflood or similar lamp fitted with a blue filter.

In general, a color film may be used over the television film camera chain without any deterioration of definition or contrast provided there is not too much blue in it. In fact some producers, notably Bud Gamble, are making all their films in color so that they can reach a double market in the home movie and 16 mm theatre libraries as well as the television stations. There is no objection to doing this provided the cost is not excessive for the purpose at hand. It is also extremely good practice in using color film. The focus of Kodachrome commercial stock should theoretically be better than the type of film with emulsion on each side due to more precise focussing.

All the precautions taken in connection with lighting for black and white film apply even more particularly for color work. The user of color will be familiar with the effects produced by improper exposure, and the beginner will do well to read the instructions which come with the film package. However, it will not be out of place to mention a few points which sometimes cause grief for beginners in color photography. Supplementary lighting is much more important in color work than black and white since the contrast range, or range of subject brightness, is more limited. As a rule, softer contrasts are required for color, but because of the contrast obtained by color itself the lighting contrast can be reduced. It is important to have adequate lighting in the shadow parts of the scene; otherwise, they may lack detail and appear as solid blobs of very dark color or even muddy black.

When color television arrives, there will be a place for color directors to do the job that Natalie Kalmus does for Technicolor today in advising producers on colors for their shows. Most of the usual rules, such as avoiding busy backgrounds especially with vivid colors, apply. Cognizance of the fact that color is only an aid to the picture and that the picture is not a vehicle for artistic license in color organ work will make a picture that pleases. Generally a color in the subject should be harmonized with the background and the colors themselves allowed to do the contrasting, but soft colors should almost always be used on a soft surface.

It is very obvious that this chapter has only touched on the subject of color television and photography. If color television is approved by the FCC this year, it will be at least a year before it is used to any extent. If it is not, then it won't be seen for five or more years.

CHAPTER 9

EDITING AND CONTINUITY

Possibly the most important person in motion picture production—including the director sometimes—is the editor. Certainly his job is no less important, for on his skill and judgment depends the blending of the ingredients made by the director and producer. In fact, the relationship may be likened to that of composer and musician. The music—or actual photographing and creation of the various movements and scenes of the masterpiece—is composed by the maestro. Then the fruits of his labors are handed to the musician to play—or to the editor to weave into a rhythmic, coherent story. No film production is better than the skill of the editor, for he can, by his handling of the strips of celluloid, make or break a producer. Because of this particular aspect of motion picture work the two artists work very closely together, although this is sometimes rather one-sided in that the producer often spends more time with the editor working on the editing than the editor spends with the producer when he is shooting the film.

The extremely close relationship between the two men is exemplified by the artistic skill and needs of each as they perform complementary tasks. In live television, the producer becomes producer-director-editor combined into one man. This may be a good thing, although a harrassed producer in the middle of a show will not agree with that observation! There he is playing two roles; one part of him positions the cameras and sets up the shots for the best dramatic presentation from the players and sets available. This process is, of course, going on continuously during the course of the show. His alter ego, the editor, is watching the pictures he creates on the preview monitor screens and selecting those that best tell the story with maximum artistic effect. The producer is completely familiar with the script, having lived with it for weeks before the show went on the air; therefore, his editing self is also. Thus, the two, working together in one body and with one brain, combine to produce and edit a production under the best possible conditions. That is, conditions for the intuitive coalition of two artistic operations are good; from the point of view of careful, cold thinking, they could not be worse than in the frenzied madhouse of a control room "on the air."

The film producer has a tremendous advantage over his counterpart in the live show in that he can make every shot exactly right by shooting over and over again until it comes out exactly the way he visualized it. Then the film editor gets the rolls of film containing perhaps seven or eight *takes* of the same scene. He, in collaboration with the producer, decides which shots or shot to use and in this way the material which is finally shown to the public is perfect; each sequence is a gem of artistic workmanship.

The film editor works by the script and has to follow the story, but he is allowed the usual artistic latitude in that he is able to use his own judgment, plus consultation with the producer, in determining the exact order in which scenes follow each other. No good editor would desire to work on an important picture without the producer with him, for after all, the film is really the producer's baby, and the editor is the doctor who sends it into the world.

It might seem from this that the ideal situation would be to have the producer do the editing as well so that he would be able to get just what he wanted in the way of continuity. But in practice this is not usually the case. Essentially, a producer is an artist with the artist's ability to compose a scene to form the ideal pictorial combination. But he usually does not have the faculty or patience of being able to visualize the finished continuity of production which is required of an editor, and generally is acquired by experience plus feeling.

Some of the new television film companies are experimenting with the technique of shooting the whole story on film in a continuous run in the fashion of a live television production. In this manner often only one camera is used, or at the most two, so that there is little editing required. The Auricon method mentioned in another chapter is the logical outcome of this form of quick production, and now that such equipment is available at low cost it is possible that the industry will see an increase in this form of operation.

The best producer in the world is only as good as his editor, in much the same way that a popular writer is dependent on his magazine or paper editor for his continued success. The feat of filming all scenes in chronological order is impossible to accomplish since too many events conspire to prevent it. But even if it were done, the odds are a million to one that some scenes would require paring down before they would meet with the director's approval. It is, in effect, a form of editing when the director or producer considers his shot in advance and judges how best to integrate it with the rest of the production. This technique applies particularly to newsreel production where there is usually no script to follow and shooting is uncontrolled.

At this point it might be well to explain just what film editing should mean to the film user. Editing is the welding or fusing together of an infinite number of perfect shots, each one in itself of little or no significance, into a cohesive whole with continuity, story, and rhythm. It is the culmination of all the efforts which have been put into the production by everyone concerned, from the lowliest "grip" to the top ranking star. It is telling the story, perhaps not as it was written but at least as the editor *thinks* it was written!

Before production shooting is started, a shooting script is written. This is a breakdown of all the individual scenes which are to be shot and includes long ones as well as those of only a second or so duration. Merely shooting these scenes in order or otherwise is not sufficient since there is an artistic optimum for each scene as well as the need for chronological order. Some scenes may be shot eight or more times because the producer does not feel satisfied with what he has. This means that the editor may have a choice of shots which are acceptable to the producer. This is where the artistic skill of the former and cooperation with the latter enter into the picture. The editor, by the order in which he joins shots and determines their length, controls almost completely the style and pace of the story.

It is probable that the professional newsreels editor knows better than almost any other editor the effectiveness of proper cutting. A newsreel for normal use consists of short, breezy shots to give the impression of breathless urgency. It is important to realize that this breathless quality is not the result of a very definite method of *shooting* but of the manner in which the film is cut and joined by the editor; in other words, the *continuity* is such that it flows rapidly and easily.

Of course this technique is only used for newsreels, or certain other productions such as some documentaries which require this type of treatment. Generally, the story progresses more sedately by means of longer scenes. It is impossible to set down any finite length for scenes since the length varies for every one. This is where the editor's skill enters into consideration, and it is by a combination of artistic ability and sensitivity as well as experience that the best editing is done.

In most respects, the film editor is like the story writer, except that he does not fabricate his own phrases and sentences. He has to use what is given to him and assemble the jumble of composition into a coherent, cohesive whole by the skilful selection of the proper scene with the proper timing. Then he must tie the complete production together with continuity, both effects and actual story treatment.

Continuity is a subject which is more important than any other phase of television and motion picture production. For this reason, it will be treated in two parts, visual continuity and story continuity. It is most difficult to decide which is more important; possibly the former is, since any discontinuity of vision, or motions in the vision field, affects the eyes more than the lack of literary development; therefore we shall deal with the visual continuity aspect first.

Visual continuity means continuity of action in which the eye travels smoothly from one place or actor to another; in other words, the attractions are so arranged that there is a logical flow of movement. This is obtained by both camera and actor workmanship. If it is not present in the film which the editor receives from the producer, then he must make the best of it by endeavoring to insert various effects which will achieve the same result. The producer of films for television is more limited in his scope than the theatre film producer because of the screen size requirements of showing two or three characters most of the time. Since this tends to limit shots to close-ups and two and three shots which will be medium shots, action has to be shown in a somewhat different way. When a player crosses the stage a pan shot following him across is often used to bring the viewer smoothly to see what the next set is like and to orient him as to where it is. If the camera were to pull back or cut to another camera with a wider angle lens, the consequent loss of detail might obscure something significant. Of course, if the producer has not provided good material in the form of exposed film, even the best editor cannot do more than make an attempt at piecing it together satisfactorily.

Visual continuity is really only a minor part of story continuity and should perhaps have been considered with it at the same time, but since it does use somewhat different techniques it seemed better to separate them, at least at first, before continuing on to the main part.

Running through a typical dramatic production and taking only the most important and unusual angles should serve to give a good idea of the various means of tying shots together. The title is usually faded onto the screen: from this it may cut; that is, make a sudden, abrupt change to the cast or credit line. Or perhaps the title is on a drum or roller so that it can be slowly moved up the screen; thus, the next title slowly comes into view as one disappears at the top. The method used depends on the mood of the production. A comedy or fast-moving action story would be best served by cuts between each title whereas a love story or heavy drama would probably set the best mood with a symbolical fade or dissolve between titles. In the case of our drama, the title is faded up from black; that is, from a dark, blank screen the words gradually appear growing brighter and brighter so that they can be read. After the title *The Widow's Secret,* has appeared it fades and the credit title appears. Following this, which may be a cut, we read the cast; then this fades out as the last credit "Produced by . . . " fades in over the top.

Depending on the impact required of the first scene, this may be faded in as the last title fades out, or it may be a cut. If it should be a strongly dramatic shot, such as a fight or struggle of any kind, the latter would seem best. On the other hand, for an idyllic scene of love or peace a fade in is obviously much more in keeping. If the level of emotion is to be kept low at first, the atmosphere is maintained by holding the shot or making any necessary moves slowly, such as gentle pans, or slow trucking shots in to the players. Then perhaps the tension increases, so a cut is made to show the impact of the man's remarks. This is a reaction cut and should be cut a fraction of a second before the impact of his words are sensed by the girl. In this way, the audience sees the man as the words are leaving his lips and the girl as she listens to what she expects to hear; then, suddenly, words come which are unexpected. Her face changes, and we see how she is affected. Here is the need for skill. If the editor cuts too soon, the continued sight of her happy face detracts from the forces of the words we were watching him mouth. So the remembrance of a vicious or angry face spitting out harsh words is gone, and the dramatic feel of the situation is lost. On the other hand, if the cut is made after she has reacted to the import of the words the high point of acting is lost—the *change* in facial expression. This is something no actor should be denied, for with television's limited field of action the usual thespian's gestures are restricted almost entirely to facial portrayal. So we see that editing or cutting, as it is sometimes called, has a definite rhythm. This rhythm must be maintained throughout the whole of the film; otherwise it bogs down in either a senseless, crazy patch-quilt of disjointed scenes, or becomes static in a lifeless, futile, meandering way.

Cuts are so important to the meaning of a film that it would be advisable to list them and add a brief description to each. At the risk of being repetitious, let it be repeated that this cutting, fading, dissolving, etc., is all done by the editor together with the producer (not physically, but at his instigation) after the picture is shot. Each sequence is usually much longer than the finished product will use; this gives the editor plenty of leeway.

The common cut is the most emotional effect at the editor's fingertips. It is capable of inducing tremendous shock if the change of scene is great. For example, a cut from a two-shot of a pair of lovers cooing at each other to a look of murderous hatred on the face of the man's brother would hit the viewer with tremendous impact. But the cut must be used intelligently; too often it is used indiscriminately and its value lost. It has already been shown that rhythm is added in editing, and cuts are means of inducing that rhythm.

Intercutting is probably the most common of all types of cut. It is used almost as a flashback to show action, which is directly dependent on what the audience has been watching or hearing, taking place elsewhere. A man may be demonstrating a new auto: as he talks about its wonderful shock absorbers there is a cut showing them in violent action as the car traverses a bumpy road. Or, a man has laid a trap, and we watch him seeking to find signs of its operation as he talks to his victim. It might be a glance in a certain direction repeated a number of times during the conversation. Finally, when the audience is eaten up with curiosity, a cut is made to show a slowly opening door. If the shot can be made so that the door is first seen closed and it commences to move as the knob turns, the effect will be much greater than if the cut is to an opening door.

If a series of cuts is being used, the length of each will differ according to the action and dialogue. Close-ups can be shorter than other shots. For example, in close-ups of two people talking or arguing, very often first one and then the other is shown as each speaks his lines. This gives added impact to what is being said. For this reason, if the scene is not active, for example, a love scene, and there is no conflict, a close two-shot will often be more suitable than a series of cuts.

There are really two main types of cuts, action and *re*action cuts. The former is used to show the cause of the action, and where and how it started. For this reason, it is desirable to show how the action concluded; therefore, any cuts should be made after the action is well under way and the continuity returned to the original shot before the action is completed so that the audience can see what really happened. It is most important in this type of shot to be sure that viewers are not confused by a super abundance of angles and shots which confuse them by presenting many apparently different viewpoints. Thus the cut *to* an action shot should be made just after the action has commenced but still in time to show why. Fades and cuts must never be mixed in the same sequence.

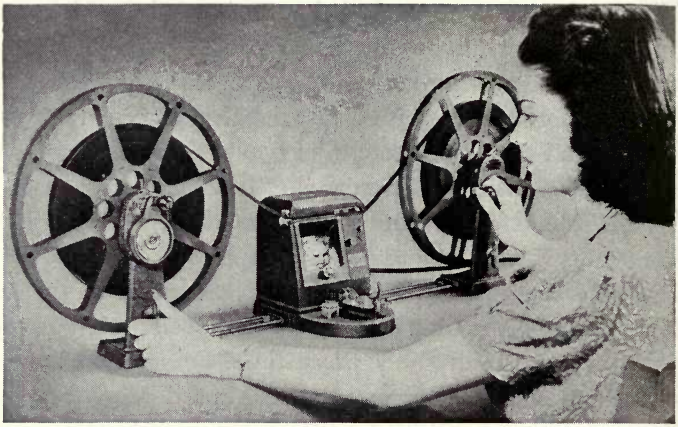
On the other hand, reaction shots which are intended to show what happens after some words are spoken are most effective if cut to the subject a fraction of a second before the reaction occurs. This highlights the contrast between the normal and the forced expression.

Every other effect used for continuity purposes is a variation of the dissolve or fade, in one way or another. Superimposition is probably the most widely known since it was one of the first effects used in films and is one of the easiest to produce. This is simply a combination of two shots, one on top of the other. Of course, care is taken to ensure that the areas which are particularly desired on one are not obscured by light areas on the other. The much overdone trick shot of two piano keyboards invariably used whenever a musical film is made is a superimposition. They are often used to show titles over action, or even trademarks. The method of making superimpositions is discussed fully in the chapter on special effects.

Dissolves can be divided into three categories; the matched dissolve, the straight dissolve, and the lap dissolve. Taking the simple dissolve first, we find that all it consists of is the fading out of one scene while another fades in. The straight dissolve can be used like the cut in many cases. Of course, the transition is bound to be smoother even with a fast dissolve, since it takes at least one second and an average length of two to three seconds. The smoothness of the change is what makes it so attractive since highly effective and emotional use can be made of it as well as excellent continuity combinations. Slow dissolves should not last over six seconds; that is very long. If many are used in the course of a film, much of the time is taken up by effects which do not advance the story and really only waste time. For flashbacks and thought sequences where the character sees himself doing something which comes into his mind as another person speaks, the dissolve is excellent. For dance sequences where a graceful change is desired from one view to another it is very useful, provided care is taken in positioning the old and the new shots on the screen so that ridiculous effects are not obtained through the careless juxtapositioning of the anatomies of the two images.

The lap dissolve is used in a slightly similar way to the straight dissolve except that it is often chosen as a means of indicating thoughts. Everyone has seen movies in which the character thinks of someone or something, and an image of it appears over his head. The only point to watch is insurance of good contrast between the two scenes so that the difference will be very clear. It is called a lap because the two pictures appear to overlap and appear one above the other. A similar type of effect can be obtained from a wipe in which the new picture seems to push the old one off the screen. This is more difficult to produce and is not used very often except in trick or documentary films since its effect is somewhat distracting and is liable to draw attention away from the story.

Matched dissolves have specific purpose in that they can be used to show a transformation occurring in an object or person without removing the camera, provided care is taken to see that the new object is in exactly the same position as the old one. If it is desired to show the difference in size and development of a child or flower, etc., a shot is taken of the object in the early stage



(*Courtesy of Bell & Howell Company*)

Fig. 9-1. Bell & Howell Filmotion 16 mm editing equipment. It consists of a pair of rewind reels and stands and a viewer for selecting places to cut.

and then faded out. A new shot of the next stage is taken with the object in exactly the same place and faded in. When the two films are properly printed in the optical printer, one fades away as the new one emerges from the old object. Dancing is particularly well helped by this effect since a cut from a long to a close-up shot is often disturbing because of the sudden transition in the middle of a delicate dance.

The actual mechanics of film editing will now be discussed from the point of view of the beginning worker. For the time being it will be assumed that titles are to be considered later so as to keep the issue clear. In many cases, the choice of titles is left with the editor.

For effective and efficient work the proper tools are required. Many companies manufacture all the equipment needed and generally speaking one make is as good as another so that the inclusion or omission of any particular make is not an indication of quality but is caused by the need to be economical with space. The one point to watch is to make sure that whatever equipment is bought, it is strong enough to stand up to continuous work.

For this reason, much amateur and so-called semi-professional equipment is unsuitable. The equipment to be described is for 16 mm film; it is similar to 35 mm but scaled down.

Probably Bell & Howell and Griswold equipment is used as much as any, and the following pictures show some of their products for editing. Figure 9-1 is the Filmotion editing equipment. This shows the two rewind brackets on which the reels are mounted and turned to rewind and inspect the film. In mounting reels on the rewind shafts, it is generally only possible to place them on in a standard position this is usually a help since it prevents errors which can occur if the emulsion appears on the wrong side. In moving film through a rewinder, the same rule applies as for film in a projector: that is, always rewind film in the same direction in which it came off the reel unless, of course, there is some special reason for desiring it the other way. Film is normally placed in the rewinder with the emulsion side down; this has two purposes—one is to protect the emulsion from scratches and marks it might pick up if the emulsion were uppermost, and the second is to present an upright image in the viewer when editing. Usually the full reel goes on the left hand rewind.

When the film is returned from processing, two copies are received, the negative, or master, and a work print. The negative is never run in the editing

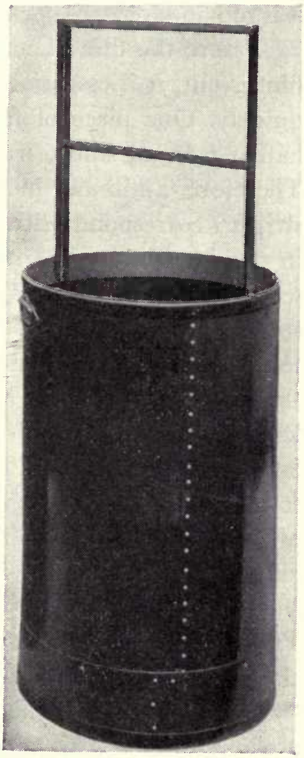


Fig. 9-2. Neumade editing rack and barrel.

viewer or a projector; in fact, it is never run through any type of projector and must always be handled with the greatest care since it is from this film that all the release prints will be made. The other film is the work print or work positive, as it is sometimes called. All editing is done on this film. On receipt, it is run through the viewer or projector two or three times to find out what is in it since all shots are out of order and it is necessary to respot them and to get an idea of the photographic quality so that poorly lit scenes can be eliminated immediately.

On the third time, or when the editor is ready, he lists each scene with a brief description and remark such as "OK," "NG" or "cut" if the scene is no good. Incidentally, the film need not be rewound after each viewing but merely reversed through the viewer for it makes no difference to the value of the scene whether it is moving forwards or backwards, and it saves time.

Before the film is cut, the scene list must be made. Whenever film is cut, it is essential to identify it so that it can be picked out quickly. One piece of film is very much like another when it is hanging on an editing rack or in one of the other editing devices. Therefore, a number in red grease pencil on the waste part of the strip to correspond with the scene number will help a great deal in rapid assembly. Then unwanted scenes are discarded and usable scenes stored in a special holder. These take many forms, but the standard is the cutting barrel. This is a fiber barrel lined with a soft material to prevent scratches on the emulsion. A rack over the top has small pins on which the film perforations fit so that lengths may be suspended until required. This is shown in Figure 9-2. As the editor goes through the film, he uses a grease pencil to mark spots where he wishes to cut. He also identifies each piece of film with a number. After the unwanted scenes have been discarded, a trial assembly is made according to his plan and the way the story is to unfold.

Some models of filmviewer have a notching device so that all the editor does to mark a cut is press a lever. This makes a small "v" cut in the side of the film and when he comes to it, it indicates a place to cut. This method is most often used where editing is

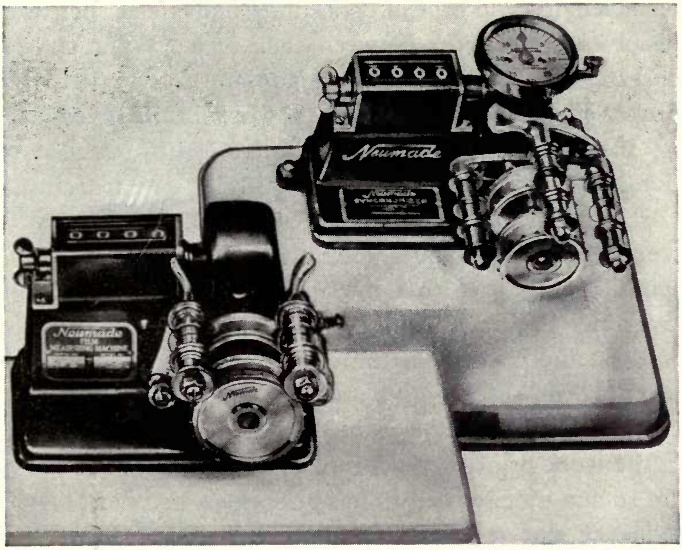


Fig. 9-3. Neumade 16 mm film measuring devices.

part of a big operation and the editor merely looks at the film and has cutters do the actual work of cutting and splicing while he indicates what has to be done. After the preliminary editing is done, scene lists are prepared. It is not always necessary to time each shot or scene, but if it should be needed it is done by passing the film through a film counter such as is shown in Figure 9-3. There are various types of counter (the one shown is used to measure footage only). Fittings can be obtained to measure the number of frames as well for accurate sound work. Counters, or measuring machines as they are sometimes called, are also made with two hubs over which the film passes for use in matching sound and picture prints. Some are combination models for use when converting 35 mm film to 16 mm. Whatever the type, the action is the same; the passage of the film over a drum with sprocket teeth causes it to rotate and move a Veeder type counter. The counter can be set back to zero or any other value by turning a knob.

When the tentative editing has been done, the producer and editor go into a huddle and make final decisions. These include scene lengths and type of continuity, i.e., effects such as cuts, fades, dissolves, wipes, etc., between each scene. When these have been decided, the final splices are made and instructions given for the proper effects to be inserted at the appropriate places.

If the production is to be accompanied by sound-over or narration, the only other editing that remains is to match the negative. For this purpose, a double rewind is used. The edited print is placed on one end and the uncut negative is put on the same spindle beside it so that the distance between each spool center is the same. The print is rewound, and the length of each scene measured on the counter in the center. The same scene is found and identified on the negative and exactly the same number of frames cut from it. This strip is then spliced in the same order as it was in the work print. If synchronized sound is not being used, there is not such a precise need to have the exact number of frames in each sequence since the sound will be added later. Cotton gloves are always used when handling negatives.

When the negative has been made identical with the work print, it is ready to print, and this is the film from which printing negatives are made. The original camera negative is seldom used to make prints. It is retained for use in case all the existing prints and negatives are somehow destroyed; then fresh copies can be made from it, and it will still be in first-class condition to make these prints.

If the picture was taken using the double sound system, the sound will probably be on a separate film, although nowadays RCA, Rangertone, and other magnetic film and tape recording systems are finding more use. However, for the sake of illustration, it will be assumed that film has been used. The sound track work print has to be married to the edited negative. This is a most exacting job, for even a difference of one frame can throw the sound synchronization out. Since the matching of sound and picture is done on the work print, it follows that the negative must be *exactly* the same frame for frame as the work print. The sound "blob" caused by the clap-stick closing and actual frame showing the picture of the stick closing are placed together in editing and

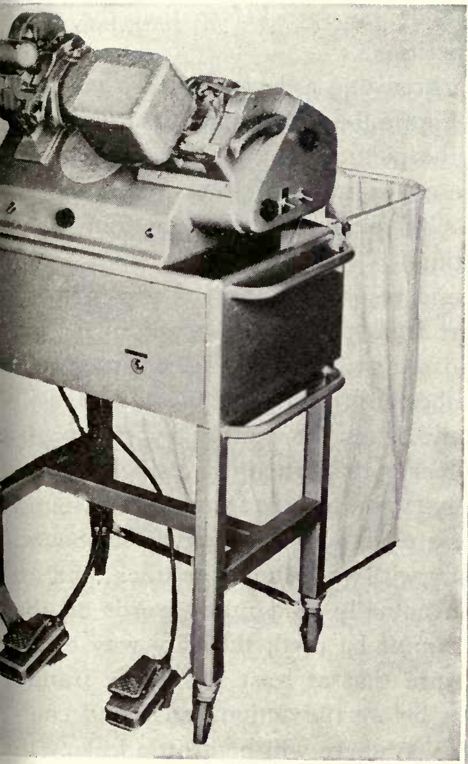
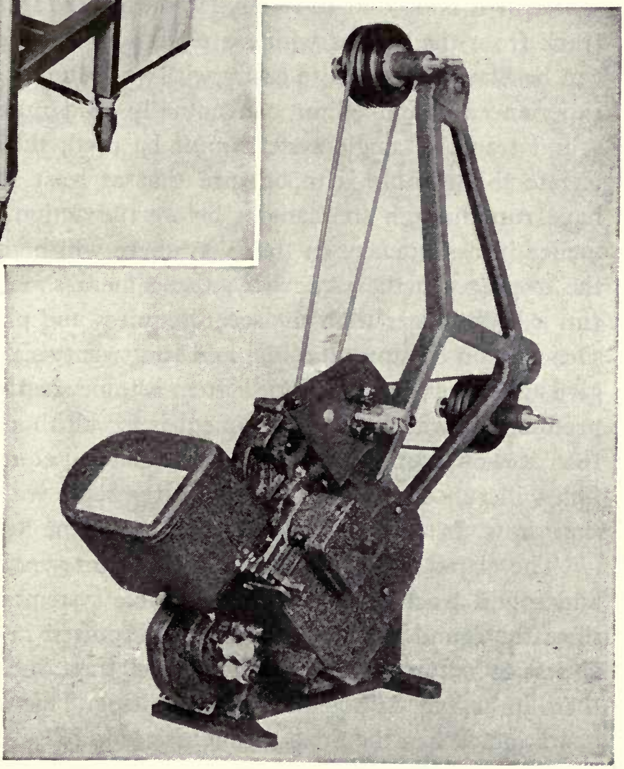


Fig. 9-4, A and B. Moviolas for sound editing and synchronizing 16 mm film.



are run back and forth on a double sprocket so that they are always in the proper relative position.

For sound-editing and synchronizing a device called a *moviola* is used; this is illustrated in Figure 9-4. This is in effect a miniature projector which shows the picture on a small ground glass screen directly in front of the editor and reproduces the sound at the same place. It is thus possible for him to get to the film without trouble to mark it for cutting.

Editing double system sound recordings does not present very much difficulty usually, apart from the normal requirement for care. But if the picture film has the sound recorded on it as well, i.e., single system, then a number of problems are involved. It will be remembered that the sound leads the picture by twenty-six frames in 16 mm film. That means that when using single system sound, if it is desired to remove some picture frames, some sound track from the frames which are left will also be deleted. Sound can be blanked out quite easily with varnish on the track, and an experienced sound editor can actually read many words on the sound track. If single system *must* be used, the only way to alleviate this trouble is to be sure that at least twenty-six frames have run through the camera before the action and sound commence in a sequence. In that way there will be a little leeway in the overlap. In the same way, the camera should be allowed to run a little longer than the scene requires and plan scenes so that silent action occupies the first and last twenty-six frames; this will give an end overlap. If single system is to be used for plays or other productions where the requirement is for all the lines to be heard, then it would probably be best to shoot in sequences so that the film will run continuously in much the same way as a live television show. In this case, no dialogue should be lost in editing.

The clap-stick previously mentioned for synchronizing picture and sound track is used only in double system sound, of course, since the sound is automatically synchronized in single system. It is best to notch the film at the side of these indicators and keep them in as long as possible during editing. This makes for ease of operation. When the final product is ready to be sent to be printed onto one film, the two prints may be labelled in two ways on the leader. The editing system of marking is to have the two notches even: that is, no twenty-six frame lead on the sound film. If this is the case, it should be noted on the leader; otherwise they may be printed in that position, resulting in a twenty-six frame mistiming in the sound. If the sound has been advanced twenty-six frames, that should be noted on the leader to help the laboratory do a satisfactory job. Many films are received for processing, and it is impossible to be mind readers regarding individual instructions and systems of sound matching.

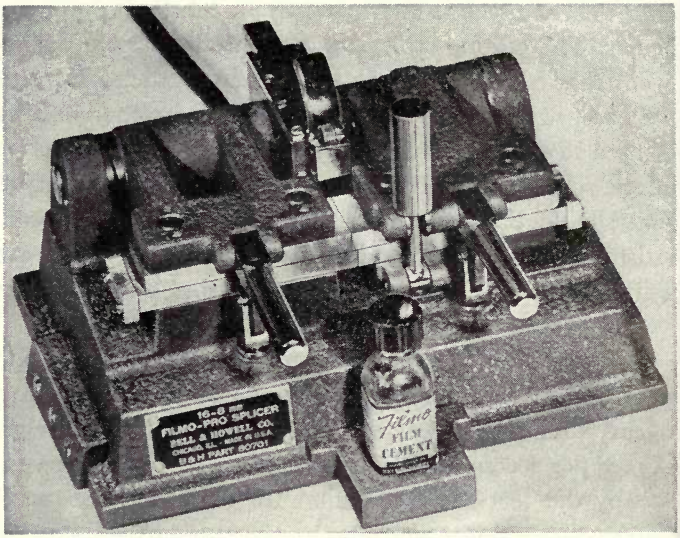
On page 298 a table of conversion from feet to frames is given, so it will suffice here to repeat that at the unvarying speed of twenty-four frames per second and 36 feet a minute the number of feet per second is 0.6 feet. In other words, twenty-four frames occupy 0.6 feet of 16 mm film. In the case of 35 mm travelling at 90 feet a minute and also at the standard rate of twenty-four frames per second, there are sixteen frames to 1 foot of film, i.e., twenty-four frames occupy 1.5 feet.

SPLICING

The reader may ask, "Why include splicing in a chapter on editing? Why not put it in with special effects and titling?" It seems logical to learn how to make a good splice before editing or trying effects and titles, and even if the reader goes no further, he will at least have read how to edit and splice.

Although it is such a simple and minor job, it is amazing how many people fail to make good splices. There is no short cut or secret to good splicing. It is very much like rifle shooting: once one has learned how to do it, it is easy and one never misses—well, hardly ever!

Figure 9-5 shows a splicer. This consists of two clamps combined with a guillotine to trim the ends of the film before splicing. There are two types of splicer, one for positive and one for negative film. The only difference is in the overlap; 1/10 inch is used



(*Courtesy of Bell & Howell Company*)

Fig. 9-5. Bell & Howell 16 mm film splicer.

for positive and 1/16 inch for negative. In the case of the splicer illustrated the clamp on each side is split, and even though the film is tightly inserted and clamped it is possible to lift the whole clamp and cut off the end of the other film to be spliced. Each clamp has sprocket teeth in the channel in which the film rests so that it is kept in the proper position for accurate joins.

Film is placed in the left-hand side, emulsion side *up*. The top is then closed and the end trimmed by closing the other side. This automatically cuts off the proper amount of film and ensures that the splice will occur at the frame line so that it should not show, and the peforations will line up properly. The emulsion is now scraped off with an old razor blade. Some of the splicers provide scrapers, but these are not usually much good and often wear a hole in the film.

The piece to be joined is placed in the other side the *same* way round as the first piece and emulsion side up, and trimmed to length. There is no need to scrape this edge, since in a lap joint (which is what this is) the underside of the right-hand film goes on top of the scraped and cemented lower piece on the left. The only time that this does not apply is in splicing double emulsion films such as Technicolor and other double emulsion film where the emulsions are on both sides to provide the layers of color. In these cases, it is necessary to scrape the underside of the top film as well.

After the emulsion has been removed from the under piece (which the author prefers to do dry, although there is no objection to dampening the film to aid in removing the emulsion), it is a good idea to apply a little film cement and then wipe it off at once. This roughens the surface and improves the splice. This also is an aid if done on the glossy underside of the upper film. After the final application of cement the two films are held tightly together by the clamps on the splicer. The joint should be allowed about ten seconds to ensure a good, sound join. Although most cements set in six seconds, it is better to give it a chance to do a good job.

The secret of a good splice is cleanliness. This cannot be overemphasized, for if any emulsion is left on the film in the splice it will weaken the join and cause a break sooner or later. At the same time it is most important to exercise the utmost care when scraping around the sprocket holes. It is very easy to tear the film here for it is very narrow, but it is also essential to remove all traces of emulsion.

As far as the choice of cut style, it does not matter much. The diagonal cut made with some of the Bell & Howell equipment is stronger than the usual straight line join, but the extra length of the former precludes its use for television or professional use since the splice is bound to show on the screen. As a matter of fact, it is not strictly correct to refer to a splice as a joint. It is a weld since the cement actually melts the two film surfaces and allows them to flow together like solder on a wire connection or welding. In any case it does not pay to buy cheap splicers; only the best is good enough for anything connected with films for television. If cheap, inferior equipment is bought, it will either wear out too quickly or give poor results which reflect on the staff of the organization and the quality of production. A good splice will not pull apart; the film will break first. If it breaks around the splice, it is usually a sign that the scraping was too deep.

Faulty splices can be accounted for by the following four reasons: old film or old cement; film too brittle and dry through improper storage; careless splicing; faulty projector. It is important to use the proper cement for safety and non-safety film. The wrong type is sometimes the cause of faulty splices.

Some film users like to make their own cement. In case any readers do (although the author advises against it, for in case anything goes wrong there is no one to blame), a solution of old film base with the emulsion removed, ether, and acetone will make a standard brew. About two feet of film—safety, of course—two ounces of ether, and sixteen ounces of acetone will make plenty.

If splices have been made in a film to be used over the air, be very sure the film has been properly examined before use. Every splice should be tested by pulling. Any doubtful ones should be replaced, for the few minutes it takes may make the film a success instead of a farce due to a broken splice.

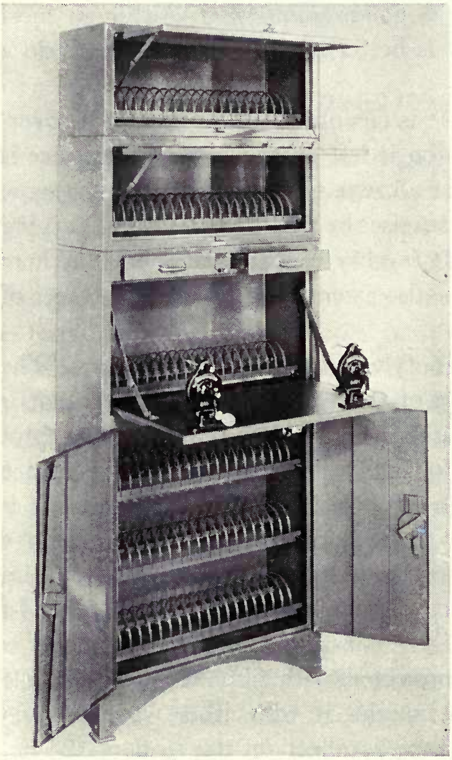


Fig. 9-6. Neumade film storage cabinet.

CHAPTER 10

TITLES AND SPECIAL EFFECTS

Films today do not rely or depend on subtitles to get their intelligence across to the viewers. The same thing applies to television and films for television. The medium should, and must, rely on visual presentation so that sound and explanations are merely supplemental or even incidental. However, programs whether on film or live *do* require titles to identify them and give credits to certain people. Irrespective of the factors of celluloid or flesh and blood, film is seen in its best accessory position when it comes to making titles.

The flexibility and unlimited possibilities of film for title-making are not always realized by producers. The only equipment required is a comparatively cheap and simple camera, a supplemental lens, and some form of titling-board support. If the camera has a single exposure feature, it will make it more flexible, but this is not by any means essential: in any case, these extras will be discussed later.

It may seem strange, but titling is not a subject which can be dismissed lightly with the idea—it's only a set of words on a piece of card. As a matter of fact, there are four kinds of title, and although the death of the silent film removed the need for one—the subtitle—a thorough understanding of the remainder will help the director to achieve a better and more polished production.

Titles are like the chrome trim on an auto. If the car is first-rate, it is well polished, well finished, and smooth; on a cheap, highly mass-produced model little flaws will be noticed, such as failure to burnish the edges thoroughly before plating, with the result that under the shine is a rough spot. A television production is like an auto: it is in the public eye all the time and the chrome trim and finish tell a lot about how much care was put into the preparation and presentation. Sloppy, hard to read, and very ordinary titles of the five for a dime variety indicate the routine attitude of, "Well, it's only a title, it doesn't mean much." Watch the works of the well-known producers irrespective of what station they are on; the title will have as much personality as the show itself. Look at an ordinary movie; even a "B" grade film will have titles which belong with the rhythm of the film. Tilting is a subject which perhaps should have been included in the chapter on editing except for the fact that it is an operation performed away from the shooting stage.

Taking the four titles and working backwards, there is the title which says "The End." This is the finish of the production. Why take it first? *Because it can be the most remembered.* In its place it is just as important as the main title which tells what the production is going to be. In the latter case, it must be designed to tickle the fancy and make the viewer stay tuned in to see what is coming. In the former case, the last title is the last impression the viewer has of a production and if it is badly out of keeping it will only tend to arouse resentment instead of respect for the show which has just ended. To digress for a moment: in this field of television with its tremendous power of attraction and its handicap of leaving nothing to the imagination, psychology plays a tremendous part. It is entirely possible, in the author's opinion, that eventually big television stations and production companies will have staff psychologists who will pass on the effect on the public of various things which the producer wants to do. Any good film or stage production has a number of technical advisers to ensure that all the details are correct, so why not an adviser to prevent psychological flaws which could ruin (and have ruined) a program?

Questions of taste enter into titling even as they do in the content of the show. "Corny" clichés and weak puns or maudlin sentiment are all poor showmanship. Not too long ago a major production of *Romeo and Juliet* ended with a wreath and "The End" in big letters in the middle. Even "RIP" could not have been much more corny. Not many people liked it and some were openly critical.

The third title is one which has not always been used as much as it should but is likely to be seen more and more as television grows. This is the credit title. It includes the names of the players, and what is even more important sometimes, the names of the technicians and artists who produced the show. Whenever the name of the head of a department appears as taking a hand in a production, it is usually technically excellent. After a while, discriminating moviegoers learn to look for screen credits in the production list. This title is often on the screen longer than any of the others because of the number of people who have to be mentioned. It usually ends with the name of the director or producer. But no matter how long it is, it is always in keeping with the rest of the titles and the mood of the play.

The last title is one which is no longer used, normally—the subtitle. When talkies came in, this went out. Today we only see it used for humor, or a necessary explanation when the plot is complicated and usual editing devices fail to indicate the message the producer wants to get across. It often consists of only one, or perhaps two, words.

As far as literary effort is concerned in writing titles, there is little scope for a second Milton or Shakespeare. The main title is generally already determined, the credit title does not require much composition, and "The End," or "Finis," with variations, is common. Sometimes the opportunity for a punny, humorous, or novel ending occurs, but generally it offers little in the way of literary masterpiece construction. However, variety does offer it-

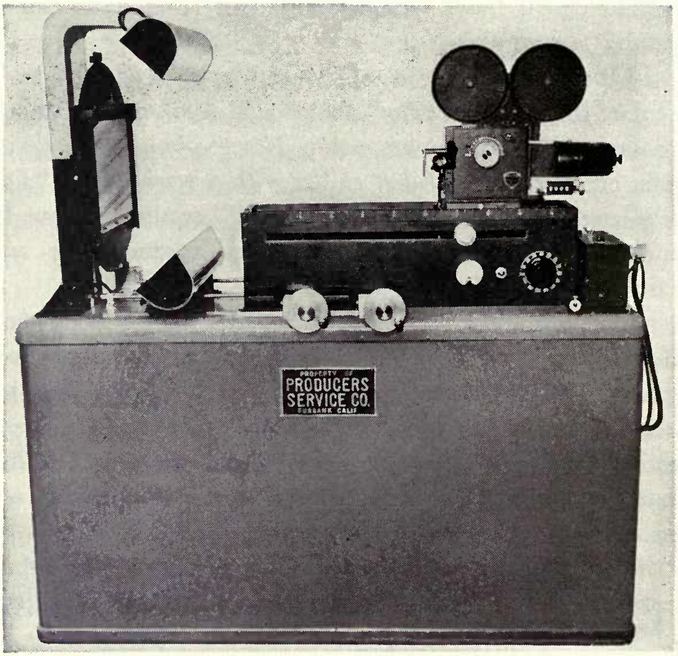


Fig. 10-1. Acme Horizontal Title Stand. This is, of course, the peak of perfection of titling equipment, but most of the effects obtainable can be duplicated by ingenuity and a careful construction. Four- to twelve-inch zooms are possible with accurate focus all the time. The camera is reversible, and single frame exposures can be made.

self in the many novel ways titles may be created. These might be listed as:

Plain still titles
Background titles, still
Background titles, moving
Animation
Ready-made and growing maps
Special effects

In the whole of the discussion which follows, silent 16 mm film only will be considered. What is said for this also applies to 35 mm. A point which it is most important to watch when using silent titles for a production—whether all film, or live, or half and half—is to be sure to use the same kind of film *base* for all parts of the film. In other words, if the production is on sound film (even though it is a silent film) perforated on one side only, use this type for the titles also. If different bases are used and spliced in haphazardly, the odds are ten to one that at least one of the inserts will have the perforations on the wrong side and refuse to pass through the projector! It is also important to ensure that the emulsion is on the same side of the film throughout (this is mentioned again when the use of positive film for titles is described later on); otherwise focus may vary when the emulsion position changes as it goes through the picture gate.

Plain Still Titles This is the most inefficient use of the wonderful servant we have in motion picture film. Generally this type of title is made on a light gray cardboard base, usually known as a card, with very dark gray or black lettering. The simplest and most uninspired method of use is to place the cards in a holder and photograph them one at a time as one is pulled out by hand. A variation of this is the flopover title.

In the latter case, the cards are hinged or supported on hooks so that one card can be dropped in front of the camera, and subsequent ones flop over like the leaves of a book held sideways.

Another method is to mount the cards on each side of a panel pivoted either at the two sides horizontally, or at the top and bottom so that turning an external handle attached to one of the pivots causes the panel to rotate either horizontally about a vertical axis or vertically about a horizontal axis. In either case, a pleasing effect is obtained.

Scroll or drum titles are simply made by inscribing the title on an endless piece of strong paper or canvas or any other suitable medium which has a desirable texture. This title is slowly moved up while the camera is shooting by mounting the strip on two rollers something like an old-fashioned wringer. To be sure of smooth motion, it is advisable to run the camera at thirty-two frames instead of twenty-four. Thus any unsteadiness in the movement would be de-emphasized by the decreased speed during projection at the standard twenty-four frames. An alternative is to do the lettering on the sides of a large barrel and rotate this slowly while shooting it.

All the methods mentioned above are not true film methods since they can be, and are, just as easily duplicated by the live television cameras. For one-shot shows they are obviously uneconomical on film, but if the show is to be played many times the use of film for titles will release another live camera for studio use as well as cut down labor costs by saving the cost of a man to handle the cards. It also reduces the risk of errors in production by having all the titles in the right place.

At this point, discussion of the types of film used, how used, and equipment would seem advisable. If normal reversal or negative-positive film is used then the titles appear in the same color relationships as they were in the original. For instance, a dark gray lettering on light gray background would appear the same. For plain movie work, titles are usually preferred to have white letters on a black ground. Sometimes for variety or other special purposes television titles follow suit. It is much simpler to make a black title on white than it is to make a white title on black. In the latter case, the black background, being darker than the lettering, is liable to show through and make the letters look muddy.

But, if positive film is used in the camera for shooting the titles, developed, and then spliced into the film all the color values will be reversed and the black letters will be white and vice versa. At once the question is bound to be raised: If positive film is used why doesn't a positive with proper color values result? This is an important point and one which all persons engaged in this profession should understand. There is no difference between positive and negative film as far as the image is concerned. They both produce a reversed image, with blacks for whites and vice versa, from an original. In the case of original pictures, the negative is opposite to the live colors. In the case of positive film printed from a negative, the positive print is black where the negative is clear, etc.

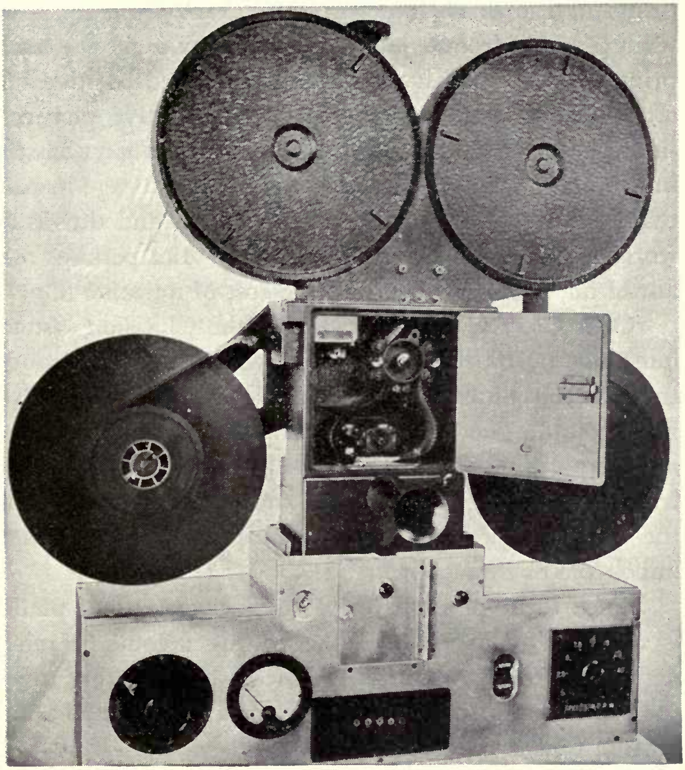


Fig. 10-2. Acme Contact Printer for 35 mm film. A 16 mm model is also available. The unexposed film is contained in the upper magazine. As the processed stock and the raw stock pass in front of the printing light the two emulsions are in contact. Notches in the processed film control the light intensity to correct for exposure variations. Up to forty feet of film a minute can be printed.

Why, then, call it positive film and why use it? The print which is exhibited at theatres and used on television stations must have very fine grain because it is going to be magnified so many times to get a large picture. For this reason, a very fine-grain emulsion is used. As we have already seen fine grain and high speeds do not go together but that is not at all important since we can obtain all the light we need from the light source of the optical printer. This is the device shown in Figure 10-2 which makes prints of the finished negative in exactly the same way that a print is made from a box camera negative (in the latter case the print is also a positive). The film is called positive film because after printing and processing it *is* a positive picture. This distinguishes it from the negative film which *always* has the negative image on it. Positive film also has the advantage in being so slow that it can be handled in a red safe light and thus is more easily worked with in making special effects. *And* perhaps most important of all, it is less than half the cost of negative film.

Owing to the characteristics of the television system, lettering must not be too contrasty; otherwise it "smears" and results in the oft-seen blurry letters with whites running into the black background. The amount of information contained in the title is also important since this controls the number of letters in the frame. From the viewpoint of clarity it is important not to crowd the screen; otherwise the letters become so small that they are impossible or difficult to read.

Since the type of lettering used in cards and plain still titles is usable also on various other titling layouts, it might well be described now. In essence, the method of creating the wording is the same in most cases. It is only the application of what has been written that is different.

Most television stations and production companies have lettering artists or someone available who can do hand-lettering. This person is generally ideal for producing well-drawn titles. In the majority of productions plain, bold letters are best for television work. Because of the poor resolution power of the system, thin letters or elaborate designs do not reproduce well. While Old English styling is very graceful and pleasing, it is sometimes hard to read on a television screen unless the spacing is increased and the letters made larger. If the production is for movie use only, then less spacing can be used.

As far as spacing is concerned, for film work five lines of twenty-five characters each, including all punctuation, is the maximum. For television, three should be the maximum, using not more than twenty characters on each line. In cases where a long introduction is required, a traveling title on a drum or strip can be made. For the main title, i.e., the name of the production, ten characters or less per line, is the limit.

If the services of a good lettering artist are not available, lettering sets can be bought quite cheaply. There is a product known as Zip-a-tone which consists of various sized letters printed on transparent sheets. These are cut out and mounted on the card. While more expensive and not re-usable, they are very finished in appearance and offer an excellent way to produce good titles for about $2 or $3 per card.

Except for special features such as productions dealing with literary or business subjects, the typewriter does not offer much scope. For one thing, the type is so small that it does not reproduce well even on movies, while on most television sets it is almost unreadable unless special large type has been fitted to it.

The scope in amateur titling outfits is almost unlimited. In fact, many of those outfits come under the heading of semi-professional or even professional. There are so many, and the number increases almost daily, so that no useful purpose would be served by enumerating them here. A visit to any camera store will turn up a selection as wide as anyone can want. Included in this array of titlers are outfits using the following methods: cut-out letters on cardboard; metal letters which adhere to a magnetized backing; pin-attached letters; sponge rubber letters which stick to any surface and consequently are fine for making strip or drum title. This type also lends itself to lighting effects because they will cast shadows if illuminated from the sides and so provide a three-dimensional effect. Even the common alphabet soup letters can be used for some types of program with suitable subject matter. Solid block letters will be dealt with again later when discussing trick titles.

Printer's type is also used from time to time since it can be obtained in many different sizes or fonts, as it is usually described. A simple outfit is all that is required to produce good results. The type is put in a "type stick," clamped tight, inked, and an impression made on any suitable card. It is well to observe here that it is essential to maintain the same style of printing and lettering for any subsequent title announcements during a production, unless for any special reason it is desired to change styles.

Book titles, either real or specially faked to simulate books, present a new approach and one which is not often used. One way to use them is to compose the title according to the style required and enter on the fly pages the credits, etc. A hand can take it down from the shelf and bring it up to the camera into focus. Then as it moves away from the lens it opens and shows the additional titles inside. This type is good for children's stories or certain old tales such as ghost stories, etc.

Following in the same style of ready-made titles, we find the sign post on the street where the on-location shots were made will sometimes fit nicely as a title. In other cases, it is possible to make a very topical title by constructing a fake sign post with the story title on it. This is done quite often in impressionistic or psychological productions; it adds to the atmosphere.

For oldtime shows borders are sometimes used, although for general use they are out. The border as an ornamentation to the title is an old-fashioned device and dates a producer as well as his product.

Background Titles, Still and Moving So far we have dealt with the various methods of transmitting intelligence to the reader and presenting it in the simplest possible ways. Now we shall see how the information can be dressed up to make a more attractive picture.

Some form of background, either incidental to the production or entirely different in subject, will add interest and atmosphere to it. Every reader will be familiar with movies dealing with, for example, sea tales or smugglers in which the titles are presented over stills from the story or suitable backgrounds such as a pirate treasure chest. In the same way, moving backgrounds are often seen with fishes swimming around or even in some trick scenes forming the letters. All these devices add to the pulling power of the presentation just at the time when it is most important, i.e., at the beginning of the program. If the attention of the audience can be captured then, and the contents are good enough, the Hooper' phone girl will add another point to the Hooper when she calls during the program. But if the introduction is not interesting, who can blame the viewers for tuning to the wrestling?

Most backgrounds involve double exposures and a certain amount of work, but to start with, only simple single exposure shots will be considered, the background interest being confined to the texture and composition of the material.

As television progresses, it will take more from the experience of the movies and learn to dress up its productions to the Hollywood level. Let it be added at once to prevent any charges of self-contradiction that this is not intended to be a call for the massive productions and tremendous expenses of Hollywood in productions, but merely for more finished work in the small details that go to make the difference between a fair show and an excellent production. Titles are a case in point.

A plain card can be used as we have shown. This is easy and lacks window dressing. Color, of course, is out for television, since on a monochrome system there is no advantage to be gained by its use, and it will be some time before color television is much used. There are any number of interesting materials which can be used with the title written or printed directly on them. Wallpaper offers tremendous variety of scenes. Burlap or sacking takes ink well and has an interesting texture for a travel film or native story. Highly grained wood will show well and simulated wood grain can be obtained on cardboard. Impressionistic titles can be made by painting shadows and designs on cards. Or an airbrush can be used to form finer, lighter details and build up a world of fantasy.

The limit to backgrounds and materials which may be used is only in the imagination of the producer. For instance, if the title card background scene is placed horizontally the letters in cutout form placed over it, and chalk or flour sprinkled over them, removing the letters will leave softly rounded impressions and an interesting background. This type of title is eminently suitable for children's shows. Beach or resort shows can be titled by writing the wording in wet sand and running a hose over it to obliterate them, or having a shapely maiden walk over them.

Quite frequently a still from the show made from a publicity picture during the rehearsals can be used. In this case, the picture is enlarged to a size suitable for the size lettering desired and usable in the titling equipment available. The print should be somewhat on the dark side and lettering in very light gray. If this is photographed on positive film and the same film used in the projector without reversal, the background will appear light with dark lettering. This negative background is very effective for "atmosphere" stories. A travel story might have for its title background a shot of the means of locomotion, either the one used all the time or the one used in the following scenes.

No description of title-making would be complete without mentioning the celluloid negative background. This is used by almost every maker of titles whether he is a professional in a service laboratory for film producers, a film producer in his own right, or just a photographer offering printing services to his customers. It is so simple that even though it calls for some darkroom work it is well within the scope of the average station which does not have darkroom facilities since all the darkroom work required can be performed in the bathroom with the light out and a red safelight for illumination.

The background desired is photographed on process film (this is film which has very fine grain and is used for *process shots,* i.e., those consisting of a number of different procedures during which the picture may be reprinted a number of times) the same size as the title area in the titling device—say, five by four. (This could be done by a professional photographer if such a size camera is not available at the station.) The exposure must be less than normal and the film is underdeveloped so that an extremely thin negative results. The only point to watch in choosing the scene to use is that there should not be any strong highlights; otherwise they will obscure lettering which may fall in the same position. This thin negative is now placed over the lettered card which has been executed in black letters on a light gray background. It is important that the two be in very close and constant contact; therefore, it is usual to place a piece of glass over the two and clamp them together to ensure accurate focus. The combination card is now filmed in the usual way on *positive film*. This results in a combined picture of the title with a thin background picture behind it. The final print is, of course, white lettering on a fainter dark picture background.

Still backgrounds are often made into moving title backgrounds by the addition of the live studio camera to the film chain. If a title is of the moving variety, such as a strip or drum it may be run on the projector while a camera is trained on the studio set. At the studio control position, the video control engineer mixes the two signals so that the title appears over the background of the studio action. This is often very effective, but sometimes details of the studio shot are liable to show through some of the letters and spoil the effect or even make it impossible to read. In most cases the moving background entirely on film is to be preferred.

If an optical printer is available, all the effects about to be described can be performed very easily and with much less trouble. However, it is not expected that many readers will have such a piece of equipment available since it costs about $25,000. Figure 10-3 shows the Acme printer for special effects work. But even though an optical printer may not be available, most of the effects can be obtained by using the film camera as a printer. Of course, it is not quite as convenient, but nevertheless it is just as effective on the screen if done properly.

For the effects and titles to be described, it will be assumed that the actual titles have already been made from one of the methods already discussed and only the means by which they are incorporated into a moving title will be described.

A simple way in which moving backgrounds can be combined with titles, although the method is somewhat bulky and awkward, is to inscribe the title on a large sheet of clear glass about two or three feet across. Letters can be painted or stuck on the

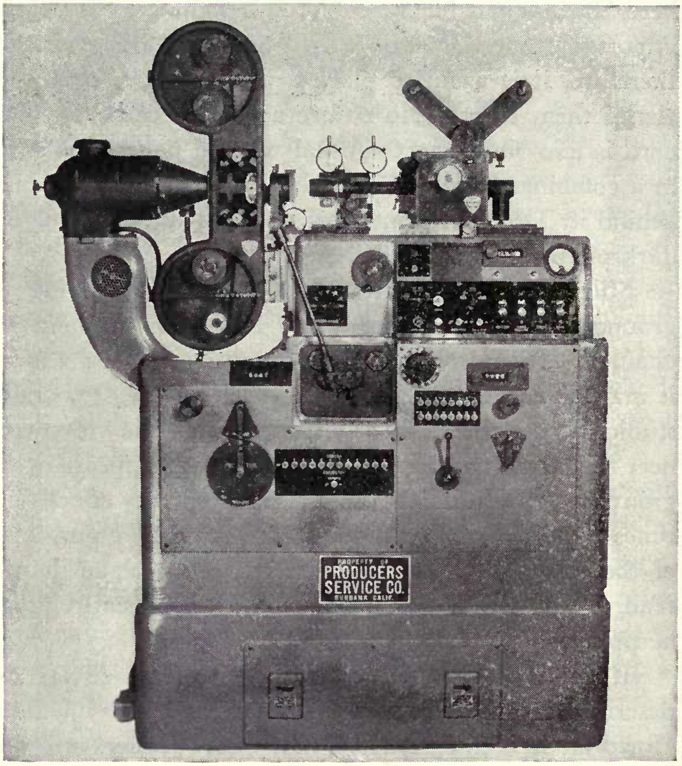


Fig. 10-3. The Acme Special Effects Optical Printer. This is for 35 mm film; similar models for 16 mm stock are available. It is possible to run as many as three films through the mechanism at once. The camera and projector can each be reversed for tricks, and zoom shots in which the object rapidly approaches the viewer can be made with a device which keeps the focus and aperture correct during the zoom. Mechanical wipes of all types are available; combined with this is an optical spin device which rocks or spins the image without moving either camera or projector. Skip printing, in which any sequence of frames can be skipped to speed up or slow down action, is also provided. By mounting a projector and camera on an old lathe bed it is possible for the impoverished user to make an adequate model.

glass. The sheet is set up a few feet from the lens in front of the scene to be used for the background. Provided plenty of light is used—either a good sunny day or in the studio with all the lights on—a small lens-opening can be used with consequent good field depth of focus so that both the lettering and the scene will be in focus. Care must be exercised to ensure that no reflections appear on the glass to ruin the shot.

This is only a makeshift method for it is "messy;" in fact, it is only included for the benefit of readers who do not have access to a camera fitted with a rewind handle. Some of the better cameras which are for somewhat specialized purposes do not have this feature, although in all other respects they are excellent. For this reason, it is well to determine just what is expected of a camera before buying it.

The professional way to do it, is to use a camera with a rewind. Before shooting the background scene, the footage indicator reading is noted. The scene is shot; then, the film is wound back to the same indicator reading. Incidentally, this will not result in fogging or exposing the film if there is a shutter which automatically closes the lens when the motor is not running. If not the lens must be capped during rewinding. Now the title is set up at the proper distance, focussed, and the film re-exposed. On development, it will be found that the title now appears over the moving background in a very impressive manner. This method is fine when it is known in advance that this type of title will be required, but if, as often happens, it is only decided during editing, then the following method must be used unless it is possible to go out and shoot at the same place again.

If the camera used does not have a rewind feature the film can still be rewound by noting the film counter reading before and after shooting. Then take the camera into a *perfectly* dark room, open the camera, and wind the film back onto the full magazine for what is judged to be a sufficient length. The camera can then be closed and the counter examined under the light. If more film than is needed for the sequence has been rewound the camera can be run with the lens capped until the counter shows that the start of the sequence is in the gate. Then the same system is followed as before.

The method described below is normally followed on the optical printer as will be guessed by the description. Assuming that there is a sequence which is required as the background for a title and it cannot be refilmed for combined titling and an optical printer is not available a camera can be used as a printer. The method to be described is essentially the same as with a printer; only the equipment is different. In effect, the camera operates as a contact printer: that is, with the films in it in contact as distinct from the optical printer in which the film to be printed is projected onto the raw stock. Some cameras will take three films at once, but almost all will take two. Therefore, assuming that the camera to be used takes two films, the film to be copied is placed in the camera with its emulsion in contact with the emulsion of the negative film on the lens side of the raw stock. The lens is set to a stop a little larger than normally used, about one stop usually, and exposed with the lens pointing to the sun or a white card well illuminated. If the film to be copied is placed in the camera with the emulsion away from the negative emulsion, a slightly diffused picture will result due to the fact that the picture definition falls off slightly with the distance from the picture to the emulsion. After the film has been exposed it is rewound, the background film removed, and the title as set up is filmed over the top of the first exposure. This then results in a combined print of the two sequences. It sounds complicated and awkward; it is not really hard, and all operations sound and are, more difficult without the proper tools, but it produces excellent results. Positive, negative, or reversal film may be used according to the final result required and the side of the film on which the emulsion has to be to match the rest of the film.

The last method comes under the heading of process photography. The film to be used for the background is threaded in the projector which throws a picture onto a ground glass or other type of opaque screen. The camera is set up to film the screen. There are two difficult problems involved here. One is the amount of light which is available to record on the camera film, the other is the question of synchronization which is so often conveniently ignored by some books on the subject. It is absolutely essential that the two mechanisms run at the same speed of twenty-four frames a second. If one runs faster than the other the shutters will not coincide and there is a possibility of *shutter bar* effect appearing in the form of a black line moving up or down the frame. Without special equipment to ensure that the proper relationship is maintained it is best to forget about this except for providing moving backgrounds for road scenes, such as the view through a car rear window. Even these, however, are very difficult.

It has probably been noted by the observing reader that no mention has been made of inverting the camera for any of the titles so far described. Although that is a well-known trick, and used often, it has been held until last and included in the following section on trick and special effect shots.

Special Effects and Trick Shots For the creation of many special effects, simple inversion of the camera is all that is required. This operation is used chiefly to cause titles to appear suddenly and built up gradually to completion and for effects where it is necessary for the last scene recorded by the camera to be the first seen by the audience.

In title work it is used for making titles which appear to spell themselves out or are revealed by the recession of a wave on the beach. For instance, one of the most commonly used is the title in which the letters suddenly appear in a flurry and sort themselves out into complete words on the screen. This is done by inverting the camera and filming the title in its completed form. Then an electric fan is started which blows the letters off the board, or they can be wiped off with a paint brush or any other suitable kind of pointer or stick. After processing, the film is merely turned upside down and projected. This means that the last scene photographed, the empty screen, is seen first by the audience. Suddenly letters begin to float on and settle themselves in position, forming the words of the title, or the wand or pointer wipes across the screen and letters appear as if by magic. There is an objection to this if no prints are to be made of the finished, edited film: that is, that the emulsion will be on the wrong side. For films which are to be used considerably and for which the consideration of scratch danger is important, however, a print is usually made in any case so the objection is not too strong.

This effect is used in many ways and the reader will find himself thinking of many other uses for it. To trigger his brain, the following suggestions may form a starting point—in any case, they will be interesting.

On the same lines as the title just described, a piece of rope formed into letters can be filmed intact; then the end is jerked or pulled gently, depending on the effect wanted. The screen effect is of the rope snaking itself into letters. The type of effect must be carefully considered for its suitability in the film with which it is to be used. For instance, the above title would not do for a story on bedside manners! But it would be fine for a sailing or murder story.

On the same lines, wooden letters or blocks can be tied together with black string and placed on a matt black background in the correct positions. The camera is inverted and the title photographed. After sufficient frames have been taken, the string is gently pulled and the letters go in a jumbled mass. In projection with the last frame first, some superior power seems to direct them to assume the proper positions. A good variation of this, especially for junior pictures, is to have the words on blocks and a child in the picture. If the words can then be disarranged the resulting effect after the film has been inserted the normal way round is of a very young baby spelling out words.

Glass can be painted with water paint and while being photographed a hose can wash the letters off the glass. Runny letters appear to clean up and form the complete title on projection. Some smart reader may say, "Well why go to all that trouble? Why not just put the letters on one at a time or paint them on the glass during filming?" This can be done, but better results are obtained if the complete line is shot first as a smooth presentation. If letters are added one at a time jumpy lines of letters due to slight differences in letter positioning often result whereas the reverse is true if a complete line is first shown and then wiped off in fast or slow action.

The possibilities are unlimited for trick work, and almost anything that the reader can imagine can be done with the exercise of a little ingenuity. For television film production there is one point to watch and that is the need to keep scenes and titles simple. The limitations of the television film chain have already been mentioned, but it cannot be stressed too highly that the temptation to dress things up and make them over-elaborate must be resisted. Otherwise one of two things will occur: either the effect will be too light to show, or the screen will be filled with a mass of lines which only confuse the viewer. Simple, straight-forward titles and effects are best, such as well-built and well-outlined objects.

Fire is always an attraction and it can be brought into titles very easily as the following examples show (the actual application depends on the subject). Smoking letters can be made of felt, soaked in impure sulphuric acid, placed above a dish of strong ammonia. For flames, they can be soaked in gasoline and ignited when required. A variation of the old horse racing parlor trick is to make a solution of saturated potassium nitrate in water in which a very small amount of gum has been added. If the words are drawn with a thick line on thin paper and allowed to dry, they will be invisible. If now the camera is focussed and started and a glowing cigarette applied to the commencement, a rapid spark of fire will follow along the line and trace out the letters. For best results, care should be taken to ensure that closed letters are not completely closed; otherwise the centers may fall out.

Water, too, is fascinating and can be used for many interesting and pretty effects. A fishing film could be introduced by the wording placed on a stream bed where the water is not too deep or swift. If the camera is inverted and the title filmed the stream can be stirred up, or ink poured in above the title. This darker water will flow over the title and obscure it. On projection the title will appear to emerge from cloudy water. This can also be done in a pond or pan if no stream is available.

Animation for titles is performed in just the same way as the animation of cartoons and since that is described elsewhere only the mechanics of timing are mentioned. Timing is the greatest difficulty, but even so it need not present any complications if it is remembered that in one second twenty-four frames of film are seen on the screen. That means twenty-four different pictures or changes of scene per second, unless it is desired to make the motion very slow and smooth and use two frames for each change of position; then it will be twelve changes per second. The important thing is to plan the title in advance so that every movement is already known before the filming starts. It must be decided how long the title is to be on the screen; to this must be added the time required for the letters to take position. If the title has four words and twenty-five letters and is to be on the screen for six seconds, then six times twenty-four or one hundred forty-four frames will be exposed and up to that number of changes of position may be made. So when it is decided how many changes are required, it will be known how much work is involved. Under the heading of animation, map work should really be included since the use of maps for any purpose almost invariably entails a small amount of this type of work. Unless the map is to be only a static illustration of where a place or thing is, it must have some life in it. This can be done in a number of ways.

For motion along the line of travel, a map—choose a clean, uncluttered print of the map, for excessive detail will only destroy the value—is mounted on the animation table or even in the titler. A series of exposures of one frame is made; after each exposure the heavy line which travels along the route followed is extended a fraction and the next frame shot. Thus the line appears to extend itself automatically. Other refinements, such as name plates, etc., will suggest themselves.

Finally, the creation of well-known real special effects will be described to close this chapter. The combination of this chapter and the chapter on editing and splicing should be sufficient to set the film user up in business! The method followed will be based on the assumption that the reader does not have a printer available, although in most cases the local processing house will probably be able to take care of most effects if the station does not care to do it.

In all the following effects the use of 16 mm film, sound or silent makes no difference, standard negative, or reversal is presupposed. If positive film is used the results will be exactly opposite, i.e., blacks will be white and vice versa. These applications are equally suitable for titles and continuity between scenes.

The most common and simplest effect is the fade. This is used both to introduce a scene as in a fade-up from black to the end of a scene or film or fading down to black. In each case the technique is the same and only the application is different.

If the fade is made in the camera, the lens can be stopped down to the smallest aperture during shooting. This will underexpose successive frames until the picture has gone. This method suffers from the drawback that sometimes the light is so strong that it is impossible to fade right out. The vignette is an attachment which goes over the lens and contains a diaphragm similar to the lens stop diaphragm. This can be closed in the same way to absolute darkness. The latter method is not likely to change the focus in the same way that closing the lens does.

A piece of smoked glass which is dark at one end and becomes progressively clearer to the other may be gently moved in front of the lens to create a fade-out. It is possible to dim the lights but this is awkward and not usually possible; also such dimming is liable to change the light values and for color it is ruinous.

For fade-ins the camera is started with the lens closed in one way or another and then the lens is allowed to open to the proper setting. The scene appears out of nothing.

These methods are all right if the film has not been exposed. If it has, then the only thing to do is print a fade in the printer. This is very easily accomplished by running the negative and raw stock together in the printer in the usual way and gradually increasing or decreasing the light according to whether a fade-in or a fade-out is desired. If an optical printer is not available it is possible to do it in a camera by loading it with the two films and exposing at a bright light. If the light is moved away and/or the lens closed, a perfect fade will be produced. In making fades the sign of the professional is the clean, *smooth* fade without jerks.

Another way of making fades is the chemical method. Needless to say this should never be attempted on the original master negative in case it goes wrong and the only copy is ruined. A chemical called Fotofade is sold which will black out a film completely even years after it has been developed. It is very easily handled; all that is required is a deep bottle such as a milk bottle. The solution is put in this, and the film gently lowered into it. The speed of immersion and time in the chemical determine the depth of the fade. If it is pulled out slowly the last part will be darkest. After fading, all that is required is thorough washing and drying.

Wipes and Lap Dissolves A lap dissolve is a fade-out combined with a fade-in. It is particularly effective in titles and types of work where there is repetition or repetitious subjects such as long titles. In television, it is used more than any other kind of effect in live production.

To make one in the camera during shooting is simplest, but it often happens that the editor calls for one after the film has been made. Taking the first case, it is a simple operation if it is made during production. A fade is made in the usual way; the film is then wound back by hand to the original starting point and re-exposed on the new subject. But this time shooting commences with the lens or fading device closed and it gradually opens to allow the new scene to fade it. In other words, one picture fades in over the top of the old one which is fading out. Any method so far described can be used except the chemical fade. If the camera does not have a rewind device, it is possible to open the camera in a darkroom and notch the film before starting the first fade. The total footage can be noted; after the first shooting take the camera back into the darkroom and rewind the film by hand until the notch is felt. Start the new fade-in there. If an optical or contact printer is used a fade is made in the usual manner, the film is rewound, and the new subject is faded in.

The wipe and similar effects are probably the most interesting and generally noticed special effects used in movies. Many of these require the use of special equipment and make possession of a printer almost mandatory, but others can be performed with a little care without elaborate equipment. Since the basic feature of the wipe is the appearance of the new scene pushing the old one off the screen and all wipes, no matter how fancy, are variations of this, we will apply ourselves to this particular feature.

It is possible to make wipes using merely a standard film camera, but these of necessity are somewhat restricted to the more simple effects. For instance, if it is desired to wipe from one scene to another, and it is known *during filming,* all that is necessary is to draw a black card slowly in front of the lens until it is completely covered. The camera is then stopped and the film rewound to the start of the wipe. Action is started again on the scene that follows. As the action proceeds the black card is withdrawn slowly from the lens—in the same direction as it was drawn in front of it. It follows that the side of the film which was previously unexposed now receives an impression. The effect is that the first scene slowly fades out on one side of the frame and the new one appears to push it off.

This method is excellent if it is known at the time of shooting that a wipe is required; it can also be done if the camera has a single frame action. In this case, one frame at a time is exposed and a card moved a fraction of an inch further in front of the lens each time. It is removed in the same manner; however, because of the time element, the latter is usually employed more for titles than moving scenes.

If a printer is available, a wipe, such as a spot which grows from the center of the screen with the new program coming out of it, can be made as follows. A black and white drawing is made of the steps in animation of the spot which is to erase the first scene; this is photographed on positive film for cheapness and fine grain. A print is made of this, also on positive film. We now have two identical films except for the fact that one is a negative and one a positive. Figure 10-4 makes this clear. The two strips are matched and a notch made in the edges as a registration mark. Now the film which is to be wiped off is placed in the printer together with a strip of sensitive film and the positive mask. A notch is cut in the raw stock coinciding with the notch in the mask. After exposure the film is rewound and mask number two, the negative, is matched up with the first notch in the raw stock. The new film, or the one which is to wipe on, is placed in the printer together with these two. On developing we find that the spot increases and wipes out the first scene and the new one seems to come out of the center of the frame. Figure 10-4A and B shows

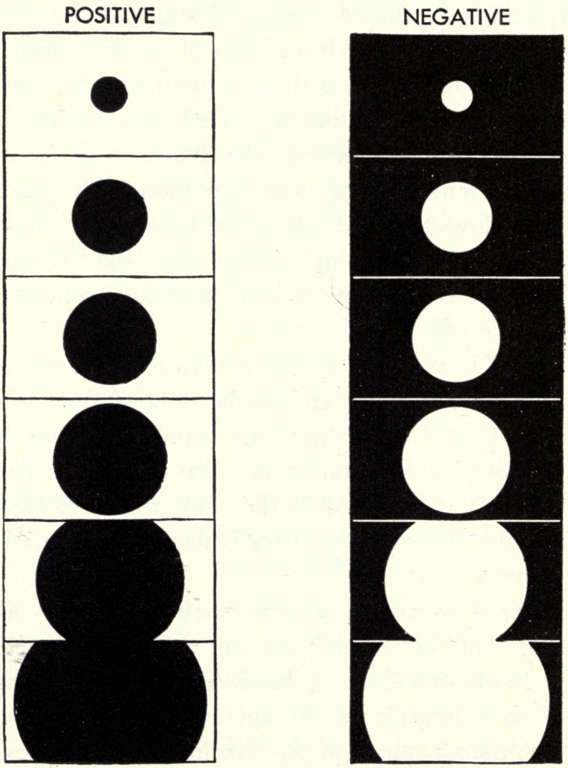


Fig. 10-4A. Positive and negative wipe films.

the appearance of the two separate exposures on the film and the final appearance of the combined print.

It should be apparent from the foregoing that any type of wipe may be produced in a similar manner. Effects like binoculars or telescopes or keyholes are simply made by placing a suitable mask in front of the lens while filming. The distance to the lens determines the size of the area exposed by the mask; bringing the mask closer to the lens increases the amount of picture recorded.

Montage work is quite specialized and deserves better treatment than it usually receives from the editor or producer. Properly used, it is a tremendous asset to many productions. But only too often in the past it has been used in much the way that a poor

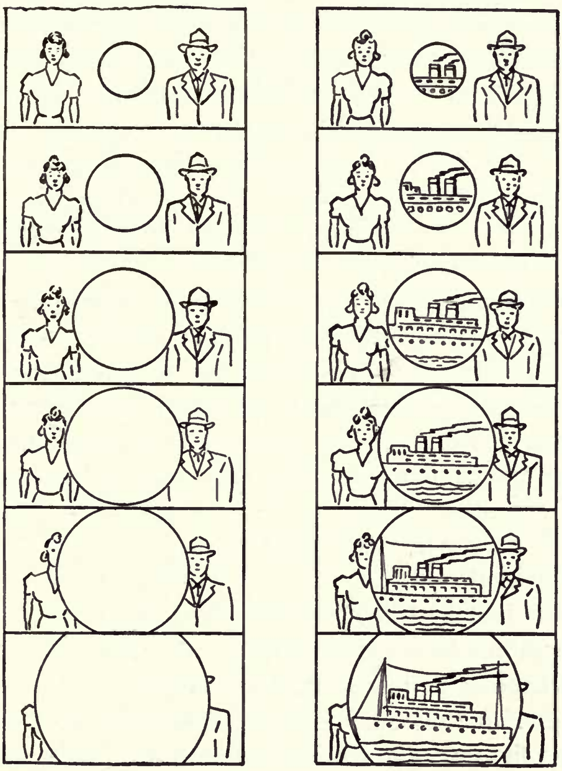


Fig. 10-4B. Intermediate and finished wipe prints.

television producer uses many camera angles to cover up inadequate direction. The French were the foremost exponents of the use of montage. It actually means the mounting or editing of a film, but in American usage it has come to mean a conglomeration of diversified scenes either cut or dissolved into each other at one time. There may be as many as five or six different scenes on one frame. When properly used, it is said to be the real spirit of the cinema rather than the trite offerings so often miscalled "features."

In essence, it is a travel of the mind, for it shows in so many cases a flight of fantasy which could only be sheer fantasy by very force of circumstances. It is often used as similes are used in literature. In one quite old film, *Enlighten Thy Daughters,* a cat and a bird in a cage symbolized the chase of the teen-age girl by the youth. The morning after her seduction (implied by the situation) the birdcage was found (by the audience) open. In another case the action by a man of throwing away a cigarette into a quietly flowing stream with a gesture was the sign for another "first time" seduction; this was in *Not Wanted,* an excellent semi-documentary on unwed mothers. These, perhaps, are significant subjects on which to dwell, but montage is at its best when used for drama and strong, emotional pull.

The simplest is the cut type in which many short machine-gun-like scenes follow each other very rapidly. In this case, the mind does the combining in the emotional aspect. The dissolve montage is merely the situation where two or more scenes are on the screen at one time, one or more of them fading or changing to others. The superimposed montage may have two or more scenes, one on top of the other. This is in some ways a more real montage than any of the others since it approaches mental impressions piling up one over the other.

Infrared light had not been used very much until Universal-International made some exciting productions requiring night scenes. Strange as it may seem, night scenes are usually not shot at night due to the many difficulties encountered in obtaining satisfactory lighting. Of course, some of them must be, but the reader would be surprised to learn which were real night shots. It was found that infrared light offered a wonderful means of obtaining night effects which were much more like night than previous attempts. Of course, certain changes are necessary in make-up and costuming, and such things as street lights and auto headlights have to be made more powerful to overcome the light of day and register through the filters for the infrared film. Overcast days are best for this type of operation. However, unless the photographer is very experienced and can afford to waste a lot of film on experiment, he would be well advised to ignore this type of work if he is shooting for a television station working on the proverbial shoestring.

In using special effects it is important to apply common sense in choosing which to use and when to use them. It is extremely easy to overdo effects and then a film, instead of being a medium of expression or a story, is merely a vehicle for the cleverness of the editor, effects man, or producer. Anything tending to confuse the issue or crowd the screen will not go over well with the viewer since his screen is so small and lacking in detail—in other words, don't use effects just for the sake of using them!

Although many effects can be produced solely by the use of a camera and auxiliary equipment, considerable ingenuity is required to perform some of them. Quite often the end results do not justify the work involved. But the requirements of some producers are a challenge to the film department on occasion. Often the answer is simple, but it sometimes takes a long time to uncover. One production required a scene to spin and then come to rest and commence the action. It was quite a long time before the obvious solution was found. It was to photograph the scene, mount it on a turntable in front of the camera, and start filming with the camera inverted. Then the table was started and it gradually increased in speed until the picture was a blur. Since the same cast was used in the still for the photograph and for the production all the players did was to take up the positions they were in when the still was made and commence their actions from there. In editing, the effects shot was inverted so that the spinning section came first, then the still at the end (which before was at the beginning) was matched into the action of the story which then started. Many revolving shots are made in this way, or with mirrors which give the effect of tilt and roll.

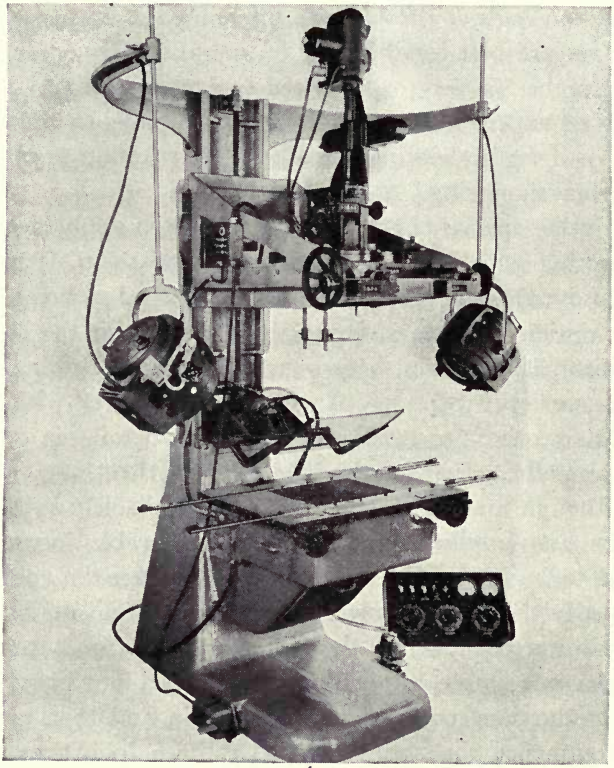


Fig. 10-5. Acme Animation Stand. Any lighting effect desired is possible with the table and lights shown. One to three films can be run through the camera at the same time. A foot control operates the camera leaving the operator's hands free. Zooms are possible of course, and the camera can be moved to follow any line or path desired. All types of effect can be made, including dissolves. Compressed air is used to move the camera and platen.

CHAPTER 11

MAKING FILMS FOR TV

Up to the present, the television film director has had to obtain his supply of films from those made for projection in the movie theatre. Apart from the fact that few films less than ten years old have been available, there is the problem that of those which are offered, only about one in twenty-five is suitable for showing over the film camera chain on television. This refers, of course, to the photographic rather than the artistic quality of the production. Films which were produced for the screen, and in the years before television was considered anything more than an engineer's dream, are usually technically unsuited for television. Most readers have seen films of the gangster era on television and endeavored without success to adjust the receiver to obtain at least some details of a character's face. However, this is usually impossible due to the extreme contrast of the scene. The print is generally intended for home and institution use rather than TV. The last thing the printer had in mind when making it was its use on television.

In the chapter on equipment for using films on television, it was explained how the iconoscope tube which converts the pictures to electrical impulses works. Mention was made of the low contrast ratio due to the limitations of the tube; at the same time, it was said that this type of tube is capable of better quality pictures than the popular image orthicon used in the live cameras. The best type of print for projection onto this tube is one with a fairly narrow range of contrasts. Some of the newer television film libraries are now producing special television film prints. These are printed one or two degrees lighter than films for projection: thus, the details are in a wide range of grays rather than the complete run of black to white. The important point to remember, and one which will be emphasized all through this book, is that high contrast and poor detail go together. Even a print made from an old high-contrast film, which could not possibly produce good detailed pictures on the television screen, will provide an astonishing wealth of detail which was not apparent on its previous state if remade as a television print.

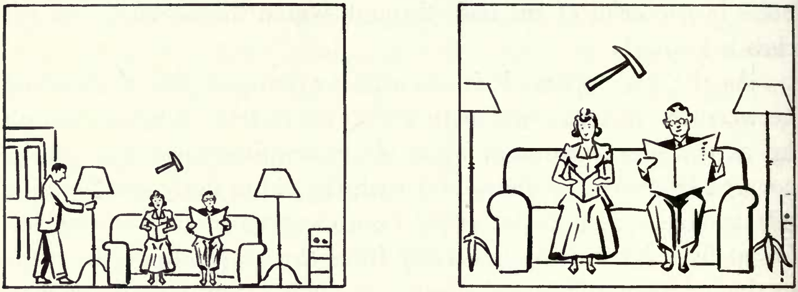
This chapter is concerned with the production of films for the television screen, so it is expected that the reader will consider the points mentioned in the preceding paragraph in relation to what follows. As television progresses, and more and more cities have stations, the demands for films will increase even more rapidly. It has been estimated that in 1948 the existing television stations used over 6000 hours of film while Hollywood produced only about 600 hours of class "A" pictures. This disparity has led to the establishment of a number of new companies specializing in the production of film for television. Many of those shoestring companies will inevitably fail due to inexperience and lack of sufficient capital. But those which remain and grow large will be those which, even though they may not have much capital, have the imagination to create television from the blending of screen, stage, and radio.

The budding television film producer must realize that his is a new medium and that very few people know even a little bit about it. Every person, once he has been in television for a year or more, is somewhat of an expert if he has only common sense and powers of observation. To produce a successful film, stage and screen technique must be combined. For instance, a stage actor usually tends to overact slightly to get his part over to the people in the rear rows where they may not hear perfectly all the dialogue. A screen actor playing the same part does not need to do so because he is playing to the camera, which can catch his slightest change of expression from a distance of a few or even many feet away. How many people in the audience these days take opera glasses with them to a play? Not very many. Quite frequently, one sees the greatest number of glasses used in the "Gods," as the highest and cheapest part of the gallery used to be called. Why? Because they are too far away to see the plays of expression and details of the actors' faces, and they cannot hear the dialogue all the time. The motion picture camera takes the scene, be it a close-up or long shot, and enlarges it onto a screen where all can see and hear. Any overacting will be as false and phony as a "plugged nickel." However, both have one thing in common—they are effectively playing to a large house, either on celluloid or live. But in television, our actors are playing to two or three people in their own living room. The atmosphere of the theatre is not present. It is intimate, and the very mild form of mass hypnosis or hysteria which grips us in the theatre is absent. Producing for television, either film or live productions poses a very great strain on the director's ingenuity and capabilities. In one very severe way, it imposes great difficulties of scenic composition. The radio director has no troubles of this kind—his audience builds their own imagined sets entirely to suit themselves. Each listener can put his hero where he pleases. But woe betide the hapless television producer who comes to the viewer with a set different from the one the viewer thinks is appropriate. The producer may come from a different part of the country and merely by a small difference in usage or custom mar an otherwise perfect set. The importance of details like this is well realized by the big men; in fact, that is how they become big—through paying attention to details. When Walt Disney put Mickey Mouse into color, he spent many very anxious months trying to decide what color to make his pants! A very small detail maybe, but millions had seen him in black pants for so long that an inharmonious choice of color to go with his personality would considerably prejudice his popularity. In the end his pants remained black! But the attention paid to this detail is justified by his acceptance and success.

Detail is the secret of success as a director and the basis of a popular program. This presents an apparent paradox, for it has been shown that the system cannot do justice to excessive detail. However, this is where the definitions of detail diverge. The concern of the director is attention to items of detail, such as establishing atmosphere and selection of suitable shots as well as the other duties of a director which are dealt with later in this chapter. The lack of resolving power, or detail in the television film camera can sometimes be made use of when shooting by the use of the simplest props. After all, when the system will not show the details of perspective, a painted backdrop can be used with much of the furniture painted on it; the books and the bookcase can all be painted flat on the canvas. Large photo murals are excellent for this purpose. The most important thing to bear in mind is the necessity for a strong establishing shot. Because of the small screen or stage area available the action must be clearly defined as to location and the physical relations of the various actors. At the risk of redundancy, it must be repeated that everything that is produced in television is intended only for one purpose—display in the home on a small screen. For that reason, only small areas can be covered at a time, and two- and three-shots are the most common and effective. The establishing shot is the one which orients the viewer and tells the locale of the action; for that reason it must be clear, uncluttered, and outstanding.

Let us assume that the opening scene of *The Singing Death,* a domestic drama, is the living room of the man and wife who are occupying the stage with the man from next door. It is the usual eternal triangle, with the man from next door, an artist, in love with the wife. Her husband is a big brute of a man, who has traveled and explored in many parts of the world. The walls of the room bear witness to his travels, not necessarily by virtue of stuffed heads—they are too uninspired—but by virtue of a display of native weapons. The play ends on the note of the hunter killing the artist with one of his weapons, a ceremonial type of knife mounted in a club handle that sings as the sacrifice is killed (the "singing" is quite logically caused by the arrangement of holes in the head of the club through which the air rushes as the club is swung).

As the play opens, it is essential to establish the relationship between the three as well as to get an air of tension which is built up as the play continues. Most of the continuing action will be covered by two- and three-shots with the aid of dolly and panning effects. The opening shot could be a close-up of the weapon followed by a long dolly shot away from the set gradually bringing in the actors as they speak their lines. This would be a weak shot, somewhat of an anti-climax, since the shot ends on at least a medium long shot in order to cover the whole scene and orient the viewer. An infinitely superior shot would be to open on a medium long shot, particularly if the action could be written to include one of the characters entering the room. As the camera dollies into the set, its field of view would naturally narrow; this would result in the exclusion of one of the characters so that the scene closes on a two-shot with the principal players one on each side of the weapon. Thus the viewer is shown the situation, and the opening words, which should give the key to the situation, are spoken while all the players are visible. An air of tension is built up by the emphasizing of the weapon as the scene cuts. After the story is told, an effective ending would be a close-up of the weapon with a hand reaching up and taking it off the wall, the camera still trained on the wall where it has left an outline of faded wallpaper; during this time a weird note is heard many times as it starts with a high pitch and drops to silence with a thud. Figure 11-1, shows the comparative sizes and details of the alternative opening shots. The film producer has tremendous advantages over the live studio producer. No matter how many times the play is rehearsed, when it goes on the air live it might well be the first time as far as the risk of errors is concerned. A slow cameraman, or a stage hand who is too early, or innumerable things can mar the production. Certain things are impossible, such as a rapid change of costume and scene. In a film the shots can be made in any sequence, but live, they must follow in chronological order.



(A) (B)

Fig. 11-1. (A) Closing shot after dolly-out from opening to a three-shot. (B) Two-shot closing accentuating weapon above the settee and two main characters.

In the live studio, using two or more cameras, changing scene will not be too difficult, but it sometimes calls for some split-second timing. The film production can always be 100 per cent perfect.

Lighting is dealt with elsewhere, and in most cases what applies to live studio television also applies to film production; however, there are certain things which are particularly pertinent to filming. One of these is halation. Halation is usually described as a ring, or series of rings of light, sometimes very diffused, around light areas. It is not confined to film and occurs quite frequently in the cathode-ray tube where the electron beam strikes the screen. In fact, it might be said it happens always to a slight extent, although usually it is not important. In film it occurs through the light passing through the emulsion, striking the base, and being reflected back to the emulsion again so that it makes a larger spot of light than was the original. Probably many readers have noticed how, on a foggy night, the light from street lamps seems to "blossom" into a ball instead of the usual globe. That is halation caused by the diffusing effect of the drops of water in the fog. In filming for television, the lighting limitations of live production do not apply. At best the lighting in a live studio is a compromise. Since lighting can rarely be changed during televising it has to be set up for best results in all parts of the scene. Sorely needed extra lights cannot be inserted where they are needed because they would appear in the picture. In film work one part of the scene is shot, action is halted, and the lights rearranged for the next bit. The BBC in its live operation has a trick which is worth remembering; a small floodlight is mounted on the front of the camera, shielded from the lens, and used if necessary in close-ups.

When making films for television it is important to bear in mind the fact that two field losses take place. One is in the film gate of the projector. To make sure that distorted or poorly registered frames do not cause the edge of the frame to show, the gate opening is slightly smaller than the frame itself. It is only very slightly smaller, but it is possible to lose enough of an important part of a character to destroy the value of the shot if this is ignored. Then there is the more important loss that takes place in the screen of the receiver itself. Because the screen of the tube is never completely flat, the focus changes over the face of the tube, and if the edges are in focus, the middle is not and vice versa. Finally, the technical "advances" of television have brought another hazard—many of the new sets have round screens, or screens which can be made to enlarge the center of the picture. When this occurs, all the information around the edges of the picture is lost.

To overcome the inflexibility of the live studio as far as possibilities of sustaining interest in spite of its limitations, television has gone in for somewhat excessive use of multi-camera angles and shots. This is the most effective way to maintain interest and sparkle in a production, but unfortunately too many producers turn to it in lieu of good production, and the viewer is treated to a succession of camera shots from all angles which have nothing to add to his understanding of the story and merely confuse him. One reason for this is the need to maintain continuity during the time that the scene is changing and another camera is getting ready for the next shot. Films do not suffer from the same handicap, and there is no excuse for an excessive number of different angle shots in the usual film.

It has been stated that the opening scene must be arresting and establish the action of the play. This is important from more than the artistic angle—think of your sponsor! Unless the station is in a small town, viewers will have a choice of at least two stations. It is during the first few moments of a program that the viewer decides whether he wants "his money back" in the form of tuning to another station, or sits throughout your production and commercial. It has been proved many times that the average viewer will be quite happy to see a play which is not a Hollywood super production. After all, a trip to the theatre is an event! It entails getting up and leaving one's house, a trip into town, lining up for tickets, and finally getting into a large, darkened auditorium in company with one or two thousand other people. One is keyed up to see something really great. At home the family goes into the living room and sits down in front of the set, in a familiar atmosphere. They don't expect to see a musical or dramatic extravaganza. What they want is entertainment fit for their living room. Some excellent half-hour television features have been produced for less than $10,000. And as time goes on, prices will come down; probably the industry will see the establishment of a central television film-distributing organization handling nothing but films made expressly for television.

Everything that applies to live production also applies to the production of films for television, and in some cases with even more meaning. The use of long shots, except for opening and occasional use for effect, is discouraged. The use of two- and three-shots, middle close-ups, and close-ups is essential to the comprehension of the story by the audience. There is one other factor which enters very strongly into the use of middle and long shots; that is the background. It is essential that this does not detract from the value of the scene and the actors. In a long shot, it is only too easy to overlook this and provide a background into which the characters blend so that they are lost. The choice of colors for the clothes of the characters is also very important. Try to aim for contrasts between the clothes of the men, and in scenes where there are men and women close together it is better to help the viewer by having them exhibit as much difference as possible in their color combinations. On the other hand, the choice of color combinations for close-up work is very important. Try not to have a large white expanse near a large black area. For instance, a player in a white shirt or blouse against a dark background, or beside a darkly dressed actor, will cause the white to run over into the black. This is a fault of the television camera and not the film camera. Whenever there is an abrupt change of color value over large masses, it usually results in a smearing of one edge over the other. For this reason, night scenes are not very satisfactory since, due to the large amount of black or dark area around the edges, *edge flare* is produced in the iconoscope camera. Middle grays reproduce best over the air, and a film which runs from light to dark gray will give excellent results. The dark gray colors will reproduce on the screen as a black, and the light gray will appear as white as the color of the kinescope tube permits.

As far as any difference between 16 mm and 35 mm film is concerned, apart from the increased cost for the latter, the chief improvement is in the quality of the picture. With 35 mm film a larger image is produced in the first place; this, therefore, requires less magnification, and more attention needs to be paid to scenery details. The scene appearing in the view finder is the same with either film. When watching the set through the view finder, there are a number of items which require attention. If the scene is a close-up, conditions of parallax error may occur. These are caused by the fact that the axis of the view-finder lens is displaced a few inches from the axis of the camera lens. At distances of over a few feet, this is not important because the field covered is about the same for either lens. However, for close-ups of only a comparatively few inches, the difference in area covered may well be sufficient to spoil a shot. This is shown more clearly in Figure 11-2 A and B where the fields from both lenses are indicated by crosshatching. In the first figure the two areas overlap, but in the second—the close-up—the subject would be displaced to one side and the composition of the scene ruined. The various makers of cameras have their own particular versions of view finder. In many of the three-lens turret cameras a complementary three-lens view finder is used. This makes it necessary to remember to select

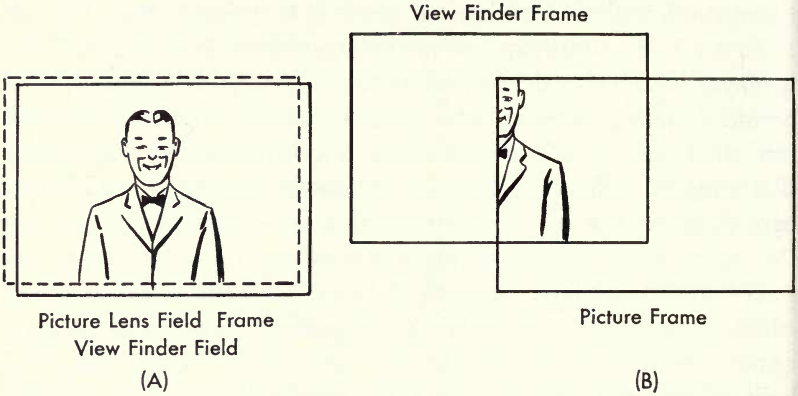


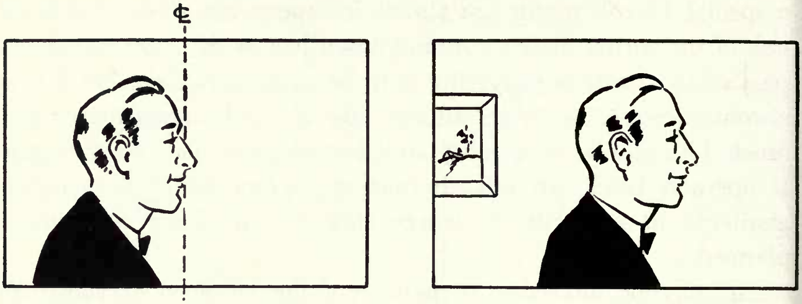
Fig. 11-2. (A) Illustration of view finder and camera lens alignment. (B) Illustration showing how, at close range, parallax may cause the photographic image to be off the film.

the correct lens to match the lens used on the camera. There is often a small viewing lens mounted on the camera above the gate. The turret lens can be focussed and the scene composed through this before rotating the lens into place. Other manufacturers use different methods of view finding, but they work out about the same in the end. The main drawback to all these methods is the fact that it is impossible to watch the actual scene being shot, especially when dollying. However, it is probable that the average film production for television will not use a great number of dolly shots, and those which are included can perhaps be made with the aid of the standard view finder.

One point which causes the average beginner in film work more sorrow than anything else is the size of magazine used. The type of camera usually found in stations is the semi-professional or advanced amateur model. These cameras generally have an internal space for a 100-foot reel of film, and provision for the external addition of a 200-foot or 400-foot magazine. They are generally spring-driven. More lost shots have been caused through the use of spring drives and 100-foot reels than any other cause. An electric motor should always be used to drive the camera. A 12-volt battery which is easily recharged and carried in a car and a special 12-volt motor are almost indispensable accessories if the risk of the spring drive's running down just as the most important part of the event is occurring is to be avoided. Of course, if synchronized sound is to be added later a synchronous motor is a must. This can be very easily added in place of the 12-volt motor. It operates from 110-volt alternating current which is generally available in most places where shooting involving lip sync is planned.

It may be advisable to note here the absolute necessity for using a tripod when making any shot. After the list of attachments mentioned in the previous chapter it may seem redundant, but there are cases on record where shots have been attempted using a hand-held camera and which resulted in useless exposures. A good tripod is essential, both for the sake of good results and the equipment. The total weight of the camera and accessories on the top of the tripod may well exceed fifty pounds, and anything but one which is well built will probably collapse. For professional results, a tilting and panning head is an investment which is almost as important as the camera. The cheaper models have so little bearing surfaces and strength that camera control is well-nigh impossible. The days of the hand-cranked camera of the Mack Sennett movies are over, and today's cameraman merely switches on his camera and, watching the set through his view finder, follows the action by moving the control of the head.

Panning is an art or skill acquired only by practice. Nothing is calculated to make an audience sick sooner than a picture which flows rapidly from side to side of the set, interspersed with occasional flits up and down! If panning is to be attempted, it must be remembered that a very slow, even movement is the only one which is satisfactory. A tilt shot should only be attempted where the background is suitable and where the results justify it—such as an effects shot. In following a character across the set, he should be allowed to lead the camera slightly. In other words, there should be a little more space in front of him than behind. Figure 11-3A and B shows good and poor follow shots. Whenever the cameraman is not 100 per cent sure that a scene has been shot



(A) (B)

Fig. 11-3. (A) Correct positioning of head in follow shot. (B) Incorrect positioning of head, too far forward.

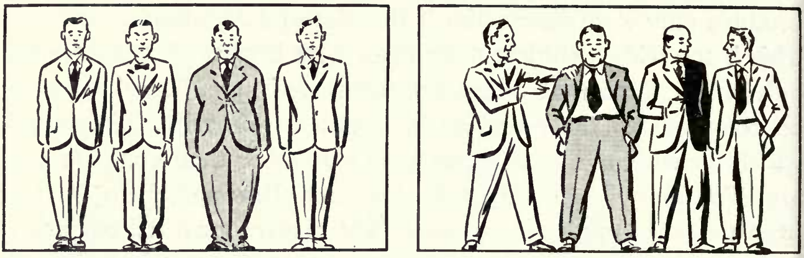
properly, the only thing to do is to reshoot. It may take a little courage on his part to admit that he has made a mistake, but it is infinitely preferable to striking the set and finding it has to be set up again and that all the characters have to be recalled. It may be that the light changed during the shooting, if it was an outside shot; or the cameraman decided the lens setting was wrong, or any one of many things.

It is essential that all shooting be done with the thought in mind that it is intended for television presentation, remembering all the limitation of that art. Because of that, it may be that the new directors and cameramen who are coming into being as a result of television's demand for new men and new thoughts will have an advantage in not being graduates of the motion picture school. With nothing to unlearn, they will have open minds receptive to the requirements of television. Very few long shots should be made, for the size of the television receiver screen renders them almost valueless. Consequently, the majority of shots will have to be close-ups or medium shots. The camera is the eyes of the audience, and their orientation is most important; too many shots of the same action taken from different angles will quickly confuse them.

Composition is one of the most important things in production work. The best story with the cream of Hollywood as its cast will produce only a mediocre film if the pictorial composition is poor. This is too wide a subject to be dealt with in part of a chapter, so only a few important points are mentioned here. The story is to be conveyed to the audience by pictures primarily. The sound which accompanies it is supplementary rather than complementary. Too many directors forget this and allow speech to detract from the story told in the picture. The picture must tell the story, and only one story at a time. Therefore, there must be only one theme running through the picture, and everything in it must add to its strength. When it is realized that television consists of 90 per cent close-ups and medium shots, with people forming most of the scenery, it becomes apparent how important rhythm and variety are in the picture. Rhythm and variety go hand in hand with balance. The small size of the screen makes it extremely easy to get in a rut and allow shots to follow a monotonous pattern while using the excuse of the size as a protection. Four characters in a row across the set are balanced and static—a picture without life. If they are unbalanced by turning the end man so that he faces in semiprofile across the screen, and one drops back to form a second rank between two others, a very strong and interesting unbalance is formed.

In most cases simplicity is the keynote, except for special bizarre effects where a complicated, confused set is symbolic. The small screen makes it easy to confuse the viewer, and a confused viewer is a lost viewer and too many lost viewers mean lost sponsors! Editing brings in rhythm and variety by the introduction of fades and dissolves through the use of the optical printer. If there is a strong vertical line in the center of the scene, it will divide the set into two separate scenes in effect, or even a repetition will do it. For instance, Figure 11-4A shows the four men referred to above in a very balanced scene. There is no vertical line apparently present, and yet the monotony has the same effect. In Figure 11-4B the balance has been improved and the scene has more interest.

To close this chapter, the mechanics of filming the opening scene of *The Singing Death* will be discussed. The script for shoot-



(A) (B)

Fig. 11-4. (A) Monotony caused by even spacing and similar positioning of characters. (B) Variety in spacing produces interest and prevents monotony.

ing has been written, the players cast and rehearsed, scenery and properties and costumes on hand. It is not usual for the scenes to be filmed in chronological order; it depends on the availability of sets, the number of times each set appears in the film, and the lighting conditions if taken out of doors on location. In this case it is known that the first and last scenes take place here, so they can be shot now, and then the set can be struck.

The producer has timed his scenes approximately, and the total running time is to be forty seconds. This breaks down as follows:

SCENE 1.	Long shot of living room, with door to left. On walls many odd native weapons, over sofa an ugly club with a number of knife blades in it. Man and wife talking on sofa, which is on right center. Very slow dolly-in, door opens and man enters, obviously not expecting husband to be there. Hesitates, but on invitation from husband comes over and sits down on left end of sofa. Hold camera on three-shot.	*15 seconds*
	Conversation between the three, obviously causing unease to wife and lover. Camera comes in for two-shot of wife and man, tilts a little to bring in part of club.	*15 seconds*
	Conversation continues as camera tilts and closes up to club. FADE	*10 seconds*
	Total time	*40 seconds*

Chalk marks are made on the floor in cases where characters have to move and lines drawn to show the boundaries of the camera coverage. When everything is ready—the lights set the way the cameraman wants them, and the effect lights the way the producer wants them—the assistant producer orders, "Quiet in the studio." The director says, "Roll," and a *take board* with the name of the film and the scene and take numbers is held in front of the camera to identify the shot. As soon as the sound recorder is up to speed, the producer calls "Camera," the hinged flap (called a *clapper*) on top of the take board is slapped, and the board removed. The producer then calls, "Action," and the scene is made. The purpose of the slap is to identify the start of the sound track so that it can be matched to the picture of the clap-stick closing. In this way the sound is synchronized. The sudden slap in the quiet studio makes a readily identifiable pattern on the sound track which is matched to the picture of it closing. The film is processed and a work positive provided. This is projected at once by the producer, and if satisfactory editing then starts. The sound is now on one film and the picture on another. After the sound and picture editors have finished, the two master work prints are matched up with the negatives and these negatives printed together or *married*. The final positive has the sound track and pictures on one film. In Hollywood, production is considered to be fast if it goes at the rate of one minute a day. This explains part of the tremendous costs. For television work, some half-hour films have been shot in one day!

If the sound had not been recorded at the same time as the picture, it would have been necessary to *dub* it in later in the studio by running the film and having the actors say their lines at the right times. This is always costly and slow. For small station production, single system sound would probably have been used although this system makes editing a little more difficult. If the camera is allowed to run for about ten seconds before the action starts and about the same length of time after it finishes, it will give a certain amount of overlap for editing. If the action is well rehearsed and can be shot in short sequences it is easier to edit.

Of course, productions which are not going to use lip sync can be run off fairly quickly, and even those which do use it could be made in much less time for less money by following television practices and shooting in chronological order as though they were television productions.

PART TWO

THE PROGRAM ANGLE

CHAPTER 12

CHOOSING FILMS FOR TV

As we commence the second part of this book which deals more with the actual production practices and aspects of films for television, the author feels it is necessary to digress for a few moments and take a look at a film department in a typical television station.

For the sake of illustration it will be assumed that this is a station in a large city, non-network, where a few film inserts are produced for the program section, as well as a regular newsreel. The reader is considered to be either the film director, his assistant, or in a position of authority in the selection and organization of films to be used over the air. Depending on the individual setup, he will be responsible for making arrangements to obtain films either from standard distribution houses, individual producers, or libraries, etc.

He works closely in conjunction with the program director and keeps him informed as to what new films become available and where he can obtain those he requires for specified shows. In all probability the film director will have the responsibility of screening films to see if they are technically good enough for television reproduction. In many stations the film technical director, who has a position of responsibility equivalent to that of the studio technical director, as far as quality of picture emanating from his department is concerned, may pass on the films under authority delegated to him by the film director, but in either case the final responsibility remains with the latter.

This matter has been gone into with a certain amount of detail so that the reader may obtain a comprehensive over-all view of the responsibilities of his job and what he will need to accomplish to perform it satisfactorily. Almost 25 per cent of the jobs in television stations are concerned with films in one way or another, and generally speaking there are insufficient people with thorough understanding of films and their place in television to fill those positions adequately. This book is not intended to produce engineers, producers, or even technicians, but after reading and studying it the reader should be well prepared for any job in the film department of a television station that does not require specialized technical knowledge. It should be equally helpful to anyone else who is concerned with films for television.

Many times it will fall to the lot of the film director to obtain and approve films for use on his station. There are numbers of organizations which specialize in renting motion pictures to television stations. These consist of independent producers, small and large independent distributors, and, on a very minor scale, some of the national distributors. It is not the purpose of this book to attempt to perform the job of a directory since there are too many to list without running into literally pages and pages of names, and even then a number of smaller ones would certainly be omitted due to their being not listed regularly in the usual directories. Since it would be manifestly unfair to mention some well-known ones and omit many others, none will be named. Also, in the time between writing and publishing this, many new ones will arise and some of the less solid ones will fall. But for the film or television producer or director, there are many trade magazines which are issued monthly and weekly and contain all the current information on the subject. It is most likely that the station or agency where the reader is employed subscribes to these magazines, but in case this should not be so, or the reader wishes to obtain personal copies, the names of the leading publications in this field are given on page 247:

Broadcasting Magazine (Weekly)
FM and TV Digest, published weekly by Martin Codel, Washington, D. C. This is a news letter type of periodical. Two or three times a year a complete directory of all program sources and TV stations is issued.
Televiser (Monthly)
Television (Monthly)
Tele-Tech (Monthly) has an annual Studio/Producer directory and technical TV station information monthly.

The costs of film rental vary considerably and it is most probable that they will increase before the end of 1950. They are usually charged in a manner similar to the movie theatre film rentals. The latter is either a fixed charge for a feature, or a percentage of the gross door, or box office, take. In the latter case, there is usually a minimum charge so that in the event of low attendance the distributor will not lose. A common figure is 30 per cent of the gross or a minimum of $12.50 (this is for either a very isolated house or a "last run" theatre): this figure was quite common in parts of Canada and the west. It will be seen that the cost increases with the audience. In television this is also true, and for general pricing purposes the country is divided into four parts with a different rental in each sector. Of course, it is highest in the east where there are the most people with television receivers. As the density of television receiver ownership increases and more people see the programs, the cost of films is bound to increase.

The motion picture and television have so much in common that it is almost impossible to foresee how television could make any progress without its help. It should be remembered that they both are shadows on a screen or a kinescope tube: they are each made in the same way; that is, away from the audience that will see the finished product. They are products of a team of skilled artisans whose presence is never apparent in the finished article and who are everywhere in sight during its creation. But when the show is seen by the public for whom it is produced, these workers are absent. Very similar equipment is used—lights, sound stages, scenery, props, scripts, and scenario writers, and cameras, of course. But for television only the instantaneous, fleeting image is picked up and transmitted.

The methods of production are very different, too. In films the story is shot out of time sequence with perhaps the last scene first. In television the story is shot in one *take* and editing is done instantaneously by the director who switches and cuts cameras. In a typical Hollywood production there are more workers and the work is less integrated so that even the cameraman may never see the complete script, whereas in television the whole production is made more as a unit with everyone being able to feel that his part mattered.

In the choice of films for television, there are many points to watch. The legal ones of libel and slander together with releases and television are covered in Chapter 22 and in any case these are the worries of the legal department—that's what they are paid for! On the other hand, an intelligent interest in what is going on in the field, and restraint from using films which are known to be badly involved legally or of dubious origin, will help one's position and chances of promotion. The question of censorship is not difficult although merely to accept a film for television showing does not mean that there will not be repercussions from various viewers or busybody, self-styled, religious censorship groups. Sometimes it will be obvious that certain films are not suitable for transmission until after the usual children's bedtime. Strange as it may seem the ever popular cartoon which is well liked by child and adult alike is not always a safe bet for freedom from censor or good taste trouble. Some cartoons, just as some live films, suffer from lapses of taste which may upset people. Then, after all questions of propriety have been settled, it is time to examine the film with an eye to the technical quality of photography and processing. A film which is eminently suitable for theatre projection is usually not as well suited for use over the television film camera chain. A film print to be used on television should be in tones of gray rather than black and white. There should actually be no black and no pure white, but very pale and dark grays.

Titles should be watched with special care; this particularly applies to main titles since subtitles very seldom appear in talkies. If at all possible, avoid films which contain a sequence in which one of the players reads a letter, or in which the action hinges on the message in a letter which is shown in a close-up for the audience to read. In ninety-nine cases out of a hundred the viewers are unable to read what is written on the letter and consequently lose the thread of the story. This may seem a small point, but it is the small points which help to keep an audience for a station. If people find trouble reading the title of the program—to take the worst case—they are likely to tune out and find a better one on another station.

When the titles are examined, note if the lettering is large with only a few words in each main or sub title. Check to see if it is brilliant white on black—this may cause trouble with "smear," i.e., streaking of blacks over whites or vice versa. If necessary, have new titles made for it and splice them in, in place of the original, for the air-showing. It won't cost much and may make a big difference to the loyalty of the audience.

Another point which hardly belongs here, and yet, since we are discussing ways of being kind to the listener and holding him, be sure that your films are at the station in plenty of time for the program. If a film is advertised for Sunday, the tenth, have that film—come hell or high water! Don't do what one big metropolitan station did, and advertise some really good films for every Sunday evening, and then without warning of the change, put on something entirely different. In the case in question, many viewers invited parties to see these specially good movies. Their disgust can be imagined when something entirely different came on without any apology. They felt silly and their friends—as well as they themselves—felt cheated.

Make sure all the film is on the station in the projection booth before the show begins. On one occasion, a New York station—let's call it station "X"—was showing a western film. All went well until time for the change to the next reel. On came a sequence of "The Shadow." After a few minutes the announcer apologized and said the remainder of the original film would be shown as soon as possible. "The Shadow" reel ran out, and then a very embarrassed man came to the screen and admitted that they could not find the second part of the western! So they used a short filler. Don't let that happen to you; there is no excuse for it, and it drives viewers away.

When checking the film for television suitability, it is advisable to project it onto a screen no larger than the standard home receiver size; that is about twelve by sixteen inches. A point which is sometimes overlooked when this is done is that the projector brightness should be reduced slightly to compensate for the increased brilliance with a small throw between projector and screen. Watch for too many long shots or medium long shots which will not be reproduced too clearly on television. In this connection it is a good idea to sit at least ten feet from the screen when making this viewing test so as to approximate as closely as possible the actual conditions. The best method of previewing does not seem to be used much because it entails tying up the film chain and sometimes bringing in a technician especially to operate equipment, at overtime rates. If this is the case at the reader's station, it might be possible for him to learn to operate the equipment or schedule the checking of films for later in the day when men are available. The use of the actual film chain is obviously the best possible method of performing these checks and if possible should be used.

Avoid films with a lot of night or very dark scenes since the iconoscope tube suffers from the previously mentioned fault of *edge flare.* If there is a succession of alternate dark and light scenes, the job of the shading technician will be made much harder, and he will probably be unable to cope with the rapid adjustments of his controls. For the same reason it is well to avoid films which have fades-in or -out unless the shading man is good. The changing light during the fades makes it most difficult for him to keep an even tone on the screen.

What is probably the most important feature—sound—has been left until last. Today the chief criticism of many movies seen over television is poor sound. This is not usually the fault of the station engineers. If the equipment is kept properly cleaned and adjusted and clean films used the only reason for poor sound can be the film, or sound track itself. Unfortunately this is often the case. *Generally* 16 mm film does not reproduce the sound track as well as 35 mm. One reason is the distortion and shrinkage which accompanies the reduction from 35 mm to 16 mm. The film base itself is more subject to shrinkage than acetate base and as a result, there is a risk that it has already shrunk a little unless the print is new. The process of reducing and reprinting usually introduces a little high note loss; this, plus the presence of dirt on the film during printing or projection, which also causes high-frequency loss, is enough to reduce intelligibility considerably. It is for this reason that many producers prefer to use direct-reversal film if they are producing their own films for use only a few times at the station. Since there is no printing involved, the actual camera film being used in the projector after processing, two places where distortion or dirt can be introduced are eliminated. Also cost is reduced.

But it is not often that the library films are direct-reversal type; therefore, it will be necessary to examine the prints carefully. It will be remembered that the film camera for television is capable of using either a positive or a negative film. This feature can sometimes be used to advantage if only a negative is available for any particular reason. But if it is, sound quality will be extremely poor unless the sound equipment has been modified, and it is well to consider this if the occasion to use negative film in the projector arises.

It is not usual for the film director to edit rented film since it is presumed to be ready for use and he is prevented from cutting it by the terms of the hiring contract. However, there may be cases where the station has bought film or agreed to edit some. This often gives the film director a heaven-sent chance to eliminate some shots which detract from its over-all enjoyment due, perhaps, to an overabundance of medium long shots or long shots. For a half-hour airshow we use twenty-seven minutes of film. This may mean that three minutes or more may have to be cut from the film under consideration. Very dark shots can be eliminated; perhaps some which are too contrasty with a large amount of white in them can be dyed and toned down by graying the whites.

In choosing films, look for plenty of close-ups and simple, direct action which takes place well within the center of the screen. Today's sets, with their round and "enlarged" screens, cut off quite a lot of the picture information which is contained in the corners of the screen. Naturally, in a film made especially for television, the director endeavors to keep all his action in the center of the screen since he has these limitations in mind. However, most of the films that are available in the libraries were made before television became popular; as a result, action usually took place all over the screen and if round or enlarged screens are used some of it may be lost to the viewers.

For the same reason, involved plays often confuse the home audience due to their inability to see a complete picture and thus orient the players or location. Backgrounds which are involved or blend with the players are to be avoided since, if there is the merest tendency for them to blend on a movie screen, it will be magnified many times on the television screen.

A short digression here to compare the commercial aspects of television and films produced for television with movie theatres may seem out of place at first glance, but if the reader is really interested in learning more about the infant industry of television he will find it interesting and an aid to the understanding of certain problems.

In the United States there are approximately 18,500 movie theatres which seat about 12,000,000 people. Of this figure 66 per cent, or 12,000 theatres, show advertising films to about 6,000,000 people. It has been estimated that every week about 40,000,000 people attend theatres showing advertising. This is quite a high figure and compares with the number of people estimated to view television in a week. However, this is a *national* figure since it includes large houses as well as small ones seating perhaps 300. But the audience is scattered over a much greater area than television and is in all types of communities, not necessarily only the richer ones which today are the only markets able to support television and its advertising.

The producer of a film for television has a much more limited market for his product; even at the end of 1950, providing all the projected stations are built, there will not be more than 107 in the whole of the country. Of course, they will have a tremendous potential audience, but in many cases two or more serve the same area and consequently reduce the effective coverage by competition. In the case of the movie theatres which accept advertising films, there is quite often no competition close at hand. While cost per thousand viewers for television station varies so considerably that an average figure is impossible to quote, for movie advertising films it is about $4 for a sixty-second commercial.

These facts about movie advertising do not seem to be as generally known around the television industry as they might be, and it is thought that some producers or even stations might bear these points in mind when working on commercials for television use and capitalize on the extra market thus opened up. A local station might even find it profitable to make films for the local advertising houses which use theatres. However, this might take some very diplomatic selling and tactful approaches due to the suspicion with which television has been regarded in the past by many theatre owners. If any deal of this sort is attempted, it should be remembered that 35 mm stock must be used exclusively, and 16 mm film can never be used and enlarged for theatre use although 16 mm prints will probably be made for television showing. The Movie Advertising Bureau of New York can provide any further information on this subject and a complete breakdown of the various cities and states where such theatres operate including population, income, performances weekly, and attendance, etc.

If television commercials are made with the possibility in mind of using them on the movie theatre circuit it opens the door to more rapid amortization of costs by widening the circle of users and reducing the cost per showing. Many interesting advertising setups are possible by this tie-in, and an alert station or agency staff might find it well worth their while to investigate this fully.

Several attempts have been made to reduce costs of producing films for television programs, but so far it has not seemed to work out too well. The only solution appears to be the continuous production of films somewhat in the style of a production line in a factory. If a series of films can be planned in advance so that it can be treated like a single production with all the actors, crews, and scenery as well as equipment used in most of the sets then costs can be reduced to about $12,000 per film (half-hour) or perhaps a little less. The most costly recurring expenses, excluding payrolls, are the sets. If the script can be arranged to call for a few simple sets with only a minimum of actors so that moves from set to set with consequent time wasted in moving equipment are reduced to a minimum it should be possible to turn out a good piece of work for about $12,000. Of course, it will not be Hollywood standard, but it will be good and quite satisfactory for television. In fact, if made on 35 mm film stock *it* is quite possible that a market can be found for work of this kind in independent movie theatres—provided it is good enough.

In the following paragraphs is given a general review of things to consider in planning, setting up, and shooting a film whether it be a twenty-second commercial or half-hour drama. If due attention *is* paid to these points, the very least that will result will be a usable production and a reasonably handled budget. This is addressed to the man in an agency who has to supervise production, perhaps without much previous experience in motion pictures, and also it may be useful to the film director who is new to his job, or just beginning to make his way in the industry.

Sets, Props, and Lighting Simple sets, without any violently contrasting blacks or whites for the background are best. If this is unavoidable, be sure the players are dressed in a contrasting color but are not in white against black or vice versa. For backgrounds, avoid anything which has a lot of complicated lines in it; in other words, a busy background which blends with the actors in much the same way that camouflage hides a ship at sea. The set should be well illuminated so that there is good contrast with the shadows lighted to keep an even tone to the scene avoiding "blobs" of light or darkness. Since the television receiver has the inherent fault of failing to resolve small objects too clearly, unless well lit and uncluttered, important details of clothes or features should be well lighted.

If possible, avoid the long shot with people in it; it is impossible to recognize them on a television screen and unless it is an establishing shot to orient the viewer it has no use normally. In the same category of shots, any rapid movements of the camera should be avoided, especially panning without a reason in the form of a climax at the end of the pan, and rapid pans which result in slurred pictures.

Titles should be economical with words and not cram too many into the small area of the frame. In these days of round screens and amplified pictures as much as 15 per cent of a picture is lost by these devices.

It is better to avoid using too many spots and very "arty" lighting; this often results in "splotchy" prints unless done very carefully. Since blacks are not well handled by the television film camera, it is advisable to avoid any intense black and use dark gray instead; otherwise there may be unwanted light patches on the television screen.

Composition and Common Sense This subject is also dealt with at length in another chapter, but a summary of highlights will not do any harm. Players should be arranged so that it is possible to take plenty of close shots, well in the center of the set so that the risk of losing action due to tube cut-off is minimized. If a commercial is being produced as a test film on the hope of selling it, it is a good idea to show the script to the sales department of the station or agency first in case there is something in it that would damn it at once as far as influencing a sponsor is concerned. Sometimes a scene list, complete with frame count, is a little extra service that gets results in winning goodwill.

If the film is being made on a firm order for someone, the number of prints required will have been specified, but in any case it is a good idea to give an extra one "free." In the case of a spot or commercial this would be less than 100 feet and would be a good-will gesture which would pay dividends in the event the original became lost or damaged and the customer needed another one in a hurry. It's not very likely that the film will run as many as 500 times, but in case it does a spare print is good insurance. Sometimes the academy leader is specified. If it is not, it is always a good plan to provide at least ten feet so that the user can suit himself.

Unfortunately a good many advertisers and even agency men who are in a position to place contracts for film production have erroneous ideas about 16 mm film quality. As a result they are biased against the small man or even station using 16 mm exclusively. Probably they have been exposed to amateur and poorly done industrial advertising films which gave them the idea that 16 mm is not good. Also, many of the older companies which specialize in 35 mm productions and already have the equipment to comply with fire and city laws are eager to keep the new firms out of the field by continuing the fable that 16 mm is not good enough for television.

If first-class equipment is used to photograph the story and process it, and the sound is also recorded on high-fidelity apparatus it will be extremely difficult, if not impossible, to tell the difference between 16 mm and 35 mm on the television screen.

We have already mentioned the awful sound that only too often accompanies the old movies that "grace" today's television screens. In every case, that is caused by the use of old films which have probably shrunk and been printed from prints which were themselves printed from another duplicate, so by the time the film reaches the television projector there is no high-frequency response anyhow. The station equipment itself is often at fault. Generally speaking, the 16 mm equipment is only improved, high-grade, amateur equipment which cannot stand the use it gets and will not remain in adjustment. Many people have complained of high background noise in the film programs; this can generally be traced to noise in the projectors due to poor design or maintenance.

Everything that can be done in 35 mm can also be performed in 16 mm and with just as good results in most cases. In fact, 16 mm film is more versatile in television than 35 mm, for many more stations have 16 mm equipment only than have both and none has 35 mm exclusively. The ratio is somewhere along these lines. Two-thirds of all television stations have 16 mm only and do not expect to add 35 mm in the foreseeable future. Most of the kinescope recording companies use 16 mm. One exception is Paramount which also incorporates it into its intermediate film big screen system. Either size film will give better detail than present day television is capable of.

The print which the reader as a producer will present to his client depends on how well he has followed common sense and all the advice he has got from friends and "experts." It is assumed that he will not do his own processing; therefore, the film quality should be good if it is done by a good laboratory. A density of negative which satisfies the laboratory will be good enough for television use. In general, a print one or two points lighter than a movie print is best. The labs usually use a standard developer and to avoid changing this with attendant cost they often vary the exposure of the positive in printing so as to produce a television print.

When it comes to paying for the films which the film director may rent for his organization, he will find that prices vary almost from day to day and certainly from year to year. Thus, the prices about to be mentioned are sure to be wrong by the time the book is in print, but they are included for comparative purposes. As much as $550 has been paid for a feature in New York and as little as $25 for a short in the same town. More and more films are becoming available all the time, but to offset the decrease this should bring, the daily increase in receiver owners tends to hold the price up. The western film is probably the most used; it certainly is the most popular with the younger set! These (the films) rent for from $60 to $200 a picture. Some series of thirteen have been offered for $50 apiece. Cartoons and serials run about $10 to $25 a reel. If film is used commercially, it is generally charged at double rates.

In closing this chapter, mention must be made of a scheme of utilizing television techniques with film cameras to produce films in the live style without the usual loss of definition from a kinescope recording. Although this method has often been suggested, it has never before been used as far as the author is aware. The Berndt-Bach Company, maker of the Auricon 1200 camera, has outlined the principle. The possibility of shooting films in this manner had been delayed pending the introduction of suitable film magazines for thirty-three minutes' filming and cameras which would not cost too much to buy in triplicate for integrated use in this system.

The setup using two or three Auricon single system cameras with the same technique as for live programs is to place the cameras—say three—on dollies and run them continuously in synchronism. The three sound tracks will be identical, and the half-hour show will be photographed from three different angles just as a live studio show is. Aften processing, the three films are projected synchronously onto a screen together with the image of synchronous footage counter. Editing is done by the producer calling his shots from screen to screen in the same way that he would if it were a live show. The cutter merely notes the footage of the individual film, and after projection cuts the film and assembles the final production. The beauty of this method is that if the producer—or cutter—muffs a shot it does not go out over the air; another piece of film is picked off the cutting room floor and respliced in place of the offending shot.

The increased cost of this method would not be much greater than present kinescoping and would certainly be infinitely superior in terms of definition. This is still in the experimental stage, but it is quite possible that it may supersede live shows which have to be kinescoped for later showing.

CHAPTER 13

PLANNING THE SCENE

It is not within the province of this book to go too deeply into the techniques of pictorial composition, partly because it is largely a matter of artistic temperament and partly because it has already been so well explored in the late Hoyland Bettinger's book, *Television Techniques* (New York: Harper & Bros., 1947). However, it is necessary in order to achieve completeness that the subject be broached briefly.

The painter who succeeds as an artist instead of remaining a painter will be the man who recognizes rhythm in art and uses it to amplify his artistic efforts. In the same way, the successful producer will utilize every bit of artistic talent he possesses to effect a presentation which will catch the imagination of his public and make them ask for more.

It is hardly possible to give a table of advice which must be followed to obtain the best results. In the same vein, only a very vague, negative approach can be indicated since what is taboo for one man because he cannot handle it is wonderful for another because he has the little something which lifts the scene out of the flop class into the excellent category. Psychology here plays a most important part in deciding the placement of scenery and props as well as the choice of actors. This chapter started out with the intention of discussing performers, composition, and artistic arrangements, but it seems now that it should also include personalities in order to cover the psychological aspect properly.

In the creation of a presentation, the first thing the producer does is to make a story-board outline. This is a series of sketches showing high spots of the story to emphasize the key situations. When these highly important stages in the development of the story have been decided, the producer can start thinking of his actors. (This sequence is not necessarily followed by all producers, but it is one which is logical and which is presented with the thought in mind that it might be of assistance or interest to readers who have as yet no set ideas on the subject.) Until the key points of emotional appeal are decided upon the producer is hardly in a position to know with great certainty what he is expecting from his players. It is necessary to obtain the services of actors whose voices match their screen personalities; otherwise viewers may be puzzled when they appear. The physical size and appearance are important. A domineering mother might be a small woman, or she might, with more likelihood, be a big woman who is physically bigger than the remaining members of the family. So there is a choice of two players. But later in the production the size of the domineering person may become important to the sense of the story, because it symbolizes something which must be brought out. The story-board key scene enables the producer to catch this point and obtain a greater meaning from the story than might otherwise be the case.

After the choice of players has been made, scene details must be worked out. It is easy to generalize, but it is not of much value to the reader if the generalization is not made in accordance with some specific plan. Therefore, an imaginary script will be followed to establish the reasons for some of the shots.

FOLLY'S REWARD

Video	*Audio*
TITLE——ROLLING	THEME MUSIC
CREDITS	DOWN TO FADE OUT

Part of the story has already been unfolded and we see here . . .

Scene 5: Dining room table father seated at head . . . family around sides . . . daughter at foot.

Camera #2. Wide-angle lens shot of five people around table, D. in left foreground.	DAUGHTER Father, I want to marry Fred.
Camera #1. Lap dissolve to CU of F.	FATHER (*Aghast, pushing away from the table*) What? You'll never marry that useless good for nothing as long as I have anything to say.
Camera #3. MS over F's shoulder of D, takes in part of table.	DAUGHTER But you haven't anything to say. I . . .
Camera #1. Cut to F on D's last word.	FATHER (*Standing*) I have everything to say. I pay your
Camera #2. Wide-angle shot dolly-in to CU.	bills, buy your food, house you, clothe you. . . . I am your guardian. You will do as I say!
Camera #3. Cut to MS of D over F's shoulder, takes in part of table.	DAUGHTER (*Standing*) No, Father. I am a grown woman now; you can no longer order my life. If you want I will pay you back for my board and . . . (*sobs*) clothes. Won't you just for this once let me do what I want to do?
Camera #2. Dolly-out from last Camera #2 shot.	FATHER You know very well that I want you to marry George James. His father . . .
	DAUGHTER I can't. I hate him and you and your business deals. Don't you ever think of anything but business? Does love never enter your heart? (*Runs round table and kneels by him*)
Camera #3. Pans on her as she goes, dollies to two-shot MCU.	Oh, Father, please give me your love and blessing because I must marry Fred. . . . I love him.
	FATHER (*Sitting and patting her hair*) *Well* . . . I suppose if your mind is made up. . . . I want you to be happy. . . .

Camera #1. Pans on her. (*Camera #2.* Gets BCU Fred ready).	DAUGHTER (*Gets up, rushes to window, opens it*) Fred, come in. It's all right! (*Fred appears in window*).
Camera #2. Cut to BCU Fred in window.	FRED (*Looking apprehensively around*) Did he really approve?
Camera #3. Pans on them to table, dollies-out to cover all players.	FATHER Come in . . . come in . . . don't let all the heat out. You might as well join the table . . . pull up a chair.

Here we can leave this corny affair and analyze the shots and the reasons behind the various angles.

People around a table form a more or less continuous, unbroken line even though the table may be rectangular, square, or even round. So when we open the scene we show a happy family seated at dinner with no more strife or undercurrents than are normal in any family. The atmosphere is one of common interest and integration of emotions. This sets the calm before the storm which Daughter's announcement arouses and thus heightens the effect of her pronouncement by dramatizing the before and after appearance of the scene.

After her statement, which is flat and uncompromising, the circle breaks or stretches by Father pushing away from the table. This groups the rest of the actors together and puts him alone, symbolizing his feelings at hearing his daughter's words which mean he will lose her. It also sets the stage for his next action which is to dominate the scene for a few moments until daughter also gets up.

Then there are two diagonals which spring from each end of the table and meet in the upper center. This is a strong expression of conflict between the two, for any arrangement of harsh verticals and diagonals results in a tightening of tension in a scene. This is held while they argue. Then the daughter acts like a woman is supposed to act and pleads with Father.

At this point some of the psychology of actor choice is seen.

Father should be a big, rough, strong-willed, but affectionate man. Daughter should be small but with an equally strong will. Her woman's nature compels the gentleness shown in the next action where she kneels and pleads with him to agree.

After her show of spirit, her love for her father makes her submit herself in effect by kneeling by him. The domination is now complete. We have the huge, uncouth father standing and the slight girl kneeling by him. He towers over her. Then the anticlimax. . . . The powerful man gives in.

We now have a combination of broken lines which give a feeling of informality and lack of tension and horizontal lines which express peace and repose. After the storm of the scene is over the shot of reconciliation is held for a few seconds. Then . . . Daughter gets up and rushes to the window.

The quiet mood is fractured by the rush to the window and we wonder what she is going to do now. Again there is the grouping that presages opposition or action. She opens it and calls Fred.

Fred climbs in through the window and is framed in it while the shot is taken down the table to impose a concentration of interest on him and group the family around his figure as it appears. The audience sees him as a somewhat small man who is not too much at ease in the presence of Father and he walks across to a seat.

This script shows a number of situations which were brought in rapidly to demonstrate the various combinations of lines and placement which are possible. It is not suggested that it has ever been used on television or ever will be (heaven prevent it!).

The placement of the characters and objects in the frame has a most important bearing on the impact on the viewer and varies according to the degree of emphasis desired from any particular part of the scene. This includes consideration and intelligent use of angle shots. Many aspects of adequate pictorial composition are overlooked by producers in their anxiety to get on with the show. This is often due to inadequate budgets and insufficient rehearsal time.

Different shots and angles have varying rules governing their use; some of these are given below.

Close-Ups Since close-ups are probably used more than any other shot in television they have acquired a certain amount of importance, and there is nothing that is more effective than a properly composed shot along these lines. It is instinctive for anyone who looks at a picture to inspect the upper part first and longest. It is the natural focus of the eyes. For this reason the most important features of a close-up should be kept in the upper part of the scene. This is usually done automatically since the size of screen imposes limitations on the amount of detail that can be included in a close-up. However, it sometimes happens that a close-up of an object rather than a person is required; then the importance of proper composition is more apparent.

Two-Shots and Close-Ups Two-shots are next to close-ups in popularity for television work. The same rules apply to each type of shot as far as *hot* lights and objects are concerned. Anything that is very bright in front of the subject will distract the eyes and reduce the time available for looking at the subject. One of two things may happen; it is possible for the eye to become tired before the scene is over so that it misses significant detail due to the brilliance of the light, or due to closing of the eye because of the bright light the scene seems to be too dark.

Although a definite, symmetrical division of a frame into two pieces is not considered good practice it may be done in the case of a two-shot where a lamp which is lit is in the background. In this instance it may be placed so as to appear between the actors. But keep the depth of field great enough so that it is in focus as well as the players. There is nothing more unpleasant to watch than an out-of-focus bright light or *hot spot;* for some reason the eye seems to be attracted to it.

The background importance cannot be overstressed. The only way to be sure that the actors do not put themselves into positions where they can tie in with the décor is to see that there is no décor which can cause such trouble. Unless full-frame follow-focus is used it cannot be determined for sure that this will not happen. And even when it is used it is not always certain since the picture is seen in the view finder in color and the differentiation in appearance due to the use of color separates the objects which form an unfortunate blend with the performers. But when viewed in black and white on the television screen two things may have the same monochrome value and result in a very humorous effect.

In most cases, eyes should be in the top part of the frame, unless the person is looking up at someone. In this case it is quite possible that the higher object may appear in the corner of the frame to aid the illusion. Big close-ups, or one-shots, should never be set dead in the center of the frame. This is static and lacks drive. It has the same effect as a vertical dividing line which merely splits the picture into two parts. The subject is presumably looking at something or someone, so why not allow space in the direction in which he is looking so that the object of his eyes might conceivably have room to materialize. It is not often that a character looks squarely out of the screen into the faces of the viewers. One of the rare cases where this might happen would be a horror film where a grim figure is suddenly found and looks into the eyes of the camera.

The use of color is a mixed blessing in composing scenes. When viewed by the naked eye, a scene may appear perfect due to the power of the human eye to resolve the different colors. If the story is shot in Kodachrome or any other color film and reproduced in color also the odds are that it will be perfect. But should black and white be used for the original filming or for making the duplicates for television use, there may be some lack of difference between the various objects in the picture, and the color balance may be all wrong.

When setting the mood of a scene the skilful producer can do much to help his scenery artists by proper arrangement of props and players; a short course of architecture would be helpful for many. It is well known how the human mind reacts to the lines of a church or other beautiful, austere building. Tall, graceful, Gothic arches or Moslem and similar lines have a feeling of serene power. The feeling of uplift one has in a church is seldom required or obtained on the television screen, due mostly to the small size of it. But these lines have their uses in greater power of attraction.

One does not often stop to wonder exactly what it is that makes a little cottage seem so cosy and warm to the eye, and why a big mansion such as an old southern mansion seems somewhat awe-inspiring and austere. It is the difference in *lines.* The mansion has height and rising vertical lines which express importance and imposing mass. The little cottage is low and probably has more horizontal components than vertical. This is the crux of the matter as far as line effects are concerned, for horizontal lines give a feeling of warmth and repose—a place where informality is the rule and people do not dress for dinner.

A more definite expression of informality and casualness such as is given by a cluttered living room where children live may be obtained by the haphazard and indiscriminate spotting of objects and people all around a room.

A very severe effect can be built by using all straight lines in the furniture and having right angles for bends with characters very stiff and formal. Military scenes such as orderly rooms or parade grounds are good examples of this type of sight. The straight-standing men with row upon row of straight rifles give a feeling of tremendous rigidity to the scene.

On the other hand, a woman's boudoir is soft and frilly and graceful. Here, curves are the rule and gracefully trailing drapes which form flowing lines to draw the eyes from one object to the next. The flowing negligee of the glamour era did this by forming a path along which the eye was led from one exciting curve to the next. The dance is an example of graceful use of the curve, although modern jitter bugging is not representative of beautiful curves.

Some psychological dramas are played without any scenery, barring a table and chair or similar props which are placed before a neutral background. Unusual camera angles are relied upon to focus attention on the expressions and words of the characters.

This is composition in the highest form of the art, for it is approaching the pure abstract in which only the *meaning* of the symbols used is considered to be important.

Since there is no depth in a television picture, various methods have to be used to obtain its effect. Perspective is the most sought after detail of a scene, and it can be obtained only by accentuating certain features. The lines of the floor boards can be caused to converge more rapidly than they normally would; this makes objects at the rear of the screen seem further away than they really are. The consideration of object size is important, too; it must be remembered that things in the foreground will be much larger than objects in the rear and, therefore, show up more. When planning lines and other methods of obtaining perspective and depth, be sure that the lines running away into the back distance are not combined with any lines which tend to form a horizontal pattern on the screen and so act as a barrier across the frame. For although the eyes normally go to the top of the screen first, in some strange way the bottom often acts as an entrance and this is where the eyes will sometimes commence to "take in" the subject. If they are "barred" by a strong line low down across the frame it may reduce the interest.

Depth of perspective and depth may be obtained quite readily by mounting the camera high in the air and shooting down. Unfortunately, this is not done as often as it could be due to lack of suitable equipment on the part of the stations and producers. The Hollywood type of camera crane is expensive, running to $3000 or more, but production from theatres where it was possible to mount the camera in the flies has shown the effectiveness of this type of angle shot.

In most scenes, one or other of the characters is usually the center of interest or is assuming a position of superiority over the others. There are a number of ways in which this can be accomplished. Some of them are rather on the imaginative side and their appeal is perhaps more to the artist than the general body of viewers; in fact, it may be so much so that only the artist will recognize the nuances, which will be lost on the rest of the viewers.

For this reason, it is best to stick to the more obvious means of showing the desired atmosphere and avoid a wishy-washy production. This should not be taken to mean that the practice of giving the public low-quality programs is being recommended—far from it! It is implied that due to the limitations of the television screen the delicate vapors of artistry are sometimes lost in the two-dimensional appearance.

Group Discrimination A person in a group can be made to appear the leader of it by dressing him in different clothes from the rest of the men; anything different makes him stand out, and the eye is drawn to him by his appeal. In the same way, light and dark colors can be used.

If the leader is in the center and lines of vision lead towards him, or the rest of the crowd looks at him, he will dominate them.

Strength can be gained from the proximity of other strong objects; for instance, a man standing by a tall, solid pillar will acquire some of the pillar's solidness and strength. The same applies if the dominant figure is in the foreground and close to the camera so that by purely optical reasons he is much larger than the rest and towers over them. This, of course, is the simplest and most obvious way of doing it, and it is merely the usual case of a big man overruling the smaller.

The subject of composition is exceedingly complex, and while we have no more than scratched the surface here it may give a little idea of the problems involved. If the reader is seriously interested in composition, he is advised to take a few art lessons from any reputable artist who specializes in figure drawing. Usually artists are pleased to have a student who is interested in the relationship between the various figures in the picture and who is not trying to outpaint the artist. The time will be well spent and dividends will very quickly be obtained.

CHAPTER 14

USING FILMS ON TV

From the point of view of the budget-restricted program director, the motion picture film offers the nearest approach to getting something for nothing. If he has to fill a period of half an hour to one hour he can rent footage to fill the time at prices that range from \$50 for the half-hour to \$125 for a feature program. Admittedly, the films are probably over ten years old; however, many people enjoy seeing the old films again, and quite a lot of them are worth reseeing. That is the basic advantage of the motion picture for television. In a way, however, this is a very minor role. The real use for film is in helping the producer of live productions to establish the right atmosphere by making it possible for him to portray scenes that would normally be quite beyond the capability of any television studio to construct. The major film studios think nothing of spending \$50,000 on one scene, but \$50 is a lot of money to the program director of a station operating in, or very near, the red. For one thing, the physical space to construct such a set is not available; for another, the number of extras required would render it beyond the scope of the organization.

Let it be assumed that a program is being produced which requires the action to take place on a crack cross-country train. Most of the action is in the lounge car, but it is necessary to show the train traveling across the country to establish the atmosphere. It might be merely the opening shot faded in after the titles, or it might be inserted between a shot of the principal characters walking down the corridor as the train dashes through the night. Quite obviously the producer cannot send a camera crew out to shoot the train and relay the pickup back to the station at the right time. The obstacles are so obvious that they do not need to be recounted. However, the producer can send to the library and either buy or rent what is called a *stock shot,* or *film clip* of an express train running through the night. It would probably be about twenty-five to thirty feet in length. This would run just under one minute. Or, he could, if he were very particular about the type of train and he could not get what he wanted from the library, send a camera out to make a shot of the train he wanted; or perhaps he could get it from the railroad running that particular train.

Now, the story is timed. It is rehearsed time and time again until the timing is perfect, and the producer has decided that he needs the film insert (which is what this operation is called) to last forty-five seconds. It will be a simple shot to time and insert since there is no action or dialogue. It is what is known as a passive scene. If the technician should switch to the projector too soon, or a little late, it will not matter for no lines will be lost. In the action that is being discussed, the hero leaves his compartment and makes his way down the train to the lounge car in the rear of the train. (It may be that it was necessary to show a storm scene outside, in which case the insert film will have been suited to the mood in the selection.) Studio space is always at a premium, so it is not likely that it will be possible for the producer to erect one set merely to show passage down the corridor; also, this would not give as much atmosphere to the production as an outside view of the train ploughing through the night. On the other hand, the continuity would be completely broken in the case of a cut on the man leaving his compartment and then suddenly appearing in the entrance of the lounge car—unless it had been previously established that he had one of the compartments in the lounge car! While there is no reason why he should not have one, it never seems to happen in scripts! So, the man has to get down the train. What is more natural than to insert a piece of film showing the outside of the train as it snakes along, and then cut to our hero as he enters the lounge?

Since 36 feet of 16 mm film take sixty seconds to run through the projector at the standard speed of twenty-four frames per second, the forty-five seconds of film insert time will take 27 feet of film. To this must be added a leader and trailer. The former is necessary to allow time for the projector to get up to speed before the train picture comes up and the latter to allow a little leeway in case the projector should be allowed to run too long. If the projector takes ten seconds to come up to speed it will take 6 feet to reach the scene. So we measure back 6 feet from the first frame of the train scene and mark this frame "Start" in red grease pencil. When the film is threaded into the machine this frame is placed in the picture gate opening. The producer knows how long the projector takes to come up to speed and will cue the projectionist when to start the equipment. While the projector is speeding up he will be watching the preview screen as well as the action on the master monitor. At the proper time he calls, "Take film," and the technical director pushes the selector button to connect the film output in place of the studio camera. Studio action now ceases except for taking up new positions ready for the cue to start action in the new sets. When the proper time has run on film the producer orders whichever camera he wants for his opening shot on the air in place of film and cues the floor manager to start action. The use of a film insert of this type is a wonderful safety valve for a producer who is running slow or fast, for he can cut the film time short or let it run longer so that it fills up a short program.

The illustration above is the simplest type in which a stock film can be used. This situation probably occurs most of the time in television simply because it offers such a fine opportunity to bring in effects that would otherwise be impossible. However, there are a number of times where this film insert has to be shot especially for the production using the actors who will appear in the final play. The insert operation is exactly the same as was described above for a passive scene, but the timing, of course, is much more precise. In the story used above, there is a scene in which the hero has to evade some pursuers and jump into a taxi to make his escape to the station. This can hardly be produced in the studio. Apart from the lack of space, one of the many things to be contended with is the fire code. In most cities, this will not allow gasoline-operated motors in buildings. There is at present but one studio in the country where this could be done and that is, of course, in Texas, at station WBAP-TV which has such large studios, open to the ground level, that cattle are sometimes driven in for roping exhibitions.

Having decided that he must use this location, the producer times the action and determines that he wants the whole of the action to take seventy-three seconds. The sequences will consist of the following scenes:

Set 1.	Medium long shot of hotel entrance. Hero, coming out, looks around. Two men converge on him on each side. He hands them off and runs to a taxi in front of hotel. CAMERA: diagonal medium shot panning to his back as he enters taxi. Taxi drives away as two men come into field and jump into next taxi.	*20 seconds*
CUT TO		
Set 2.	Middle close-up of hero in cab turning and looking out of rear window.	*6 seconds*
CUT TO		
Set 3.	Medium long shot from roadside of two taxis, one following the other.	*6 seconds*
CUT TO		
Set 4.	Middle shot of first taxi at red light passing it, other one held by policeman.	*5 seconds*
CUT TO		
Set 4.	Medium long shot of taxi pulling up in front of Grand Central Station. Hero leans forward to pay driver, gets out. CAMERA: middle close-up changing to medium long shot as it pans with him to his back as he enters station.	*12 seconds*
CUT TO		
Set 5.	Close-up of departure time on gate, fast pan to middle close-up of big clock showing five seconds to go.	*6 seconds*

CUT TO

Set 6. Middle shot from train side, hero just getting through gates as they are closed. Hold focus as pursuers run up and try to argue way through to train. Close-up of expressions of anger as "All aboard" and train starting sounds heard. *18 seconds*

CUT TO LIVE ACTION

None of this insert has dialogue, but it does have sound-over; that is, background sounds are dubbed in after the film has been shot and edited. All the sounds required can be obtained from sound effects records or manufactured in the studio. For the sake of convenience and reduction of possible human errors in operation, it is preferable to record the sound on the film after it has been edited. Of course, an acetate disc could be cut or the sound could be recorded on tape or wire, but each of these systems has the disadvantage that it is an additional operation which could go wrong. It costs more to make a sound film, but not very much, and in the opinion of the author it is worth every penny of it in peace of mind and the knowledge that there is one less thing to go wrong. After the work print has been edited and the negative cut to conform with it, a sound film track can be shot by projecting the final work print, making the sounds to be dubbed in, and recording them on a separate sound film. This sound film is then printed in contact with the picture print negative and the result is a *sound-over* positive with all the sounds on it. If there had been dialogue, the cost for accurate synchronizing would have been considerably greater and the importance of the sequence might not have justified it. In that case, after a lot of practice on the part of the cast in timing their dialogue, a tape recording could probably be made which could be cued in at the proper time and provide lip sync sound.

The operation described above comes under the title of "Shooting on Location" or, more briefly, "On Location." There are a number of pitfalls for the unwary even in this comparatively simple task. Before even planning the operation, it is essential to ascertain that permission can be obtained from the owner of the property to take films there. This is most important, for if it should be neglected and the film shot and used, the owner can demand a fee for the unauthorized use of his property. If it is public property, it is always wise to get police cooperation before shooting or setting up equipment. In fact, in New York it is necessary to get a police permit to make films in public parts of the city. A good working contact with the police force will usually be very worth while, for in addition to making the permit available in cities where one is necessary, they will also keep areas clear and the public out of the line of camera lenses.

Light is a matter which causes more retakes than almost any other. This is not necessarily because of poor exposure in terms of adequate light on the subject but in terms of wrong light on the subject. By that is meant poor choice of light-value angles. Although there always appears to be all the light one can possibly want in the open air, it is not always exactly where it is wanted. Television audiences have become very technically minded since the advent of the movies, and the television producer must bear in mind the fact that as soon as the novelty of owning a receiver has worn off, the viewer will commence to look for technical flaws. For instance, in a scene supposed to occur at midday, shadows would be very short and squat. One or two hours either side of noon would not matter very much, but if the scene were shot much earlier or later the length of the shadows would give the hour away. Similarly, if a scene is shot depicting a certain time of the year, it is essential to ensure that the characters (in the form of the general public included in the background) are suitably attired. Girls passing in sheer summer dresses while the heroine swelters in a mink coat would be a dead giveaway.

Shooting midday shots in bright sunlight may sound very simple, but great care is needed to ensure that the eyes and nostrils do not become black pools of ink due to the excessive shadows cast by the combination of bright sun and its overhead position. In cases like this, gobos are essential or some form of auxiliary lighting must be used. Generally when choosing a location, it is possible to find one where the camera can shoot across the light so as to provide a degree of modelling and, if possible, to shoot very slightly into the light. In this way the objects will appear to stand out from their background, and shades of the proper gray values for television will be more readily obtained. Readers who enter the television field with a smattering of photographic knowledge are usually well steeped in the old precept "always shoot with the sun behind you." If a film is made under those conditions, the resulting picture will have very little or no depth. It will be the same as if the scene were illuminated by a floodlight as described in the chapter on lighting. All parts of the scene will receive the same amount of light, and as a consequence nothing will stand out in relief to model the subject. The converse, shooting into the light, will produce very dark shadows which will cause trouble with contrast ratios in projection onto the iconoscope camera tube. In the extreme, a form of silhouette is produced without much detail.

Finally, the location itself is certainly not the least important consideration. Wherever possible, pick a street, if it is a street scene, without much traffic. With all the good will in the world from the police, it is asking too much to block up an important thoroughfare while a two minute (screen time) scene is shot. Rehearsal before the expedition is most important. Having decided on the set to be used and the area to be used for it and obtained permission to shoot there from whomever controls it, the time of the shot should be decided. A plan of the area is then drawn, complete with compass directions, and the scene "blocked out" on the floor in a studio. Here the players will rehearse until they are part perfect and will require only one run-through on location. Of course, if sound is to be shot at the same time, they will also be word perfect by this time. During this time camera shots are planned with due regard to the light conditions normally obtaining at the time of the shoot, so that on the actual day everyone will be prepared and the action can run smoothly with everyone knowing what he is to do and how to do it. By following this routine on location, shot costs can be cut by as much as 60 per cent in extra time and labor charges.

Chalk marks are made on the ground wherever necessary to show actors where to stand and to indicate camera limits. If required, gobos will be used to provide fill lights similar to those used in the studio and to ensure adequate lighting of the shadows. When everyone is ready, action starts as described elsewhere.

Thus far in this chapter only the use of film as an aid to live production has been discussed and in that respect only as an insert or scene which could not otherwise be produced. However, there is another manner in which film can be, and is, used as a direct production aid. That is by using it to break up a difficult production so that time is provided for the crews to get new sets ready or change camera positions. Live television productions and film making have a lot in common as far as operation is concerned, but there the similarity ends. As has been pointed out elsewhere, television live shows must go on the air as a continuous production, and the only break usually afforded the camera crews and participants is for a commercial. This means that quite frequently certain shots are impossible to obtain because of the difficulty of getting a camera in the right position at the right time due to the fact that it would appear in the field of view of one or more of the cameras in use. To a certain extent, the Zoomar lens has solved some of the problems pertaining to special close-ups by making it possible to get very close shots of action occurring at a distance. But, even with the aid of this lens, certain shots are still hard to make because of the angles involved. If it is required to show some business that is important to an understanding of a character but which must be hidden from the general view of the other players, then a switch to film for this is easy and logical. The live sound can continue unless problems of lip sync are involved.

For remote pickups which do not come under the headings of newsreel coverage and where the most interesting action may occur sporadically, or at any time within limits, film offers the only well-planned way of presenting it. This feature of all shows, whether they are factual or fiction, is called continuity. To be good, a production must have continuity; that is, it must flow smoothly with a steady pace, or, if the pace is controllable, then if it slows it must be possible to speed it up to recapture the audience's interest. This continuity control is called editing. Quite obviously in many cases the subject does not require much editing. For instance, a parade, if properly marshalled, should not need to be edited since the waning interest of one section will be revived by the appearance of the next. The people watching it at home see it in pace with those present. However, something like a royal wedding, in which the crowds may have to wait for some time between appearances of the personages in their carriages, is all the better for editing which removes the tedious waits between action shots. There is another side to this also and that is the fact that time on the air which has little or no appeal shows poor production. In the case of the wedding, or similar event, a film crew can be sent to record the whole thing and the editor will cut out those parts which do not have any action. Another such event well suited to television, but especially to delayed televising via film, is an air show. In this particular type of event there is very often at least one race starting or finishing while some other action is taking place. If live presentation is used, one of these events has to be missed, but if film cameras are there recording, both the films can be combined and excellent continuity obtained for the whole show.

There are many examples of the uses to which film may be put in television programming apart from those given above. The only limit to them is the individual producer's ingenuity in devising means of using the medium, always bearing in mind the fact that the simpler the operation, the more likely it is to be accepted by the audience and go off without a hitch. In addition to those examples cited above, film inserts may be used to provide settings for exteriors, such as foreign scenes, period plays, or to establish moods, such as an idyllic love scene with birds and hearts! More practically, film inserts may be used to set the moods for such events as a storm, with angry waves dashing against a cliff or breaking over a ship at sea, or perhaps for the eruption of a valcano smouldering after or before the cataclysm. A particularly effective suspense shot can be inserted by a shot of lava slowly and sluggishly flowing down towards the central character or scene. The slow, inevitable approach of the mass suggests a relentless monster or approaching doom.

Flashbacks to another time in which the players appear in different costumes are out of the question unless a film insert can be used. The time taken to change clothes precludes such quick changes of scene. Or perhaps it is necessary to show a player's dreams along the lines of *The Secret Life of Walter Mitty*. In that case, only film could fill those famous flights of fancy.

In the production of titles, film is probably the most versatile of all mediums. Many titles are drawn on cards and photographed by one of the studio television cameras. There are many different ways of presenting titles; the most popular may be the cards which are flipped over like a desk calendar. If the play is of an historical or period nature, atmosphere would be added if the title were superimposed over an old castle or historic action scene. To do this, a piece of film of the required subject is made into a loop of film perhaps four or five feet long, maybe longer. This is run continuously through the film projector during the time that the title cards are being flipped. The technician at the fader controls fades the film picture over the output from the camera with the titles so that a superimposition results in which the titles appear clearly over an appropriate background setting. The degree of intensity of either can be controlled, and it is quite effective to fade out the last title and commence the action with the film as the opening set. This makes for a very smooth transition into the story. On film, the same effect can be produced by the use of the optical printer. Another use for film in titles is to photograph the titles on film and project it for the opening. Unless the title is one which will be used more than once, this method is not very economical since in addition to drawing the title cards they have to be photographed at additional cost.

Commercial treatment is dealt with elsewhere. However, since the subject of film integration cannot be left without mention of this very important aspect, it will be considered briefly. In the case considered, the commercial is fitted into the story and a smooth transition is made. A suitable subject would be the Suprabat Battery advertisements which show an incident occurring after dark in which a flashlight powered with a Suprabat Battery saves the "day." The narrator could appear on the screen with a reminiscence and as he talks he is faded out and the film faded in. He continues his narration during the action of the film following standard sound-over technique. In front of him is a monitoring screen with the film action appearing on it; he reads his script or ad libs according to the program, timed to the action on the screen. If he is reading a script he will have a director to cue him for timing, telling him in sign language to speed up or slow down. Then as the action finishes the film is faded out and the narrator is again seen, perhaps wiping his face with the comment, "Gosh, that was a close shave. I'd have been lost if it hadn't been for Suprabat!" Of course, the whole short could have been on film and in that case the production would have been easier from a technical point of view. But, by making an "open-end" production of it, it is suitable for any special announcer or favorite of the listeners of a station, to produce.

Film's most potent operational advantage is its certainty. For commercials this is a must; for the general production it is almost as definite. The time will surely come when important productions will be recorded on film for transmission at the proper time. The instantaneous nature of television makes every scene in every production liable to go wrong on the air. It also means that no last minute changes can be made in camera shots or action. In one production a door was supposed to open mysteriously. After the final rehearsal, the director decided to move the camera covering that shot. When the program went on the air, an arm and hand were seen opening the door. The whole effect was ruined. If the scene had been on film, the fiasco would not have happened. Or if it had been rehearsed again the director would have caught it. This illustrates the overwhelming need for sticking to production plans once they have been made. Film makes that possible by making changes in the story impossible once they have been made. But even with film, errors can occur in the editing and printing processes.

Not so very long ago a spot film for a well-known tobacco company and an equally well-known candy maker were sent to the laboratories for printing and marrying to their respective sound tracks. When they were received from the laboratory the program assistant fortunately was conscientious and ran them through to check for breaks and quality. It was fortunate he did so, for the candy advertiser's film started off well and got to the point where the announcer said, "Take a bite into this delicious combination of milk chocolate and coconut and . . . blow it through your nose for sheer, deep-down smoking pleasure!" Somehow the sound tracks had become mixed! No one had checked at the laboratory, and if they had not been run through before air time there would have been two very disgruntled sponsors.

This illustrates the great care needed in dealing with film when it is received from the library. Merely because the can says "Home on the Range," and the leader also says it, is no indication that it is "Home on the Range." The only way to be sure is to run it. Apart from this aspect, that of film condition is important. It may have been sent out without checking since the last user and may have a number of breaks in it. It may be rewound the wrong way round with the emulsion on the wrong side; it may be sound film with a double perforated leader and be rewound so that the sprocket holes in the sound film are on the wrong side with the result that as soon as the sound film commences there are no holes for the teeth to engage, the bottom loop on the gate is lost, and there is, of course, no sound either. Anyone of a number of things can be wrong with the film, and running it without the precaution of checking it first is asking for trouble.

CHAPTER 15

NEWSREELS FOR TV

It is in the field of news that television was logically expected to excel by its promoters and even by its opponents. Catching that fleeting event as it happened and transmitting it to viewers far away seemed to be the fulfilment of man's dream to see things all over the world as they occurred. However, because of the lack of cooperation on the part of news worthy events by occurring at awkward moments, such as late at night, or in the early morning or afternoon when too few viewers are normally tuned in to make a transmission of any value to a sponsor, it was found desirable to record these events on film, in much the same way as wire or tape recording is made of an aural event for later use, and broadcast it at more convenient hours for the audience. Thus the television newsreel was born. It is almost identical with the familiar reel we see on the theatre screen.

The first newsreel was established in Paris by Pathé Freres in 1909. Its popularity resulted in an American version started in New York about 1910. The early reels were quite similar to those we see at the present day; there was the inevitable horse race, baby show, bathing beauty parade, and then, to attract the ladies, the fashion show. The usual reel length was 800 to 900 feet and, of course, ended as it still does, with sports of the day.

The early newsreels did not suffer so much from the rigidity of the present-day version, probably because of the newness of the medium. Today, it is almost possible to predict the contents of a newsreel before even seeing it. In the editor's assignment book there will be the regularly occurring events from year to year, almost to the same day. These are religiously covered because they are "bread-and-butter" news that is there for the filming and that offers little in the way of inconvenience in getting it. The present trend in theatres seems to be away from the newsreel, and many of the chains are discontinuing the exhibition of this matter. This is noticeable both here and in Great Britain. Strangely enough, the home viewer seems to like to see news on his screen more than he does at the theatre. This may follow the pattern set up in aural broadcasting where the newscasts have always been quite popular.

The home viewer demands a slightly different approach to the news event, and it is of importance to the tentative producer to examine these requirements so that his product will appeal to his audience. Most devotees of the television newsreel demand more detail and subject matter. In other words, their complaint anent the theatre newsreel is that there are too many subjects, none of which is treated in sufficient detail to do more than whet the interest before it is gone and something else is on the screen. In newsreels for the theatre, screen cuts are sometimes as short as four or five feet; members of the television audience complain that these brief flashes are confusing and they want to know more about the subjects. It appears that the televiewer wants more information and longer sequences in his news films. This is being done by Telenews of 1600 Broadway, New York, which is producing the first, and best international newsreel for television.

Telenews service is very complete. It puts out five 16 mm reels a week on negative stock and two on 35 mm. The latter is sound while the former is silent supplied with script for the narrator to accompany the film. The cost at the time of writing is fairly high, but it is not given because cost decreases as more and more stations use the services they provide. The daily (five a week) newsreel runs about eight minutes with the balance of time available for local spot sales and announcements. The only time that sound is supplied on the film is when sound occurred at the location such as a speech or concert, etc. The weekly twenty-minute reel is scored for sound and music is on a disc. This lends itself to very effective presentations in quite the manner of a first-rate theatre newsreel. Incidentally, INS-Telenews has an agreement with many countries to exchange film to get foreign film for America.

There is also a still news service which has perhaps twenty-five stills of important news events taken from the wire of International News Service (that is, of course, INS). The latter tied in with Telenews and they formed the INS-Telenews service. It was an obvious necessity for the news services to tie with television operations since their whole operation exists only to provide news to stations and newspapers. Thus UP has tied in with 20th Century-Fox.

Quite a large number of television stations produce their own newsreels, either by employing outside production firms, or by using their own staffs. The majority of these are made on 16 mm film since economy is a highly important feature of all their operations. Generally speaking, these films are available to other stations on an exchange or rental basis, but so far not many stations have done much about it in this direction. Individual, small unit newsreel production will be dealt with later in this chapter so for the moment we'll return to the major newsreel.

Movietone News and Telenews have been for a long time the only professionally produced news films available. The former, of course, was made exclusively for the theatre audience, but judicious cutting made it good entertainment for the television audience. It is possible that by the time this book appears in print a special television version will be made.

The Telenews organization is similar to the long established theatre newsreel companies. It is completely established on an international and national basis, with exchanges in London, Rome, India, and most major cities in foreign countries. At home every city of any size has a representative either in the form of a "string man" or full-fledged camera crew(s). At this point, it may be a good thing to describe a string man. In most cases he is a man who is living in some part of the country where the newsreel company desires coverage but where there is not enough day-to-day work to keep him going on a full-time basis. The company either pays him a retainer of a few dollars a week and a lower footage fee for his film, or pays no retainer and a higher fee for his footage. He owns a camera and whenever news occurs he shoots it and forwards the film to his office, usually undeveloped. If the material is good and of current interest, or can be kept and released later as fill or stock shot material, he receives payment. In other words, he operates in much the same way as the AP or UP correspondent who sends in hundreds of words every week and probably gets only one—or less—inch published at a time. But when he *does* hit the news he also hits the jackpot, and his name goes over the news lines with his material and he gets a by-line.

The job of string man is not exactly lucrative and in itself would probably not pay enough to live on unless one were very fortunate in location and had news happening every day. A good memory and keen recognition of faces are essential for this kind of job in addition to photographic skill, for very often a public figure such as a film star or politician seen in a town off the beaten track presages news events worthy of the television screen. On the other hand, the string man is apt to have his feelings hurt sometimes for if there is known to be a big news event coming off at his town it is very likely that the company he works for will send their own complete crew to cover the event. From the point of view of the company, too, unless they know the man extremely well, leaving him to his own devices in the optimistic conviction that he will cover everything is not good practice either, for he may be out cutting corn just as the wire on the hot news comes through, or he may be unavailable, although any string man worthy of the name will always leave his phone number wherever he goes—like a doctor.

This seems like a good time to discuss the method decided upon by the station in which the reader is assumed to be working. If he is in a position to decide policy there are many factors which should enter into consideration. First off, newsreels can be bought outright, or what amounts to made to order, by a news outfit. This is apt to be expensive and not always too satisfactory. Renting in the standard manner is much cheaper and in the long run usually more satisfactory. Prices for rental are not included simply because they are changing so rapidly that they would be of no value to the reader. The biggest demand for news is from the local viewer, the people who support your station, and in most cases they are much more interested in what is going on down the road than what happened in China last week. Human interest beginning in the home town is what they want. If they see places they recognize on the screen and see familiar faces and figures, interest is sustained. But a shot of the UN, while a very praiseworthy organization, is not half as likely to appeal to the people in, say, Albuquerque, as are shots of New Mexico fiestas. A point to watch here is the risk of not seeing the wood for the trees; that is, ignoring some highly interesting local event because of the thrill of big names somewhere else. The average human is a "ham" at heart and loves nothing better than to see himself on a movie screen, the larger—in terms of audience—the better. If it were not for this, how can one account for the sale of so many home movie outfits? If the local citizenry know your station makes and shows home town news films taken in places where they are likely to be, they will make a practice of tuning in to watch and your Hooper, Neilson, Conlan, Pulse, Radox, or what have you ratings will go up.

Human interest is something that always gets 'em! The bigger the event and the person concerned, usually the better chance there is of dressing it up for television. If it is a big event by local standards but not really front page stuff, it can be made more so by window dressing. Most people respond to the magic words, "We are going to televise your show," by being eager to do anything to cooperate. For instance, suppose the Veteran's Administration declares a surplus on housing funds and decides to build a swimming pool at the site of the latest housing project. It can be a mediocre affair with the mayor digging the first sod with a shovel and everyone not too interested, or it can be a slap-up show with the mayor using a bulldozer to start the excavation. A word in his ear before the day will usually be sufficient to start things working, if it is worked properly. The foregoing applies equally well to what we are going to discuss next—self-produced newsreels—and is probably more pertinent to that topic.

The reader is assumed to be in the process of forming a television newsreel service. The first decision to make concerns the number of programs which will be produced each week. If the town is average size, then a daily reel will be apt to run rather thin at times (this applies to cities other than New York and similar big metropolitan areas). Therefore a tri-weekly program will probably fill the bill very well. Each production may run for about seven to eight minutes or it may be say twelve to fifteen minutes. If the advice already given to lengthen the time devoted to each story and expand it in greater detail than is done in theatre newsreels is followed, it means that about four subjects can receive good treatment. The minimum personnel required to produce this newsreel are listed below. It must be borne in mind that the number of people quoted will vary considerably from station to station. Also, the question of whether all or any of them will "double in brass" by being part-time on other station jobs enters into it.

Assignment Editor Probably the news director for the station if it has an AM or FM operation. If not, he may be the film director or his deputy, depending on the setup.

One, or preferably two silent cameramen One may be a part-time regular TV camera-man or other half-and-half job. The other should be full-time man capable of good work and able to make spots for sponsors if needed.

Editor-Librarian The film editor usually doubles as a librarian in small stations since he may not have a great deal of work to do and setting up a film library and cross index system is most important.

Projectionist-Writer—contact man This is a job where there may not not be much projecting work, but writing the script for the newsreels and contacting news sources is important.

Grip-Handyman He does all the carrying of equipment, fetching coffee and sandwiches, and going back to the station for forgotten film.

The above is the absolute minimum and many other job classifications will come to mind and become essential as soon as the department is organized. The assignment editor should be a man who knows people and the town well. He should be well in with the city administration and be able to get hot tips on what's happening. In this respect it helps if he is a student of human nature, for sometimes watching people leads to being on the spot, and even in the line of fiction where the smart reporter solves the murder, a clever and understanding assignment editor who has his finger on the pulse of his town may get similar scoops. Unless the event is known to be small, the best cameraman available should be sent. Quite often the man who doubles on the TV camera will be happy to be on call nights so that if anything really big does break then—or even if it's only small—he can cover it while the other man is being located.

It is assumed that everything we discuss here in connection with newsreels is for 16 mm film. The same treatment applies to 35 mm except that its use presupposes the intention to sell to other services on a regular basis, or even for syndication. In the latter case, more personnel would be used and the whole cost would rise due to the increased cost of 35 mm stock and personnel to operate the equipment. Most of the news will be local since there is no way of covering events more than 50 to 100 miles away. However, local news is the thing people want, and this can provide not only bread-and-butter work, but even a little cake for the station if properly handled. Anytime really important national news breaks stock footage can usually be obtained in a few days for insertion, or a special reel can be rented.

If the quality of work and production is good it should be possible to sell to Telenews or other organizations and so reduce overhead. So much depends on the location of the station. If it is in an area where events seem to occur frequently, or near Hollywood, it is probable that quite a number of feet can be sold. On the other hand, even the smallest town can sometimes provide exciting news for a wide-awake cameraman. An unusual fire, swarm of grasshoppers, train wreck, or any one of a number of events can be sold. If business is very slack in the news line it can even be drummed up by having the station organize some sort of novelty week. If it is cleverly planned, well promoted, and *unusual,* it will hit the national papers and good footage can probably be sold; charity drives are always good for publicity especially if tied in with veterans in some way.

One of the most important—if not the most important—things in newsreel work, apart from film quality, of course, is accuracy. Names MUST be spelled properly, titles given correctly, and personalities treated with respect. Facts must be given a meaning and be right, as must the actual identification of places. This means that positive identification must be made at the time the film is exposed and accurate notes taken on the occasion, since the writer of the commentary will need these for his script. Sometimes research is needed to trace back an event and tie it in with former news stories. In this case the *New York Times, World Almanac,* or *Chicago News* are about the best sources. Generally speaking, small station operation will not demand a great deal of research, and those subjects which do will generally be local personalities so that local papers will probably have all the information required.

The question whether to shoot silent or sound is sure to crop up sooner or later, so we may as well settle it now. Almost every newsreel film is shot silent, that is at least 90 per cent of them. Most functions and events do not require either synchronized sound or sound that is recorded at the location. The only time that lip sync sound is required is for interviews or events where the mayor or some other public person is appealing for something such as money or re-election. Then, of course, sound must be used and it must be synchronized. On all other occasions sound is not only not necessary, but is also expensive and, strangely enough, it is not as satisfactory to record the actual sounds as it is to fake and dub them in, in the laboratory. Everyone is familiar with the sound effects man used in movies and sound broadcasting. He never uses the real thing to produce film sound. For a large explosion he uses a .38 revolver fired in a barrel—blank, of course. It sounds like 100 pounds of dynamite blowing up a building. Airplane motors are produced by rotating small wheels with strips of leather on them very rapidly on an electric motor. It sounds better than the real thing when recorded. Similarly, to imitate the sound of flames, paper or cellophane is rustled in front of the microphone. By dubbing the sound in later like this, its quality can be controlled very closely.

A point which is probably even more important is that of costs. If sound is taken to the event it will require the services of at least two more men to operate and carry the equipment. This means increased labor costs, overhead, maintenance, and eventually these are reflected in the price for which the program can be sold. If you listen carefully to the next local newsreel you see on television you will notice that all or most of it is accompanied by the narrator's voice alone without any sound effects.

The equipment to be used occupies a most important place in the consideration of the film department. Quite obviously a camera will be required—better to have two in case of repairs and for use of the part-time cameraman. We have already said no sound, so that narrows the field considerably. If money is tight, as it usually is, the good old stand-by, the Cine Kodak Special, is probably the best all-round camera one can buy. With its two-lens turret and facilities for motor, hand and spring drive, as well as the single picture feature, it is amazingly versatile. The Bell & Howell Filmo series is also excellent for this purpose. If we run to more ambitious equipment there are the Mitchell and Maurer cameras. Now if we decide that we need a single system sound camera for multiple purpose operations, the Auricon at once comes to mind. This camera, while being in the low price field, is also well made and performs satisfactorily. Although it is a single system camera it does not have to be used that way and it can, of course, be used silent. However, it suffers from the disadvantage of requiring a 110-volt power supply to operate it. Generally a completely self-contained camera is better for field work since one never knows just where the next scene will be taken. Film editing and splicing equipment is also required, as is a titling outfit. For checks and demonstrations to prospective sponsors a projector is an essential. Since it will probably be used for many purposes it is advisable to purchase one which also

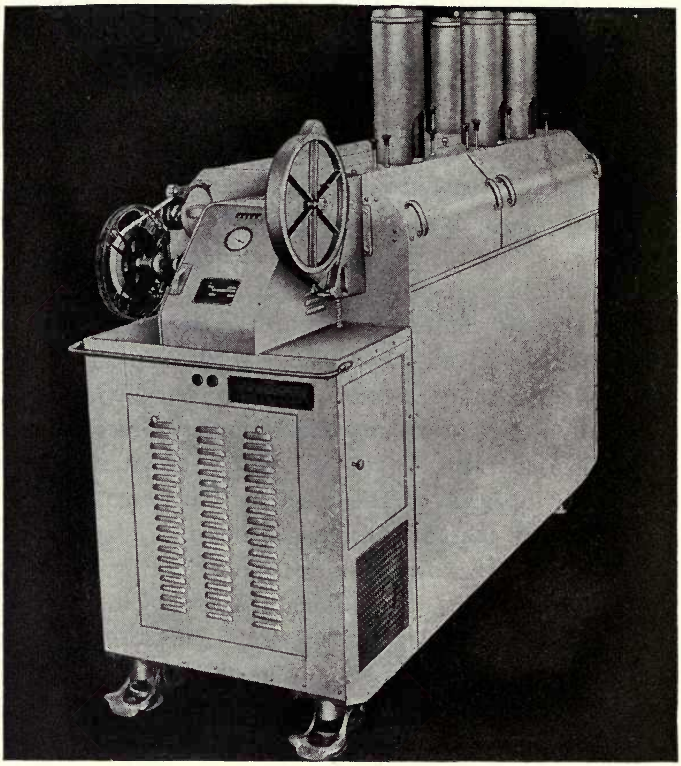


Fig. 15-1 The Houston model 22b processing machine for negative-positive and reversal 16 mm film.

handles sound. Spare reels and containers are needed and a good storage cabinet for them. Carrying cases and a sturdy tripod for the cameras come to mind automatically.

The last problem to face in setting up a small station film or news operations is both costly and important. To process or not to process? Many cities today have laboratories where film can be processed and returned in a day. This is true of all the large cities. But in the smaller ones a problem sometimes exists because the nearest laboratory may be 100 or 200 miles away. In this case film can either be flown to be processed or it can be done at the station. Flying the film can usually get it back in twenty-four

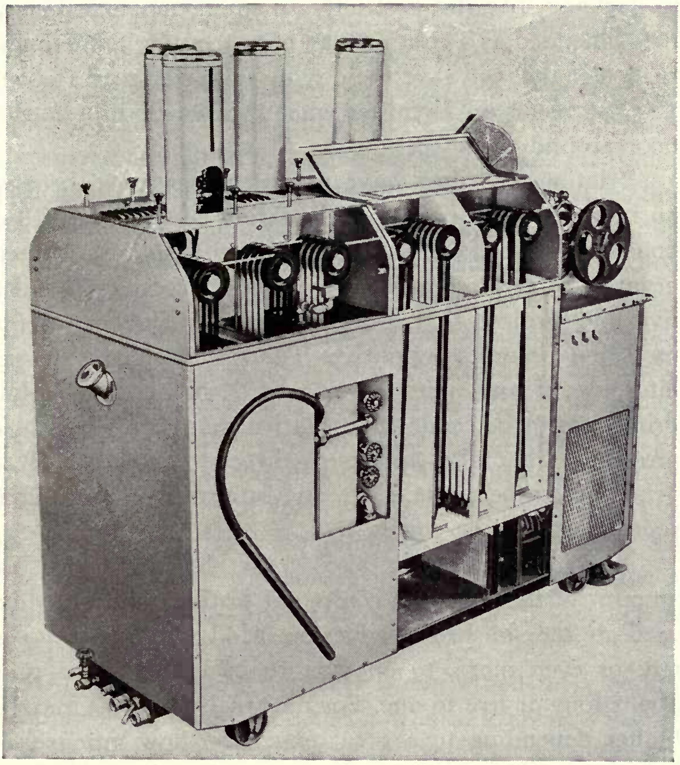


Fig. 15-2. The Houston model 11B processing equipment showing internal arrangement of rollers and passage of film through tanks.

hours, particularly if special arrangements are made with the company concerned. Processing at the station is apt to be expensive and it will take many years to amortize the equipment. If there is enough work in the town from amateurs or other users of 16 mm film then it might be worth while, or if a franchise can be obtained from one of the large movie companies, but usually the latter prefer to do their own work so that it can be properly controlled. Another point that is highly important—fine-grain work is required and even if a laboratory is near it may not be able to turn out work which is suitable for the television screen. In an emergency film can be developed in a milk bottle in the bathroom in darkness, but this is strictly an emergency expedient and is not recommended as a routine way of processing. Sometimes for a late rush shot this will save the day or enable a scoop to be made. But 100 feet seems an awful lot when tangled up in a bottle or on the floor around one's feet!

Printing machines have not been mentioned because there is no need for them in the small station layout even if processing is done at the station. The faculty of the film-TV camera to take negative or positive film makes it only necessary to edit the negative and project that, or, of course, direct-reversal film can be used and becomes a positive. The system chosen depends on the later use, if any, that is going to be made of the film. If extra prints are to be made the negative should not be run through a projector; that also applies to direct-reversal film if subsequent prints are to be made, since any scratches on the original will be reproduced on the copies.

A point to consider also is the shooting ratio. That is the amount of film exposed compared to the amount of film actually used in the finished production. Hollywood may go as high as ten, or even more, to one; an average for a film production is about four or five to one. For newsreel work this may be lower or higher depending to a great extent on how much has to be deleted when the events crowd out previous news. But it is obvious that double sound recording with its double, or even triple amount of film, as well as extra editing problems and time requirements place it well outside the normal scope of a small station.

The film library is something which will grow with the job and the station. This is the place where all the film that has been shot or bought is kept. It is imperative that all persons who appear in any news shots be positively identified for use at the time, and later for indexing purposes. The best system for positive 100 per cent film identification is to write or scratch in indelible ink on the leader the title and index number of the subject. Cards should be kept in each can with the subject and there should be a label on the can itself. Sometimes the reels themselves are labelled. But none of these things is sure, for films can be put back in other cans, cards can be left out and, easiest of all, other films can be rewound onto wrong reels.

Film should be indexed with master cards and cross reference cards. Suppose you were cataloguing Rita Hayworth's marriage. It would go under her name, of course, and Ali Khan's. It should also go under "1949 Screen Weddings" or a similar title, and "Film Star Weddings," and perhaps, "Aga Khan." This may seem a lot of effort, but it certainly simplifies searches for suitable film clips. If a properly organized and maintained library is not established it will mean wasting hours and hours in screening odd bits of film to see what they are about. One piece of film looks very much like another when it is on a reel. A point to note here is that it is always dangerous to use shots out of newsreels for productions after the news value is over, or to use them out of context if there are people in them who can be identified. This constitutes invasion of privacy and unauthorized use of another person's likeness for profit without permission or release as it is generally called. This is dealt with in more detail in Chapter 22 so we will leave it at that.

As far as the technique of shooting is concerned there is only one which applies to the newsreel; this is what is known as *uncontrolled*. That is, the cameraman has no control over the actions of the subjects and everything that happens is unrehearsed. Of course, there are exceptions, such as shots of politicians and famous people or groups of people, but for the pure newsreel in which news is recorded *as it happens* the action is uncontrolled. In studio production filming everything is controlled so that the cameraman knows what is going to happen next and is prepared. But even the newsreel will be better if it can be made more of an artistic production by the proper use of production tricks such as cutaways. Frequently, because of lack of time or film, it is impossible to show all the action as it occurs. But in order to carry the story—there *is* a story in newsreels, otherwise they are flat—reference to it should be maintained. A very brief cutaway to some object which tells the story of what happened makes the whole shooting hang together in a very professional manner.

Suppose we are filming a train wreck; the action of clearing the track may take hours or even days, and yet because it is a local wreck and we are shooting for our local station and local personal interest, we want to tell the whole story. In this case it is obvious that the whole job of clearing the track could not be filmed and shown on the air. So a cutaway is made; perhaps a shot of the huge crane commencing to lift the wrecked engine. This fades to a calendar or perhaps a trainman's watch which spins rapidly, or the calendar leaves strip until the new date or time is shown. This takes only a few seconds of screen time, but it covers maybe twenty-four hours. The story on the screen remains coherent and there is no need for the narrator to say much about what is occurring. One of the most important things to remember in shooting newsreels for the television screen is to keep away from long shots and employ plenty of close shots. It is especially important to avoid limiting the duration of shots which *locate* or tell a story about something the audience has not seen before; otherwise they will only be confused and dissatisfied. That is their chief complaint against movie newsreels—not enough of each subject to explain the story fully or to satisfy their interest.

Stations which are owned and operated by newspapers naturally have both a greater interest in getting out good newsreels and better facilities for their production. The services of one or more of the news services are available to them; also, they probably have wire picture services for stills. An illustration of heavy news work by a newspaper station is WGN-TV owned by the *Chicago Tribune.* This station has been shooting about 6000 feet of film a week. In the first one hundred days of operation 476 news assignments were covered; of these 396 were used. During this time 50,000 feet of film were shot and about 33,000 finally used. Another newspaper owned station, WEWS—the Scripps-Howard station in Cleveland—does a good job in shooting a ratio of about two to one. Between 2000 and 5000 feet of film a week are used. Either positive or negative is used for telecasting.

As time goes by, and more stations come on the air, operations will broaden, the amount of footage shot will increase tremendously, and so will the importance of the film department in station operation.

The type of film stock used for newsreel production has an important bearing on the acceptability of the finished product, but usually there is not much choice in the usable emulsion. Most unexpected events seem to occur under conditions of minimum light which necessitates fast emulsion with consequent coarser grain. Even if extra lights can be arranged, the conditions often result in high contrasts at the scene with consequent flare and poor shading during telecasting. The usual emulsion for all-round work seems to be either Du Pont 330 which is a fine-grain reversal film, Du Pont 314A and 301A for negative-positive use, and in the Eastman Kodak line, Super-XX panchromatic 5242 for negative use and Kodak Super-X reversal panchromatic 5261.

Color is almost never used for news film work for the reason of light availability and the somewhat ephemeral value of news material. Probably "never" could have been stated, but since there is always the exception to the rule someone somewhere may be using it occasionally.

CHAPTER 16

PROCESSING NEWSREEL SCRIPTS

After the newsreel has been photographed and edited there remains the problem of the "words" to be used. Shall it be made into a sound film with a sound track dubbed in, or shall it be narrated in the form of sound-over by an announcer reading the script as it is telecast? There is a third alternative which is to record the sound on wire or tape and play it back while the film is running. If the tape has been properly recorded against the projection of the film with start sound and picture marks, then it should be satisfactory. However, this method is not recommended since it is very easy for something to go wrong with the tape or wire—or for that matter, disc reproducer—so that the sound runs away, or lags.

The first step in writing the narration is to time and measure the film and break it down into individual scenes. In other words, prepare a scene list. After this, the time in seconds is noted against each scene as an advancing total so that the total time of the whole film is known as well as the individual scenes. For example, see the table at the top of page 297.

To find the length of each scene the film counter is used. The dials are set to zero and the first frame set up on the top of the sprocket. When the desired frame or cut mark has reached the same point the dial reading is noted. This is the length of the scene in feet; the conversion table on page 298 provides a quick and

Story: Air Crash

Scene Description	*Scene No.*	*Feet*	*Time (in seconds)*	*Time Total (in seconds)*
Plane approaching field	1	9	15	15
Shot along runway	2	18	30	45
Long shot, wheel collapse	3	6	10	55
Long shot, fire trucks going out	4	6	10	65

easy means of converting to time. For accurate synchronization of picture and sound, or work print and negative, a film measurer incorporating an additional dial calibrated in frames, is used. Thus a length can be expressed as 16 feet, 33 frames, etc. No illustrations or examples of typical editing and timing sheets have been included since many individuals prefer to make their own.

The point that so many producers and writers fail to realize is that the medium is tele*vision*; that means the pictures should tell the story. So if you have good pictures which really do a good telling job, hold the narration and let the pictures tell the story. When there is writing to be done it should be timed at the rate of approximately four seconds per line of 68 characters or typewriter strokes. One way of writing is to set up 68 strokes on the margins by setting the left to 10 and the right to 78. Of course, there are countless other ways of arriving at a count of 68, and it doesn't matter how it is done. But it must be remembered that every stroke of the typewriter counts, and that means spaces as well as punctuation marks. So in the table we have above for the imaginary newsreel, the *maximum* lines of 68 points would be for each scene:

Scene number	1	15 secs	3.75 lines
	2	30 secs	7.5 lines
	3 & 4	10 secs	2.5 lines

Just because all that time is available does not mean it has to be used. If the picture does not need words, don't use them. The story should be simple and avoid long or unfamiliar words since they distract the listeners' attention as well as lend themselves to loss in transmission due to inadequate sound systems.

CONVERSION TABLE FEET TO SECONDS—16 MM STOCK

Feet	Seconds	Feet	Seconds	Feet	Seconds
1	1⅔	13	21⅔	25	41⅔
1½	2½	13½	22½	25½	42½
2	3⅓	14	23⅓	26	43⅓
2½	4⅙	14½	24⅙	26½	44⅙
3	5	15	25	27	45
3½	5⅚	15½	25⅚	27½	45⅚
4	6⅔	16	26⅔	28	46⅔
4½	7½	16½	27½	28½	47½
5	8⅓	17	28⅓	29	48⅓
5½	9⅙	17½	29⅙	29½	49⅙
6	10	18	30	30	50
6½	10⅚	18½	30⅚	30½	50⅚
7	11⅔	19	31⅔	31	51⅔
7½	12½	19½	32½	31½	52½
8	13⅓	20	33⅓	32	53⅓
8½	14⅙	20½	34⅙	32½	54⅙
9	15	21	35	33	55
9½	15⅚	21½	35⅚	33½	55⅚
10	16⅔	22	36⅔	34	56⅔
10½	17½	22½	37½	34½	57½
11	18⅓	23	38⅓	35	58⅓
11½	19⅙	23½	39⅙	35½	59⅙
12	20	24	40	36	60
12½	20⅚	24½	40⅚		

When titles are required, either sub or main titles, it is good practice to keep them as short as possible so that larger point can be used with the result that they stand out more clearly. Every reader must have seen those titles on the older movies which are so small that the usual smearing of transmission renders them difficult, if not impossible, to read. A reasonable general figure to work to is 30 characters for two lines for a main title.

The narration, if it is done live, and even if it is recorded for repeat use or dubbing onto the film, is done in the following manner. The narrator sits in a small studio which has a television monitor in it. With him is a director who watches the screen. The narrator does not look at it at all—if he does, he will probably lose his place. After some practice runs, the film is started and the director cues the narrator to start reading. If the latter runs slow or fast he is given cues by hand signals on his shoulder or other prearranged code. It is not as difficult as it sounds and it is astonishing how proficient a man can become doing it.

It is in the creation of the script that the thoroughness of the research work done by the producer or cameraman or editor shows up. Here is the place where misspellings or mispronunciations or other misinformations are aired to the world, and if there are any errors it does not take long for the world to point them out. The delivery must be slow and clear. Everyone has heard the frenzied voice of the sports reporters on radio and newsreels. That style of delivery is not required for the average scene in a news film, apart from sports. Remember that television sound is not always very clear and insist that your narrator watch this point.

If it is desired, of course, there is nothing to prevent the sound from being recorded on the film. But this entails a double process in that after the film negative has been edited, the sound is recorded on some form of synchronized or semi-synchronized medium such as tape or discs. This is then transcribed onto the positive which is made from the negative film. Thus, there is not only more time taken in the double printing and processing but the cost goes up greatly which is even more important in many stations.

Although the following may perhaps come more nearly under the heading of production of newsreel rather than writing, it is included here because so much can be said by the leaving out of words as well as their inclusion and even more so can words be implied in the way film is cut. As will be seen in the editing chapter, a good editor with well-shot film can tell most stories without words. As usual, get signed releases, if possible, if anyone is featured. And most important of all, refrain from poking fun at anyone or making fools of them. At football or other public games the members of the audience are part of the general scene; by their very presence they *form* the public. Therefore, a pan shot of them in the stands or bleachers is quite in order, but beware of returning to someone with a "funny face." The temptation to get a laugh out of a person fast asleep at a church service, or actively picking his nose in the middle of a dull spot in the game is strong, but if the director does do that, he is inviting a suit for damages for ridicule and hurt to pride. The 1948 presidential conventions in Philadelphia, when they were televised for the first time, contained a number of shots like that, and yet in some way or other there were no suits of which the author ever heard. But that was sheer luck and may not happen again.

In the case of flagpole squatters or others who perform silly stunts just to get in the public eye, it is best to let them be their own ridiculers by not commenting. Usually the picture itself is enough for a laugh; the same thing goes for peanut pushers. Even though the action *is* foolish, the courts are quite hard on statements which tend to ridicule or hurt people's feelings. Some of the sweepstake winners are filmed for news; here is a case where a release is absolutely essential, for in many cases the results are very humorous, and the subjects take umbrage at their appearance on the screen.

It goes without saying that religion or race should not enter into any commentary or even have any bearing on the treatment on the subject.

CHAPTER 17

FILM COMMERCIALS

Elsewhere in this book mention is made of the fact that the three minutes of commercial time in every half-hour is the sole reason for the advertiser's investment in television. Similarly in the case of ten-, twenty-, or forty-second spots or station breaks the message that the sponsor wants to get over is the only purpose he has in buying the time and preparing his sales message. In each and every case he wants to be as sure as humanly possible that it will be telecast the way it was rehearsed to give it maximum impact on the buying public.

In the case of operating products, demonstrations are usually the best means of drawing attention to good features and highlighting comparison with competitors. But live demonstrations are not always satisfactory for various reasons. The demonstrator may not be familiar with the equipment, some external agency may fail, such as a power failure in the middle of a washing machine demonstration. There are so many things which may go wrong that even thinking about it can give a sensitive sponsor a headache. Apart from the commercial, which is, of course, the most important thing in the program, special effects or tricks are best done on film. If certainty of operation and best performance are required, then film is the only medium which can guarantee it as far as mechanical perfection is concerned. Of course, in this statement we include slides, which, although static, are also capable of error only as far as the limit of human care is concerned.

Before film for both commercial and program use can really come into general acceptance by the viewing public and the advertiser, many improvements must be made. This does not mean that the medium is no good—far from it, in fact—but in far too few cases the transition from studio or even remote program to film is much too obvious. Sometimes it is due to lack of care and experience on the part of the technician; at other times poor quality of film makes itself so obvious both in sound as well as picture that even the least critical viewer must remark it.

The technician problem is one that can only be eliminated by training and perseverance on the part of station management. At the time of writing the supply of competent technicians is severely limited. The expansion of television in the last three years has been truly phenomenal. Much less will be seen in 1950 owing to the slowness of the Federal Communication Commission in deciding the question of color and the allocation of ultra high and the remainder of the very high frequencies. It is probable that not more than twenty-five television stations will be built in 1950 compared with about twice that number in 1949. But even for the present stations the supply of experienced technicians is severely limited. The few men who have been operating for any length of time are now mostly in executive positions, and the work is done by men who have been through a training school and without practical experience. Consequently, the standard of operation is generally low. There is, too, a most unfortunate reaction to the medium because of its newness and scope for experimentation. That is the tendency to excuse its errors on the ground of youth. As long as hardheaded businessmen, in the guise of sponsors, will put $25,000 into one program (not to mention the initial investment of $500,000 or more for the television station owner), it is time to cease regarding it as a plaything. During the last war we had the stock reply of which everyone grew so unutterably sick, "Don't you know there's a war on?" in reply to a request for something; usually the remark came from someone who had never even been nearer the war than seeing it in a newsreel. In the same way in television there is a growing tendency to excuse faults by saying, "Oh, well, it's only television."

Another problem in connection with technical proficiency is the real lack of control which employers have over their men in the way of disciplining them for slack and careless operation. In some cases if the employer tries to dismiss a man the union concerned rises up in arms and goes to his rescue no matter how wrong he may have been.

The foregoing is not wandering away from the problem under discussion, for it directly concerns the choice of the sponsor for film or live presentation of his commercial. In the long run the human error is the limiting factor, provided the equipment is perfect. If we assume for the moment that the film *is* perfect and the studio or live presentation has been rehearsed until it is perfect, we have more or less equal footing for the two—or have we?

A perfect film is placed in the projector. What can go wrong? (We'll assume that in each case the equipment is in first-class operating condition and will not fail.) The film can be placed in the projector wrong way up and wrong way round through gross carelessness and laziness. The projector can be out of focus and dirty; the change-over can be muffed and the film come in early on the leader, or late on the second scene; the film can break; if it is a sound film the sound may not be switched to the projector with the video circuit. But after all these things have been corrected the film will still have the perfect commercial on it and the last part will have a chance of atoning for the beginning.

Compare this with a live presentation where comparable errors have been made in the cut to commercial. In this case suppose the demonstration is coming from another studio so there will be a cut to muff by going over too early on video or sound so the listener may see and hear remarks or actions not intended for the air. This is especially so if preparations for the demonstration have been left to the last minute as is so often the case. The cameraman may be out of focus, may have moved from the excellent position set up by the director at rehearsal; the demonstrator may take up another position just a little different from his approved one, but different enough to ruin the shot, or lighting. Having got over these things, perhaps from a missed cue to open, the demonstrator is quite naturally a little flustered, and it is usually at times like this that mechanical contraptions decide to play up. The poor man finds everything going wrong and the demonstration winds up a complete flop. The sponsor is mad and probably takes his show off the station, the manager is mad and perhaps fires the unlucky announcer or director, and the agency thinks, "Ugh! That station is not too well organized. Let's put our next campaign on XXXX-TV."

There is a school of thought which maintains a strong argument that the *immediacy* of television demands that all action and programs be live. The answer to this is long and many-fold. News events are, perhaps, the subjects most reasonably likely to be transmitted live. After all, man has always wanted to see things from across the world as they happened. News and sports events are things which the fan or eager news follower wants to see *at once*. But so often these things happen at hours when the maximum number of viewers are at work or otherwise unable to see them. So what happens? They are filmed and shown later in the evening when people are not at work. In most cases, the quality of entertainment is improved by the editing it gets. Of course, for sports fans who want to see every movement of the ball and players, editing is a pain in the neck and for that reason is seldom done to any great extent. We hear complaints from people that they don't like to see films on television and they are cheated when these are shown. Yet other people say, "That was a good program; the quality and production were excellent; it was just like a movie." Now, that latter remark is the greatest compliment that can be made to a producer or station about a production, for if it is like a film, then it is approaching the standards we have all seen from Hollywood. We all know, too, that there are some absolutely awful films from there, but when a remark like the one above is made we know that although comparisons are supposed to be odious, in this case nothing "stinks!"

One of the things that still has to be learned by both producers of shows and sponsors as well as agencies is an awareness of the mood of the program that is in juxtaposition to the commercial. Both technical picture quality as well as story content are most important. If the last act was a tender love scene building up through an increasing air of dramatic tension to the triumph of love over the rest of the world, there will probably be a few moist eyes in the audience. These are people who, because of their identification with the players on the screen, may be more impressed with the sales message—*if it is properly presented.* But if an animated or stop motion film of any kind comes on immediately following, the transition will be too abrupt, and instead of receptiveness there will be nothing but dislike for the product and sponsor. That is a problem for the agency and sponsor to work on, but a producer worth his salt will never let such a thing occur except over his dead body.

Then, too, if the show was live, there will be a very noticeable jump and change in tonal values which will immediately tip off the viewers to the fact that film is being used unless the light values of the last scene are matched to those of the film commercial. In fact, it may necessitate the adjustment of receivers, either necessary or imagined, owing to the changed appearance of the screen. In either case resentment will be aroused and it will find an outlet in a dislike of film and, of course, this will be reflected by association with the product.

This means that greater care must be used in making commercials for use on television by ensuring that the contrast range is right when the film is made and that the processing is done to produce a proper television print. It also entails the exercise of great care in the choice of colors used in the costumes and set colors. Attention to details like this should not result in any increase in the cost of film production since it only means using different colors and arrangements of lights.

For a product that must be demonstrated perfectly the first time, and especially a type which is subjected to suspicion because it has been the butt of jokes for years, film is a must. Such things are objects which once, perhaps many years ago, were regarded as gadgets and thus became fair game for humorists and are now household and daily life necessities such as fountain pens which write under water and cigarette lighters. Probably the classic example of the live commercial which misfired—literally—was for a certain cigarette lighter. The slogan being demonstrated was, "A click and it's lit"; unfortunately, due to circumstances beyond the control of the demonstrator, there were more clicks than one before it lit. And the viewers were treated to the view of a frenzied man trying to ignite a lighter! After this all the commercials for this product were made on film and there has never been a failure since.

It stands to reason that only film can produce such absolute certainty of exact performance. For no matter how many times the show is rehearsed there is always the knowledge that until the air show is over, it will not be known whether it will operate properly. During the time that a film is being produced the action is rehearsed over and over again until the equipment functions exactly as wanted. Then there is no possibility of there being a failure on the air. A few examples are given in the following paragraphs of commercials which failed to connect during live shows.

A well-known cake mix company had a program on the air and was using its favorite woman demonstrator to show how easy it is to make biscuits with their product. Unfortunately, the cook was accustomed to a gas cooker and since the demonstration was coming from the studio, an electric range had to be substituted. All went well until the time came to take the biscuits out of the oven. Then the door was opened, the camera trained on the opening to bring the first view of the sizzling, tempting hot biscuits to the viewers, with the object of sending them out to buy a package of mix for themselves. The tray was gently withdrawn and a view of the sorriest mass of soggy mix ever seen was flashed to thousands of viewers. Due to her inexperience with this particular type of stove, the poor demonstrator had the wrong temperature and the biscuits were ruined. After that film was used for all commercials.

A very humorous failure occurred during a nationally known vacuum demonstration. This one had been running for quite some time without any troubles and with good viewer response. On the occasion mentioned, it started as usual with the announcer extolling its merits. The scene shifted to the demonstration area where a nice pile of soot was set on a white rug. To demonstrate the efficiency of the instrument the nozzle was held a few inches from the soot preparatory to absorbing the pile into the cleaner and showing how clean the rug was afterwards. The camera was set up within line with the pile of soot and the nozzle so that the pile was between it and the nozzle. At the proper point in the demonstration the cleaner started and—blew the whole pile of soot into the camera lens, over the cameraman, and apparently into the viewers' homes. For weeks after the company was expecting letters from viewers complaining that the soot had ruined their carpets, too! That commercial also was later placed on film.

More recently an error occurred in a live presentation which while not exactly due to the non-use of film, at least reflected a certain lack of care in setting up the act. A cigar manufacturer had a well-known person sitting behind a desk at the close of the story reach in a box and pull out a cigar, light it and take a tremendous draw, meanwhile observing: "There's nothing I like better than a—cigar." This he did and was then doubled up in a huge fit of coughing and retching. It seems no one had thought of checking to see whether he smoked—and he had never done so before!

In most cases film commercials which are to be used more than a few times are much cheaper than live. For the latter there is always the talent fee, cost of props and men to move them up, and general overhead. There is no studio charge, for film does not tie up a studio for half an hour or more but stays in a small can until the time comes for its act. Of course, if the film is very interesting and has real entertainment value, as do quite a lot of the good present-day ones, it must not be repeated too often or its value will be lost, and the money invested in it by the sponsor will not be realized in terms of advertising.

Also films should not be topical if they are to be used for a long and nation-wide promotion; this also applies to locale. Films intended for this type of use should be very vague as to where they were made—unless there is a purpose in identifying the location. If sound-over or narration is used, it is generally possible to revitalize sound tracks by re-recording them with new contents and a current topical message. It is not very often that a film commercial can be turned to the day's happenings and thus tied in with it. However, live commercials can always be rewritten to include any big events of the day, either national, regional, or even local, but it is doubtful if this advantage outweighs the advantage in cost of film commercials.

In the matter of *location*, film, of course, scores heavily. An object, such as an auto, for instance, is not seen at its best in a stationary shot in a studio, even if it's surrounded with pretty bathing beauties. And even the most persuasive narrator cannot do as convincing a job telling about the shock absorbing properties of its springs as can a shot of the car driving over a ploughed field. The Ford commercials showed this up very well in moving scenes taken from one car to the other. The subject auto was driving over ridges in a ploughed field and the camera was mounted on another car which drove along the runway holding a steady position.

The things in general film production which are important in deciding whether to shoot on location or in the studio are just as important in commercial production. It might even be said more so, for the cost of a spot which may be used by itself is quite often an important factor in determining the length and the number of stations which carry it. In comparing the relative costs of film and live commercials, it is well to bear in mind several points. They apply whether the commercial is to be used for spot announcements only or for integration in a regular production. (Unless the spot is for purely local use on a one or two time basis film will practically always be used.)

Cost is, of course, the deciding factor. This, in turn, is based on a number of things, some of which may be classified as intangibles, and others which are only known when the production is finished.

Location, script, and sets are also important factors. First the script should be examined to find out what it calls for in the way of sets and whether any of these are on location or all in the studio. If any are on location the question of traveling and transportation costs become important when compared to the cost of making equivalent sets in the studio or even using stock shots in back-projection equipment to save the cost of building or traveling. If quality is the aim, it is best to avoid use of stock shots unless they are known to be good. If process shots are called for, the question of cost arises again—is it optical effects, slow-motion, miniatures (costly), back shots, or any one of a dozen other types of effect?

What of the writer? Is he good and has the script he prepared made the best use of all the facilities you have available at the cheapest rate? Does it call for special lighting effects which will run up big bills or elaborate wardrobes and scenery which requires a specially large studio to produce? If you have to go on location, will it entail taking a large amount of equipment along to add to transportation costs? Are the director, cast, and narrator—if narration is used—all capable of good work in return for a good day's pay? Speaking of sound brings us to music. Will there be music and if so, how will it be produced? The AFM has now commenced to set rates for musicians for television films and the amount and type of musician required is important. Sound effects and animation can run up costs, the latter to fantastic amounts. Generally speaking, animation and live action will not be combined in one spot or commercial due to the enormous cost of animation. Film stock (raw) and editing have a very direct bearing on the cost of production. If the producer and editor can work well together and eliminate expensive retakes and discarded film, the shooting ratio—that is, the ratio of exposed film to actually used film—which is usually four or five to one can be reduced perhaps to three or four to one.

These are the things which run up the costs of film production. There are others, of course, which do not appear and are not as easy to separate. But before even starting to think about quoting a price for a film, it is essential to read the script through very carefully many times to make sure that it does not contain any trick shots which will require the use of specially prepared equipment and increase the costs.

And, probably most important of all, is the decision whether to use lip sync or narration. Upon this depends in most cases the decision whether to use single or double system sound. This then runs on into whether to use 16 mm or 35 mm film for the production. If it is to be the cheapest possible job and intended for local station use only, then 16 mm film can be used for the original negative shooting as well as the release prints. But if it entails distribution to networks or originating stations, then 35 mm is a must for 16 mm quality is not good enough for use in an origination over the network lines. This latter statement refers not only to the negative but to the positive as well. But unless the film *is* for national distribution there is very little point in using 35 mm for release prints since not many TV stations have the equipment for using this film due to its expense. From this it will be seen that 16 mm can be used exclusively for the original negative and release prints; 35 mm can be used in the same way for 35 mm negative and release prints, in this case for special key station use generally; or the negative can be made on 35 mm film and release prints made on 16 mm. The latter usually gives a much more satisfactory picture than straight 16 mm all the way. There is nothing to be gained by shooting on 16 mm and then enlarging to 35 mm.

This chapter started out to offer a comparison between the pros and cons of films for television commercials, but it seems to have finished up as a rather one-sided argument in favor of films, period. It is not exactly what was intended for this chapter, but it seems that what has been said above tells the story itself. Summing up, it might be said with a fair amount of truth that films are more satisfactory, cheaper (apart from initial cost in some cases), and infinitely more convenient than live commercials for television in the majority of cases.

To recap briefly, probably the biggest single objection to films for television commercials today is the poor technical and photographic quality of so many of the commercials seen on the air. This includes, of course, the sound tracks and the sudden change in contrast and picture quality which comes with the cut from live to film. The human errors of omission and commission will eliminate themselves as technicians become more proficient.

In all the productions which are made for television advertising, as well as for program purposes both on film and as live shows, the most important requirement, apart from technical excellence, is creativity on the part of the producer. Unless he has a creative sense the best technical support in the world will not turn a poor film into an acceptable one for the viewers. On film, if the director has made an error of judgment, his mistake goes on the floor of the cutting or editing room, and he either has the scene reshot or edits around it to produce the same result. In fact, the editor is almost as important as the producer since on his judgment depends a lot of the film's appeal. In most cases he and the producer work very closely together. In a few cases, especially for low-priced television films, the producer is often the editor as well.

On a live show the producer *is* the editor as well and any mistakes in production cannot go on the floor this time because he is editing even *as* he is producing, and any errors will go on the viewers' screens.

In closing this chapter it may be of interest to describe a most ingenious commercial which was used by Schaefer Beer over CBS live.

The technique used was one which has not so far been used by many producers. It is the *I* technique with the camera playing the part of the eyes of the viewer so that everything that is seen appears as it would if the viewer were standing in place of the camera. Of course, Robert Montgomery used it in *Lady in the Lake* and various other producers have dabbled with it but it was left for CBS and Schaefer to apply it to the television commercial, and a most effective use was made of it.

A prop bar was set up complete with barman and taps which worked. The scene opened with the camera glancing across the bar and coming to rest on the barman who was pouring a foamy glass of beer. The camera's hand came out from the side and picked up the glass which was then poured down the throat of the camera. The picture on the home receivers was the same as a man sees when he lifts a glass and drinks it down—just the rim and inside of the glass and the foamy head of beer pouring over the edge into the camera's stomach below, (a bucket on the floor).

It was done by using a short focus lens for the eye and handling it as one. The arm which came out to lift the glass belonged to a human body. The arm brought the glass up to the approximate position of the mouth and then proceeded to tilt it as though it were pouring into the mouth. Beneath the lens turret was a bucket to catch the beer. The whole effectiveness of the trick depended on the exactitude with which the beer was raised to the "mouth." The amount of work for the producer was terrific and it was a very effective commercial, but if it had been on film the strain on the whole crew would have been eased.

CHAPTER 18

WHAT MAKES GOOD COMMERCIALS

Since the only purpose of the sponsor in presenting his program, commercial, or spot is to gain sponsor identification, it follows that he demands and tries to obtain the type of advertising announcement which does that most successfully. The type of article to be advertised plays a large part in determining the form that the commercial will take.

Most readers know the attraction that the animated cartoon has for children, and for adults, also. In fact, it might be said that many adults like cartoons better than living characters. The sheer mechanical ingenuity of the animated figures has a tremendous appeal to the average viewer whether it is seen on television or a movie theatre screen. Psychologists say that this is due to the desire in all of us to get out and perform the dream actions which these little figures do so easily. The stroke of the artist's pen enables them (the viewers) to perform feats such as flying through the air or overcoming the bully by identification with the dancing figures on the screen. Incidentally, the secret of success for any production is *self-identification.* If the production is a love story it will succeed if it is possible for the men to feel themselves in the place of the hero as he takes the beautiful Joan Bennett in his arms. Similarly, if the heroine is just an ordinary girl with whom the tired housewife can identify herself as Victor Mature sweeps her up, the boxoffice will reflect its success. For a commercial to sell its audience it must show the people *how* they need and can use the product. If it shows Joe Citizen actually using it, it can be a good selling point, but if it is not a glamor article, is static, or otherwise impossible to demonstrate easily, a cartoon may do a better job.

The comparison between live and cartoon appeal is well reflected by an experiment at one of the author's classes. This class, studying films for television, was shown a reel of film consisting of forty minutes of Ford commercials. This included both cartoons and live actors. The theme of every film was "Bring your Ford home." Probably most readers have seen it. The length of each varied between twenty seconds and one minute. Some of the animated spots contained the same subject matter as the live action films with the result that it was possible to watch a story unfold in live action and then see it again in animation. At the end of the session the class was asked, "Which do you prefer, and why?"

The overwhelming concensus of opinion was that the animated spots made more impression. The live spots, while *factual,* did not make the same deep impression as the former. One sequence in particular that they felt suffered by comparison was one in which the little animation man pushed a testing rack over to the auto to test the motor. In the next live action a Ford drove into a garage and the mechanic struggled over to the auto with a similar piece of equipment. The animated spot made a much deeper appeal to them. It is interesting to note that the sixty students in all, who saw it in a number of sessions, represented a very good cross section of the public. Only about three of them had any working connection with television or radio; the balance worked at all trades and were merely drawn to the class by the lure of television and the hope of getting a job in it after graduation. Asked why they preferred the animation so much more, they gave varying replies but the gist of it was that the animated spots made everything so much easier and they felt that it highlighted the smoothness of service at Ford dealers.

This reply is interesting in view of the desire of people to identify themselves with situations and characters. They probably felt unconsciously, when watching the animated film, that everything would be that easy if they took their own Fords to be serviced, but the harsh reality of a brother man lugging a large piece of apparatus to work with on the car was too much like some of their own jobs or experiences.

Naturally some products are only suitable for live demonstration. These include clothes, jewelry, operating merchandise such as toys, and many others. For these, animation has nothing to offer since it is the real thing which needs to be seen. But although animation has been ruled out above it does not rule out stop-motion, which, while being a mechanical process in that it is done by taking one picture at a time and is longer to do, is very effective because it actually *shows* the product.

A box of breakfast food, for instance, could be animated or it could be shown live. Animation would not be able to point up much in the way of package appeal, unless its marvelous powers of giving energy were used. Cream of Wheat and Lil' Abner lend themselves well to that, for the energy he needs to rescue Daisie May seems to come from a big steaming bowl of Cream of Wheat. But if cost of production is an important consideration, as it usually is, then rather than go to live treatment, it might be preferable to use stop-motion photography.

A possible treatment would be to start with a close-up of the package, then have the sides bulge in and out (done with a bladder inserted from the bottom and inflated with compressed air to force the sides out), and finally by stop-motion which would show the flaps giving way and flying open. At this point shooting stops and when the bladder is removed cereal replaces it and filming recommences. Air from the same tube in the bottom would then be released and blow the cereal into the air like a fountain. Thus is demonstrated the effervescent energy-giving properties of whatever the food happens to be.

The foregoing is only a very brief outline of a possible method of preparing an interesting and selling film for an inanimate object, but there are probably many better ways. The section on animation contains more information on how the actual films are made.

For a straight clothes demonstration, fashion shows cannot be beaten; even men will sometimes look at them, especially if a few bathing beauties are thrown in for good measure. Generally speaking, twenty seconds are not long enough for a demonstration of clothes or wearing apparel, but animation for this period to point up a feature can do wonders.

Animation properly executed can assist considerably in overcoming the limitations of the television screen with its lack of fine detail. Too often in commercials on film or even in films for entertainment purposes the quality of the image is too poor for viewing without eyestrain or a certain feeling of "fuzziness" around outlines. If this occurs in commercials the irritation it engenders can quite easily influence its selling effect on the viewer. Animation with its bold lines and clear-cut boundaries does not suffer from this limitation and can often get a story or point over more forcefully in twenty seconds than one minute of drawn out repetition in live acting.

The tendency to forget the limitations of the small screen on most home receivers is not as great with animation for its chief appeal is in the frantic actions which are shown close up or at most in medium shots. Even a chase is commonly presented as a large figure in the foreground followed by smaller ones; the background, if any, is usually heavily drawn and stands out from the distance without being lost in a haze or a myriad of small details.

Semi-animation is cheaper than full animation and offers an interesting medium for lower budget presentation which requires the attraction of some form of mechanical assistance in catching and holding attention. As will be observed in a later paragraph cost is lower because fewer drawings are used in making the film. This, of course, results in less smooth action, but for the somewhat limited field for which this is suitable the results obtained are perfectly satisfactory.

Discussion of mechanical means of bringing life and movement to inanimate drawings would not be complete without mention of the latest development in the synthetic field. This is the creation of sound that has never before been heard. The sound track is actually drawn onto the film with a brush in much the same way as animated pictures. But in the former case the marks represent sound waves and when passed through the sound head of a moving picture projector sounds which have *never been made* are heard. This offers boundless possibilities for unusual sound accompaniments for comparatively cheap spots. By this method it is possible to draw a sound track to represent a fifty piece orchestra and have it sound like one, too! And yet it was produced by a twenty-five cent paint brush!

Going a little deeper into animation we find that there is an almost infinite number of stages or divisions between full animation and very simple camera movements. If the reader is concerned with making a decision on what type of presentation to use or is on the receiving end of an assignment to produce such a film, he should always have his animator in at the conferences with him. A competent animator will be completely familiar with all the different techniques and be able to visualize how a certain effect will look under various types of animation. He should also be capable of estimating fairly and accurately approximately how much each style will cost. At this point it might be well to point out that there are absolutely no cheap and easy ways of doing animation that do not look cheap.

For twenty second spots, where it is necessary to capture the viewers' attention as quickly as possible by an attention-compelling opening, animation appears to hold considerable advantage if it is handled properly, but by the same token if it is badly and irritatingly done it will drive viewers away. There are two schools of thought on this subject. Both will be discussed and the high points of each presented. But before proceeding to that, the *repetition factor* must be considered. This is the amount of positive identification that viewers have for the spot. Very tricky, catchy spots repeated often in one market will saturate it so that after some time—long or short depending on the spot—the value and money invested in the production are lost. This is a risk that must be guarded against by the sponsor who creates a really attractive commercial which captures the public's affection. Quite often this sales message is produced at considerable expense with the intention of using it for a long time. However, so great is the identification and attractiveness that, just like a popular song, if it is plugged too often it loses its appeal and people become sick of it. A very good example of an expensive spot which has lasted for a very long time in spite of its audience appeal is the famous marching cigarettes. Originally produced for about $7500 it was a comparatively expensive proposition and needed to be handled carefully; otherwise the benefit of the full animation and excellent work which went into it would have been lost. However, by intelligently changing the sound track from time to time and not overdoing its use in any one area, it was possible to continue using it over a number of years. In fact, many viewers have been heard to remark on their hopes for its telecasting because they wanted to see it or show it to friends.

The rates quoted by producers for various types of action vary, of course, but representative figures would be somewhat as shown in the accompanying table.

Time	*Type of Action*	*Price*
	Diagrammatic	$ 100 to $ 225
10 seconds	Limited	150 to 315
	Full Animation	300 to 775
	Diagrammatic	125 to 300
20 seconds	Limited	200 to 400
	Full Animation	410 to 1025
	Diagrammatic	315 to 760
60 seconds	Limited	500 to 1025
	Full Animation	1015 to 2535

A diagrammatic animation is a simplified form of cartoon which is specially suitable for the presentation of titles, diagrams, or other similar devices. Limited animation is used where smooth, lifelike motions are not essential and rapid changes made by optical effects or camera movements will take the place of the hundreds of drawings normally required. Full animation is the same as the cartoons seen in the movies where the characters move with smooth, lifelike action and really appear to be alive. Stop-motion, as already mentioned, is a series of photographs of an object which undergoes a very slight change between each exposure. In this way the objects appear to move when the film is projected.

There is no time limit laid down by the FCC for commercials. Any excessive commercial airings, however, will bring unkind looks at license renewal hearings. Although there is no legal time limit for commercial plugs, individual stations have their own rules and the National Association of Broadcasters has a code of ethics which is supposed to be adhered to by all its members. However, sometimes this is not done, and the commercial time may be extended—it is almost never shortened—so that a program may be almost all commercial. But quite frequently in this kind of production the sponsor's name is brought in so skilfully that the viewer is not aware of its persistence. For example, in the Buick show the word "Buick" appears on the back curtains and is in view on and off throughout the whole of the show. But no one objects. In some of the daytime participation and market style shows the sponsor's name is in view all the time.

Some of the best commercials are blended so skilfully with the program that they are painless. This is wonderful if it can be done successfully, but so often the result is a horrible mismatch where the viewer is suddenly hurled from a comfortable story into a spiel by one of the players whom he has been watching and enjoying. More often than not the viewer will resent being fooled by the action of one of the characters leading into a commercial and, becoming resentful, will develop a block against that particular sponsor. Everyone has probably heard the Jello commercials on aural radio BT (before television). The author always felt that they were well integrated and enjoyed the way they flowed into the story. The well-known "pitch man" on the Milton Berle show is an excellent example of an entertaining commercial.

As far as duration is concerned a point that is too often forgotten both by the public and the advertiser himself is the fact that the sole reason for the thirty-minute program—the only thing in which the sponsor is interested—is the *three* minutes of commercial which he gets out of the half-hour. Twenty-seven minutes of program are designed merely to drawn as many people as possible to his station so that when his message flashes on their screens it will be read by the maximum number of people. Sponsors are not philanthropists, and while they often get quite a lot of pleasure out of the fact that so many people enjoy their offerings, they would not continue them if advertising messages could no longer be transmitted. It follows, therefore, that the message which is presented in this very brief time is as strong and pulling as possible.

Although the viewers may not reject the commercial, and may actually enjoy it, they are anxious to get on with the story when they tune in at the beginning of a program. Therefore, experience has pointed up the fact that the opening commercial should be brief and not delay the story. It may take the form of a short spot or other brief announcement—about twenty seconds. Then twice more during the course of the program there are two longer announcements running a little over a minute each. These together with a closing of about twenty seconds take up the three golden minutes which represent the *entire reason* for the sponsor's investment.

The choice of the commercial's position in the show is extremely important and unfortunately is only too often ignored or not considered, as is the actual text used. On the integration of these two factors depends in great measure the success or failure of the investment. To break the action at an extremely exciting part of the story is permissible; it is done all the time in the theatre, and the audience goes out for a breather or a rest from the tension. In television the acts are so much shorter that the relief factor is not so important, but the *going out* factor is! If the commercial breaks in with a gross commercial message just as the widowed mother of seven young children has been sent to jail for offering counterfeit money in an effort to save the old homestead, the viewers will be in a sympathetic mood where softness and delicacy of approach will merge with it and continue their attention. If a jangling or harsh, flamboyant announcement hits them they will probably take a rest or go for a smoke by tuning to another station or leaving the set and the message. Thus the whole thirty-minute investment is wasted! This brings up some more points: continuity, style of announcement, i.e., visual or aural, and identification.

Continuity is the vague something which holds a show together. The entertainment side of the industry is dependent on some thread which, running through all the acts, provides a skeleton on which they are hung. This is well demonstrated by the excessive number of theatre and music hall type shows which rely on the fictitious name of the "Blank Music Hall" or "So-and-So Theatre." There is nothing wrong with this, let it be added at once, but it indicates the need for the familiar thread which the audience can find every week, or even in each act. Every successful television or radio show has used this tenuous something in one way or another. It should also be applied to the commercial which supports that very program, but too often it is not, with the result that there is a sudden break in the continuity of the story that the Smith family is watching, and instead of attending to the message of the sponsor out of gratitude for the fine show he has given them, Mr. and Mrs. Smith turn to little Willie and ask him how he got on at school today. Then, the commercial over, little Willie's school day is no longer of any interest and attention is again focussed on the screen. What caused this? The commercial was out of place or out of tone with its surrounding material and the public resented it. While it is sometimes very necessary to start an announcement with an attention-getting device, such as an animation or even a jingle, the mood of the presentation is upset and irritation results unless this is done with great care.

In television there is no room for the irritant commercial approach. While an overlong commercial may not be tuned out or ignored and will perhaps insinuate itself in the memory of the viewer it will live there as an irritant recollection, and have an active part in preventing sales by associating the product with the particular unpleasing experience. This applies particularly to repetitious narration or illustration and indifferent production. (If film is used there is no excuse for indifferent production since perfection should always be assured by reshooting until it is obtained.) Third person and baby talk "cute" types of commercial are also, generally speaking, very bad irritants.

The question of format of the commercial is one that is still being argued. Audio-video balance is the subject of many a long discussion. A number of experts in the field assert that since television is a visual medium, vision should be used in the presentation of its message and maintain that a ratio of 90/100 should be maintained. This applies particularly to feature length films and shows rather than specifically to commercials. On the other hand, television is different from the theatre just as much as it is different from the movie, and its presentations are aimed at entirely different groups of watchers with the result that strictly theatrical or movie rules cannot apply. The fact that the important time from the advertiser's point of view is the moment when the story ends and the commercial commences and is told to a group of two to five people means that they must be able to attend to the message even though they have gone to replenish beer mugs and sandwich plates.

The other school, which is larger, says there should be quite a lot of audio appeal and message so that even though people are stretching and moving around the room they will still get the message. In either case the important thing is to get hold of the audience's attention by some means or another—it may be by an aural appeal to bring their attention back to the screen and then sell them on the screen. The balance between the two styles depends on the type of article that is being demonstrated. If it is easy to show in use and lends itself to demonstration, visual is obviously the better; on the other hand, if it is large, bulky, static, and needs a lot of explaining, more words must be used to increase the information available and thus the appeal.

Identification really belongs with the foregoing inasmuch as it is tied in directly with balance and selling power. It is important that the sound or narration which accompanies the story is properly tied in with it so that both the picture and the announcer are talking about the same thing at the same time. Otherwise, the special offer which is perhaps the high point of the whole thing is not shown in the picture and the announcer is not listened to, so that the effort is a failure.

While it is impossible to lay down any rules for the production of commercials since not only is the art so young but every agency and producer has different ideas—and who is to say one is wrong—there are some angles which it pays to watch and apply as a kind of yardstick to the production in which one is interested. The rest of this book could be filled with advice like this, but the five following sum up the situation quite well.

> One really important, significant production is more impressive and remembrance-making than a lot of small squibs which fizzle without a good BANG!
>
> The television receiver owner *invites* your program and salesman into his house. Behave like a guest, and while showmanship is the real way of selling, let it be controlled showmanship, not an insult to your hosts' intelligence.
>
> Good taste and good manners go together. That means no off-color jokes or double talk especially if children can hear it. Since children are always around that means never.
>
> Demonstrations are the things which sell either in person or on the television screen. If it can't be demonstrated—very few fall in that category since animation can always be used—at least dress it up so that it seems to have life. Never use still pictures.
>
> Don't talk too much; follow Mr. Topps' advice—"Don't talk, chum . . . !" Let the picture do the selling. If there is an item that cannot be covered satisfactorily in the picture due to camera limitations, etc., *then* and only *then* use words to talk about it. If you must talk do as little as possible. Remember it's teleVISION.

The length of the commercial depends on a number of things as has been shown, but so far the different types of *spot* annoucements have not been mentioned. When television began to expand these were by far the most popular and the little twenty-second and ten-second station breaks were not much respected. However, times change and so do availabilities. As more and more sponsors began to buy time the amount of space for one-minute spots in useful time segments became less. On the other hand, certain time adjacencies became very valuable by virtue of the preceding and succeeding programs. One-minute spot times are not generally fixed and inviolate, and what may be a fine schedule for some months because the time has not been sold in a block, may suddenly become unavailable because someone has bought the segment containing the desired time.

On the other hand, station breaks of ten and twenty seconds are usually pretty stable and once obtained can generally be kept. Many advertisers who invested a lot of capital in one-minute spots are now regretting it strongly for they have no good availabilities and less chance of using them all the time. It is not often that a one-minute spot can be made into a successful ten- or twenty-second break; the pace is too slow. It has not been stated in this connection that almost 100 per cent of the station breaks and spots are on film, but in addition to the advantages which were demonstrated for film in Chapter 17 it is important to note that live breaks and spots are almost always much dearer than film due to extra production costs and the live talent factor. If repeats are involved the difference becomes even greater. In other words, film corresponds to the electrical transcription or ET.

It has been said that the short short spot is like the short short story popular in so many magazines. This is quite true, for in each case it is essential to begin as near the end as possible and build to a climax, and good ones are just as hard to produce, for the shortness of the story makes it imperative to make every fraction of a second count. Spots can be produced cheaply, but if too cheap they will look cheap and do a poor job for the sponsor. The ten- or twenty-second spot is one place where penny pinching will ruin a good idea.

An argument that has not yet been settled concerns the problem of producing a commercial which is equally effective in terms of clearness and quality on both small and large screens. It seems beyond doubt that more receivers are used in private homes than in bars or other places where crowds gather, and a film made for the home screen should be satisfactory on the larger one. If the film is properly produced and the following faults are avoided it should be entirely satisfactory on all screens: small print running to edges of screen—often lost in "blown-up" picture receivers or through misadjustment of scanning circuits; long and involved sequences or messages which confuse the viewer; lack of contrast which tends to wash the picture out; very rapid scene changes, i.e., too many different scenes in a film; and long shots which show very little on most screens—large or small.

Turning to the production side, the pros and cons of 16 mm versus 35 mm film have not yet been agreed on by all concerned. If the producer or agency has Hollywood background and outlook then in all probability he will insist on 35 mm stock at least for the original shooting. The argument is whether 16 mm or 35 mm stock for the original shooting gives better quality when used for printing 16 mm release prints. As far as the quality is concerned, 35 mm does give better pictures, but comparatively few stations are equipped to handle this for projection due to the extra cost and building regulations involved. Generally speaking, a better quality picture print will be obtained if the original is made on 35 mm stock. Sound and animation are not affected in any way by the choice of film, and when film is reduced to 16 mm the added costs are less than equivalent 35 mm prints. Of course, if the whole operation is cut very close to the bone the cheapest job can be done by using 16 mm all the way.

A point which has not received sufficient attention to date is the quality of film—photographically speaking—which is released for television commercial use. Too few producers seem to be aware of the fact television's appeal lies in its immediacy, i.e., the fact that the action on the viewers' screen is actually happening at the studio thirty or forty miles away. If he is watching a live show and then a low-quality film is thrown at him, the change in quality of sound plus poor resolution, contrast, and shading, make him very aware of the medium used for the commercial. It makes the fact that it *is* a commercial stand out very clearly and spoils the illusion of life. We have all seen those commercials where detail is lacking, the picture seems continually out of focus, and the sound quality is so bad that we get up to retune the set. There is no excuse for using films whose quality is less than first-class; it does not cost much more to make good prints from good originals, and the amount of good will that is lost through such poor offerings is tremendous.

There are five general categories into which commercials utilizing film fit. While they are not all examples of moving pictures they are at least adaptations of film principles. They are:

Slides costing from \$10 to \$250.

Silent films with or without live commentary: sometimes called *sound-over;* film costs \$100 to \$500.

Narrated films with sound track added after film is made, \$250 to \$1000.

Sound films with full lip sync, \$1000 to \$10,000.

Animation with full movement and sound, up to \$10,000.

Some idea of the reason for the high cost of animation may be gained from the fact that in a sixty-second spot with full animation 90 feet of 35 mm film are used. This represents 90 times 16 (frames per foot) which equals 1440 frames. Therefore, there will be 1440 separate, different drawings. When it is realized that each has to be drawn properly, oriented to the story, planned before drawing commences, and photographed one at a time the reasons for the huge costs become apparent. Because it is full animation and does not repeat cycles like the cheaper semianimated film, every drawing has to be done by hand separately. If some of the originals can be used over again in a form of cyclic animation, such as a train rolling along a track, the cost can be reduced.

The story of animation is long and involved for it is an art in itself, and a whole book would not be enough to do it justice. There are, of course, tricks of the trade which make it possible to use camera techniques to avoid redrawing everything as various changes are made. For example, if a scene or character is coming closer it may be possible to have only one drawing and continually move the camera closer so that the effect of an approach is obtained. Animation costs vary from between $10 and $200 per foot, depending on the amount of time required for drawing and photographing. A rule of thumb for calculating film length on 16 mm film is to decide how long the action shall take in seconds and multiply by 24 (frames per second). This gives the total number of different scenes or drawings required.

CHAPTER 19

USE OF KINESCOPE RECORDING

One of the strongest criticisms levelled against television is that it is such a fleeting art. The picture exists only as it is being transmitted and as soon as the program is over there is no record of what has happened. The introduction of film recording, or kinescoping, to give it what seems to have been accepted as its standard name, has changed this condition considerably. The mechanics of kinescoping were discussed in an earlier chapter; therefore, this one is devoted to considerations of its effects on, and use in, television.

Probably the first use which comes to mind is that of extending network television service to those areas which the coaxial network lines or high-frequency radio relay links do not presently serve. A map of the United States showing existing radio relays and coaxial cable services appears in Figure 19-1. Also shown are projected extensions by the end of 1950. Even with the tremendous activity that is taking place in this field, it is very obvious that it will be many years before the whole of the country has anything like a comprehensive service.

Another factor to be considered in this connection is the fact that television station construction has slowed tremendously due to the action of the Federal Communication Commission in "freezing" new station construction and allowing only those holding construction permits to construct. No new grants have been made since the summer of 1948. This means that when the remaining construction permits have been used no more stations will be built for some time. Since there are no construction permits left to construct in 1950 there will not be much financial incentive for the telephone companies to build and lay new relay links. Therefore, even though television stations in single or even two station markets desire to have network service, the cost would be too high for them to carry and would not bring a great enough return for the telephone company to be able to support it financially.

The only alternative to this is for the stations to use recordings—electrical transcriptions as they are called in sound broadcasting. Thus, the kinescope network was formed by the use of films of the desired programs sent to affiliated stations all over the country. Before continuing with the important subject of networking, it would be interesting to discuss the place of kinescope recordings and films in the international field.

Radio is truly international in its ability to penetrate national boundaries and be received by peoples thousands of miles from the transmitter. Even though the language is different, propaganda messages can be sent in the tongue of the nation to whom the message is directed, and most important of all, there is no limiting of service to an arbitrary fifty miles or so by the physical properties of the medium. Finally, the methods by which the message is sent are standard all over the world and an American receiver will work as well in Russia as it will in England or Italy.

But, in television, a number of countries have different standards of transmission. This means that an American receiver would not produce pictures in England, France, Holland, or Russia without a change for each country, so that even if the waves *did* travel all the way to these countries, the existing sets would not work on the outside signals. Although the language problem would reduce the value of visual pictures slightly, their value would still be much greater than speech only.

Methods of film projection are standardized in all countries, and a program on film would be the ideal way of getting programs from one country to another when either transmission standards or distance made direct pickup impossible. This idea

TELEVISION NETWORK ROUTES

—IN SERVICE --- PLANNED FOR 1951

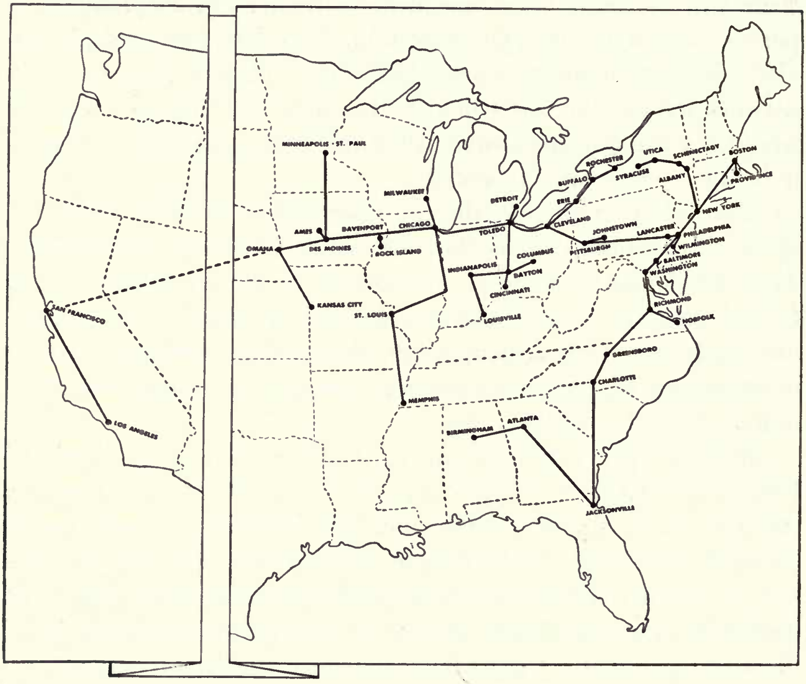


Fig. 19-1. The television cross-country lineup showing present and projected connections by coaxial cable and micro-wave relay link.

was proposed in 1949 and given the provocative title of the "Fifth Network." The conception is excellent and since the foundation already exists in the kinescoping facilities of the major networks and some of the film companies, notably Paramount which already has its own kinescope circuit, it is likely that its use and horizons will expand greatly in the next year. Already there has been some interchange of programs from Great Britain with films of the Royal Wedding and the Boat Race being sent to the United States for use here.

The quality of the average recording leaves a lot to be desired and unfortunately is not generally as good as the signal over the coaxial lines. This, of course, will improve with time, and by the end of 1950 we may see recordings which are indistinguishable from live shows. The viewers in New York are most fortunate in that almost all their programs originate in that city or come from Washington or Chicago via the coaxial cable. Thus, whenever a kinescoping is shown there the difference in quality stands out like a sore thumb; however, all recordings do not have to be bad. Some of the west coast recordings of the winter of 1949 to 1950 were almost as good as live studio shows.

There are two schools of thought on the subject of film size and type of operation, i.e., 16 mm versus 35 mm and single system versus double system. Characteristics of these have already been discussed and our interest here is in the practicality of each system. The cheapest is, of course, the 16 mm single system and properly operated and used it produces excellent quality films. There is nothing to choose between it and the 16 mm double system, and the latter has twice the film cost.

In 35 mm stock there is a choice of single and double system operation and here again there should be little difference between the two, although the single system is always derated and talked down. Now as far as picture quality is concerned there is no doubt that 35 mm does have better quality than 16 mm. When enlarging takes place, either optically or electronically, 16 mm film has to be magnified about three times more than 35 mm to provide the same size picture. This means that the grain of picture is more noticeable and resolution is poorer. However, first-class picture definition of 16 mm film is higher than the 525 lines presently used in television, but resolution of this kind requires the finest of equipment in photographing and printing.

The kinescope recording, apart from offering a means of keeping a record of shows, also provides a unique method of making auditions portable without having to transport stage sets and property, not to mention actors, around from agency to agency. The act is played in a standard television studio under normal live conditions, but instead of being transmitted it is recorded on film. Now the producer has his complete show in a highly portable form which he can carry around with him in his brief case from demonstration to demonstration. If this method of auditioning is used it is well to remember that the film will show to best advantage if projected over a standard film chain rather than an ordinary projector. If the latter is used the horizontal scanning lines usually show with a rather objectionable clarity which detracts from the quality of the audition and its chances of selling. It should also be shown on a screen no larger than twelve inches by sixteen inches to approximate the largest home receiver screen. Although sponsors are supposed to buy on the artistic and entertainment quality of material only, it is a sad but well-known fact that technical appearance and presentation do have a big part in its acceptance or rejection. Of course, when peddling the film around to the agencies it is not usual to find one with a complete film chain for viewing audition reels, and in cases like this it is sometimes a help to tone the stock or print on dyed positive stock with a color suitable for the format of the show. This should be used sparingly, of course.

The monster that is television is a sort of Frankenstein, created by engineers, that now devours programs and material at an ever increasing rate. Being at the moment strictly a one-shot medium (that is, one in which only a single performance is given of any show, no matter how good it was), it is a maw into which actors, script writers, and producers are being gulped. To expect a writer to produce for week after week first-class topical scripts is asking an awful lot. But when the producers are expected to unearth actors who are both telegenic and able to memorize at very short notice and continue to do that week in and week out, the strain begins to tear the organization at the seams. Even the dean of all weekly first-class programs, Milton Berle, sometimes seems to be scraping the bottom of his barrel, and it may be that we shall see him in bimonthly shows one day.

All other considerations aside, it is like plugging a song to death to expect the same players to appear on television every week, or sometimes even more often. The eye is much more inclined to remember than the ear and is also more easily tired by repetition; therefore, it is almost unfair to the artists to ask them to wear out their welcome by being in different shows too often.

On the other hand, some shows are so good that they would bear repeating once or even twice more. It must have happened to every reader at one time or another that the choice had to be made between two or more simultaneous programs, all good and all live shows. The odds are that the viewer, in an effort to see a bit of each "to know what he has missed," tunes in to one after the other of them and winds up by not enjoying any! Or sometimes unexpected guests drop in and wreck plans for an evening's television show. The knowledge that the desired show will be on in a few days' time would help to still murderous feelings in the breast of the host.

The economic factor is a great problem and deterrent in the use of repeat showings either by kinescope or live repeats since talent and time have to be paid for, and television time costs are high. However, the time may come when an advertiser will cash in on the field that exists today in "split-tuned" viewers who want to see two shows with conflicting times. The BBC does it all the time and usually repeats a good play or feature presentation a few days later so that those who missed it the first time will have a second chance to see it. In this case, it is done live each time. Kinescoping would offer a wonderful way of economical recording for repeat showing. A deal would have to be worked out with the unions concerned, but that should not be too difficult once they see how much benefit will accrue, not only to their members but to the whole of the industry. There is no place in this book for union problems since the situation changes so rapidly that anything written now would be out-of-date by the time it is in print.

The production of films for television recorded on film is already greater than the annual output of films from Hollywood, and it will increase, particularly as the techniques of kinescoping recording improve and it becomes more accepted. The attitude of the big film producers is well exemplified by the view taken of theatre television by Paramount and Fox.

Paramount has its own film recording studios in New York, Chicago, and Los Angeles. In addition to this it has provision for big screen theatre television so that within sixty seconds of a picture being received it is flashed on the screen as a movie film. The same equipment that produces the film for the theatre screen is used to make kinescope recordings, with the difference that the film, instead of running into the projection booth, is spooled in a magazine and retained.

In New York, Paramount has a studio in the Paramount building which can be rented by anyone who wishes to make a recording of a program on film. It is a complete television studio with three cameras and all the usual control room features. In addition, the program from any of the seven New York metropolitan market stations can be recorded by connection into the telephone company's lines.

This is the situation which might eventually come about in many big cities where there are television stations which are not owned and operated by networks or big companies and so cannot afford to buy individual kinescoping equipment. The television station desiring television kinescoping service would merely call up the center and request it. The recording company does the rest and within fifteen minutes after the end of the program the finished print is delivered to the station. This sort of thing is done in hundreds of small towns today in sound-radio broadcasting. Small stations have a line to a central recording studio and if a transcription is required the program is "piped" to the studio. A charge is made for this, of course, but it is quite often cheaper for the small operator to do this than buy equipment which is rarely used.

When costs are considered both opinions and figures vary concerning the over-all cost to the station. The subject is further complicated by the fact that so many variables enter into it in the form of union charges and terms that it is inadvisable to quote them here; consequently, only generalizations will be made. Briefly, the problems to be faced come under three headings: performers' rights, musical problems, and literary rights. Actors have certain personal rights as to the use which may be made of their performances; therefore, a release has to be obtained from them before a recording of their work may be made and used.

The musical problem is one of the most complicated; the musicians as well as the music have to be cleared. Normally, in addition to regular broadcasting and televising clearances, permission to record and re-use must be obtained. However, this is usually made much more simple by the existence of Broadcast Music, Inc. which is an organization run by the broadcasters to publish and clear a large portion of the music which they use. Negotiations with the AFM are currently going forward to determine exactly what payments and arrangements are to be made for recording and re-using music by union members. At present kinescope recordings may not be used more than thirty days after the date of production. And no films may be made for television using musicians. This latter ban has recently been lifted in the case of films for *audition only,* but these films must not, under any conditions whatsoever, be used for entertainment purposes.

The situation as far as literary rights are concerned is much the same as for other aspects. That is, rights must be obtained for the single broadcast and for the delayed broadcast as well as for using the film later as a repeat entertainment production.

Under the heading of kinescoping recording should be included closed-circuit recordings. This is a technique which may be likened to delayed broadcast transcriptions or to the system of using three film cameras mentioned in the chapter on production and the various methods employed. In the system under discussion, the performance is put on just as though it were a regular live program but instead of being broadcast it is fed to the film recorder. Later, when the program is required, it is used as a regular film. This can also be used to audition over the network's closed circuit in the case of programs which are to be sold in cities other than the ones where they are produced. Of course, this system does not produce such good photographic images as the direct film camera, but it is cheaper from the point of view of film costs.

Closed-circuit operation has tremendous possibilities for television programming. With a live show, once it has commenced, the producer is on his own. True, he has a floor manager, but at best he is only a relay position, and if the actors are not watching him (and they should not be, otherwise it will show in the picture), it may be a few minutes before the floor manager's frantic signals to speed up, slow down, turn to the microphone or camera, or cease blocking another actor are seen and acted upon. Or lights may get out of position due to actors not following their rehearsal instructions. When a show is on the air live the producer is editing from second to second instantaneously with the pictures from three or more cameras blinking at him. Sometimes he makes a mistake and calls the wrong shot, sometimes the technician makes a mistake and pushes the wrong button, or is slow or early in performing an operation with the result that some of the smoothness and perfection of the show is lost.

Films have been accepted as the best possible way of presenting the commercial message to the viewers due to the certainty of operation of the articles demonstrated therein and the practical impossibility of anything going wrong with the presentation. The majority of people who see them either do not know they are films, or if they do know they do not care because the transition to film and back to live is well done. Many people think that films offer the best medium for entertainment because so many more effects are possible. After all, most people regard television as the ultimate entertainment medium and buy receivers for that reason alone. Very few buy them for educational reasons or purposes, except, of course, institutions for learning and for therapeutic work. It has been argued that the appeal of television is its immediacy, i.e., the faculty of seeing action at a distance. This may be so, but it is the author's opinion that entertainment is the reason most people buy receivers. Nothing in the theatrical field is more popular than movies, and many of these are old enough, goodness knows! Given the choice, most people would choose a *perfect, well-photographed, high-definition movie* on television in preference to a live show with a number of fluffs and errors; this would be especially so if the film were made the same day and thus was not more than a few hours old. In fact, to incite deception, there would be no need to tell the audience that they were seeing a film—if it was good. At present however, and until techniques improve, it would not be possible to palm off a kinescope recording as a live show.

In most of the stations where kinescope recording is practiced, the time taken to obtain the processed print is in the order of hours because there has been no great demand for it any sooner. In the instantaneous system used by Paramount the dried, finished film may be seen on the screen within sixty seconds of shooting. This is wonderful for the producer, for if he thinks that a miscue or other fluff has occurred in any scene he can see the "rushes," and even before the show has progressed more than one minute past the error scene he calls "cut," and has the scene reshot. Then all that remains is a little editing to insert the good shot in place of the bad one and the show is ready for the air.

The major networks have varied plans for kinescoping. In general, they are quite similar, with any station desiring to carry their shows being allowed to do so, but with affiliates getting first choice. When a network price is quoted it includes the cost of film prints in the same way that line charges are included where cable is used. It immediately becomes obvious that there are various ways in which the recordings can be used. In one case they can be sent out immediately after the live show is over, so that non-connected stations can show them the following night on a special local time spot. Or, if the sponsor desires his program to be on at the same time on a national basis, it can be done by all those stations on the cable using the current show and those not connected using the previous week's edition. Provided nothing very topical was included in the script, there is no objection to this. A method which is considerably cheaper than this is for the print to "circulate" around perhaps four or five, or even more, stations and have each one run it at its own local convenience depending on the sponsor.

The kinescope recording is as yet only in its infancy, and within the next few years the industry will see great changes both in the quality and use of recordings. The cost should come down as the amount of use increases. There may even be home kinescope recording outfits similar to the present home tape, wire, and disc recordings for the general public. Perhaps we'll see in every home an outfit for recording the program in the absence of the owner and showing it when he returns for his own individual repeat performance.

CHAPTER 20

SCENERY AND PROPS

Rhythm and motion have as much place in the setting of a production as they do in the music for an extravaganza. Although one is heard and the other is seen the effect of the visual medium is just as important; in fact, it should be said that it is more important since the eye is so much more critical than the ear.

When the stage was in its infancy, scenery was not used and the players performed before bare walls. Since that time the art of stage dressing has made tremendous strides and anything is possible today. Television, a medium that is still finding its feet, has been a vehicle for many kinds of productions using all varieties of scenery, including none at times. The influence of movies on the growth of television is natural and as inevitable as gas engines in autos. Scenery considerations are dealt with in this chapter together with abstract and concrete discussions of usage. Television has infinitely much to learn from the motion picture, and for all intents and purposes of stage direction and mechanical operation television *is* motion pictures by radio.

Everything we have learned about scenery placement and usage in movies should be applied to television with, of course, some slight modification, as, for instance, the elimination of most long shots. Even so, limitations such as these are really only temporary and will vanish with improvements in the technical aspects of the art. Certain conditions do not hold for film operation which are confining for live television. The logical path for television to follow is that of the movie, always with the guiding principle in mind that the end product is for use in the home and not the theatre. For this reason, the action must be kept on an intimate footing and not allowed to embrace the psychological level intended for mass hypnotism applications in large gatherings.

The motion picture offers so much more in the line of effects and scenery than the live theatre can ever hope to equal even with revolving stages and every other assistance which modern science can offer. At the risk of being accused of indulging in advertising, the author must point to *The Red Shoes* as the epitome —in his opinion—of motion picture production.

Scenes of sheer fantasy completely beyond the scope of the stage were presented in technicolor with a beauty that was breathtaking. Although the remote, professional self realized that all this was done in the optical printer, it had the same effect as superb music from an organ has on a music lover who, although he knows that an unromantic noisy, mechanical contraption produces the ethereal sounds, is carried away by the beauty of what he hears. It is not suggested that television does this, or will ever do it—at least until the quality and size of pictures is improved—but the lesson of using mechanical and optical effects to dress up the stage might well be followed.

The greatest problem in television and small independent movies for theatre and television use, is, as usual, finances. Scenery costs money to design and construct. Especially in the case of one-shot television shows it is expensive. Any method of improving scenery or using process shots or the equivalent so that scenery can be kept on slides would net its inventor a fortune. At present this is impossible to do, for the super-imposition of one picture over the other results in unreal, ghostly effects in which one of the pictures shows through the other in a palpable, double exposure effect. However, a system of doing this is now being worked out, and it is probable that before the end of 1950 it will be announced.

The small size of the screen and the lack of detail and resolving power inherent in the television system, whether it be all live or film, operates to the advantage of the producer since no picture can be better than the weakest part of the chain. In today's television, there is no weakest part of the chain; the whole structure is weak. Its weakness lies in the arbitrary number of lines which circumscribe the results obtainable. But because we have to work with what we have there is nothing to be gained by criticizing the system. If the best possible scenery is placed before the live or film camera, it will assure optimum results. Film productions are capable of the best definition in the original, but in use over the television system they generally suffer due to the limitations of the iconoscope film camera. For the purpose of the discussion following it will be assumed that the word camera refers to both live and film cameras, unless the text indicates a specific type.

The lack of spatial dimension in television reduces the need for depth in many cases so that a painted case full of books will look as real as the real thing when seen over the air, and the viewer would swear that one could pick a book off the shelves. The scenery used in the average stage production, while so obviously unreal on the stage, looks authentic over television because we cannot judge the lack of depth in the screen.

The type of scenery used depends on the purpose of the production, but in many cases where authenticity is required a large proportion of the scenery may be on very large photographs called *cycloramas.* These may be as much as twelve feet wide or even more and are enlargements on a grand scale of various scenes desired for the background. Placed behind a window they provide a perfect outdoor effect. Parts of one may be used for more than one scene. If the cyclorama is of an outdoor scene it may have trees on one side and grass, etc., on the other. The tremendous size of the print makes it possible to cover an unusually large area in one shot with consequent flexibility of action.

The scene to be described may be considered by some to come properly under the heading of a special effect except that nothing very complicated is used and all the image recording is done in one operation. Quite obviously underwater scenes are difficult to photograph in a studio. However, if the scene is set and then a *thin* glass tank of fish and underwater flora, etc., is set close before the camera lens so that the front of the tank completely covers the field through which the shot will be made an excellent reproduction of an underwater scene is produced which is almost impossible to tell from the real thing if proper care has been taken with the props. It is extremely important to use plenty of light on the set, for the success of this effect depends on good depth of field. Therefore, the lens must be stopped well down to provide the necessary depth and this requires more light than usual.

Another way of doing this, and one which is more satisfactory since it follows standard practice, is to use two films and put them both in the printer, thus making a super-imposition. For example, one film has the scene which is supposed to be underwater, and the other has the shot through the fish bowl. When the two are printed together the effect is of an underwater scene. If this were being done live the fish scene would be on one camera and the action scene on another. The two signals are then mixed electronically and produce the desired underwater shots.

If an illusion of towering trees and dense jungle is required small trees or shrubs can be arranged close to the camera lens and shooting performed in such a way that the tree trunks almost obscure the lens. This will produce the well-known amateur photographic effect in which objects such as feet or hands invariably appear monstrous when photographed closer to the camera than the rest of the body. Actors in the background are dwarfed by the trees in the front and the desired effect can be obtained. Of course, it is necessary to have the background flats suitably dressed.

In the other direction, the use of miniatures offers unlimited scope for production detail and special effects in scenery and props. Unfortunately miniatures cost a lot of money to build, although there are a lot of artists who like to work on them for sheer love of creation, and it may be possible to find some made by these people or to get them to work for a station on a part-time basis. Simple miniatures are not outside the scope of the average station staff, although who will actually build it depends on how many people are employed and the quality of the scenery painters. In each case the conditions will vary. Sometimes the producer himself builds it. This is very logical since who knows better than he what he wants?

Although miniature-building can be extremely expensive, it can also be quite cheap if labor costs can be discounted or can be absorbed in other charges. Sometimes a keen producer will decide to make a miniature in his spare time or off moments. One way in which a highly effective miniature can be built is to lay out the design desired on a solid foundation, such as a piece of one-inch plywood. Depending on the configuration, pieces of wood are cut out to provide the framework on which the papier maché will be deposited. Figure 20-1 gives an idea of the foundation with cut out pieces of wood in position to support the hills. It is good practice to insert small nails into the tops of the layers of wood to give the wet papier maché a grip on the foundation.

The covering is made by tearing up old newspapers and pounding them in water until they form a soggy mass. This is lifted out, gently squeezed to remove excess water, and smoothed over the foundation to the shape required. Some people like to

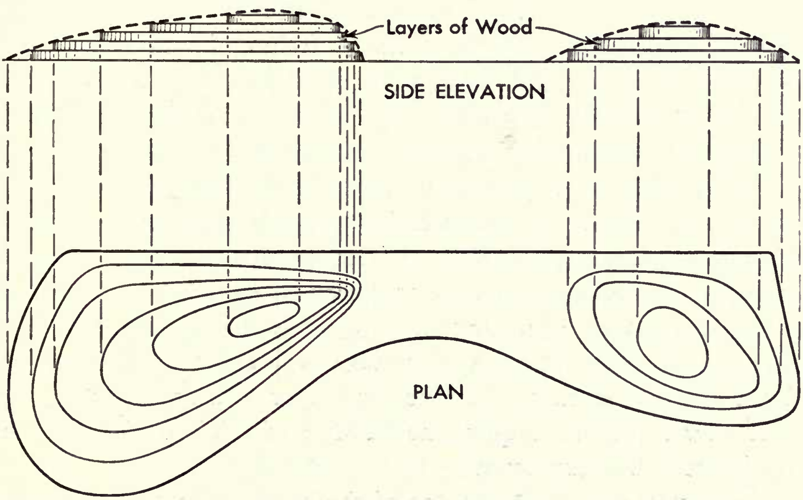


Fig. 20-1. Miniature construction showing layers of wood, and foundation to be covered with plaster laid over chicken wire or papier maché laid over wood.

add a little size to the water. This does no harm and often helps to make the paper bind better.

After the covering has hardened, another layer may be applied if required, or the priming coat of paint can be applied. This should be of the same color as the final desired color and may be caesin or any other kind of flat paint. It is best to insert trees and other objects which have to be attached to appear to be growing out of the soil while the covering is still damp and secure them with glue. Model railway supply houses have perfect miniature pieces of equipment for television and film miniature use. The scale of the miniature was not mentioned, since this depends largely on the purpose of the individual presentation as well as the size of the original. Model railroad "O" gauge accessories are built on a scale of one-quarter inch to one foot. This is a handy size, and yet the equipment is still strong and well detailed. When shooting the miniature it is best to make shots from as far away as possible and still get the required detail. Due to the size of the miniature, i.e., the small amount of area which represents quite a large area on the earth, it is usually best to use a narrow-angle lens so as to take in only a small amount of the scene when at a distance and still provide the necessary feeling of reality. It should be unnecessary to point out that the light should come from only one source so that all shadows are in the same direction, unless a foggy or murky scene with no apparent sun is required.

Of course, on a miniature, fog and similar scenes, such as storms, are simple to simulate. For normal usage they are only suitable for longer shots, such as from an airplane, or panoramas —in fog. But sometimes it is necessary to show the details of a house or doorway when there is no actor in the picture, such as a shot of the little ivy-covered cottage where the lovers hope to dwell. All action shots are taken inside or against a window or door which does not require the building of a full-sized house; so a miniature is constructed.

This may very easily be one of the model railroad accessories already mentioned, set up, painted and perhaps with a few

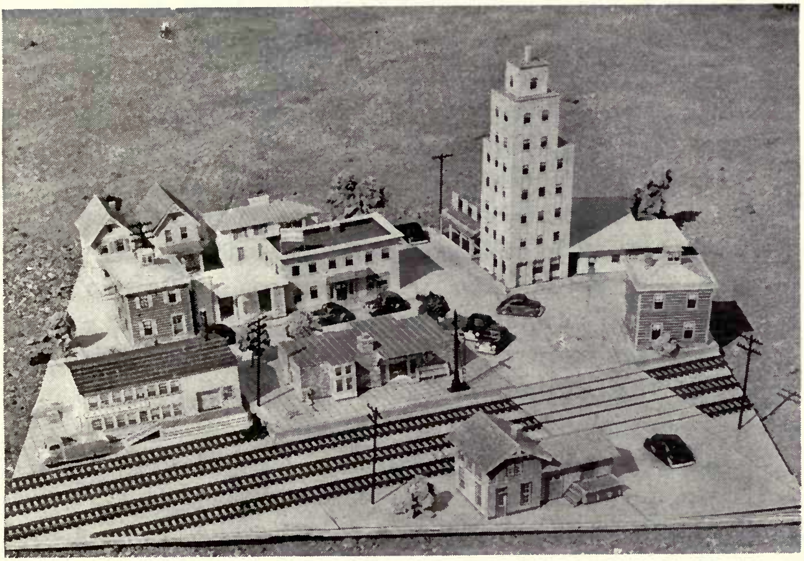


Fig. 20-2. Model railroad, $\frac{1}{8}$ inch to the foot, scale buildings suitable for miniature construction, made by Town-Craft Models, Box 54, Hermosa Beach, California. They are also obtainable in $\frac{1}{4}$ inch scale ("O" gauge).

touches, such as lights in the windows and general dressing up. Since these models are usually made by union workers there should be no trouble with unions. An illustration of some of these products appears in Figure 20-2. They can be bought at any hobby shop and many different makes are available for almost any period, modern or gay nineties style.

For a television station, or organization such as Paramount Pictures, which provides kinescoping facilities for any client who cares to engage the studios for a recording session in much the same way as many audio recording studios work, miniatures may be a possibility. In many cases their size and construction costs for a one-shot show are prohibitive, but where they can be re-used many times they may be worth while. It may even be that one day we shall see special effects rooms for visual effects in much the same way as radio stations have special effects studios for sound effects. Then the miniatures could be set up and left undisturbed until needed, at which time the desired shot would be piped in, or the camera set up for film work.

Sea and water scenes are not always too easy to fake. It may be imagination, but the author feels it is always possible to spot a fake scene by the appearance of the waves. In real waves the surface of the water is never smooth and oily between waves. Yet in every shot of a model rolling, or steaming along, the waves in the foreground are not only too large for the condition of the water, but are also too smooth between crests. In actuality the water is crisscrossed and broken between them. The camera angles are also unnaturally low and result in odd perspectives. This is sometimes aided by the improper use of lights in that the lighting is too even and appears to have no source.

Fog and smoke scenes perhaps should come under special effects, but since they are at very least scenery, and in a sense props also (for a set can be blank except for fog), they belong here. The Hollywood way to produce fog is by the spraying of oil through a very fine nozzle. In fact a popular oil is used for the purpose—Nujol. This is about the closest known representation of real fog, for it can be moved around by winds in billowing clouds and it even settles on the faces of players and gives them that shiny, damp look so peculiar to a foggy night. However, this is very expensive and most small producers and stations prefer to find something cheaper. For this, any kind of white vapor will usually do, subject, of course, to the requirement that no ill effects are experienced by the actors through breathing it.

Steam, smoke bombs, or dry ice are common. The former does not last long and is very unpleasant for the actors besides fouling up the air-conditioning plant. Dry ice is good but the vapor does not last long and is toxic. Smoke bombs are cheap but smelly. Magnesium ribbon or powder as used for flash pictures is quite effective and is cheap. Fog filters are possible, but here the effect is limited to static conditions of weather, for the resulting picture looks really foggy, but the fog cannot eddy about as it should. A fog filter can be made from a piece of white material with a fine mesh placed close to the lens so that the camera can "see" through it and with enough light on it so that it is hazy and indefinite and tends to make the picture look indistinct.

Props include dummy autos which can be dismantled, wind machines, cobweb makers, back-projection equipment (already discussed), rain and snow makers, and, of course, hand and stage props.

Taking the last first, anything that is handled by the actors is known as a hand prop; stage props are, in general, pieces of stage scenery which are not normally moved, such as floor lamps, etc. The organization required to handle all these props is quite complex.

Rain makers are almost universally used in preference to the real thing. Contrary to popular belief rain cannot be relied upon to descend when required and when a company is on location, it becomes necessary to assist nature and manufacture its own. For one thing, real rain does not photograph well and is usually unsatisfactorily reproduced due to lighting difficulties. For perfect rain making a set of pipes is built over the whole of the set with a special spray in front of the lens to ensure that the camera really does get some rain to photograph. Or it can be done with a spray in front of the lens and damp-looking people in the background.

Automobiles are next to impossible to use "as is" for photographic work. The various parts of the bodies get in the way of the lens and block the view. Although in real life a glance through a car window seems so natural, when a camera sees the same shot the little matter of the door pillars or windshield frame is exaggerated by the lens and the result is sometimes ludicrous and always unsatisfactory. Therefore, a special car body is built which can be disassembled to allow shots from all angles. The front can be removed to allow the camera to look back into the car and watch the faces of the passengers in the front seat. The hood and front seat are both removable to allow full-face shots of the rear seat passengers; the same thing can be done with the rear so that unobscured shots from all angles are possible. Of course, process shots are used very much more than is ever realized, especially with this type of auto; and the main highway scene is likely to be filmed with only half a car supporting the cast and a process screen behind their heads showing the sights of the open road.

Snow makers are large fans which silently and gently waft quantities of soggy, bleached cornflakes onto the set. Cornflakes were found to be better than anything except real snow and when not crisp would not make an unrealistic noise if trodden on. Various ice effects have been tried but they all required the use of cold areas and refrigeration which is costly and liable to give stars colds. The Christmas tree snow sold in dime stores will give an excellent frosted effect for very little outlay.

Cobwebs are made in a number of ways, but for setting up that disused, old, haunted look they are generally sprayed. Compressed air forces various "secret" plastic solutions out of a nozzle similar to the well-known paint gun. Stiff rubber cement can be used with good effect. Another type is a combined electric fan and solution dispenser which makes really authentic looking webs, although as far as is known no one has yet fooled a spider!

Everything in the scenic field for television, be it live or film, is still experimental so that there is plenty of scope for invention and skill. It is probable that live television has the greatest problems since the pickup tubes differ so greatly in their characteristics. While one tube may have an apparent straight-line response and the scenery is set up to match that, the next camera may render it quite differently. It sometimes happens that after a scene is set up a camera tube has to be changed. This can complicate matters greatly, for the new tube may have entirely different color characteristics and necessitate considerable changes in scenery coloring, or else it may ruin the effectiveness of some shots.

Among the problems encountered in live television, and in film work also, is the necessity to show certain views in detail. These are known as detail shots. For instance, it may be that poison has to be put into a pot of tea or coffee. A long or medium shot of the stage with the actor putting the poison into the pot would fail to show the details of the shot. Therefore, in normal low-cost television filming action is stopped and a camera dollies in for the business of dropping the poison, or a hand may be filmed anywhere in the studio provided the background and appearance of the hand and clothes which show are similar. In Hollywood operations, the hand might be shown this way or it might be shot later with a double. In live television production, action cannot be stopped for this side-play and yet it is essential to show it. The advent of the Zoomar lens has made this possible by using the amazing properties of the lens to pick up great detail at a distance. Another way is to have this action take place in another studio with a bit player's hand performing the dirty deed. At the proper time the director calls for a cut to this signal and the viewers see what appears to be the main character whom they were watching in a close-up a second ago. This is an additional case for the creation of an effects studio previously mentioned.

As far as the treatment of scenery construction is concerned, it has no particular place in this book, for it is a purely mechanical job and is usually performed by men (carpenters) specially skilled in this kind of work. However, the appearance of the finished product does concern the producer. The appearance of the *surface* of the material is important, of course, for it must be smooth and clean, but the color of the faces exposed to the cameras is of even greater importance. It is here that the gray-scale matching must be done to ensure that all the colors used are known in their response to the cameras. One method often used is to make a test of each batch of paint on the cameras. Then the proper gray-scale number is marked on the side of the can. In this way its appearance on the television screen can be estimated for future use without the necessity for extensive tests each time a new piece of scenery is painted.

The gray scale, shown in Figure 20-3 consists of a graduated scale of colors. When this is photographed it, of course, appears as shades of gray on the television screen. These are numbered, and the corresponding number to the various colors is used to identify the gray color or real color.

Designing the scenery is generally done by a scenic designer

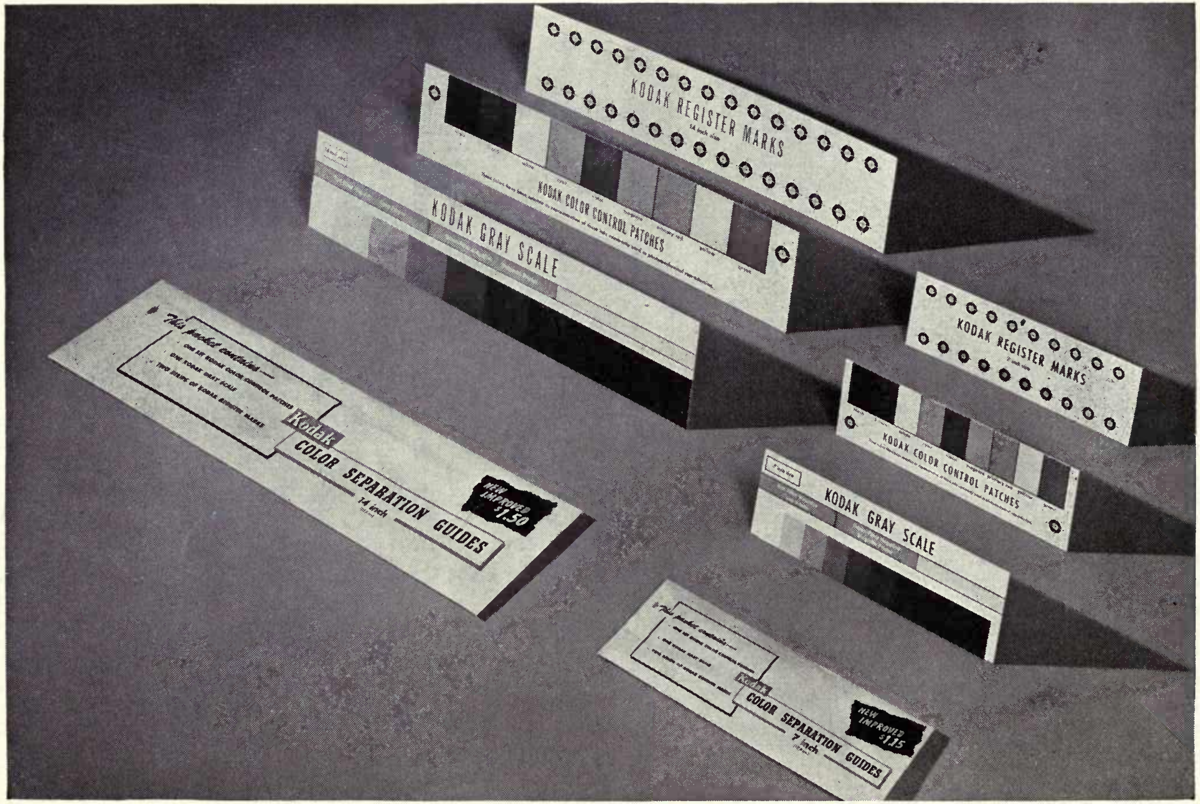


Fig. 20-3. Gray scale made by Eastman Kodak for judging color contrast values. Also made as color scale for use in comparing colors in reproduction.

who specializes in this type of work. It is not essential to have a specialist of this kind, but it is advisable if much scenic work is to be done. During his career the average producer picks up a lot of knowledge of design work and quite often an experienced producer can design his own sets. However, this is not very common. Usually the producer and designer get together and work out the design which will produce the required effects. When planning the stage the producer often makes use of small model flats and stage property which are built to scale and enable him to work out all his moves on paper without calling the cast in for expensive rehearsals.

His problems at this stage are to solve questions of camera shots and lighting, not forgetting the all important business which makes the story. Experienced producers can visualize the sets, but even so they frequently resort to mock-ups using scale models.

The scale used depends on the whim of the producer, the amount of space he has for the layout, his own personal preferences, and, of course, the size of the stage. It is most convenient if the producer is able to set up in his office a small stage which need be no more than half the size of his desk top. This can be a permanent feature and used indefinitely. The stage area is marked out in squares, each side representing one foot. If a scale of one-quarter inch to one foot is used (this is O gauge in model railway equipment), the same source of supply can be used for obtaining figures and almost every kind of prop imaginable as was used in building the miniatures already mentioned. Of course, if the stage area is small or the space for drawing the model stage is large, a larger scale can be used. But the convenience of being able to obtain figures and scenery already built is very great, especially since they are so realistic that a better idea can be obtained than by using dead bits of cardboard or wood to represent actors, or having to paint up other bits to make scenery. For $10 to $15 one can obtain a large supply of figures and models, which will also be usable on the miniatures already discussed.

If a larger scale is used, models can be obtained from the dime stores which are almost in scale, and certainly close enough. Both GE and RCA supply cut-out models, in book form, of their television equipment for use by engineers in planning studios and stations. The scale is about half an inch to a foot. The camera models from this can be used with great effectiveness in this kind of setup. Although blank or lettered pieces of wood and card can be used for setting up, it is much easier and more impressive if lifelike models are used. The dime stores today also carry sets of plastic furniture which is built to an approximate scale. Since these vary from store to store and time to time depending on whose make of toys is in stock, it is pointless to attempt to state the scale here.

Generally, one foot by two feet is the approximate space occupied by a standing man or woman. Flats are often made in four-foot widths because the plywood and composition sheets used come in that width. Dioramas and roll scenery can be built to scale as desired.

Plastic scales are used to represent the field and angle widths obtained from cameras and to plan early camera shots. These must, of course, be cut to the same scale. Usually Plexiglass about one-eighth of an inch thick will be satisfactory. Triangular in shape, they show what will be included in the frame with different lenses and distances. If the model cameras already mentioned are used, the pointed end is placed at the lens of the camera. If they are not used it must be remembered to allow room for the camera operator behind the apex of the triangles so that he has room to work as well as get his camera in. In the artistic frenzy of planning a production it is quite easy to forget the little detail of allowing space for the camera to be in position for a shot.

Having decided on the layout of the stage, the furniture style is decided. It is most important to ensure that pictures on walls are treated with great care. It is only too easy to produce an odd effect by the unfortunate positioning of a frame round a player's head, or by having an object appear to grow out of his head.

When changing scene from room to room it should be remembered that the viewer has only limited areas to watch; therefore, it must be apparent that the switch *is* from the kitchen to the dining room or bedroom and it is not just a corner of one of the previous rooms. For this reason distinctive furniture must be used.

Movies, of course, are able to take down walls and shoot from the back of the sets and generally get angle shots, sometimes called reverse-angle shots. In television it is not possible to do this because the lights will be all wrong and the dismantling of the walls to get the camera lens into position would be a risky proceeding on the air—something would be sure to go wrong so that when it came time to resume shooting from the front the wall would be missing. In film work for television this can be done if normal movie practice is followed, but as continuous shooting is brought into use more and more this may no longer be possible, unless it is done after the story is finished and the extra scene spliced into the film.

The limitations of dress previously mentioned are even more important in props and furniture, for these latter being often large, and always static, set up an unbalance in the picture characteristics if they are dark or very shiny. Flat gray or unpainted wood is highly satisfactory. Articles with a high gloss cause reflections and high spots, which result in negative reflections appearing as black spots in the picture due to overloading the mosaic of the image orthicon and causing saturation.

The best advice for anyone who wants to try out a new idea in scenery and stage dressing is go ahead and try it. But try it out on a closed circuit where the results, if poor, cannot be seen by hundreds of people. Invest in a few hundred feet of film and shoot the presentation of the idea for examination; this may often prevent the sponsor from trying to shoot the producer after a show has been panned by the critics!

Television is so new that anything can be tried, and anyone who can find a way of saving expense on scenery or any other aspect of television will earn not only the gratitude of the industry but a lot of extra money as well.

CHAPTER 21

STUDIO OR LOCATION SHOOTING

Into the life of every producer or film department head comes a day when the choice has to be made between studio and location for some particular scene or series of scenes. While at first sight it may appear that there is nothing better than location for authenticity in scenery and cheapness in costs, it must be investigated more thoroughly than that.

First thought should be what is the budget appropriation? Only too often the auditing department does not understand how the costs of shooting vary, and very likely they will assume that because the story calls for a busy street scene or a shop window set it will cost next to nothing to get it on some side street. Then the type of scene required should be examined to see if it is easily found and conveniently located from the point of view of transportation of equipment and personnel to the location. Traffic conditions must be investigated with special reference to the state of traffic at the time of day when the scene is to be shot. This is most important if the script calls for a specific type of lighting and it is important enough to be detectable in the finished product. At the same time, the investigation should include light conditions at the specified time; this means sending a man there, or more than likely, in most cases, going oneself. Attention should be given to the day of the week on which the action is to occur; if it is not important it may be possible to schedule it for a day when the traffic is light, but against this must be weighed the possible need for overtime.

When checking the light, it is important to be sure that buildings will not prevent the desired effect from being obtained. This is especially important in places like New York City where skyscrapers ruin the light in the canyons and most of the time plunge the roads into shadow. The availability of a-c power must be confirmed, since most cameras and sound equipment require it and perform best with it. If the sound is to be added later or if it is a silent production, this is not so important, and spring-driven (not recommended) cameras can be used. Infinitely preferable is the use of electric cameras with battery power from a small portable battery case. However, it may be that the script calls for dusk or dawn scenes where extra lights are needed to provide enough illumination. Or there may be just not enough light-period due to local conditions. In this case it will be essential to have a source of a-c power at 110 volts, preferably 220 volts for the lights.

City rules must be checked to see what special licenses have to be obtained, for in the modern city it is impossible to move without infringing some ordinance. Many cities require a permit to be obtained from the police before filming is started in the streets. This may be as much as $25 in some places; this all has to go on the budget. On the other hand, the permit is usually waived in the case of 16 mm operations, due no doubt to the fact that it has the somewhat dubious title of amateur use. But if a great disruption of traffic and pedestrian flow is to occur it is best to get one and request police help in controlling the crowds. This, of course, means more money for refreshment for the policemen on duty—and it all goes on the budget.

So far it sounds as though a lot of money is or may be involved, but this may not be so and all cases have to be considered separately. Another thing to be included in the calculations, and one which may be the most important of all, is our friend the weather man. The weather conditions called for may be special, such as snow in June or blazing sunshine in December, the latter is more possible! But if they are merely normal, such as any dry day, or a wet day (this is sometimes harder to find in a hurry), there should not be any special problem. Of course, it may be necessary to wait for three or four days to get the right weather, and with a full cast standing by it can run into money not to mention playing hell with the shooting and production schedule.

Now we have mentioned just about all the things which come into the picture. Of course, there *are* others, but these can generally be classified under "miscellaneous." So let us return to the first topic —the budget. This is usually fixed for certain productions or else supposed to cover special assignments for the production department. In any case it will always be small, and it will either be utterly too small and inadequate or it will be sufficient to do a good job. This all depends on the station manager or sponsor. The lower the film director can get and hold his budget, the more chance there is of it being approved. It is not often that a film director will be given the authority to go into film production on his own without a request from the program department, so most of his efforts will be for inserts for live shows and a newsreel if one is used. This matter of filthy lucre can be left here and we will proceed to the next problem.

Choosing a suitable location is not always easy. The script may say merely "street corner with a lamppost for the heroine to lean against." Or it may say "the corner of 42nd and Broadway." In either case it may be simpler for the set to be built in the studio than to use the real thing. If the set is the inside of a store at either of these locations without any traffic or street scenes, then faking the store background would probably cost less than taking a production crew. Due to the unfortunate fact that the television system does not transmit all the colors equally well and also suffers from the problem of low definition and resolving power, one-dimensional backgrounds, i.e., painted flats, are often undistinguishable from the real thing. So it is quite possible that a painted row of shelves containing cans, etc., will do as well as rows and rows of cans in a grocery store.

If there is space to store the scenery and it is made in such a manner that it can be dissassembled and is of unit construction so that it may be usable in parts for other sets it would probably be worth while constructing artificial sets. But most television stations, although built with the intention of having adequate storage and expansion space, seem to suffer from the effects of "not enough room to store equipment."

If the shooting is to be for the purpose of making an insert for the production department and they are selecting the location, it is important for the film director or an experienced cameraman to accompany the producer who is selecting the location. Otherwise, it may be found that something utterly impractical from a financial or legal point of view has been chosen. The checks already mentioned should be made thoroughly. The decision should be made whether to use the studio or to go on location. If action scenes are required then there is no question but that location scenes will be required for the movements of autos and other traffic. If the plot is laid in a particular time of the year there may be trouble ahead with the clothes of the passers-by. If it is summer and the story is set in wintertime, watch the light summer dresses and summer suits. They will clash with the mink coat of the heroine. The reverse also applies, and the snows of winter will be out of place in a story of summer love.

It must be remembered that location work always—well almost always—entails more work and expense. Equipment has to be taken to the set; that means at least one porter. A two-man camera team and two sound technicians are required if sound is to be recorded. Gobos must be set up, working areas marked. If many players are involved they will have to be transported in station wagons or cars. This all involves extra expense and if everything is not prepared when they arrive overtime may be the result. Weather may change over night, or even during the day so that carefully laid plans go wrong and it becomes necessary to shoot another day. This may mean having to obtain a fresh permit from the city to make motion pictures in public places. However, as was mentioned earlier, 16 mm is often exempt from this bother. This is especially so if filming is done from a car where there is no blocking of normal traffic and the operation is unostentatious. Judging from the number of groups one sees around New York City, consisting of perhaps a cameraman, director, and one or two actors posed on church steps or in doorways, there must be an unlimited field for the substandard (in size only, of course) operators.

Certain other types of program apart from those already mentioned must be filmed on the spot. These, of course, are the well-known "Man in the Street" type of show in which the M.C. stops people walking past the camera and interviews them. For real authenticity of detail it is necessary to have the action take place on the actual location of the interview. The presence of the inevitable crowds helps the atmosphere, and the background of faces while the interviews are taking place is a necessary adjunct to the showmanship of the production.

It is well to remember that signed releases must be obtained from *all* the people whose likenesses appear in the shots. For this purpose most producers carry a sheaf of mimeographed release forms which they can hand out and get signed with a minimum of trouble. In most cases it is not necessary to give anything as a fee for the performance—human nature being what it is there are often more willing participants than room. The actions of studio audiences on the camera shots when they go wild trying to outdo each other in waving is good evidence of that.

If the above-mentioned action is to take place in the studio it will be necessary to get this crowd into the studio and while that may not be too hard it may cause complications in that the time may be difficult for some to make. And they may expect to be paid extras' fees which may cause trouble with the unions who might demand that union actors be employed for the purpose. If a crowd gathers to watch an interview in the street however, the union can hardly declare that they are being employed by the company and thus doing a regular actor out of a job.

Of course, there is no cost for scenery on the street, but on the other hand it is seldom built exactly as one wants it and it may need a little altering. Studio props are always rather flimsy and it is only too easy to have a backdrop of other scenery which moves with the wind or shakes when someone closes a door. On the stage we have come more or less to expect to see scenery that is obviously one-dimensional and only painted on the canvas. But in the cinema, and even more so perhaps on television, watchers have come to expect perfection, or at least so much attention to detail that this type of fault does not appear. With untrained members of the general public as extras unused to their way around a television studio the risk of one of them leaning against a prop lamppost or poking a foot through a canvas wall is very high. The Metropolitan Opera hires "supers" for one dollar a performance and anyone who sends in his name may be called, and most people are. Although untrained, very ordinary members of the public are used for this purpose and because of the distance between the audience and the stage and the absence of close-ups or two-shots, etc., there is almost never an accident—although the author *has* been present on the stage playing the part of a soldier when the pike of the man in front of him caught in some netting and almost pulled down one of the flats!

Location shooting requires that all the shots be taken quickly and immediately after they have been set up. This is because of the lighting situation. Since the sun is depended on for light it follows that the whole core of the operation must be built around this light source. With the advent of fast emulsions and fast lenses with low graininess, and good depth of field, it is no longer necessary to have a blazing sun overhead. The original studios were built on a circular track so that they could be swung around to follow the sun as it moved to keep plenty of light on the subject. Today, the best light for street filming is one which is not bright sun but a grayish, overcast sky; in fact, in some cases even a slight drizzle is excellent.

If bright sun is available the lens has to be stopped down to prevent overexposure, and to eliminate shadows round the eyes and black pools of shadow under the nose and chin light reflectors are used. However, once the light conditions are established the filming must be done immediately afterward; otherwise, the movement of the sun will change the lighting on faces—these are the hardest things to light properly in outdoor shooting. If a number of retakes have to be made it is imperative to check the light; otherwise, what was a good balance at the beginning of the operation may later be completely out of adjustment. In other words, all things being equal the only aspect which causes trouble is light, and this seems ridiculous for there is so much of it in the great outdoors. "Hollywood makes lots of outdoor scenes," we hear someone say. "How about them? They're pretty good." Yes, they *are* good, but Hollywood has miles of its own streets where it can set up any kind of lighting plants and reflectors from almost unlimited power supplies. The resources are so great that it is not only unkind to the average television station to compare the two industries, but it is also as foolish as saying the ten-year-old boy on the bicycle is incompetent because he cannot pace the seventeen-year-old on a motorcycle. Given time to grow and prosper he will be able to do all that the other boy does and probably more, because the odds are in his favor that some new things will be developed by the time he is seventeen. In the same way television's facilities are limited by financial problems, but these will be overcome and new methods of working developed.

Thousands of words can be written about this subject for it is highly controversial as well as involved. The chief problem is to know when to stop. The purpose of this rather brief chapter is to familiarize the reader with the problems he is likely to meet and summarize them.

Weather Location conditions are highly variable and, while predictable within certain limits, can never be relied upon from day to day, or even hour to hour. Also, it is not always possible to duplicate conditions required in script. Studio conditions are always the same and under complete control, but if seasonal effects such as snow are required, very often location shots will be better.

Lighting The same limitations apply for location shots as for weather with the extra factor of constant change during the photographing of a scene. Lighting requires the use of extra equipment in the form of gobos or shades, etc., on location. In the studio everything required is always at hand.

Equipment On location it is necessary for everything to be transported with increased cost and the always present risk of forgetting some important accessory and holding up production while it is fetched, or leaving something behind and losing it. Extra manpower is usually required for porterage.

Personnel Much the same problem is presented as for equipment with the overtime factor to be considered since delays caused by any of the other static elements may cause it to run up while forgotten objects are retrieved and weather or lighting changes force readjustment.

Scenery On location it is always more authentic, but sometimes even the authentic scenery looks unreal owing to the way the camera sees it. This is often so particularly in color work. While we shall not be concerned with color at the present for television it may be that the reader will make some films for home libraries or even for universal exhibition. Some producers are making all their films in color these days because the cost is not excessive and the resulting film has a much greater appeal and field of possible sales. Either color or black and white prints are used for television showing.

Costumes and Props Much the same criticisms apply to these as to equipment and lights with the addition of an occasional need for a place to change for the artists and (although not normal to an actor) perhaps a certain shyness to appear in public streets clad in some very odd dress.

Incidentals Permits have to be obtained from police, etc. Plans must be laid for transportation and a coordinator of transportation appointed to avoid costly duplication of effort and equipment usage. Even matters of food are sometimes important, although in the city there is always a handy drug store or delicatessen to visit. If the trip on location is to the country, seaside, or any wilder places not only must all the equipment, players, scenery, miscellaneous effects, food, and props be taken but more solid preparations are required for ordinary human comfort. Adequate supplies of food and drink are needed and the addition of a trained nurse, or even a doctor if the budget is large, is very worth while, for it is on these supposedly simple expeditions that people choose to break legs and arms, etc. Although these accidents are often the result of the victim's own folly, since he, or she, is on duty, the employer is often held liable and the presence of capable first-aid is a big point in the employer's favor if the case ever comes to court. It is surprising the silly things that people will do once they get in the country away from the inhibiting city.

One last thought should be left with the reader. A keeper of the purse should also be appointed and supplied with a goodly amount of petty cash. It is utterly astounding how many things are found to be needed when out miles into a bare country far from the studio and it becomes necessary to improvise. Also a little palm greasing is usually effective in obtaining special consideration from keepers and attendants alike when the usual wiles have failed. It is logical for one person to have the money, do the spending, and account for it afterwards. If this point is not considered it may happen again that a location party gets stuck for gas because each member had left it to the producer "to take care of things like that."

CHAPTER 22

COPYRIGHT AND RELEASES

Television to most people is thoroughly confused with movies and Hollywood and as a consequence they believe that everyone connected with either must be a millionaire. This belief can be ruinous to a small station if it becomes mixed up in litigation, or suits for damages due to an error on the part of one of its employees. It is a standing "joke" that people never sue for less than a million dollars; even though that may not be strictly true it *is* a fact that extremely large sums are always demanded. For this reason, it behooves the film or program director to pay very careful attention to questions of release and copyright infringement before using any material.

The whole field of rights and releases is highly complicated, and only a lawyer can really untangle many of the problems. For this reason, all stations and companies employ experienced attorneys to guard their interests. But even with this it sometimes happens that something gets past the attorney and the company becomes involved in an expensive law suit—it may also mean the end of your job, too, if the firm fails as the result of excessive costs being assessed against it, or if it is due to your negligence in part. Therefore, the importance of being sure *before* the event rather than after cannot be too highly stressed. It is rather like jumping out of an airplane—once committed by jumping, or having shown the film or production, there is no undoing it.

The American Association of Advertising Agencies, generally known as the "Four A's," has prepared a short pamphlet for the guidance of personnel engaged in signing contracts and obtaining releases. It is suggested that a copy of the current revision of this be obtained by interested persons.

Some of the main problems which cause trouble to the station, producer, advertiser, or agency are literary and music rights, motion picture rights, invasion of privacy, and defamation. In the case of motion pictures used for television the subject becomes very involved since very often the person who *really* holds the rights to its television use is unknown and may even be dead. Since literary and dramatic rights are bound up together it seems well to discuss them coincidentally.

Generally speaking, the author of a play holds the television rights as well as the theatrical rights and, therefore, he is entitled to a fee for the performance of his work over the former medium. Permission to use these works may usually be obtained from the author or his agent or publisher. On the other hand, the play may have been made into a film, in which case the motion picture company will probably have bought all the rights including broadcast and television performances. In that case it is necessary to get authorization from the motion picture producer before the play is produced over television, or, even more important, it is refilmed, perhaps for a special TV film.

Literary rights are controls vested in the author which determine the uses which may be made of his works. If the work is not a dramatic production or intended for such use, the release to use it may not contain specific permission to use it as a dramatic presentation, and it is possible that the courts may rule that the use made of it was unfair to whomever holds the rights. Even if it is a lecture which you wish to dramatize or televise, it *should* be released, since the copyright holder has all rights to use it as he desires. Even the fact that the performance is not for profit will not protect one against a suit for infringement. Every dramatic performance requires a specific license. This works somewhat of a hardship on producers for there is no one source where all these licenses may be obtained.

Almost every situation is different and must be considered as a separate case. It is very seldom that a precedent can be followed safely because the art is so young that there has not been enough time to establish any particular method of handling the various aspects. Leave these matters to your attorneys; that is what they are paid for and follow their advice. A case may seem to the layman to be very similar, or even the same as his, but there may be a hidden hooker in it which renders all previous decisions on comparable issues inoperative in this one. If he fails to get legal advice or ignores it, that slight difference may cost him his job or his fortune, depending on his position.

It is only good business to get the release contract drawn up and signed before the production goes into rehearsal. Sometimes it happens that this has not been done, with the result that many precious days and dollars were tied up while the legal departments hunted for someone to give a release. There have been cases, where even after a very thorough search had been made and someone located who was presumed to be in position to grant permission, a suit ensued because the granter did not really hold those rights, and a person with prior rights appeared and claimed infringement. It is sometimes possible to show in cases like that that a conscientious effort to make an honest deal has been made by the scope of the attorney's search. The courts will sometimes consider this in determining the verdict and amount of damages.

As many people have discovered to their discomfort there may still be trouble even after a release has been obtained. In one case it concerned an old movie, which was released by the distributor for TV use. Shortly after it was televised the producer turned up and insisted that *he* held the only television rights to it and demanded substantial damages. However, before his case was settled the author of the original story appeared on the scene and insisted that *he* was the person they should have dealt with in renting the film for air use. The case was settled amicably out of court, but it could have led to involved and long, drawn-out court proceedings.

In the case mentioned above, even though the television station had obtained a release to use the film on TV, and the form of release was the usual one, which, "holds safe the hirer from suits arising from the use of the film," and goes on to state that the owner guarantees the immunity of the hirer from damage awards, it might have afforded no protection to the station concerned. Suppose the hiring company had been operating on a shoestring, as so many of these film supply houses are. The damages would have been assessed against the user—in this case the station; they in turn would have relied on their guarantee from the distributor and passed on the claim to him. Now, unless he has the money and resources to implement his guarantee, the protection is not worth a cent. It is like hiring a cripple, unseen, as a bodyguard simply because he says, "I guarantee you will never be molested." Similarly if the hirer relies only on a printed piece of paper from the "owner" without checking into his rating and financial stability it is inviting trouble. The claim will merely bounce right back into the hands of the user, who after all is the person who caused the infringement.

Music rights are another thing which cause the television producer or station operator a lot of trouble. The subject is complicated by the fact that there are many different licenses to contend with in the field. By the time that this book appears in print the discussions with ASCAP—The American Society of Composers and Publishers—will have been long settled. The general agreement for AM broadcasters was simple, but now that television has come along to complicate matters, the issues are more involved. In general under the blanket license straight instrumental use is use of music by vocalists not in costume, small groups in costume if not tied in with performances in dialogue, scenery, or dancing routines. However, any number which was originally written for an operetta, motion picture, or dramatic musical work must be specially licensed if used in costume with scenery, dialogue, or dancing. Any special use which dramatizes the title or words of the song requires special treatment.

The use of music for dramatic and non-dramatic public performances is the thing which will cause the most trouble simply because it arises most often. This is particularly true in the case of kinescope recordings. Here the field is highly unstable due to the various attitudes towards these recordings. The producer and station operators regard them quite logically as a means of extending the network operations of the broadcaster. In cases where the coaxial cable does not extend, a copy of the program is sent to affiliated stations and used as an electrical transcription as in sound broadcasting. This now involves us in recording rights.

The copyright law provides a royalty of two cents per copy; however, in many instances the radio business has paid more than that. A kinescope recording is only one variation of that since the medium is film instead of a disc; therefore, it seems logical to pay the statutory sum. In this connection it is interesting to note that not too long ago it was held that a motion picture sound track did not fall into this category. In the case of kinescope recording it is merely a means to an end. If the program went by cable there would be no problem, apparently if it went by disc there would be no trouble, but because it uses film, which, after all, is only the vehicle which transports the program to the distant point, we run into many problems.

Literary rights in the kinescope field are a little less uncertain. Agents are granting the right to use works for recording for audition, reference, and one-time use over a particular station for thirty days. It is clear that some very definite decisions concerning kinescope recordings will be made quite soon since this is an aspect of the industry which will become of increasing importance.

In the field of general film use there are some important points to keep before one at all times and especially when using news films. This is the right of privacy. Most of the states have laws which make it unlawful to use the name or likeness of anyone for commercial purposes. The only clear exception to this is in the use of newsreels. Current news is public property; it is something which the public has a right to be interested in. Old news and historical events are also in that category if they are genuinely of interest to the public. But if these events are fictionalized or dressed up to provide entertainment instead of news appeal, then the production goes beyond the bounds of news and the way is open for lawsuits.

Every person has the right to personal privacy, but if he does something or goes somewhere so that he becomes part of the news, then he has waived that right temporarily. In the case of a man who goes to a football game, he is taking part in a public affair, and, therefore, is one of the incidental units which make it so. If in panning or sweeping the bleachers or stands for normal interest shots of the crowds and audience he is picked up and shown briefly on the screens of home viewers or recorded permanently on celluloid, he has no cause for complaint, for he went there willingly, knowing that it was a public affair, and by going he was becoming a member of the public. This is so even if his boss sees him and fires him for attending the wrong venue for his grandmother's funeral!

If an onlooker has some facial or other affliction which can be the cause for amusement, or has a grotesque or humorous mannerism and the camera singles him out for ridicule by holding on him for a period of time longer than needed to give a *general* impression of the affair, then he has a strong case for damages for invasion of privacy or for holding to ridicule.

In general, if an ordinary, undistinguished member of the public is minding his own business and not doing anything to attract attention to him, he should not be filmed or televised. On the other hand, by appearing in public places such as the street, he immediately becomes one of the people constituting the public and as such temporarily abrogates his rights to the extent that he is one of the units making a whole. In the case of the world-famous Fifth Avenue Easter Parade people, especially women, go just to see and be seen. Here it is a different case, *but,* if it desired to photograph some lady in a particularly pretty or grotesque hat or costume, it is best to get a signed release first; otherwise later on some night-school attorney friend of hers will say, "Did you sign a release?" If the answer is, "No," he may talk her into suing.

Any public person is news wherever he may be. If Governor Dewey walks along Broadway, he is news, and a picture of him in the papers doing just that is not an invasion of privacy. But if a photographer were to break into his house or garden to get pictures which were not ordinarily available to the public, then the law would be against the eager photographer.

Most readers have probably seen tickets for shows which are being televised. The backs usually carry a note to the effect that by accepting the admission ticket the public also gives a release from liabilities and a consent to be televised. In the early days of television it is said that more than one divorce was caused by the sight of an erring spouse out with a paramour! The companies concerned were reportedly taken to court, but the judge ruled that by attending the public place of entertainment the plaintiff became part of the public scene.

Most television stations and film studios carry a large store of stock shots. These quite often contain a high percentage of old news films. On occasion some of these shots may be used in an entertainment program and it can sometimes lead to trouble since someone who was present at the event and is recorded in the movie may object.

The whole problem of releases and legal liability is beyond the scope of control of the average reader. The wise operator gets a good lawyer and puts the problems up to him and devotes his time to producing good television programs. One last word of advice—at the risk of repetition—is always get a signed release to use the person's picture over the air or on film while he is there. That means don't take a picture, then after it's developed decide to get a release. The subject has probably gone back to the other end of the earth where he came from, by then. And finding him will be difficult. The advice about the release also goes for inanimate objects, which do not come under the heading of literary works or music and which you want to use on your program. Merely having the item in your possession is not enough.

The question of royalties is still complex. At the time of writing, musicians are not generally allowed by their union to record for films to be used on television. Also films made recently are not licensed for TV use by the musicians. It was only a short time ago that musicians were allowed to record for kinescope recordings. The great convenience of being able to audition shows on a piece of film rather than setting up the whole show with its subsequent expense every time a deal was "hot" finally swung the union to the point of agreeing.

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American Standard

Specification for 35-Millimeter Sound Motion Picture Release Prints in Standard 2000-Foot Lengths

1. Protective Head Leader

1.1 The protective leader shall be either transparent or raw stock. When the protective leader has been reduced to a length of 6 feet, it is to be restored to a length of 8 feet.

2. Identification Head Leader (Part Title)

2.1 The identification leader shall contain 24 frames as specified below:

(a) 6 frames on which are plainly printed, lengthwise with the film, in white letters on a black background: (a) reel number, (b) picture title.

(b) 18 frames on each of which are plainly printed in black letters on white background: (a) type of print, (b) reel number (Arabic numeral not less than 1/4 of frame height), and (c) picture title.

3. Synchronizing Leader

3.1 The synchronizing leader shall consist of 20 frames ahead of PICTURE START mark, then 12 feet, including picture start mark, to picture. This leader shall be opaque except as specified below:

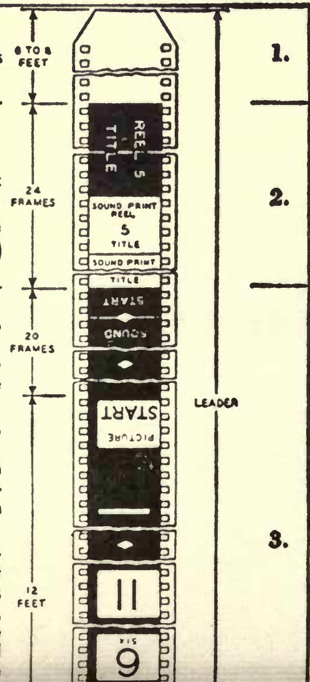
In the center of the first frame there shall be printed across the picture and sound track area a white line 1/32 inch wide upon which is superimposed a diamond 1/8 inch high. In this same frame shall be printed "SOUND START," in white letters on a black background.

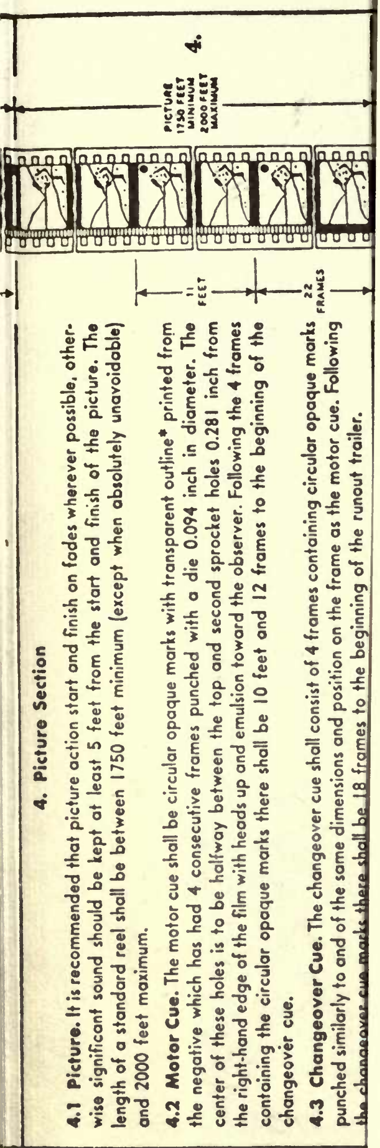
The next 15 frames may be used by the studio for sensitometric or other information. If not so used, this leader shall be opaque.

The picture start mark shall be the 21st frame, on which is printed "PICTURE START" (inverted) in black letters on white background. The standard camera aperture height (American Standard Z22.59-1947) of 0.631 ±0.002 inch shall be used in the photography of this frame and all others between PICTURE START mark and beginning of picture.

From picture start mark to picture, leader shall contain frame lines which do not cross sound track area.

Beginning 3 feet from the first frame of picture, each foot is to be plainly marked by a transparent frame containing an inverted black numeral at least 1/2 frame height. Footage indicator numerals shall run consecutively from 3 to 11, inclusive. In the frames in which the numerals "6" and "9" appear, the words "six" and "nine" (also inverted) shall be placed immediately below the figure, to eliminate the possibility of misreading in the projection room due to the similarity between the inverted numerals. At a point exactly 20 frames ahead of the center of each footage numeral frame, there





(*Continued from front flap*)

film clips with live scenes, the production of newsreels and commercials, and the uses of models, cycloramas, animation, etc.

The author gives specific examples of successful and unsuccessful commercials, information about the costs of different types of production, and valuable advice on factors to be considered in shooting on location, good and bad scenery from the TV point of view, and many other practical aspects of programming.

Anyone working in television today, and especially those working on a budget, will find a wealth of useful information and guidance in this book.

John H. Battison

The author of this book, an Associate Editor of *Tele-Tech Magazine* and member of both the British and the American Institutes of Radio Engineers, is a widely experienced television engineer. He has worked as a research and design engineer for the E. K. Cole Co. in England and the Midland Broadcasting Co. in Kansas City, and as Assistant Chief Allocations Engineer for the American Broadcasting Co. in New York. He has played an active part in the design and construction of four television and eight radio stations, and has had over 60 technical articles published in such magazines as *Electronics*, the *Journal* of the British Institution of Radio Engineers, *Aero Digest, Radio Electronics, Televiser*, etc.

During the last few years he has conducted courses on "Films for Television," "TV Station Operation and Programming" and similar subjects at New York University and other leading professional schools.

IMPORTANT BOOKS FOR TELEVISION TECHNICIANS

TELEVISION FOR RADIOMEN

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A very thorough, understandable course in television for the serviceman, this book explains in non-mathematical terms the function and operating principles of every circuit in television receivers and the major components of transmission, with step-by-step instruction in installation, adjustment, alignment, and trouble shooting.

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This book combines an up-to-date text on antenna theory with a detailed reference handbook on the characteristics and installation of all types of antennas. All commercial models, special types for special locations, antennas for the proposed high frequency allocations, high gain antennas, and a number of new types recently tested by the authors are included.

RADIO & TELEVISION MATHEMATICS

A Handbook of Problems and Solutions

by Bernhard Fischer

721 problems, with solutions, show you how to set up the equations for and how to work out all calculations commonly required in radio, television, or industrial electronics work. Arranged under radio topics, they enable you to find quickly the step-by-step solution for any problem you encounter.