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The Audio-Visual

# *Projectionist's Handbook*

A Pictorial Manual  
for the Guidance of the  
Student Operator in Schools,  
Industry and the Community


PRICE ONE DOLLAR

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# The Audio-Visual *Projectionist's Handbook*

## TO YOU THE PROJECTIONIST

The projectionist is an important link in the teaching and learning process. Upon you will depend how well the aid is shown. No matter how good the photography or how valuable the aid is educationally, a good deal of its value may be lost if it is given poor handling in projection. You must know your job well if you are to show the aid efficiently. Skill in handling the equipment and the techniques of good showmanship can only be acquired by constant study and practice. Remember the best projection goes unnoticed while poor projection is marked by distractions and interruptions, all of which disrupt the class. By learning your job thoroughly you can help the instructor to use audio-visual aids more effectively.

Amo De Bernardis

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## In This Handbook

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**SCREEN SELECTION  
FOR GOOD VIEWING**

★ ★ ★

**DESIGNS FOR  
VISUAL EDUCATION**

★ ★ ★

**SCREEN TABLES**

★ ★ ★

**TRENDS IN PREVIEW ROOMS**

★ ★ ★

### Section One

**The Projectionist's Job  
Before the Showing  
Starting the Picture  
During the Showing  
Ending the Picture  
After the Showing  
Projector Care  
Lubrication  
Splicing**

**Film Care & Maintenance  
Types of Film Damage**

★ ★ ★

### Section Two

**THREADING DIAGRAMS  
TYPES OF 16MM PROJECTORS**

★ ★ ★

### Section Three

**FILMSTRIP PROJECTION  
SOUND FILMSTRIP PROJECTOR  
STILL PICTURE TIPS  
TYPES OF STILL PROJECTORS  
RECORDINGS**

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**PROJECTIONIST'S TROUBLE CHART  
PROJECTIONIST'S CHECK SHEET**

## Sight & Sound Paths to Learning

**M**ORE THAN 400,000 16mm sound motion picture projectors and nearly twice that number of silent and sound filmstrip projectors among schools, churches, farm and urban groups, professional, business and industrial owners give evidence that audio and visual methods for achieving "more learning in less time" are widely accepted and practiced.

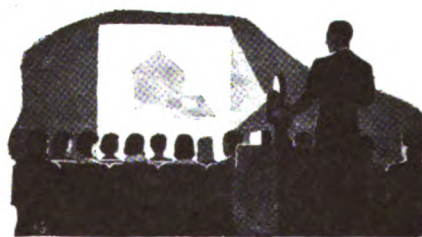
The millions of linear feet of safety film stock now being used for informational and educational purposes alone are a further example that this is truly a "Visual Age." The printed word remains the basic means of idea communication but this complex world of swiftly-moving social, political and economic events gives evidence that "books are not enough" to keep us informed. The lighted screen, in natural color or monotone, accompanied by mechanical sound or by the spoken narration of a skillful teacher, is helping to bring the knowledge and understanding mankind so urgently needs to keep abreast of the times.

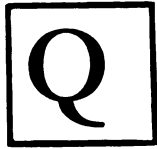
The finest sound motion picture, intelligently created and skillfully produced for its specific purpose, is no better than its presentation on the screen. Young projectionists in the school, salesmen in the field, teachers, trainers, service men, doctors, preachers, and executives — all these hold the future of our films in their hands as the operators of projection equipment. To help prepare and improve their skills and thus to increase the effectiveness of all sight and sound media, we have prepared this visual Handbook.

— OHC

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**Acknowledgements:** Our co-editor of this Handbook is Amo DeBernardis, Supervisor of Audio-Visual Education in the Portland (Ore.) Public Schools. Graphic illustrations were originally prepared by John Thorne of the Graphics Division, National Film Board of Canada.





## What ARE the AUDIO-VISUAL MATERIALS?

### 1. MOTION PICTURES

Informational, educational and training films for business, church or school use are distributed in 16mm sound-on-film size. This non-inflammable film has no fire hazard. It will be mutilated on *silent-only* type home equipment, so use only on standard makes of sound projectors.

### 2. FILMSTRIPS (SLIDEFILMS) AND SLIDES

Filmstrips or slidefilms are rolls of still pictures, 35mm in width, to be projected successively with the text in titles on the film or with a sound recording on an accompanying disc (sound slidefilms). *Slides* are made in standard sizes of 2" x 2" or 3 1/4" x 4 1/4".

### 3. RECORDINGS

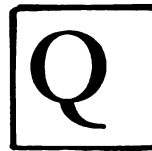
Educational, music, or business material may be reproduced on either normal speed (78 rpm) or slow-speed (33 1/2 rpm) discs. Most commercial recordings are of the 12", 78 rpm type; sound slidefilm transcriptions are generally made on slow-speed 33 1/2 rpm discs of the 16" size. The new microgroove recordings which carry the equivalent of 4 standard (78 rpm) records on each side of a 12" disc are also of the slow-speed 33 1/2 rpm type. A special playing arm is required. Tape and wire reproducers are also being widely used for recorded classroom material.

### 4. OPAQUE, CHART AND PICTURE MATERIAL

Diagrams, maps, technical data, etc. may be projected on opaque type equipment or used by means of "flip charts", exploded views, or in blow-up sizes for classroom purposes. Photostats and gravure enlargements are widely useful.

### 5. MODELS, MOCK-UPS AND DIORAMAS

Mechanical devices, engineering and other technical objects etc., either too small or too large to be seen, may be demonstrated by means of 3-dimensional models, cutaways, and solid models. Dioramas help visualize historical or geographic scenes, technical situations, etc.



## Why USE AUDIO-VISUAL MATERIALS?

### 1. LEARN MORE

Tests show that students and trainees learn more in a given time. They are more attentive while watching a sound film (81.7%) as compared to only 54.6% of attentiveness while listening to lectures.

### 2. REMEMBER LONGER

Facts learned with the assistance of sight and sound aids, under the supervision of a good instructor, have been retained up to 55 percent longer, according to tests by the armed forces.

### 3. INCREASE INTEREST

Sound films and other sight and sound aids help prepare the learner and familiarize him with the scope of the lesson. Tests have shown that this preparatory advantage increases interest and confidence.

### 4. MAKE TRAINING AND INFORMATION UNIFORM

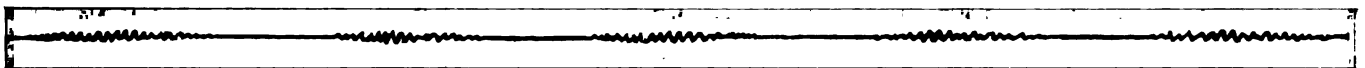
The unvaried accuracy and completeness of a filmed message help to get similar results on a higher level from different locations in business or educational use. Human failings are minimized by the assistance of sight and sound aids.

### 5. BUILD MORALE

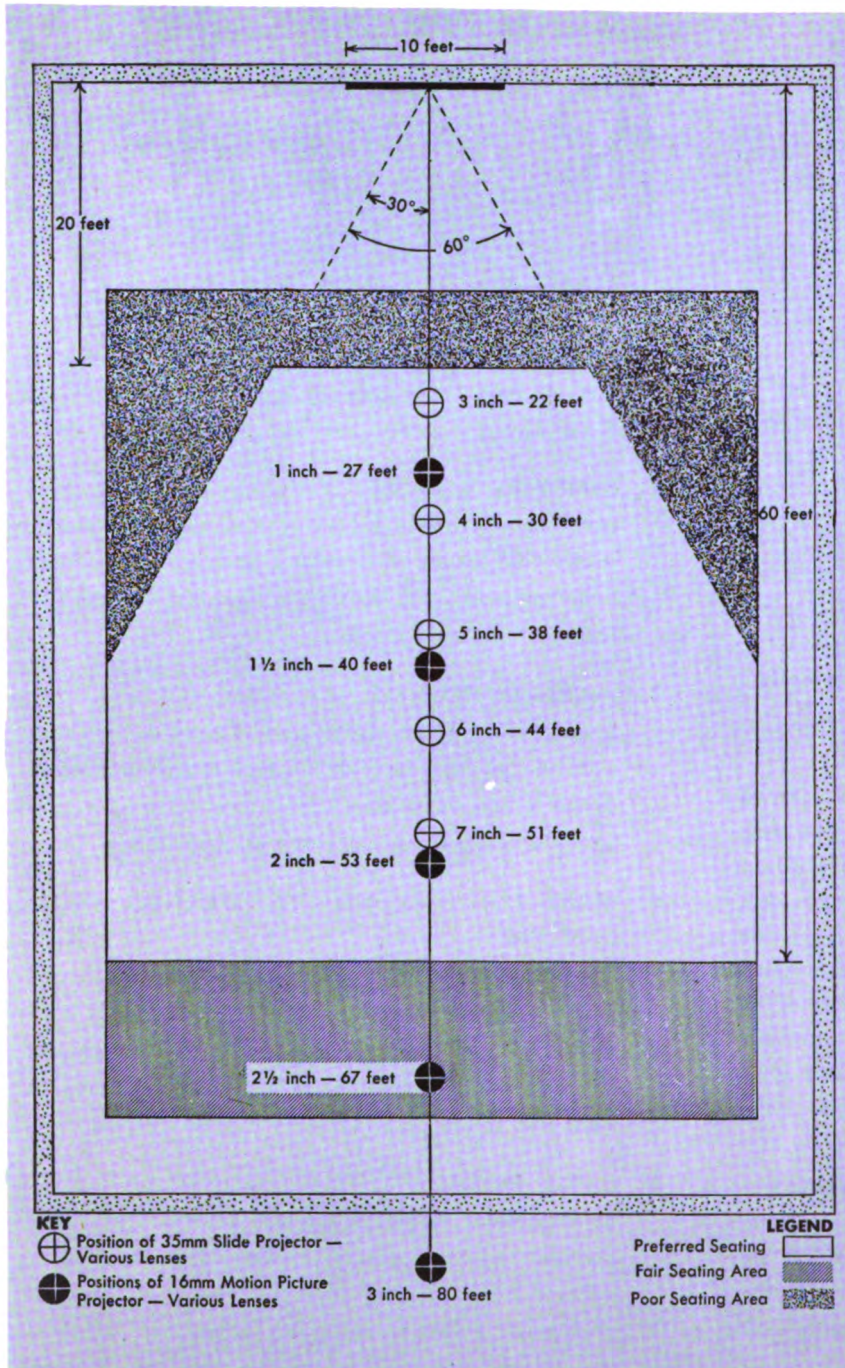
Better understanding of visualized lessons increases confidence of the learner through comprehension of difficult or involved mechanical, mental or physical problems. Indoctrination of workers or students through showing of films reduces time loss through unfamiliarity with policies, regulations and general background.

### 6. SAVE TIME

Audio-visual materials help business and schools meet higher standards of learning, covering a wider range of subject interests, in less time.







## SCREEN SELECTION FOR VIEWING

**A** PRIMARY STEP in the design of room facilities for audio-visual presentation is the selection of the projection screen. The screen should be selected first to suit the room in which it is to be used. To proceed otherwise is to risk loss of seating space in the audience area.

The room diagram illustrated above shows a typical layout of seating areas, preferred, fair and poor; also shown is the relation of motion picture and slide projectors and lens sizes

**THE TWO AND SIX FORMULA:** it is well established that the recommended minimum viewing distance of a projected picture is twice the screen width and the recommended maximum viewing distance is six times the screen width (it is assumed that the picture fills the screen). This will be best remembered as the "two and six" formula."

As the layout indicates, motion picture or still projectors equipped with various lenses will not change the screen requirement.

**THE DARKLY-SHADED AREA** close to the screen (see diagram) is the least desirable seating space due to the inability of the human eye to encompass the full screen area from such a short distance. The area outside of the 30° line of vision also introduces undesirable distortion to the image being viewed. The center of the viewing area is considered optimum.

**THE LIGHTLY-SHADED AREA** farthest from the screen is satisfactory but serves to emphasize the importance of the proper screen size in the auditorium or the classroom. Too small a screen will tend to increase the competition of general room space and diminish the pictorial values on the screen. When screen and lens are properly matched, the greater part of the seating area will be satisfactorily served.

**VIEWING ANGLE DISTORTION:** in the average room layout, distortion will not be a problem, but in a very wide space, it must be considered in the layout of the seating area. Undesirable viewing angle distortion occurs beyond the 30° line of view, thus 30° (see layout) generally becomes the maximum viewing angle recommended. It is obvious that it is not the function of the screen to eliminate viewing angle distortion, for this is a matter of perspective and the screen does not cause or control it. Viewing angle distortion can best be minimized by intelligent seating of the audience.



# DESIGNED FOR VISUAL EDUCATION

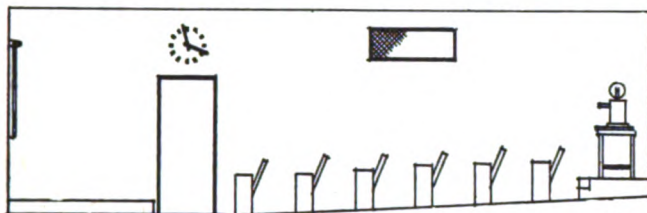
**T**HE BASIC PRINCIPLES of room layout for good projection are as follows: (a) good seating arrangement, which is a matter of utilizing the best area in relation to room size and screen (see page opposite); (b) provision for adequate darkening of window areas, at economical cost and convenience of operation and comfort; (c) adequate ventilation, either natural or artificial, so that the audience will be comfortable at all times; (d) good acoustical conditions, particularly in the case of large halls. This is not a serious problem in classrooms or smaller spaces.

Drapes for windows to be "blacked out" ap-

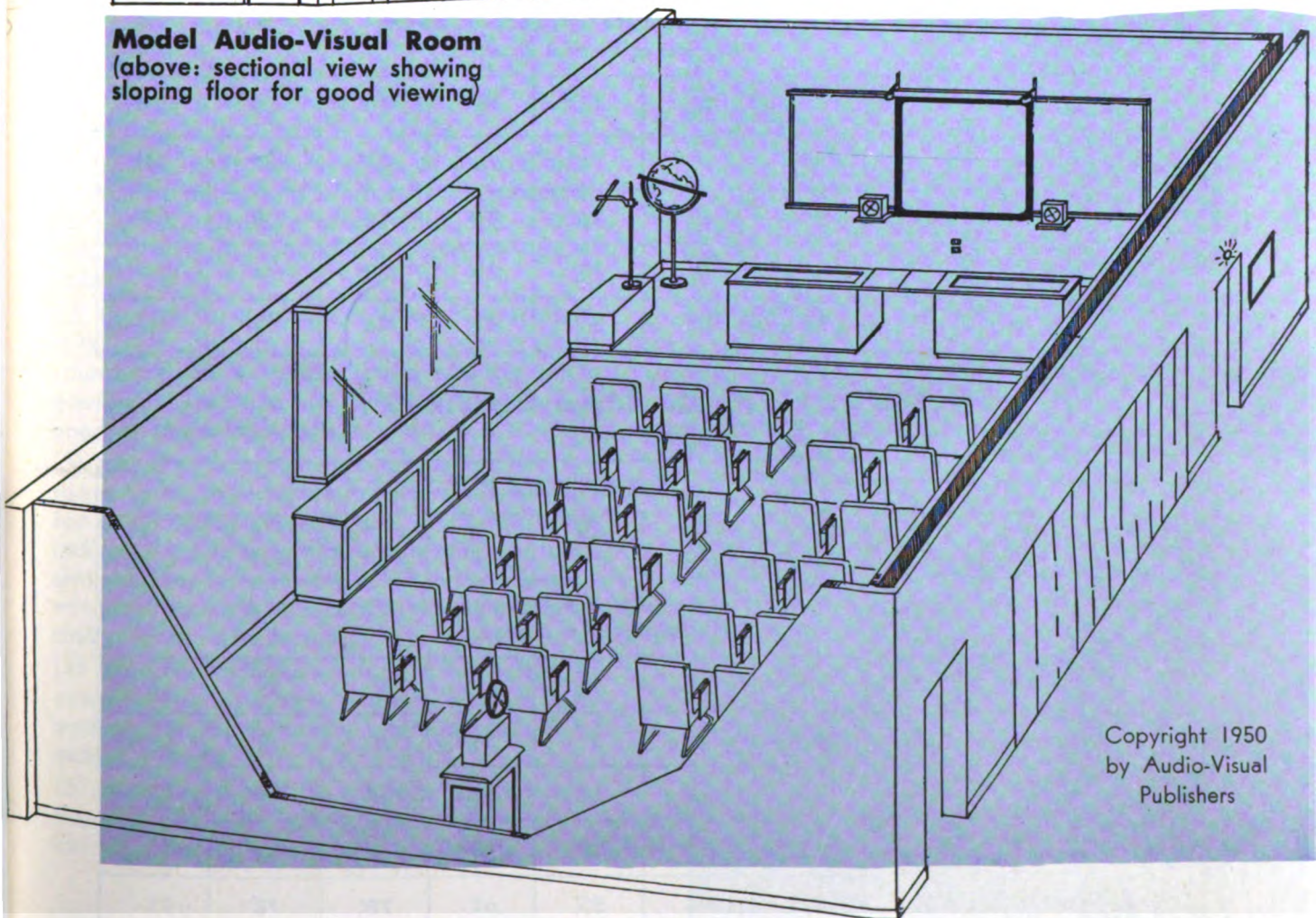
pear to be the most efficient and readily available material. Rooms to be frequently used for projection should be equipped with darkening shades or flameproofed drapes. A good idea is to hang drapes a little distance away from the window surface so that air-flow is provided. There will be little light leakage if made to proper length.

With regard to acoustics, the proper placement of the speaker in the front of the audience is worth noting. The speaker should face slightly downward toward the center of the audience. It is also important that none of the audience is too close to the projector or speaker.

A portfolio of suggestions and ideas called "Designs for Visual Education" is available at \$1.00 to executives and architects on this subject. Write Business Screen Magazine, 7064 Sheridan Road, Chicago 26, Illinois for this portfolio.



**Model Audio-Visual Room**  
(above: sectional view showing sloping floor for good viewing)



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## SCREEN TABLE FOR 16mm MOTION PICTURES

LENS FOCAL LENGTH	SCREEN SIZES								
	30'' x40''	37'' x50''	45'' x60''	52'' x70''	63'' x84''	6' x8'	7' x9'	8' x10'	9' x12'
	Approximate Distance — Projector to Screen								
1''	9'	11'	13'	16'	19'	21'	24'	27'	32'
1½''	13'	17'	20'	23'	28'	32'	36'	40'	48'
2''	18'	22'	27'	31'	37'	43'	48'	53'	64'
2½''	22'	28'	35'	39'	47'	54'	61'	67'	81'
3''	27'	33'	40'	47'	56'	64'	72'	80'	96'

## SCREEN TABLE FOR 2"x2" 35mm SLIDES (Double Frame)

LENS FOCAL LENGTH	SCREEN SIZES								
	40'' x40''	50'' x50''	60'' x60''	70'' x70''	84'' x84''	8' x8'	9' x9'	10' x10'	12' x12'
	Approximate Distance — Projector to Screen Horizontal or Vertical Projection								
3''	7'	9'	11'	13'	16'	18'	20'	22'	27'
4''	10'	13'	15'	18'	21'	24'	27'	30'	36'
5''	13'	16'	19'	22'	26'	30'	34'	38'	45'
6''	15'	18'	22'	25'	30'	35'	39'	44'	52'
7''	17'	21'	26'	30'	36'	41'	46'	51'	61'

## SCREEN TABLE FOR 35mm FILMSTRIPS (Single Frame)

LENS FOCAL LENGTH	SCREEN SIZES								
	30'' x40''	37'' x50''	45'' x60''	52'' x70''	63'' x84''	6' x8'	7' x9'	8' x10'	9' x12'
	Approximate Distance — Projector to Screen Horizontal Projection								
3''	11'	14'	17'	19'	23'	27'	30'	33'	40'
4''	15'	19'	22'	26'	31'	36'	40'	44'	53'
5''	19'	23'	28'	32'	39'	44'	50'	56'	67'
6''	22'	28'	33'	39'	47'	53'	60'	67'	80'
7''	26'	32'	39'	49'	55'	62'	70'	78'	93'



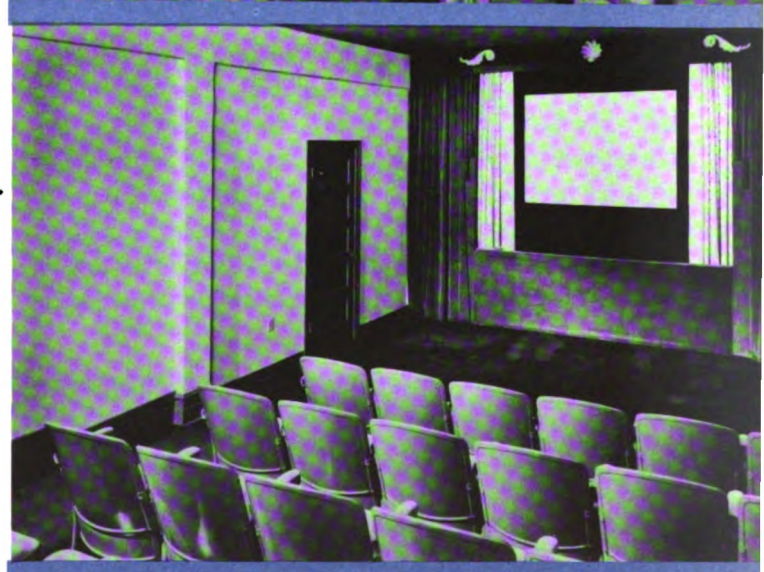
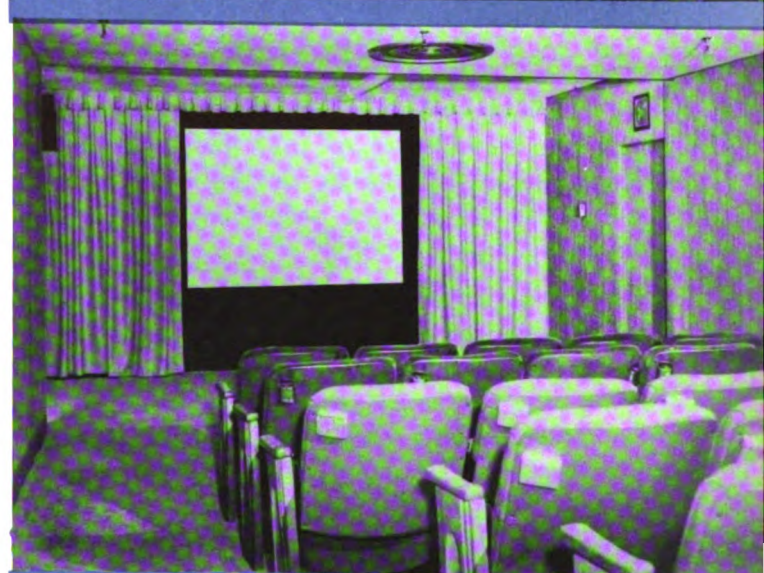
# The NEW Trend in PREVIEW ROOMS

**T**HE IDEAL USE of audio-visual materials in industry and in education is within the classroom. Individual classrooms within the school or plant buildings should be equipped on this basis and the minimum requirements are simply (a) proper electrical outlets; (b) darkening of window spaces; and (c) provision for a wall or ceiling screen.

The trend among many business firms, advertising agencies and industrial plants as well as larger school systems, however, is to equip at least one or more rooms as specific audio-visual centers. Modern design can provide many advantageous features for the functional use of all types of audio and visual aids. Such spaces can also combine the objectives of conference room use, presentation room and preview facilities.

Here are a few of the ideas now being put into practice (and illustrated in part on this page):

- (1) Select a windowless area of the building. Artificial lighting and air-conditioning provide for absolute control of illumination and ventilation. Such space is sometimes more easily available.
- (2) Provide for a projection booth if space permits. The booth is not essential where 16mm sound projectors are used but serves to remove equipment and film handling from the conference or screening space.
- (3) Good lighting can enhance the preview room and also provides functional advantages for dramatizing presentations. Both direct and indirect lighting should be considered. Inexpensive rheostat units are available to provide dimming of room lights (except fluorescent) before and after the film showing.
- (4) Provision should be made for the storage of presentations. They should also be easy to mount and stage. Supplemental materials should be easily reached.
- (5) Furniture should be comfortable and functional. Neither furnishings, room color nor accessories should distract the audience.





# SECTION ONE

# 16MM MOTION PICTURES

## A FOREWORD TO GOOD UTILIZATION



Audio and visual — or “visual-sensory” — aids to learning are widely used in schools, industry, the church and community with recognized advantages in each specific field. Motion pictures, slides and slidefilms, recordings and other familiar “aids” are now especially prepared for these fields of use; their successful utilization largely depends on the quality and effectiveness of pictorial projection as well as good sound reproduction.

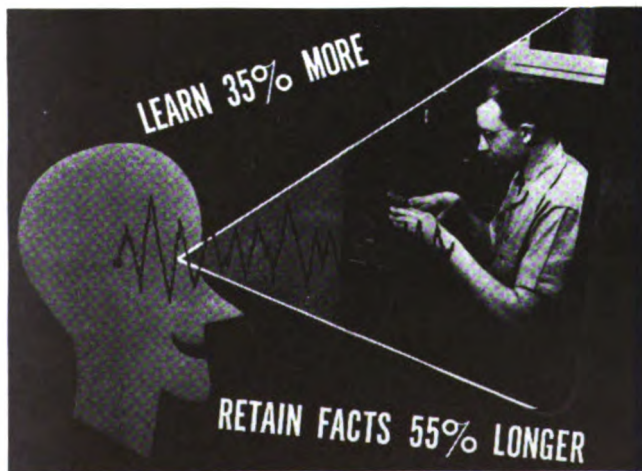
Once the picture has been produced with utmost professional skill and interest — the show's the thing! Good showmanship implies careful training of projectionists, familiarity with the principles of many and varied types of audio and visual equipment, a sense of good “Theatre” and basic knowledge of successful procedure to assure the nearest to perfection which can be achieved in putting images on the screen and reproducing sound.

The basic skills to be acquired are not difficult. Students, workers, church and club members, sales and service employees may all be quickly trained to become qualified projectionists; a vast increase in the effectiveness of all visual training and general educational use of these aids must certainly result. There is, in fact, entirely too much

dependence on a single trained operator in many schools and plants, handicapping the development of these classroom tools. To meet an apparent and highly desirable trend toward use of films and sound by small groups of students and trainees and a corresponding development of portable equipment, there should be an adequate reserve of trained projectionists.

But it is not alone manual dexterity which these trainees must acquire; of equal importance is the art of good showmanship mentioned. For good projection is the final realization of all the art and skill which has gone into picture-making. Never apparent except when inefficient or careless, the qualified projectionist fills the place of real responsibility. No distractions or interruptions must deter him from the successful completion of a fine performance. No mechanical failures or other delaying factors can break the age-old tradition of the theatre: the show must go on! Thus the good projectionist earns a deserved reputation for dependability and professional skill in his job.

It is in this spirit that the Editors of this Handbook approach the problem of providing to many thousands of trainees this basic outline of projection factors, physical procedures and simple technical guidance.  
— The Editors



### HERE ARE THE LESSONS AHEAD:

- THE PROJECTIONIST'S JOB
- BEFORE THE SHOWING
- STARTING THE PICTURE
- DURING THE SHOWING
- ENDING THE PICTURE
- AFTER THE SHOWING
- PROJECTOR CARE & LUBRICATION

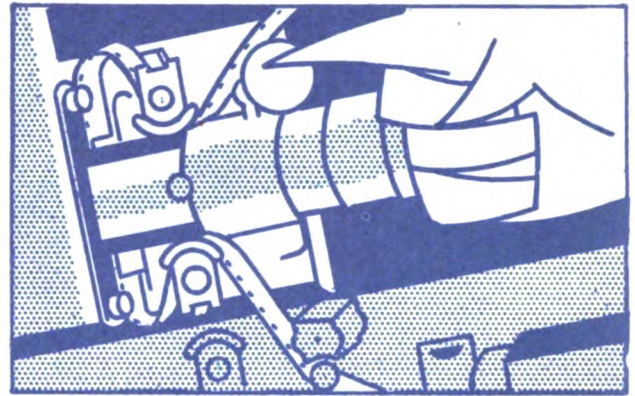


# THE PROJECTIONIST'S JOB

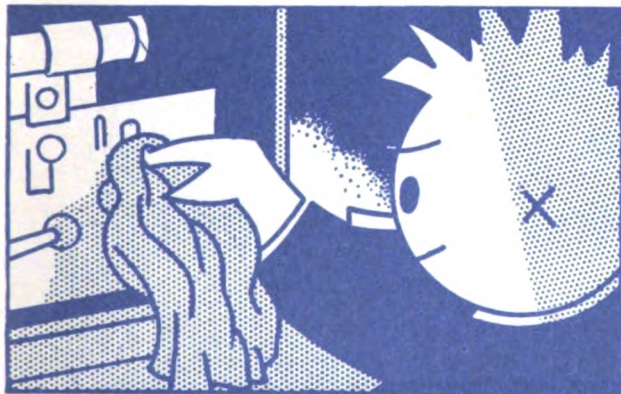
The projectionist is concerned with more than just the operation of the equipment he is using. He must know:



**1** The various types of audio-visual equipment now in common usage.



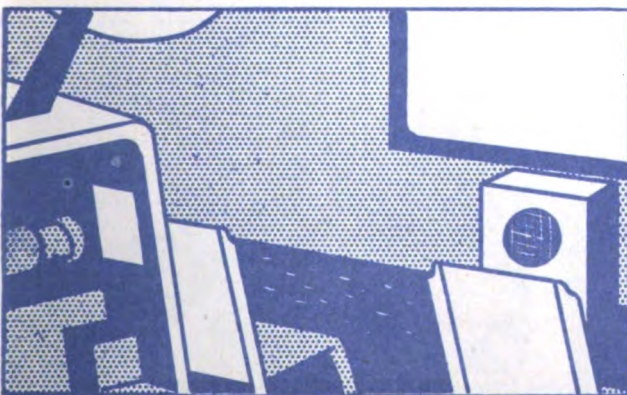
**4** How to properly thread the projector and care for the film.



**2** How to clean and oil equipment.



**5** The techniques for effective showing of visual aids.



**3** How to set up the equipment.

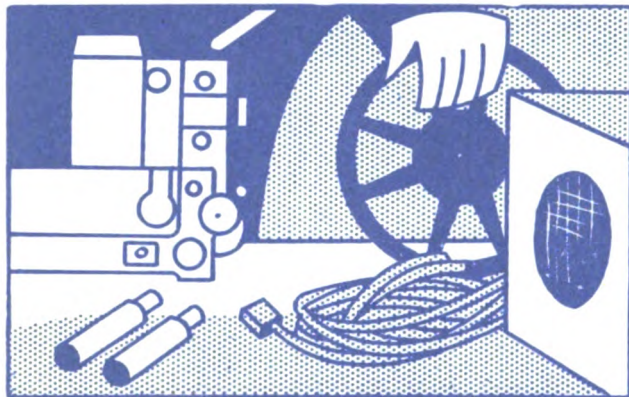


**6** How to keep the required records.

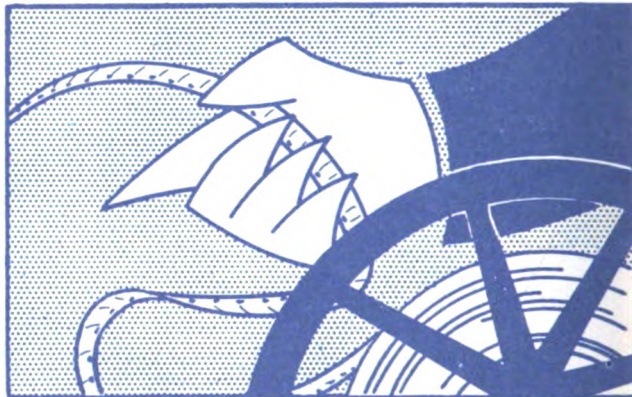


## BEFORE THE SHOWING

Getting ready for the film showing is one of the most important steps in putting on an effective presentation. A good projectionist makes sure that everything is in order before the class assembles. He should:



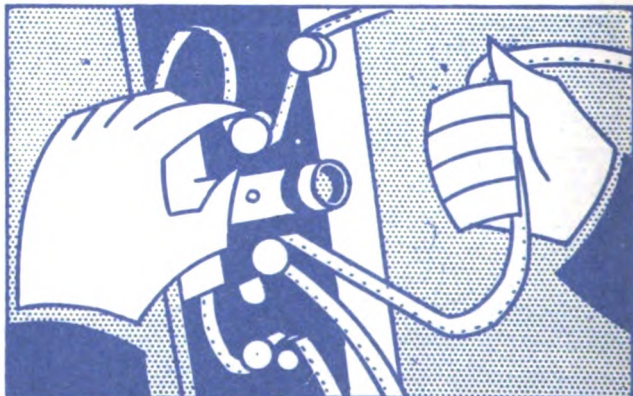
**1** Check the equipment to see that all cords, spare lamps and reels are on hand.



**4** Check film to see that it is correctly wound and in condition for showing. Check title.



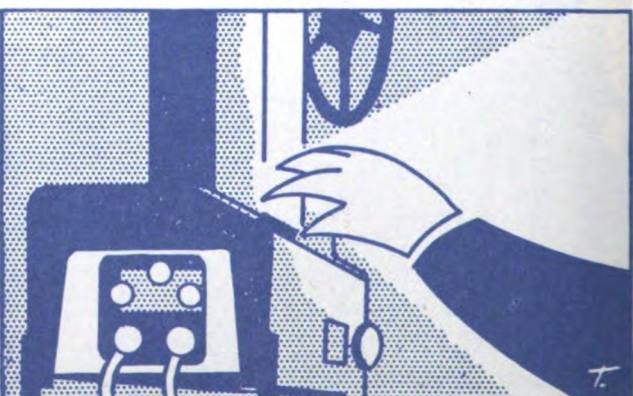
**2** Set up equipment, place speaker in best position, center projection beam on screen.



**5** Thread projector. Test to see that film is moving through projector properly.



**3** Clean gate and all surfaces over which film runs with carbon tetrachloride or alcohol.



**6** Warm up the amplifier. Test run, focus picture, adjust volume and tone.



## STARTING THE PICTURE

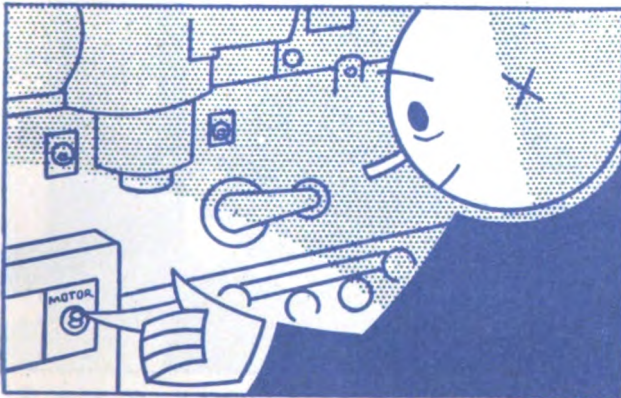
A poor start will disrupt the class and cause them to miss important clues upon which the rest of the film depends. To insure a smooth start:



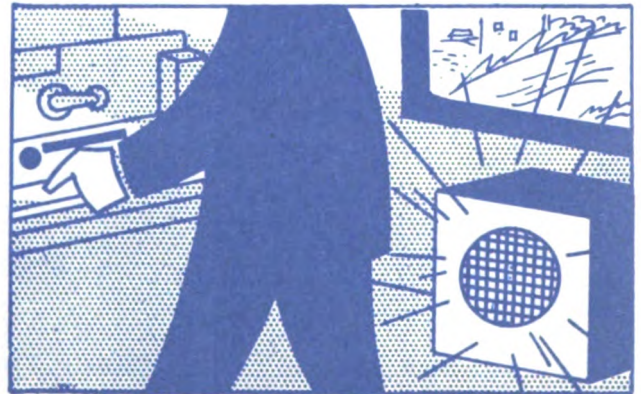
**1** Arrange before showing to have assistant turn off or dim lights when ready to show.



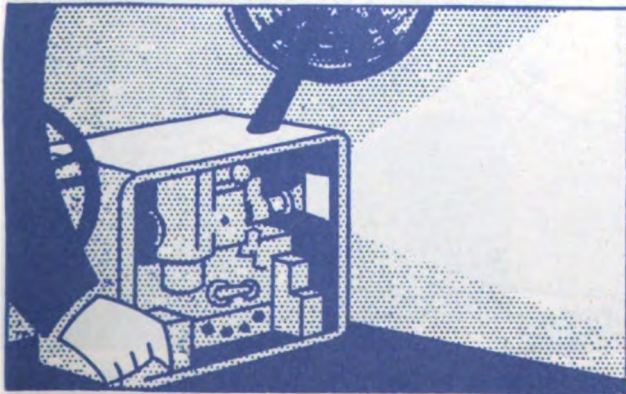
**4** Check the focus and framing.



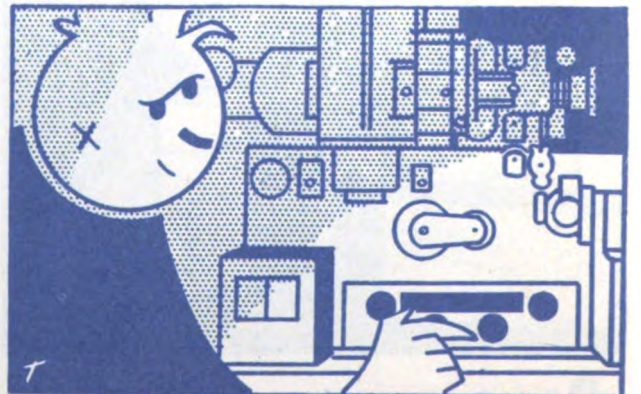
**2** Turn on the projector motor.



**5** Fade the volume.



**3** Turn on the lamp.



**6** Adjust the tone.

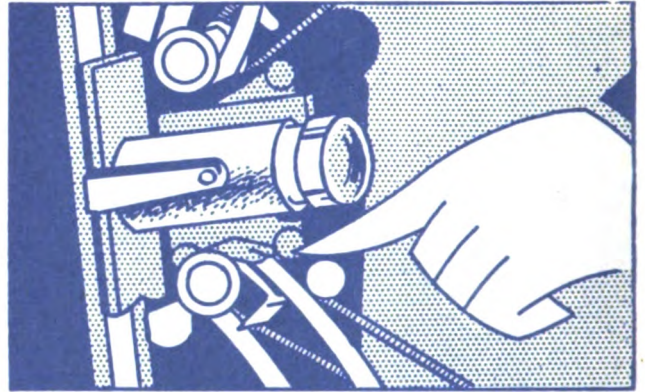


## DURING THE SHOWING

The projectionist's job does not end with the starting of the film. Throughout the entire time that the picture is being run he must be alert for any emergency. During the showing the projectionist should:



**1** Never leave projector while it is in operation.



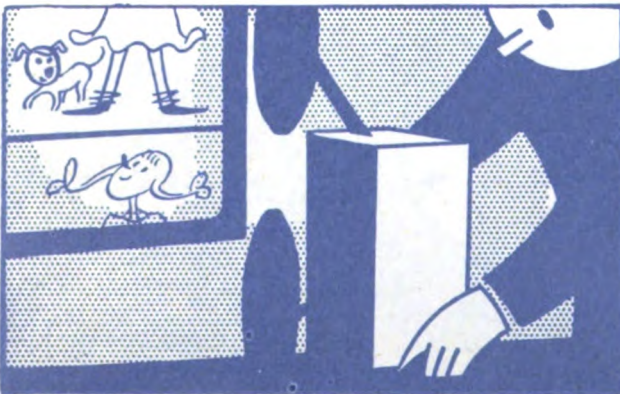
**4** Check the film occasionally to see that no damage is occurring.



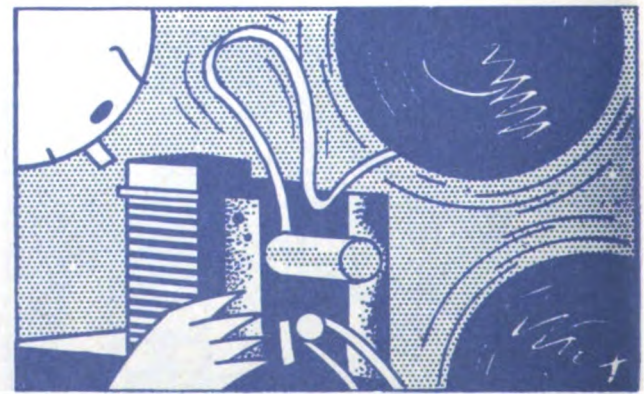
**2** Keep volume and tone at proper level.



**5** Keep the picture in focus.



**3** Keep the picture in frame.

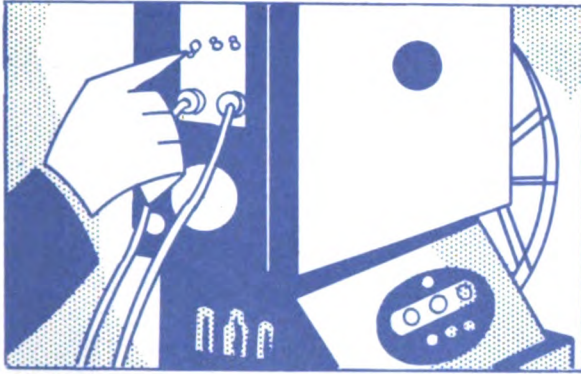


**6** Check loops periodically. Loss of loops causes film damage.

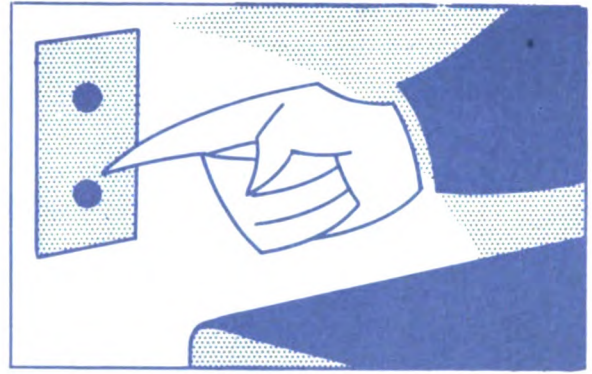


## ENDING THE PICTURE

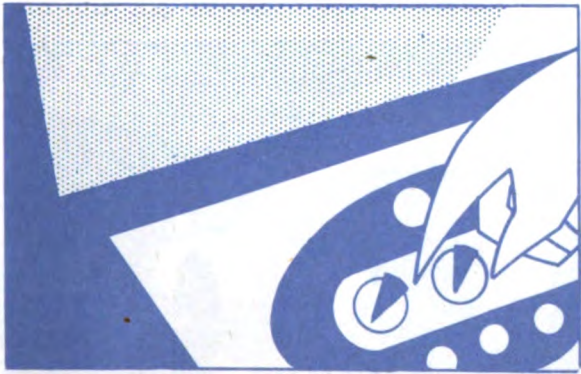
The ending of the film is equally as important as the beginning. A poor ending will divert the attention of the class from the film content. For a smooth ending use the following procedure:



**1** Turn off the lamp.



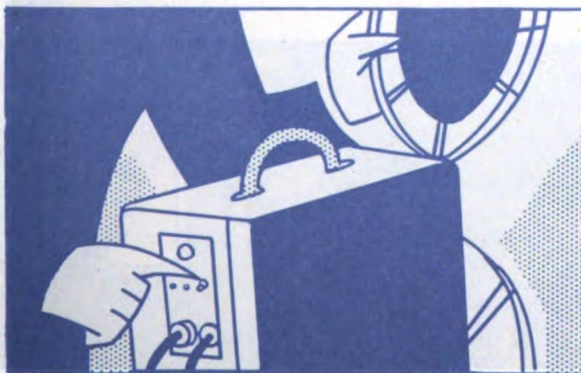
**4** Have an assistant turn on the room lights.



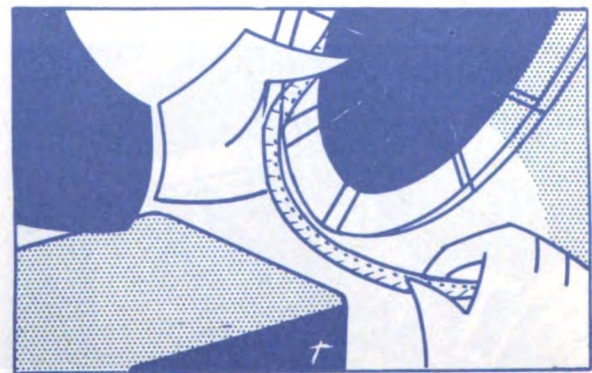
**2** Fade the volume.



**5** Turn off amplifier if no more films are to be shown.



**3** Turn off motor after film has run completely through the machine.

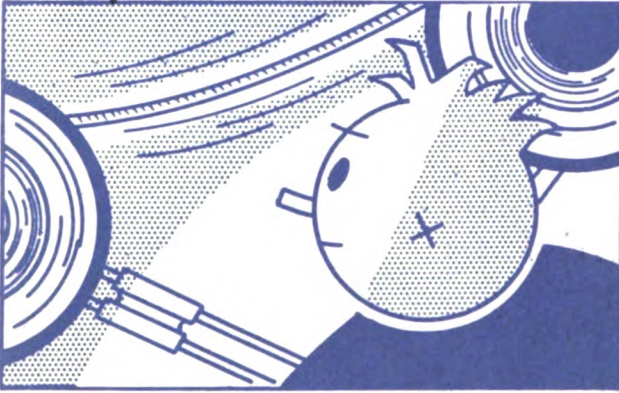


**6** Get ready for the next reel if other films are to be shown. Work quietly.

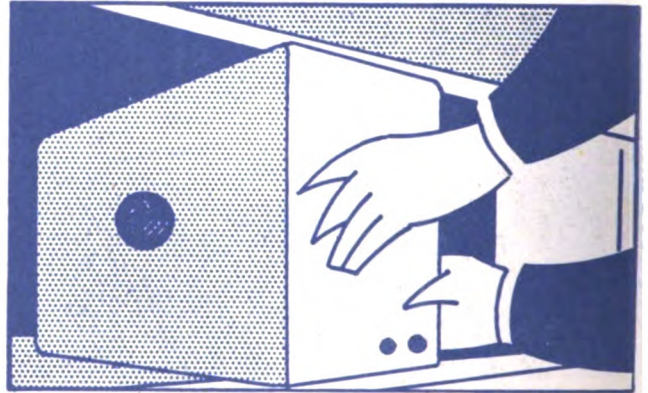


## AFTER THE SHOWING

The job of the projectionist does not end with the showing of the film. After the class is over he must:



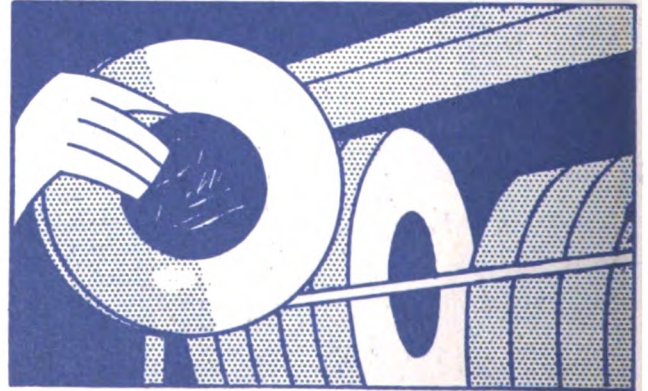
**1** Rewind film if to be used again or get ready to return to the library without rewinding.



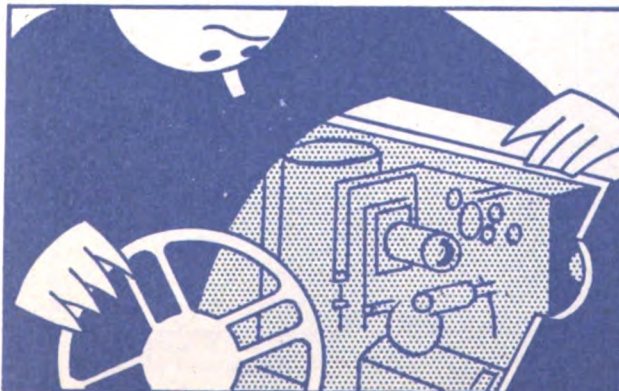
**4** Return projector to proper storage place.



**2** Clean projector thoroughly. Wipe off excess oil, clean film channels.



**5** Get film ready for return to film library.



**3** See that all cords, reels, spare lamps are in their proper place.

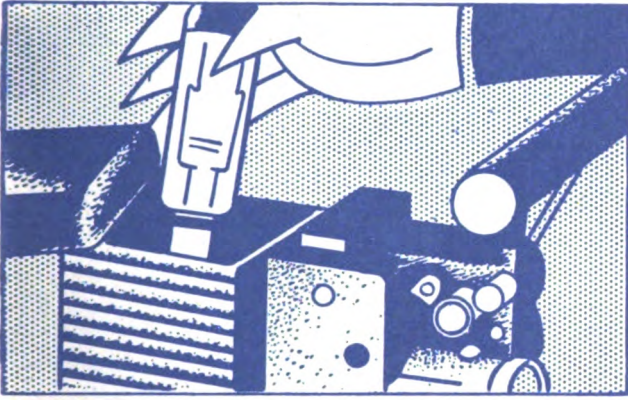


**6** Make out required records.

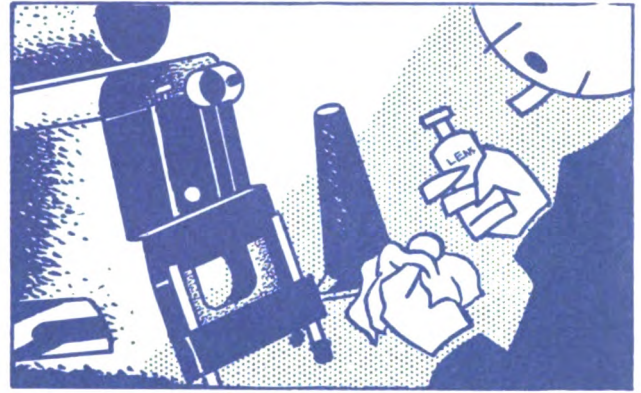


## PROJECTOR CARE

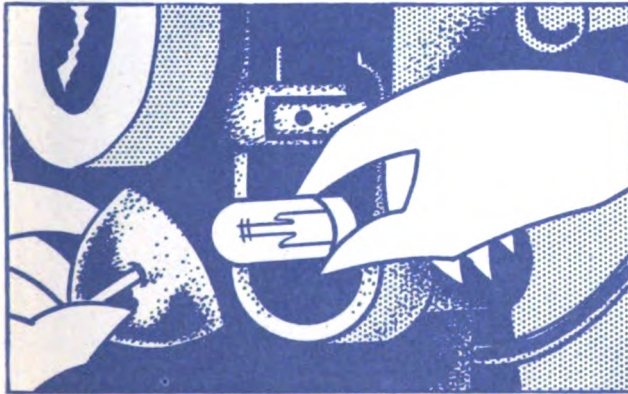
With proper care all projectors will give good service over a long period of time without major repairs. The projectionist should concern himself with elementary maintenance, leaving major repairs to a qualified serviceman. The following maintenance is the responsibility of the projectionist:



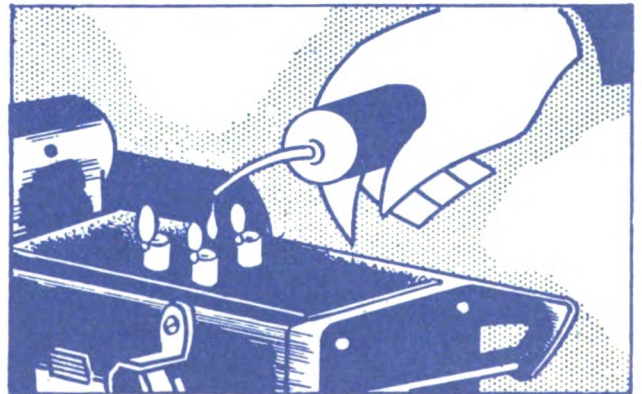
**1** Replacing defective lamps; projection, exciter, or thread (pilot) lamps.



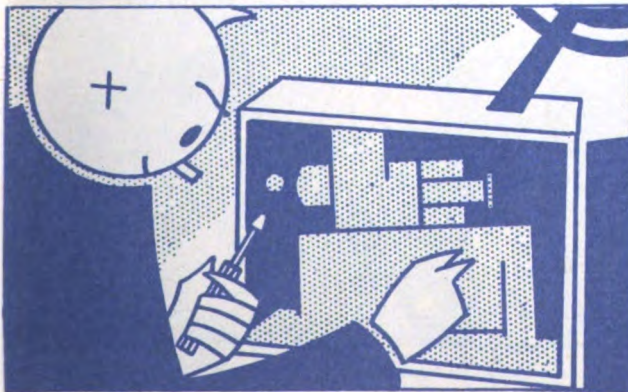
**4** Cleaning reflectors, lenses, gates.



**2** Replacing defective tubes, photo cells, and fuses.\*

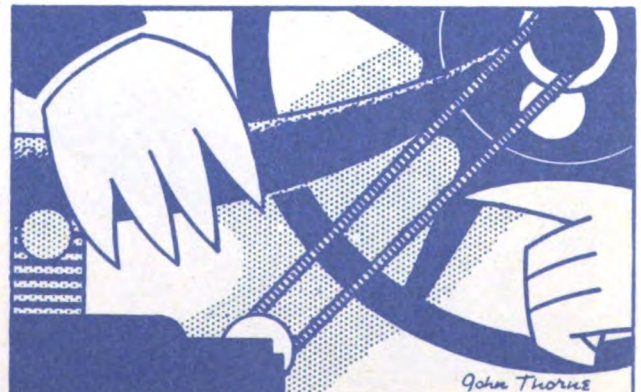


**5** General lubrication according to instructions.



**3** Minor adjustments; tightening loose screws.\*

\*Not to be done by student operators.



**6** Replacing motor, take-up, and rewind belts.\*

John Thorne

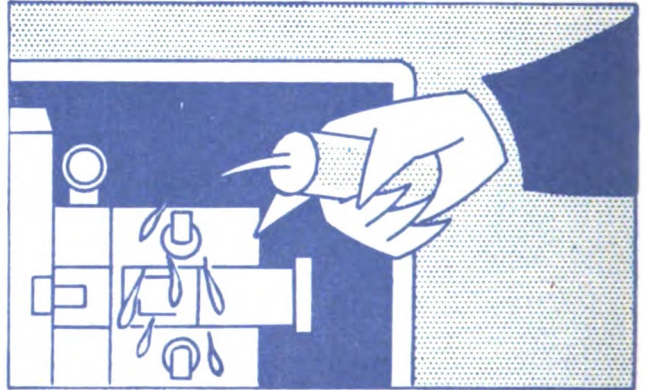


# LUBRICATION

Lubrication is essential to any piece of machinery; audio-visual equipment is no exception. One of the projectionist's jobs is to keep the projector properly lubricated. In oiling a projector you should:



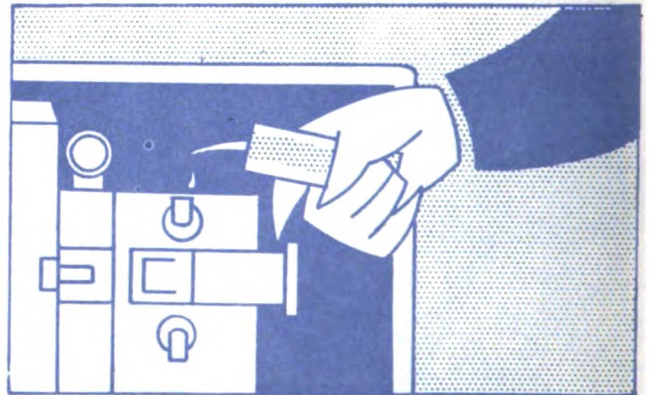
**1** Know location of all oil holes and cups.



**4** Do not over oil. Too much oil causes sluggish motor, oil on film & blurred sound.



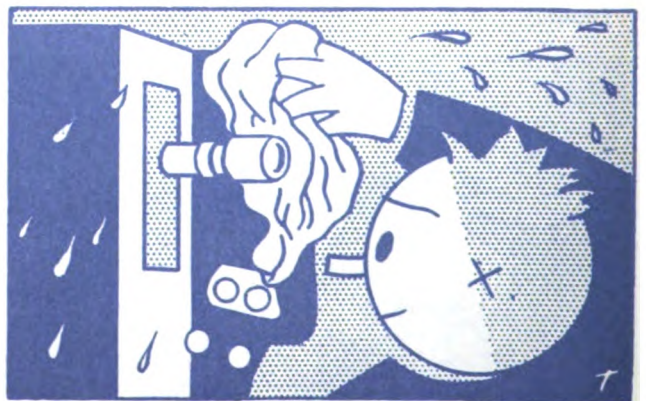
**2** Know type of oil required.



**5** Do not under oil. Under oiling causes motor freezing, noisy projector & worn bearings.



**3** Know how often oil is required.



**6** Wipe off excess oil from projector.

*Note: Always consult the manufacturer's instruction book for oiling instructions for your machine.*



## SPLICING

Even the best of projectionists may break a film. Knowing how to properly splice a film is an important part of the projectionist's job. A film with a good splice is as strong as the original.

For a good clean splice use the following procedure:

1. Clean splicer thoroughly.
2. Insert film in splicer, emulsion side (dull) up. Be sure perforations are seated on pins. Fig. 1
3. Cut film leaving clean cut edges. Fig. 2
4. Moisten exposed edge of film with water.
5. Scrape emulsion from film. Fig. 3
6. Wipe off excess water.
7. Apply fresh film cement. Do not use too much cement. Place film in right hand lock on scraped edge of left hand film.
8. Apply pressure and allow cement to dry a few seconds. Fig. 4
9. Wipe off excess cement.
10. Check splice for strength, smoothness, and cleanliness.

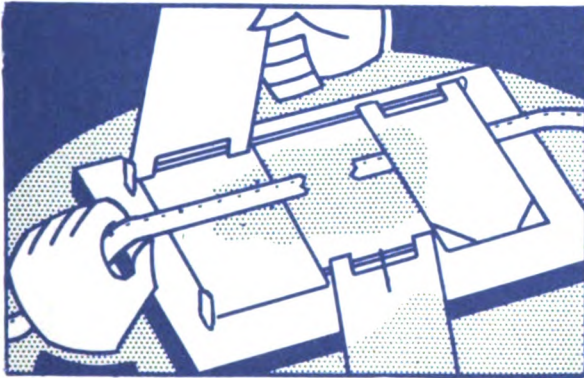


Figure 1



Figure 2



Figure 3

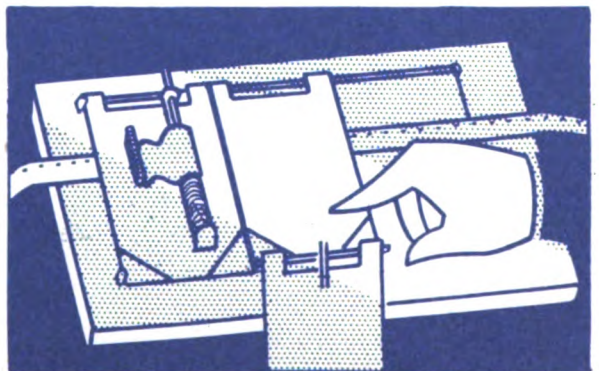
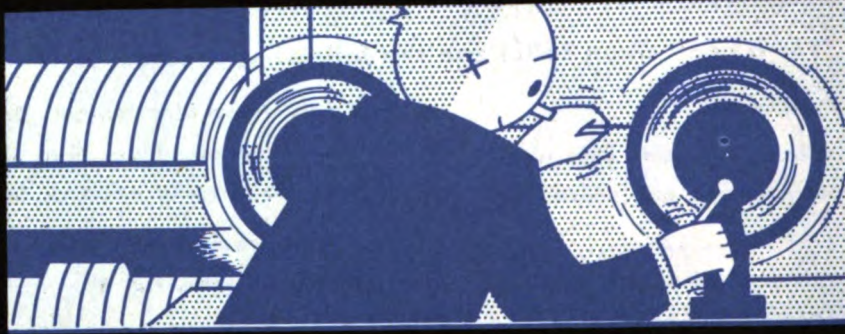


Figure 4



## FILM CARE AND MAINTENANCE

The projectionist will have a great deal to do with prolonging the life of the film. Most damage that occurs to film is due to careless handling and improper threading at the time of the showing.



The common sources of film damage are:

1. Equipment in poor condition.
2. Dirty projector.
3. Improper threading.
4. Careless rewinding.
5. Incorrect splicing.
6. Thoughtless handling of film.
7. Improper storage.

Film damage can be avoided if the following practices are followed:

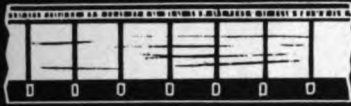
1. Keep projector clean and in good repair.
2. Thread projector properly.
3. Occasionally check film as it goes on take-up reel for damage.
4. Avoid use of bent reels.
5. Rewind and inspect film carefully. Repair brakes, tears and torn sprocket holes.  
Make neat strong and proper splices.
6. Store film in cool place. (55° to 70° F)
7. Clean film at frequent intervals.
8. Keep film off floor.
9. Never cinch film on reel.



# TYPES OF FILM DAMAGE ITS CAUSE AND REMEDY

## PROBABLE CAUSES

## REMEDY



### 1. Scratches

- a. Dirty rollers, gate, film channel.
- b. Cinching film on reel.
- c. Letting loose film fall on floor.

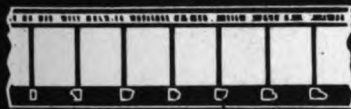
Clean projector, handle film carefully.



### 2. Creases

- a. Stepping on film.
- b. Pinching film in closing film can.

Handle film carefully.



### 3. Enlarged Sprocket Holes

- a. Too much tension on gate or take-up reel.
- b. Jerking movement of take-up reel.
- c. Shuttle worn or out of adjustment.
- d. Worn sprockets.
- e. Loss of loops.

Have projector attended to by approved repairman.

Rethread.



### 4. Torn Sprocket Holes

- a. Too much tension on gate or take-up reel.
- b. Jerking movement of take-up reel.
- c. Worn shuttle or sprockets.
- d. Dry film; loss of loops.

Have projector attended to by approved repairman.

Humidify; rethread film.



### 5. Breaks

- a. Faulty film splice.
- b. Sudden jerk on take-up reel.
- c. Film improperly placed in film channel.
- d. Failure to allow loops.

Make correct splice; rethread machine.



### 6. Sprocket Holes on Sound Track or on Film

- a. Running a sound film on silent type projector.
- b. Incorrect threading. (Sound track and sprocket track reversed)
- c. Film failing to engage sprocket teeth.

Use appropriate equipment for type of film.

Make sure film is on reel properly.

Rethread and check.



### 7. Burned Spots

- a. Faulty or sticking fire shutter.
- b. Projector running too slow without fire shutter in place.

Have projector checked by approved repairman.



### 8. Dirt on Film

- a. Improper or careless storage.
- b. Dirty projector.
- c. Improper handling of film.

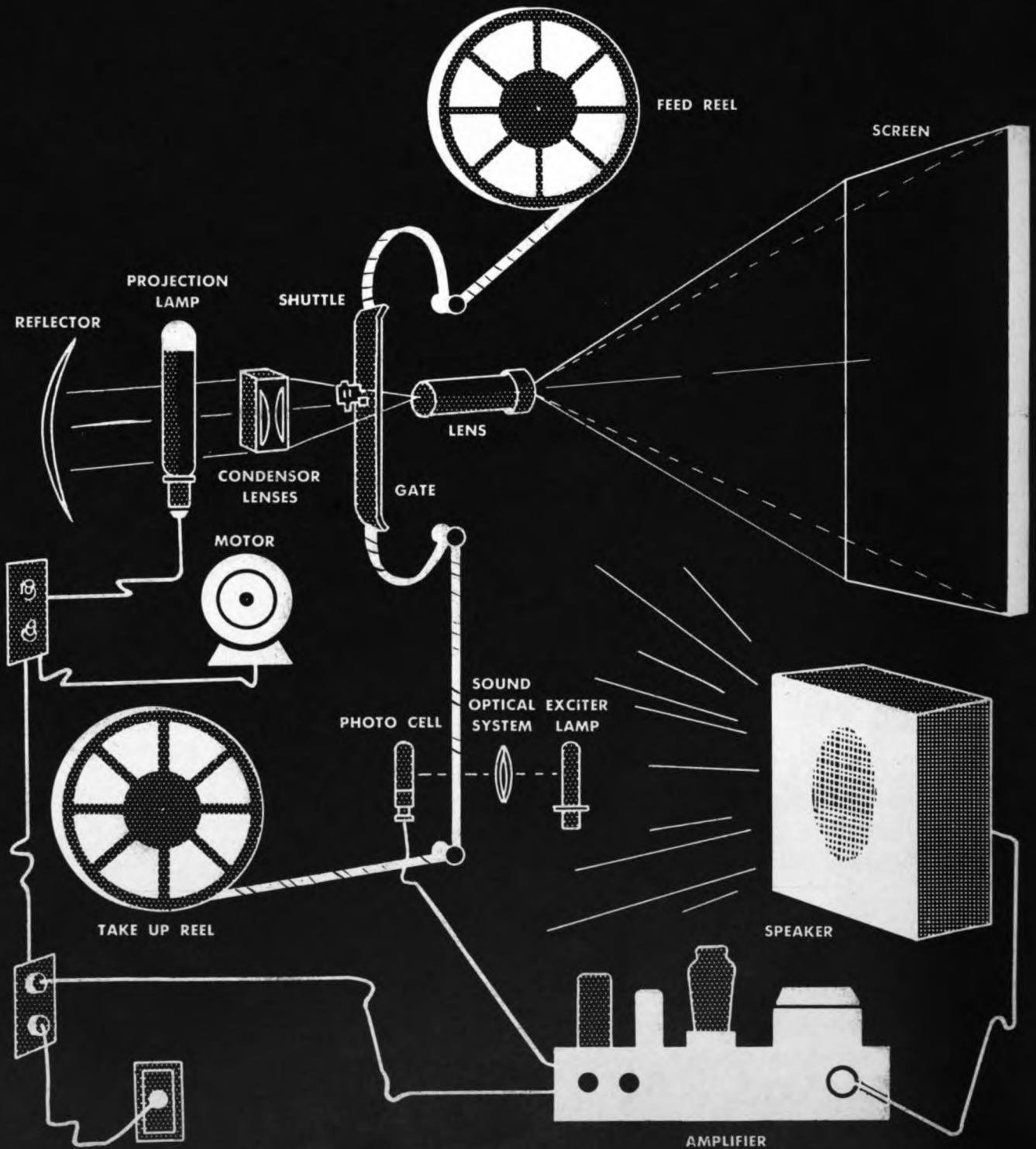
Clean projector. Clean film. Wipe with soft clean cloth and carbon tetrachloride.

Handle film carefully.



# 16 MM SOUND MOTION PICTURE PROJECTOR

This exploded view shows the parts common to all 16 mm projectors. Learning the names and functions of the various parts will help you to better understand this manual and the manufacturer's instruction book.





# SECTION TWO

# THREADING DIAGRAMS

## 16mm SOUND MOTION PICTURE

Simplified graphic threading diagrams with key parts of 16mm projectors shown in color are presented on the following pages of this Handbook. For the most part these are original and exclusive diagrams created for this Handbook.

A great deal of film damage that occurs is due to improper threading. Most standard makes of

sound projectors are designed to give minimum film damage if they are properly threaded. Always test projector operation before the show begins. Run slowly through a few feet of leader. Do not try to thread sound films in a silent projector. Seven simple rules for safe sound projection are provided at the bottom of this page.

## SAFETY PRECAUTIONS

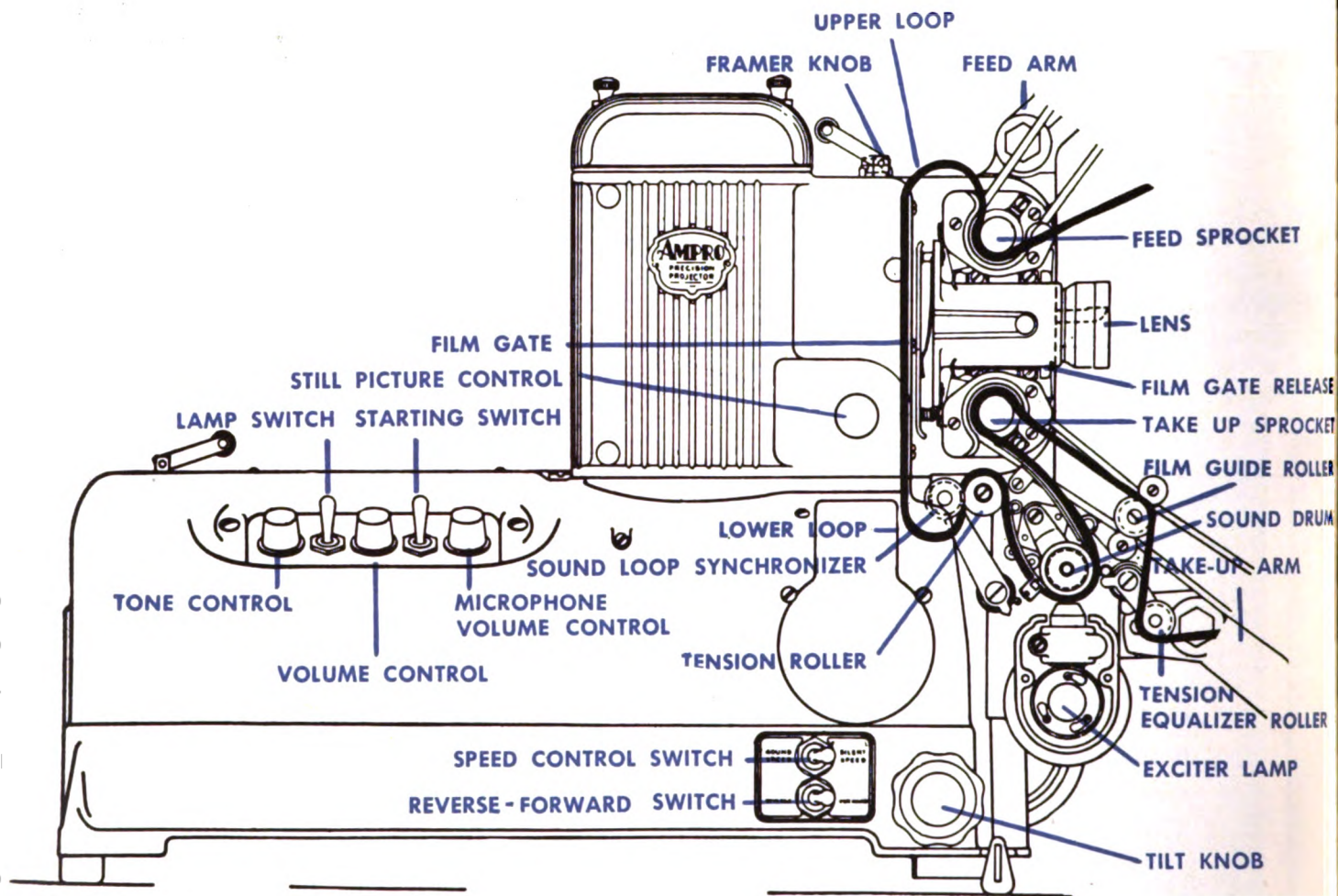
Modern audio-visual equipment is designed with the safety of the operator in mind. However, care must be taken in handling any piece of electrical equipment. In handling audio-visual equipment the following practices should be observed:

1. Never use a fuse of higher rating than specified.
2. Disconnect the power cord when checking fuses.
3. Never leave the projector while it is running.
4. Always use a cloth or lamp remover to change hot lamps.
5. Don't use worn or frayed power cords.
6. Keep a flashlight handy in case of power failure.
7. Secure projector and speaker so that there is no danger of them being knocked over.
8. Provide substantial stands for speaker and projector.
9. Keep sound and power cords out of aisles whenever possible.
10. Avoid excessive rewind speeds.
11. Do not clean projector gate or sprockets while running.

### FOLLOW THESE SIMPLE RULES:

- Follow the manufacturer's threading diagram carefully.
- Form proper loops.
- Seat film correctly in gate.
- Engage film with sprocket teeth.
- Check all reels before using to see that they are not bent.
- Attach reels securely to reel arms.
- Test projector to see that film is moving through properly.





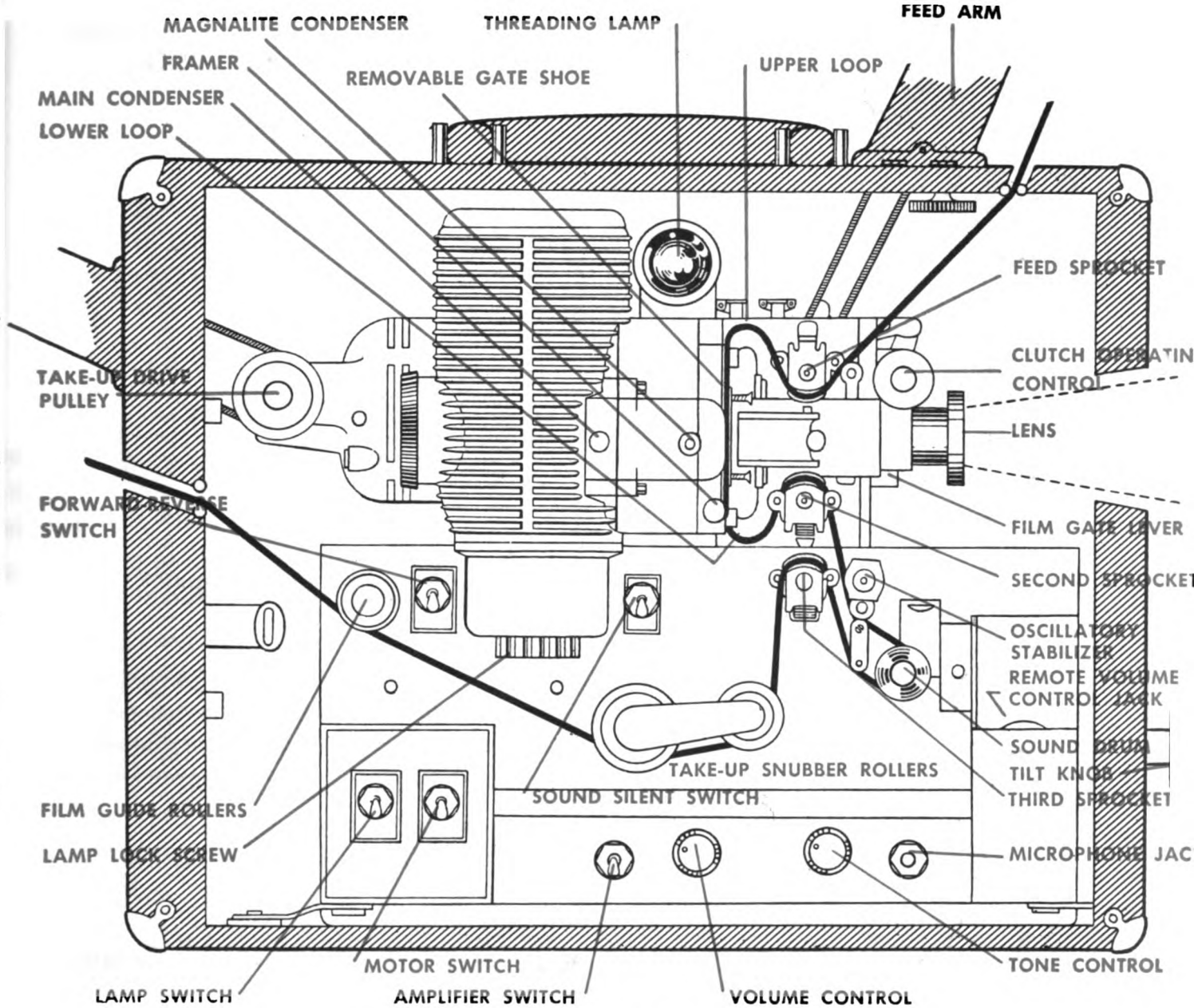
## AMPRO THREADING

1. Place full reel on feed arm and pull out about three feet of film.
2. Thread feed sprocket.
3. Form upper loop.
4. Thread film channel. (Push sound loop synchronizer to rear position).
5. Place film over tension roller.
6. Thread film around sound drum.
7. Thread take-up sprocket (close film gate and move sound loop synchronizer to forward position).
8. Thread film over guide roller and under the film tension equalizing roller.
9. Attach loose end of film to take-up reel.
10. Check threading by turning manual adjusting knob on left side of projector.

## REWINDING

1. Attach loose end of film in slot in upper reel.
2. Move belt shifter to maximum counter-clockwise position.
3. Throw reverse-forward switch to "reverse".
4. Throw motor switch to "start".
5. Push in the rewind clutch button.





## BELL & HOWELL THREADING

1. Place full reel on feed arm.
2. Thread feed sprocket
3. Form upper loop.
4. Thread film channel. (Close gate)
5. Form lower loop.
6. Thread second sprocket.
7. Thread sound drum.
8. Thread third sprocket. (Applying proper tension on oscillatory stabilizer rollers)
9. Place film under take-up snubber rollers.
10. Attach loose end of film to take-up reel.
11. Check threading by turning hand setting knob clockwise.

## REWINDING

1. Remove full reel from take-up arm and place it on feed arm.
2. Attach loose end of film to empty reel on take-up arm.
3. Raise up take-up arm spindle to engage rewind gears.
4. Turn on motor switch.
5. Use hand as brake as film rewinds.

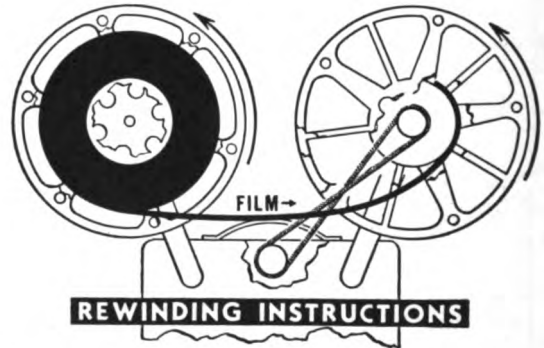
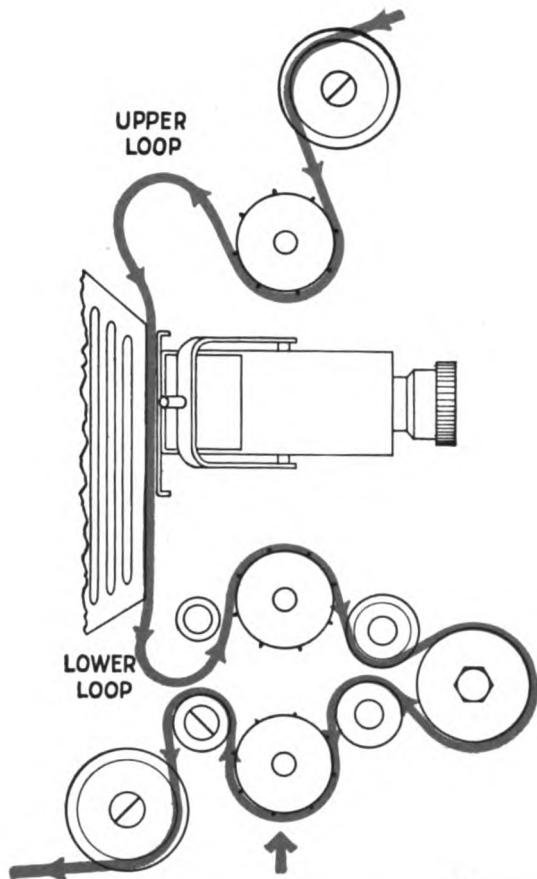


# T.S.I. THREADING

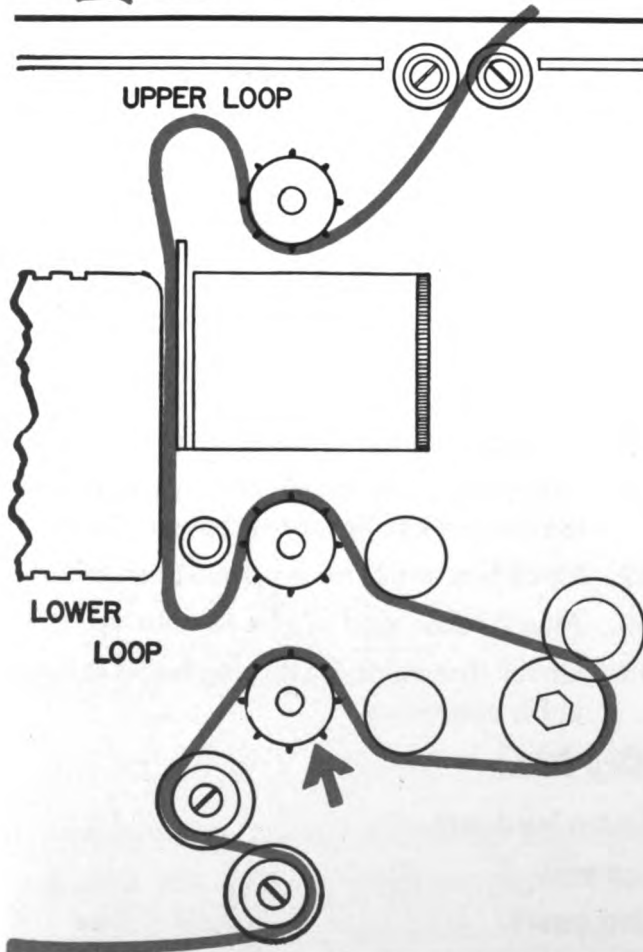
## THE DEVRYLITE "5"

### IMPORTANT

Before Engaging Film to Take-up Sprocket (RED ARROW), Draw Film Tight to Left. Then Release Film Distance of Two Sprocket Teeth to Place Correct Slack in Film.



1. Place Belt on Large Pulley.
  2. Put Half Twist in Belt and Place on Pulley on Front Reel Arm.
  3. Attach Film to Hub of Empty Reel.
  4. Start Motor.
- (After rewinding return belt to projection position)



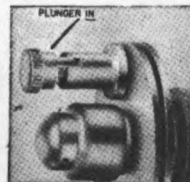
## THE BELL & HOWELL "JAN"

### IMPORTANT!

Before engaging film to take up sprocket (RED ARROW), draw film tight to left to take out all slack. Then release film until first available set of film perforations are in position for engagement with sprocket teeth.

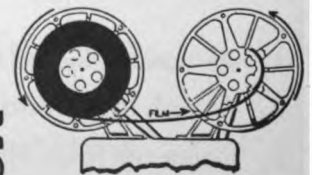
(Correct slack is equivalent to about 1/2 frame)

### REWINDING INSTRUCTIONS

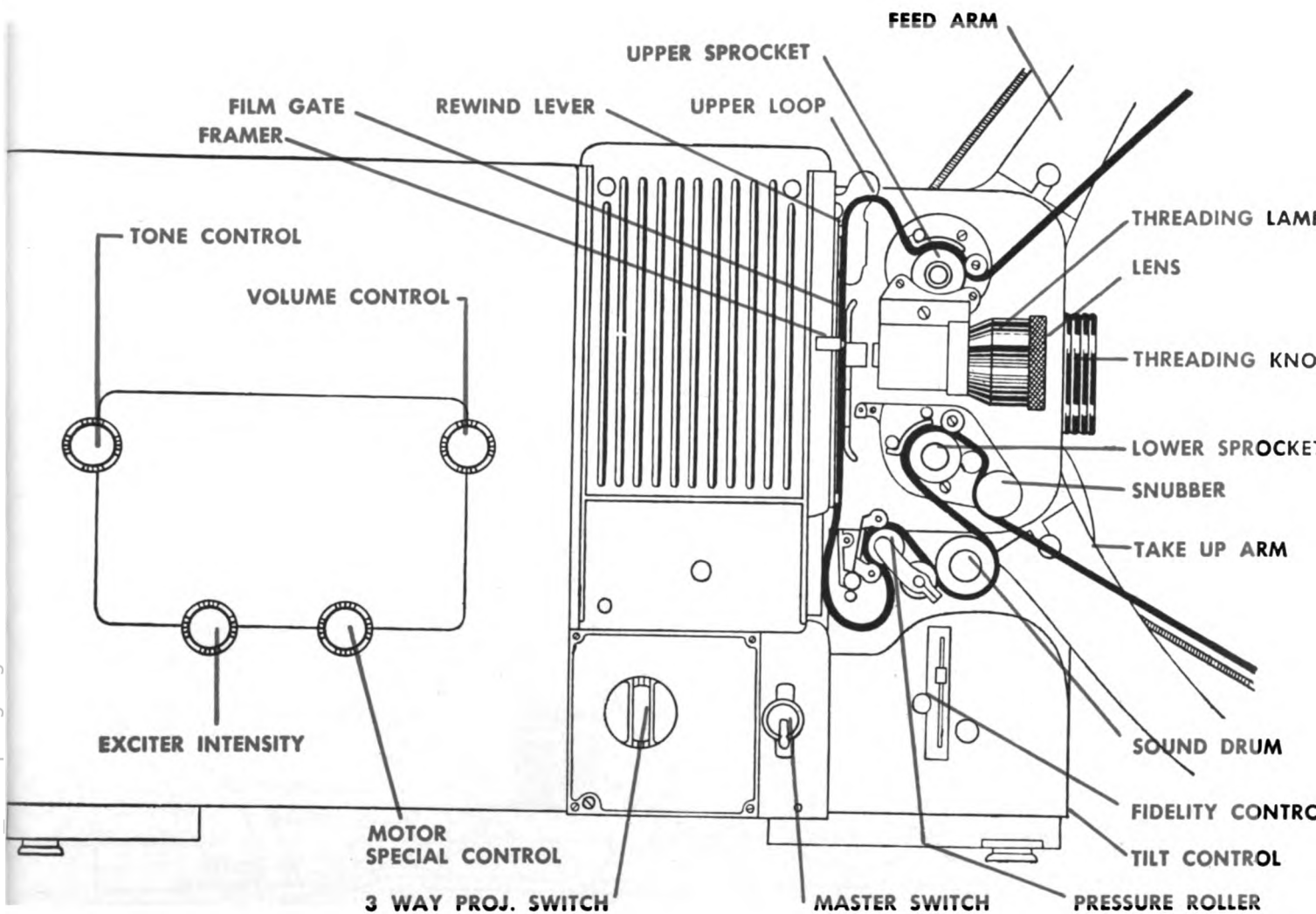


1. Close Plunger on Front Reel Arm
2. Attach Film to Hub of Empty Reel
3. Set Switch to "REV" Position
4. Start Motor

**CAUTION!** Before Projecting Set Plunger OUT, Set Switch To "FWD" (Forward Position)







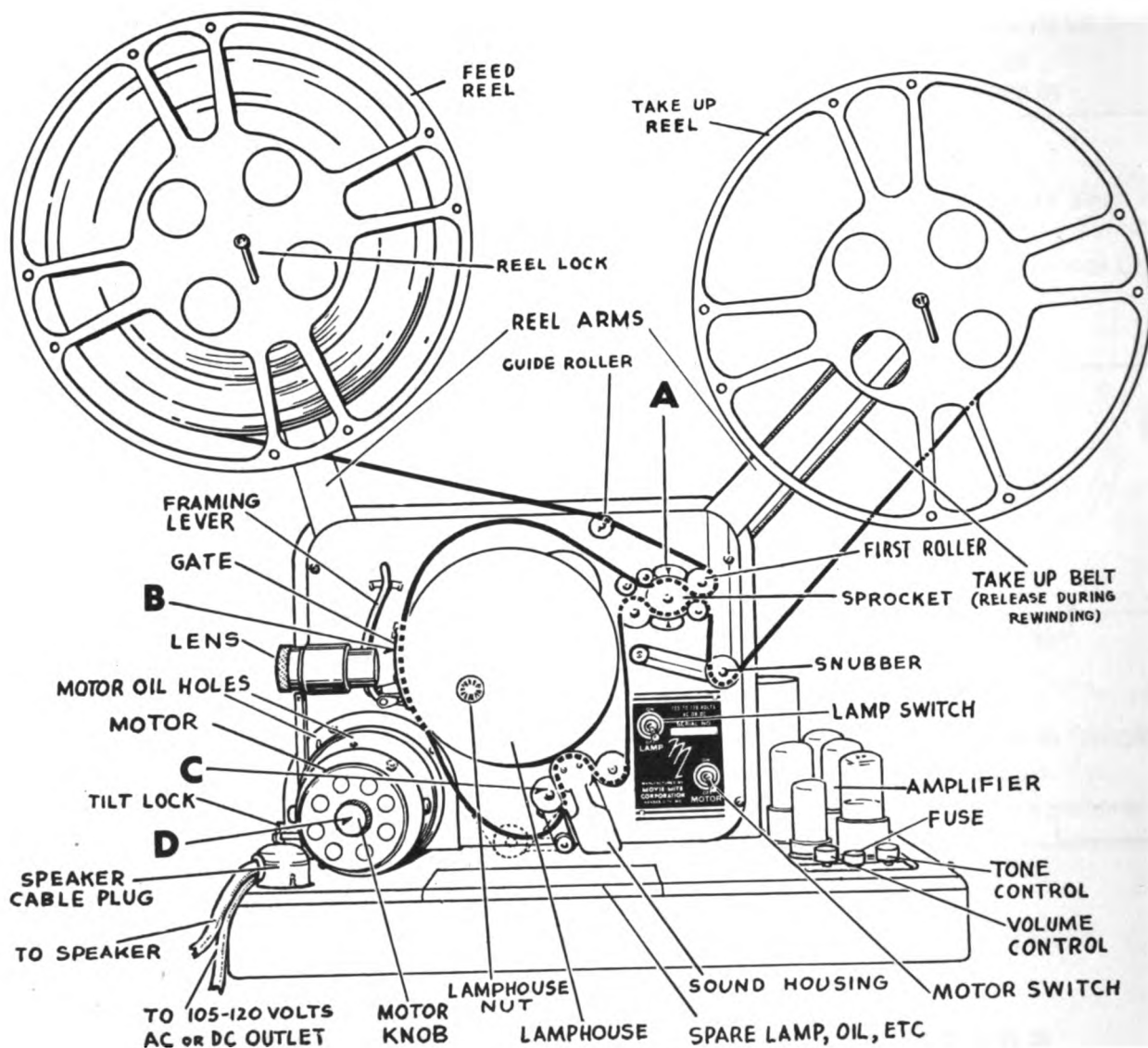
## EASTMAN (Sound Kodascope) THREADING

1. Place full reel on feed arm.
2. Thread upper sprocket.
3. Form upper loop.
4. Thread film channel. (Close gate).
5. Form lower loop.
6. Thread sound drum.
7. Thread lower sprocket.
8. Thread snubber.
9. Thread take-up reel. (Take up slack)
10. Check threading by turning hand threading knob.

## REWINDING

1. Be sure that film has run completely through machine.
2. Attach film to upper reel.
3. Pull out on rewind lever.
4. Turn switch to "motor."
5. Brake full reel with hand.





## MOVIE-MITE THREADING

1. Insert film as indicated at A. Film Clip A is pushed back to allow perforations to engage with sprocket teeth.
2. Line up any tooth on sprocket with arrow stamped on film clip A by rotating hand setting knob D counter clockwise. Film channel at B is now cleared of shuttle teeth, allowing film to be edged behind pressure plate at B.
3. Rotate hand setting knob again so arrow at A is between any two sprocket teeth. This assures maintaining upper loop.
4. Swing pad arm C to left and complete threading without slack. Raise pad arm C after completing threading, allowing film to resume position indicated.

## REWINDING

1. Leave reels in same position as when in operation.
2. Remove take-up belt from pulley.
3. Pull out rewind belt and place on feed reel pulley for rewinding. (Do not cross belt.)
4. Feed film back under the original feed reel and rewind.

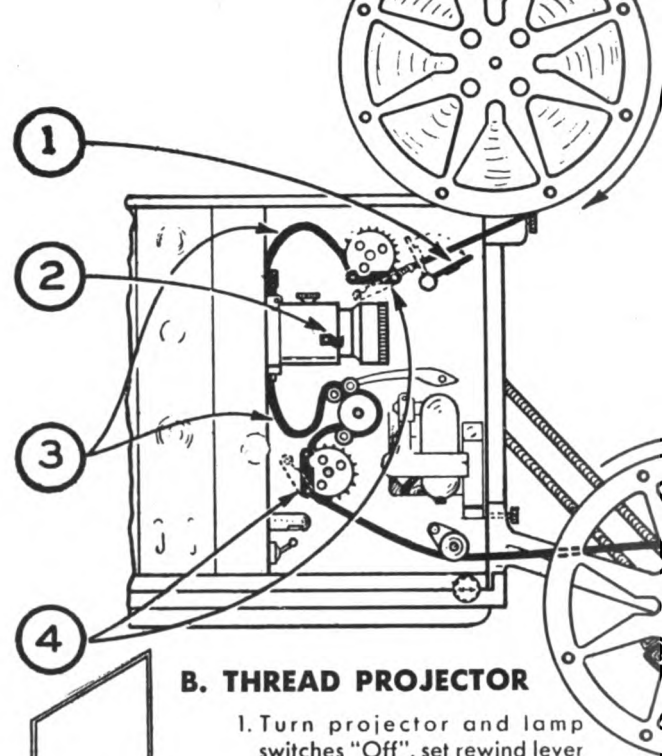
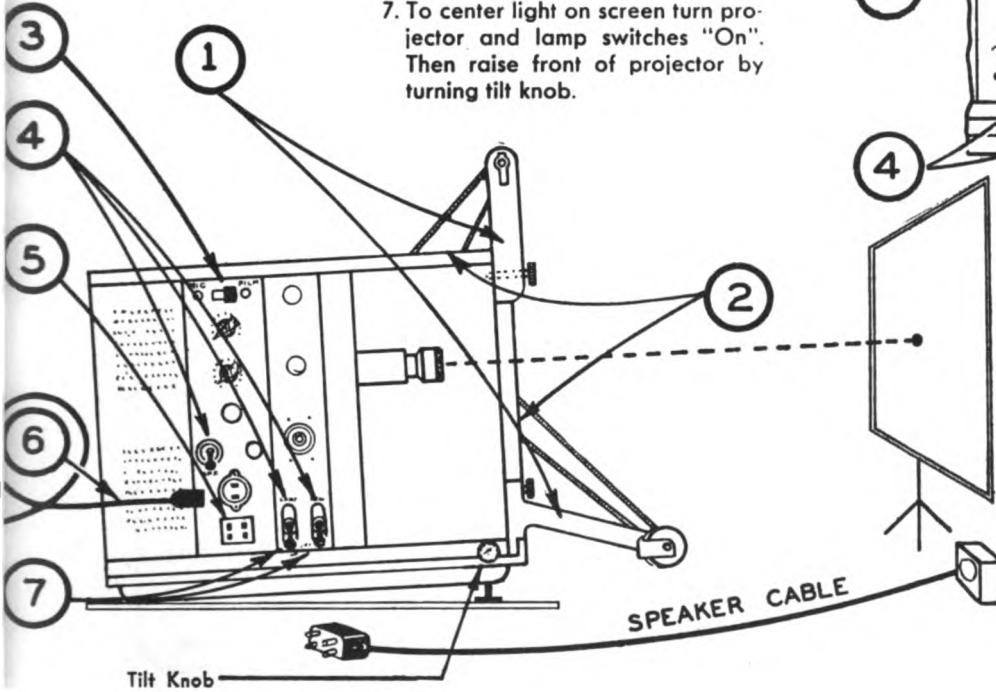


# RCA THREADING

## A. SET UP PROJECTOR

1. Attach arms (packed in speaker case) in front edge of projector by means of the thumb screws.
2. Release latch; pull spring belts out of projector case; place over pulleys.
3. Set this switch to "Film".
4. Turn these switches "Off".
5. Unreel speaker cable (packed in speaker case) and plug in here.
6. Attach power cord here. Plug free end into 110V-60 cycle A-C only.

7. To center light on screen turn projector and lamp switches "On". Then raise front of projector by turning tilt knob.

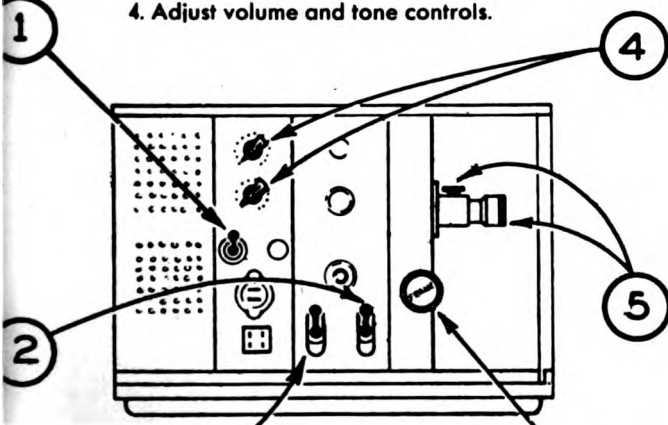


## B. THREAD PROJECTOR

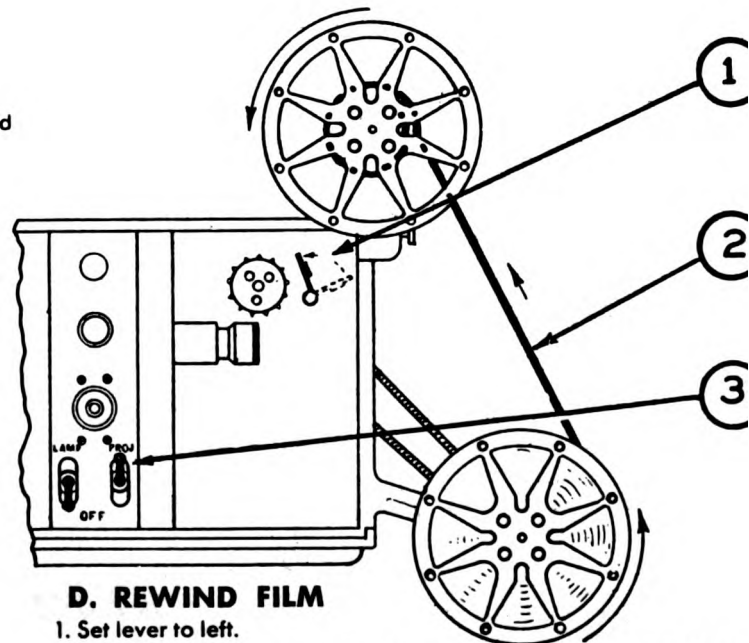
1. Turn projector and lamp switches "Off", set rewind lever to right.
2. Open gate by pulling out on hook; open sprocket shoes; unwind 4 feet of film; insert film as shown.
3. CAUTION: Form loops above and below the lens to follow the white guide lines closely and close gate.
4. Engage film with sprocket teeth; close sprocket shoes.

## C. RUN THE SHOW

1. Turn amplifier switch "On".
2. Turn projector switch "On". Film loops must be maintained with projector running.
3. Turn lamp switch "On".
4. Adjust volume and tone controls.



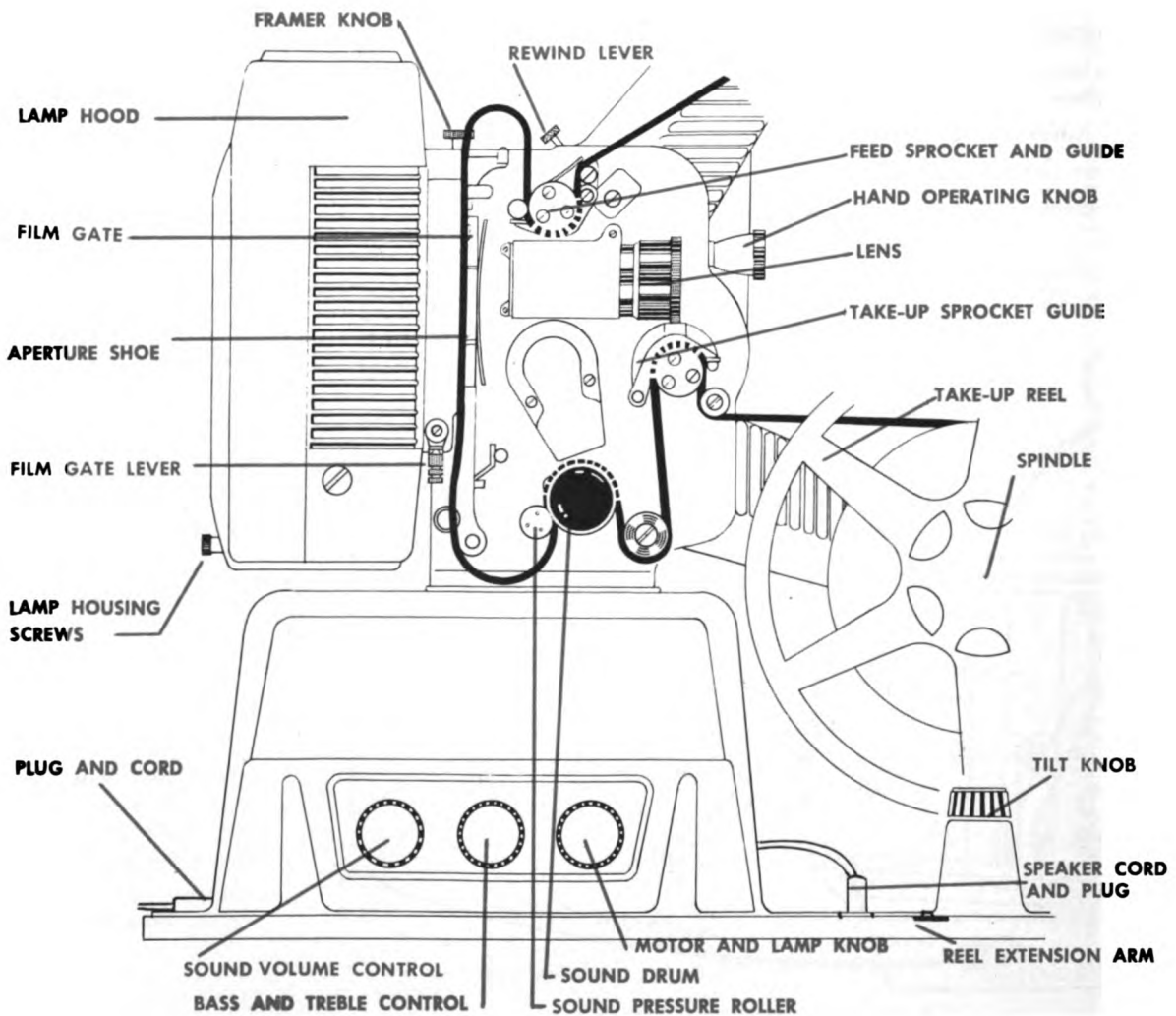
5. Loosen screw and adjust focus by turning barrel; tighten.
6. Adjust framing knob for one complete picture on screen.



## D. REWIND FILM

1. Set lever to left.
2. Thread film from bottom reel around top reel in direction shown.
3. Turn projector switch "on."





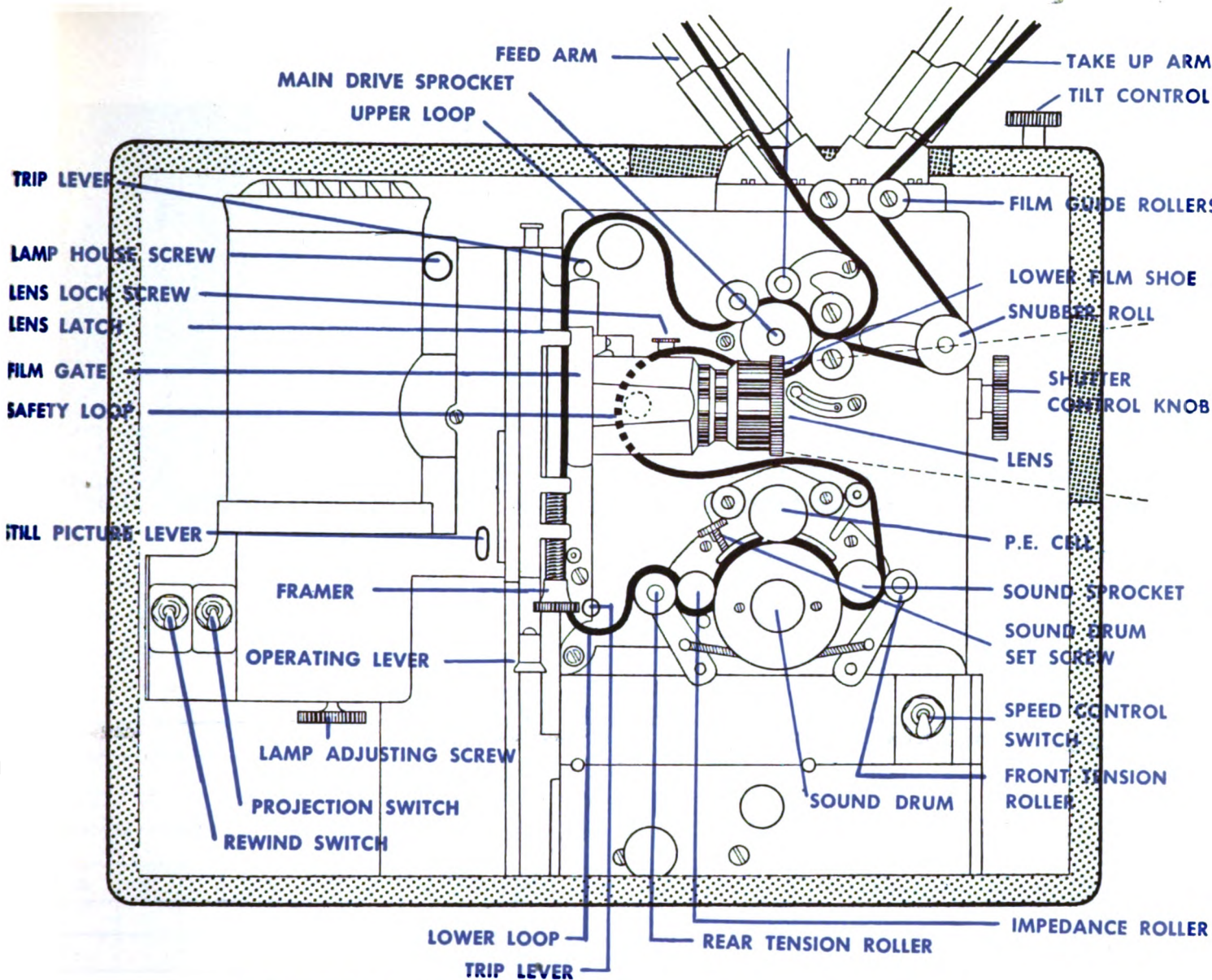
## REVERE THREADING

1. Place full reel of film on upper feed arm.
2. Open upper and lower sprocket guides. Loop film around upper sprocket.
3. Lock sprocket guide by pressing upward.
4. Slide film in film gate.
5. Upper loop should be higher than top of framer knob.
6. Close gate by pressing lever down.
7. Loop film under pressure roller and over sound drum.
8. Form bottom loop by drawing film to a position corresponding with guide line on projector.
9. Loop film over take-up sprocket.
10. Pass film under lower roller and attach it to take-up reel.
11. Wind bottom reel to take up slack.

## REWINDING

1. Be sure end of film is running free.
2. Turn motor switch to "off" position.
3. Thread end of film on upper reel.
4. Move rewind lever back to "rewind".
5. Place motor switch to "on" position.





## VICTOR ANIMATOGRAPH THREADING

1. Place full reel of film on feed arm, attach loose end to empty reel on take-up arm.
2. Pull down loop to thread sound drum.
3. Thread sound sprocket. (Close front tension roller)
4. Form safety loop.
5. Thread drive sprocket. (Close film shoe)
6. Thread snubber roller.
7. Thread impedance roller. (Close rear tension roller)
8. Form lower loop.
9. Thread film channel (Close film gate)
10. Form upper loop.
11. Thread drive sprocket (Close film shoe)
12. Check threading by turning shutter control knob.

## REWINDING

1. Attach loose end of film to empty reel on feed arm.
2. Remove spring belt from take-up arm. Place spring rewind belt on feed arm pulley.
3. Turn on rewind switch.
4. Brake full reel with hand.

## TROUBLE CHART FOR MOTION PICTURE PROJECTORS

This table identifies with (X) the probable causes (listed below) that should be investigated when the trouble symptoms (at right) appear. When the projectionist is not qualified to make the necessary repairs, the nearest service agency of the manufacturer should be consulted.

probable causes of trouble		trouble symptoms							
		No sound	Impaired sound	No picture	Poor picture	Hum or other noises	Irregular motor	Picture and sound not synchroniz.	Loss of film loops
1	Low line voltage		X		X	X	X		
2	High line voltage					X	X		
3	Speaker improperly or not connected	X	X			X			
4	Amplifier not on	X							
5	Amplifier tubes defective	X	X			X			
6	Exciter lamp defective	X	X			X			
7	Photo electric cell defective	X	X			X			
8	Projector lamp burned out			X					
9	Projector lamp out of alignment				X				
10	Lens incorrectly focused				X				
11	Film incorrectly threaded	X	X		X	X		X	X
12	Volume control not on or defective	X	X			X			
13	Fuse burned out	X							
14	Projector cable broken or loose	X	X			X	X		
15	Defective motor belts		X		X				
16	Poor acoustics		X						
17	Dirty sound lens	X	X			X			
18	Dirty projection lens and reflectors				X				
19	Speed control at wrong position		X		X				
20	Film channels dirty	X	X		X				
21	Lack of or too much oil		X			X	X		
22	Motor governor brushes dirty or damaged		X			X	X		
23	Motor commutator dirty or damaged		X			X	X		
24	Poor contact in line cord	X	X	X	X		X		
25	Poor screen or extraneous light				X				
26	Defective or dirty film		X		X				X
27	Line polarity or plugs switched	X	X			X			
28	Film gate pressure shoe not seating properly		X		X				X
29	Faulty switch	X		X					



# SECTION THREE

# FILMSTRIP PROJECTION

## SOUND AND SILENT FILMSTRIPS

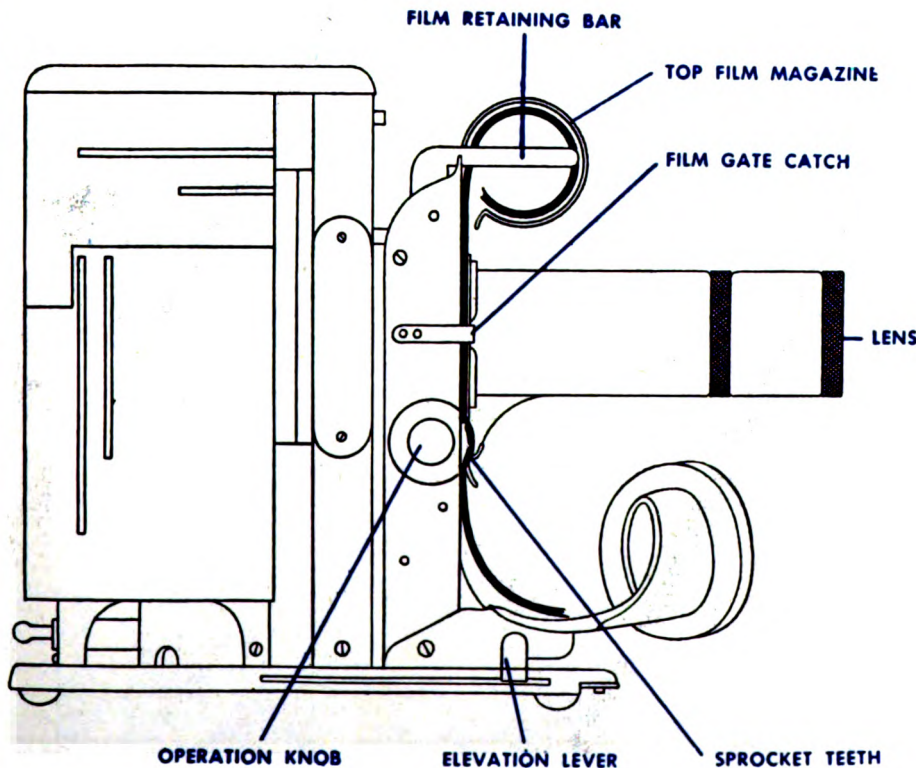
The simplicity and convenience of still picture projection, whether for lighted pictures in color or monotone, makes this visual tool one of the most widely used. The 35mm roll of still pictures arranged in sequence is familiarly called "filmstrip" or "slidefilm."

Filmstrips accompanied by a recording which explains the pictures on the screen are known as "sound slidefilms." The silent filmstrip customarily has titles and printed explanations on the film or printed in accompanying manual.

## SUGGESTIONS FOR BEST USE OF FILMSTRIPS AND SOUND SLIDEFILMS

1. Be sure to engage sprocket teeth in perforations.
2. Keep fingers off surface of filmstrip.
3. Clean filmstrip occasionally with soft cloth and carbon tetrachloride.
4. When using silent filmstrip on a sound slidefilm projector do not turn on amplifier.
5. Store records in a cool place.
6. Store records so they will not warp.
7. Change steel needles for every record.
8. Clean records with soft brush.
9. Keep fingers off surface of records.
10. Handle sapphire needles with care.
11. Never cinch filmstrip.

## THREADING THE FILMSTRIP PROJECTOR

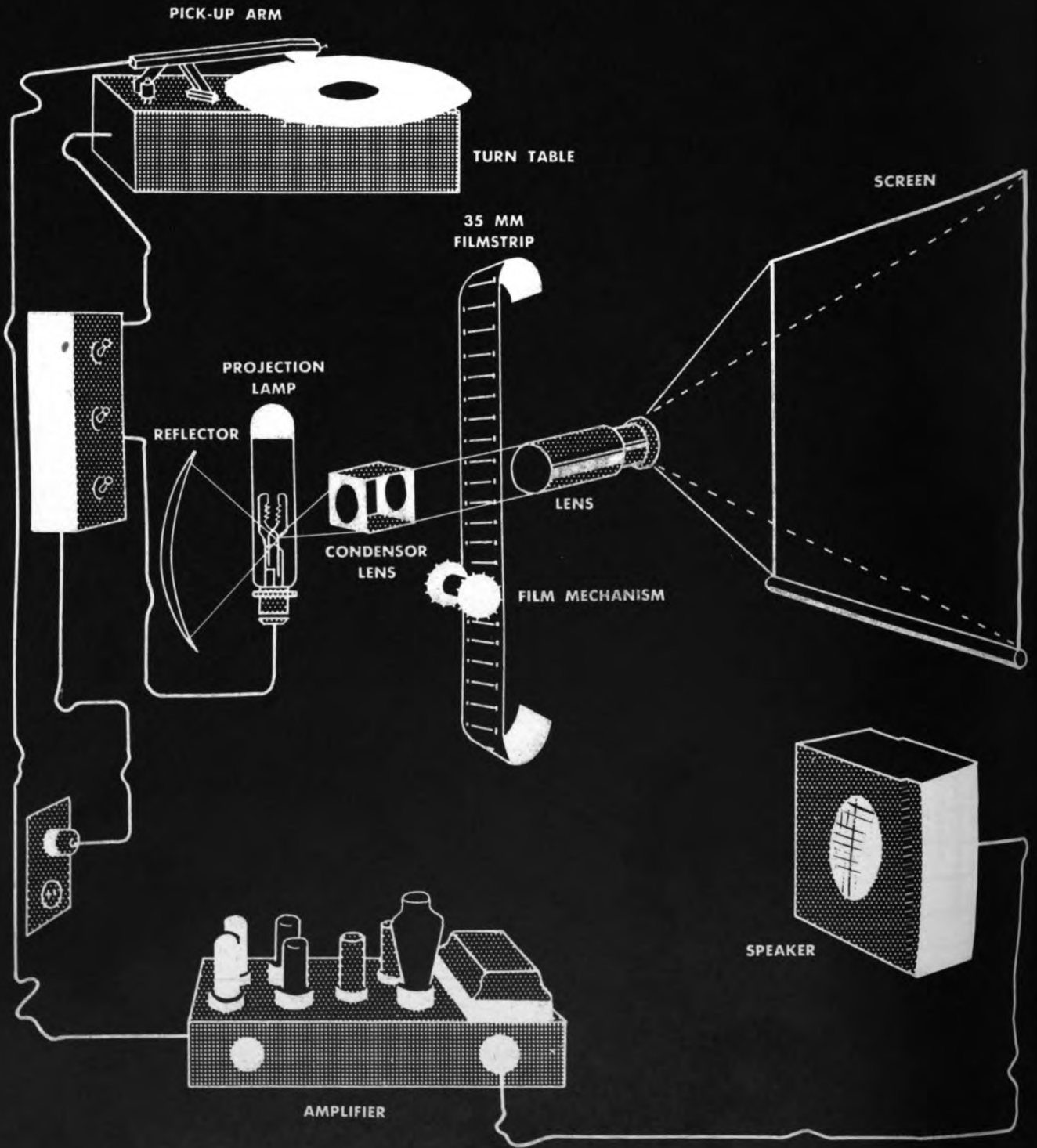


## STEPS IN THREADING

1. Lift film retaining bar.
2. Insert film in top film magazine; place so film rolls counter-clockwise as it feeds.
3. Open gate by releasing gate catch.
4. Thread film on sprocket teeth. (Be sure sprocket teeth engage with film perforations.)
5. Close gate.
6. Turn on projection lamp switch.
7. Frame film by pushing in on operating knob and rotating. When picture is in proper frame, pull out on knob.
8. By turning control knob clockwise, picture will be advanced in proper frame automatically.

# SOUND FILMSTRIP PROJECTOR

This exploded view shows the parts common to the sound filmstrip projector.



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## SOUND FILMSTRIP PROJECTOR

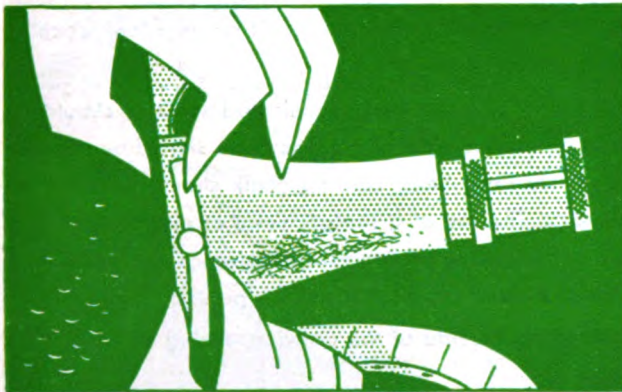
The importance of proper operation of the 35 mm filmstrip projector cannot be stressed enough. *In brief the projectionist must:*



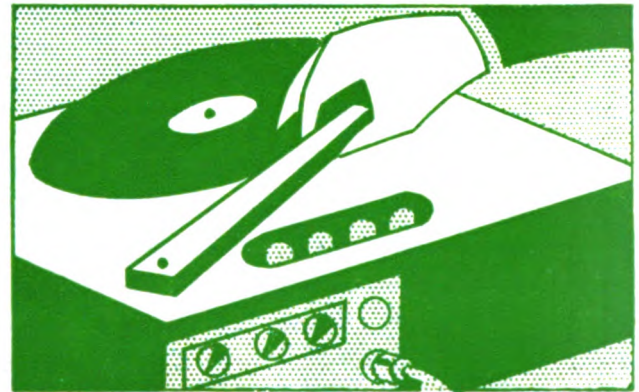
**1** Set up equipment properly. Check the AC-DC switch.



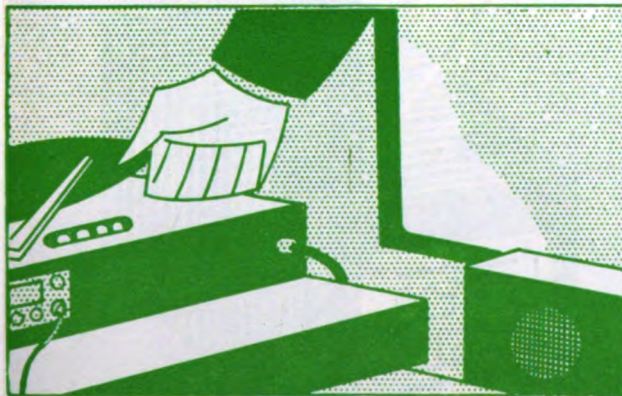
**4** Frame and focus picture.



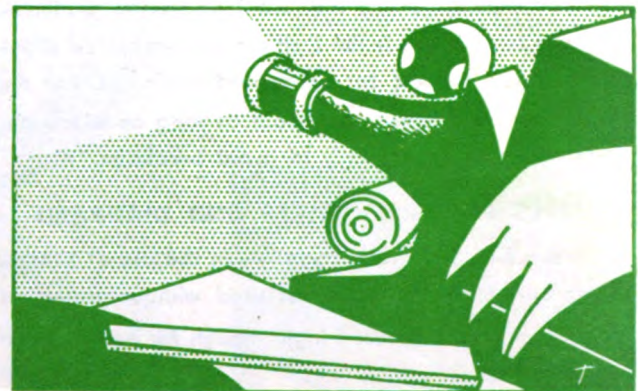
**2** Check record & film titles. Thread projector; see that sprocket teeth are engaged in film.



**5** Synchronize record with proper frame.

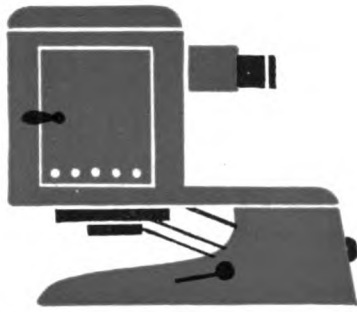


**3** Warm up amplifier and turn on projector. Set speed control if dual-speed turntable.



**6** Be alert. Advance film at proper signal. Keep sound and film synchronized.

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# STILL PICTURE TIPS

**Suggestions for good use of slides, opaque projection and other valuable teaching tools**

## USING THE OPAQUE PROJECTOR

After illustrations, diagrams, charts or printed matter have been selected, they should be carefully arranged in sequence before the showing. The operator should be carefully instructed as to his duties and cues arranged beforehand.

Use a good projection screen, preferably of the beaded type, to give all possible brilliance to these materials. The room should be darkened as much as possible and the image kept comparatively small for brilliance. Pictures should not be kept in the projector too long. The instructor should stand beside the screen with a pointer.

## TIPS ON SLIDE PROJECTION

Projectors of three general types are used. They are (1) the filmstrip projector with a 2" x 2" slide adapter; (2) the slide projector in two standard sizes, 2" x 2" or 3 1/4" x 4"; and (3) the slide projector size 3 1/4" x 4" with an adapter for 2" x 2" slides.

Follow the manufacturer's instructions carefully. The instruction sheet furnished with each projector should be mounted on cardboard and kept with the projector.

Slides should not be left too long in the projector. Seven to ten minutes is the limit for glass-mounted slides; two to three minutes for cardboard mounts. Color film should not be allowed to remain as long as black and white. Store slides carefully to avoid breakage.

## USING POSTERS, CHARTS AND DIAGRAMS

There are five good rules to follow in the use of posters, charts and other pictorial aids used without projection.

- (1) They should be placed high enough for every student to see the details easily.
- (2) Captions, text, and major points must be large enough to be visible to students at the back of the classroom.

- (3) When explaining a chart, the instructor should stand to the side of the poster, face the class and talk to them instead of to the chart.

- (4) All graphic devices and symbols should be explained.

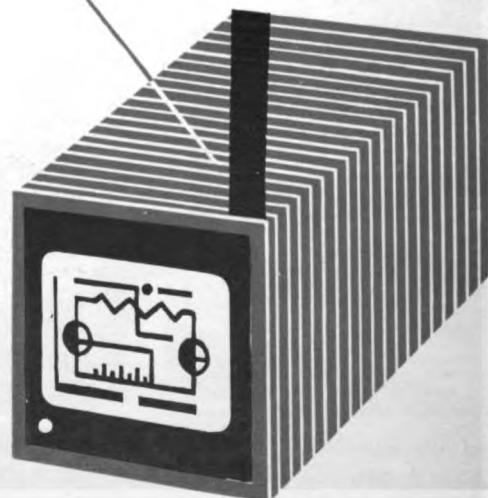
- (5) All other charts or similar types of aids should be covered while one is in use; otherwise attention will be distracted.

## DON'T OVERLOOK THE CHALKBOARD

The familiar chalk or blackboard is an excellent teaching tool. Here are a few tips:

Drawing of large and complicated subjects should be made before the class meets. The chalk should be trimmed square for even lines; colored chalk should be used for emphasis. The use of a straight edge or and compass will give better geometric figures. All drawings should be on a large scale and captions should be printed large.

Stand at the side of the drawing, facing the class. Use a pointer.

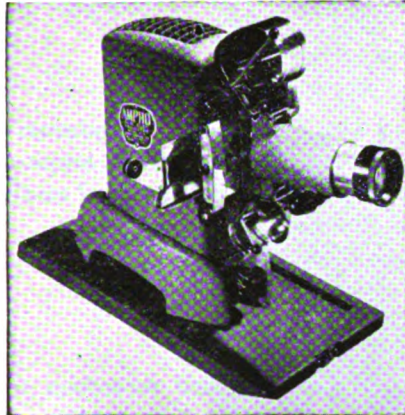




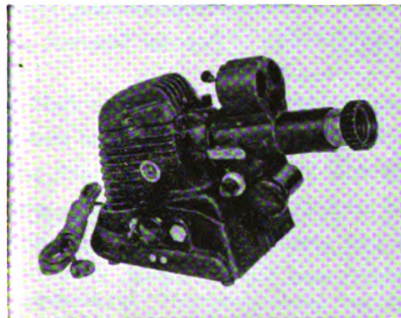
# FILMSTRIP, SLIDE AND OPAQUE PROJECTORS

— for —

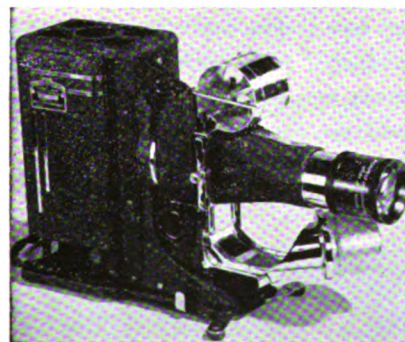
## SLIDE & SLIDEFILM



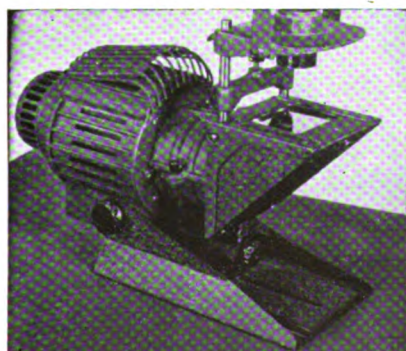
**Ampro Model 30-D**



**Golde Triple-Purpose**

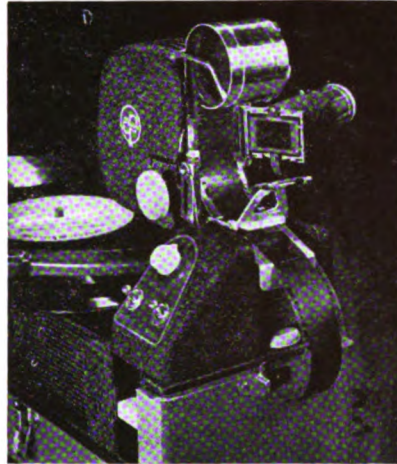


**S.V.E. Model AAA  
OVERHEAD**

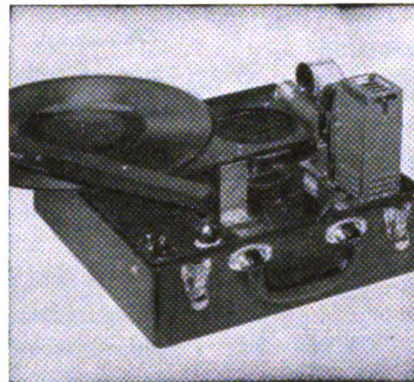


**Keystone Model 245**

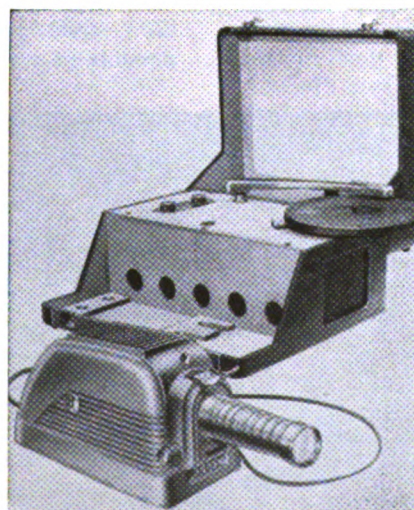
## SOUND SLIDEFILM



**DuKane Model 14A135**



**McClure Picturephone**

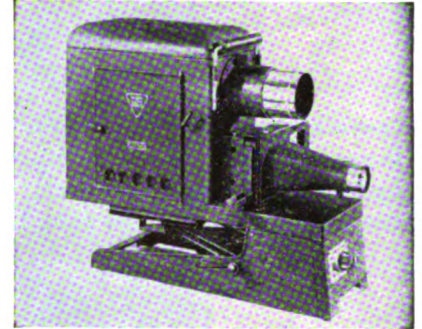


**Soundview Model SA-43**

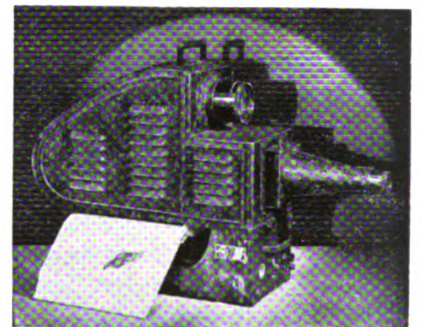
### Other Projectors

Only a few typical models in current use are shown. Write mfrs. listed on Page 38 for complete literature.

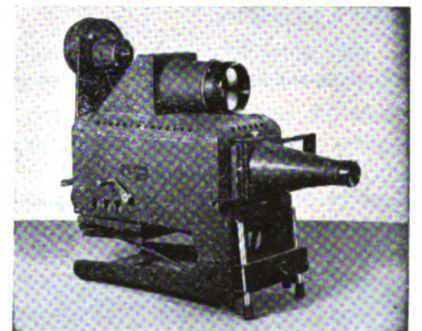
## SLIDE & OPAQUE



**Bausch & Lomb Model LRM**

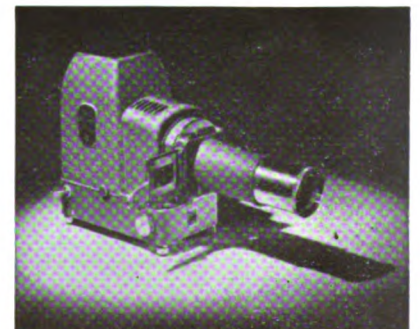


**Beseler Model OA2**



**Spencer Delineascope**

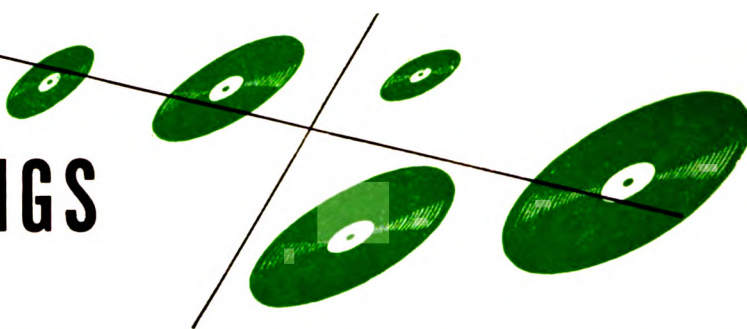
## 2" x 2" SLIDES



**Filmo Duo-Master**



# RECORDINGS



Learning through listening fills an important place in many kinds of instruction: speech training, music appreciation, language arts, reading skills, etc. The advent of excellent sound reproduction meth-

ods such as tape and wire recording to supplement the widely used disc player only serves to emphasize the ever-widening field for this type of audio material in schools, churches and industry.

## THE VALUE OF RECORDINGS

Learning in many ways takes place best through the auditory sense. Sometimes it is desirable only to *hear* what is to be learned. Seeing is not always necessary.

Recordings help to convey accurate information, delivered by executive, technical or scientific personnel, etc. as well as aiding the development of auditory skills.

## PREPARATION FOR CLASSROOM USE

When the class meets, the instructor should explain the content of the record (or of the recording to be made) and the purpose for its use. The class should be instructed to find answers to definite questions and listen for specific points.

The recording should then be played through. The instructor may replay the entire recording or certain portions if necessary.

Both class and instructor should listen attentively. All possible outside and room noises should be eliminated.

At the end of the playing period, the instructor should review and summarize the main points. During the discussion period new questions should be clarified. The content of the recording should always be related to other class activities.

## CLASS PROCEDURE

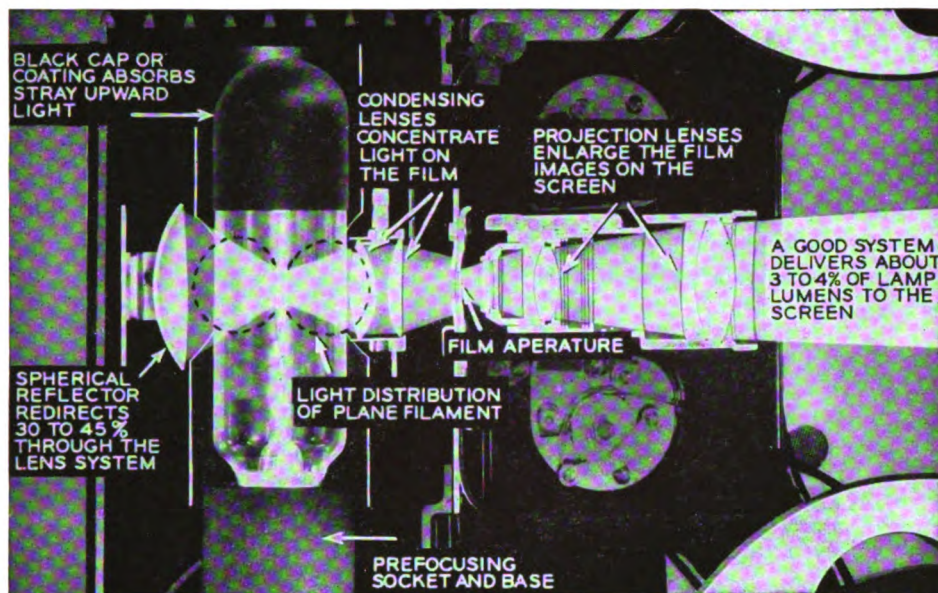
An excellent bibliography of suggested recordings for school use has been prepared by the Editors of *See & Hear Magazine*. Among the sources in this field are the U. S. Office of Education, RCA Victor, Linguaphone, Training Aids, the Audio-Visual Division of Popular Science, etc.

The range of curriculum subjects includes the field of literature and poetry, the language arts, the social studies and music. Recordings can be utilized well in such programs. They are vivid and dramatic; they arouse emotional response. They can present people and situations far removed from students and the classroom.

In business education and sales training, the use of recorded messages and inspirational talks is an obvious field. But technical facts can also be presented without loss of accuracy in transmission. Field demonstrations with charts or lighted pictures can be accompanied by transcriptions. For such purposes, the slow-speed transcription (33 1/3 rpm) is most suitable because of program length possible on a single side of a record.







One form of optical system, typical of the small portable motion picture projectors that have made 16mm movies both practical and popular. A glance at the picture shows that good projector performance must inevitably mean close collaboration between projector manufacturer and lamp makers. It is the co-ordination of lamp and optical system design that has made possible a sustained increase in screen brightness.

## LAMPS FOR LIGHT PROJECTION

Light sources used in picture projection systems represent extreme precision in lamp making. Light must be accurately controlled in the interest of efficiency and compactness. Filaments must be accurately located at the focal points of the optical system by extreme care in positioning the filament with respect to prefocusing bases. Highly concentrated monoplane and biplane filaments accurately regulated as to horizontal and vertical dimensions are employed. Tubular bulbs allow the spheri-

cal reflector and condensing lens to be placed close to the filament to intercept all possible light. A lamp with a 750-watt filament operating at a temperature of 5300° F and only three-quarters of an inch away from the glass envelope which has a maximum safe operating temperature of 975° F must dissipate as much energy as a one-horsepower motor. Forced ventilation of lamp housings is necessary in many cases to keep glass from softening.

## RECOMMENDED LINE OF PROJECTION LAMPS

Most modern projectors are designed around the fourteen types of lamps listed below. This line of lamps gives an adequate range of sizes from 75 watts to 2100 watts. The group of seven lamps with medium prefocus bases from 200 watts to 1000 watts represent 80% of the demand, with approximately 10% each for both the lower and higher wattage group.

It will be noticed that this recommended standard line exhibits only focusing types of bases in candelabra or bayonet, prefocusing and bipost which assures accurate light positioning. Early models of projectors, almost universally, used screw bases. This aspect alone doubles the number of lamp types. The early use of non-standard voltages further multiplied the line several fold.

BAYONET CANDELABRA					MEDIUM PREFOCUS						
100	100	150	200	300	200	300	500	750	1000	500	1000
PROJECTOR TYPES					PROJECTOR TYPES						
MIN. SLIDE	MIN. SLIDE	8-mm. MOTION PICTURE AND MIN. SLIDE	8-mm. and 16-mm. MOTION PICTURE	8-mm. and 16-mm. MOTION PICTURE	MIN. SLIDE and 16-mm. MOTION PICTURE	8-mm. and 16-mm. MOTION PICTURE	8-mm. and 16-mm. MOTION PICTURE	16-mm. MOTION PICTURE	16-mm. MOTION PICTURE	STEREOPHONIC 35-mm. PORTABLE MOTION PICTURE	35-mm. SEMI-PORT MOTION PICTURE
NATURAL	NATURAL	NATURAL	NATURAL	MODERATE FORCED	NATURAL	MODERATE FORCED	HIGH DEGREE FORCED	HIGH DEGREE FORCED	HIGH DEGREE FORCED	NATURAL	HIGH DEGREE FORCED

Technical data and illustrations on this page were supplied by the Lamp Department, General Electric Co.



# A DIRECTORY OF AUDIO-VISUAL EQUIPMENT MAKERS

● For your convenient reference in writing for reference literature, price quotations, and other useful data on audio-visual projection equipment and accessories, we include this directory of representative manufacturers and their headquarters addresses:

## 16MM SOUND-ON-FILM PROJECTORS

**Ampro Corporation**, 2835 North Western Avenue, Chicago 18, Illinois.

**Bell & Howell Company, The**, 7100 McCormick Road, Chicago 45, Illinois. (Now mfg. DeVry "JAN")\*

**Calvin Co., Inc.**, 1105 East Truman Road, Kansas City 6, Missouri.

**Eastman Kodak Company**, Rochester 4, New York.

**Forway Corporation**, 245 West 55th Street, New York 19, N. Y.

**RCA Victor Division**, Visual Products Section, Radio Corporation of America, Camden, New Jersey.

**Revere Camera Company**, 320 E. 21st Street, Chicago 16, Illinois.

**Technical Service, Inc.**, 30865 Five Mile Road, Livonia, Michigan. (See DeVry "5" on page 24.)\*

**Victor Animatograph Corporation**, Davenport, Iowa.

## SOUND SLIDEFILM PROJECTORS

**Automatic Projection Corporation**, 29 W. 35th Street, New York City 1, N. Y.

**Illustravox Division**, Electro Engineering and Manufacturing Company, 627 Alexandrine, Detroit 1, Michigan.

**O. J. McClure Talking Pictures**, 1115½ West Washington Boulevard, Chicago 7, Illinois.

**DuKane Corporation**, St. Charles, Illinois.

## SLIDE AND SLIDEFILM PROJECTORS

**Argus, Inc.**, Ann Arbor, Michigan.

\* DeVry Corporation "JAN" model listed at bottom of page 24 is now manufactured by Bell & Howell; the DeVry "5" at top of page 24 is now manufactured by Technical Service, Inc., Livonia, Michigan, as the TSI-DeVrylite. Service on these former DeVry products has been assumed by these respective companies for the models named.

**Bausch & Lomb Optical Company**, Educational Sales Division, 635 St. Paul Street, Rochester 2, New York.

**GoldE Manufacturing Company**, 4888 N. Clark Street, Chicago 40, Illinois.

**Keystone View Company**, Meadville, Pennsylvania.

**Squibb Taylor, Inc.**, 1213 South Akard, Dallas 1, Texas.

**Society for Visual Education, Inc.**, 1345 West Diversey Parkway, Chicago 14, Illinois.

**Standard Projector & Equipment Company**, 7106 Touhy Avenue, Chicago 31, Illinois.

**Three Dimension Company**, 3512 N. Kostner, Chicago 41, Illinois.

**Victorlite Industries**, 4117 W. Jefferson Boulevard, Los Angeles 16, California.

**Viewlex, Inc.**, 35-01 Queens Boulevard, Long Island City 1, N. Y.

**Also see:** Ampro Corporation, Bell & Howell, Eastman Kodak.

## OPAQUE AND OVERHEAD PROJECTORS

**Bausch & Lomb Optical Company** (see above).

**Charles Beseler Company**, 60 Badger Avenue, Newark 8, New Jersey.

**Keystone View Company** (see above).

**Victorlite Industries** (see above).

## CONTINUOUS DISPLAY PROJECTORS

(slide, slidefilm projectors for continuous showing)

**Admatic Projector Company**, 70 West Hubbard, Chicago, Ill.

**Harwald Company, Inc.**, 1216 Chicago Avenue, Evanston, Ill.

**LaBelle Industries**, Oconomowoc, Wisconsin.

**Picture Recording Company**, Oconomowoc, Wisconsin.

**Spindler & Sauppe**, 2201 Beverly Boulevard, Los Angeles, California.

## PROJECTION SCREENS

**DaLite Screen Company**, Warsaw, Indiana.

**Radiant Manufacturing Corporation**, 2627 W. Roosevelt Road, Chicago 8, Illinois.



# The Film Prayer

**I AM FILM, not steel; o user, have mercy. I front dangers whenever I travel the whirring wheels of mechanism. Over the sprocket wheels, held tight by the idlers, I am forced by the motor's magic might. If a careless hand mistreads me, I have no alternative but to go my death. If the pull on the takeup reel is too violent, I am torn to shreds. If dirt collects in the aperture, my film of beauty is streaked and marred, and I must face my beholders — a thing ashamed and bespoiled. Please, if I break, never fasten me with pins which lacerate the fingers of my inspectors. Don't rewind me — my owner wants that privilege, so that he may examine me, heal my wounds, and send me rejuvenated upon a fresh mission.**

**I travel many miles in tin cans. I am tossed on heavy trucks, sideways and upside down. Please see that my first few coils do not slip loose in my shipping case, and become bruised and wounded beyond the power to heal. Put me in my own can. Scrape off all old labels on my shipping case so I will not go astray.**

**Speed me on my way. Others are waiting to see me. The next day is the last day I should be held. Have a heart for the other fellow who is waiting, and for my owner who will get the blame.**

**I am a delicate ribbon of film — misuse me and I disappoint thousands; cherish me, and I delight and instruct the world.**

**A. P. HOLLIS**



