

# *Instruction Manual and Parts List Catalog*

*DE VRY 35 mm. Sound  
Motion Picture Equipment*

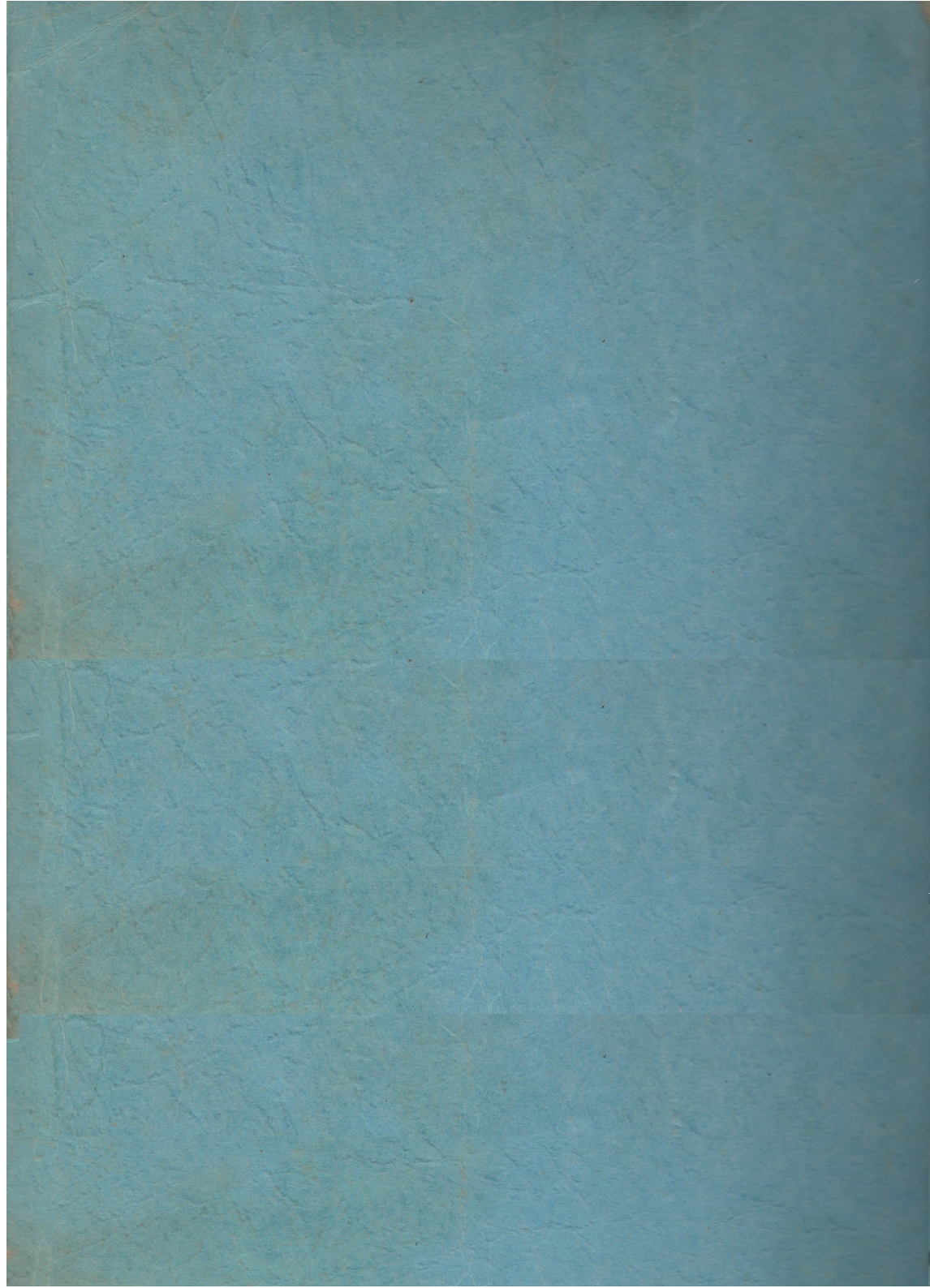


CONTRACT NOS. \_\_\_\_\_

Projector Serial Number \_\_\_\_\_

Amplifier Serial Number \_\_\_\_\_







INSTRUCTION  
MANUAL  
AND  
PARTS LIST  
CATALOG

DE VRY MODEL "XD"  
35MM. SEMI-PORTABLE  
MOTION PICTURE  
SOUND PROJECTOR  
AND  
MODEL "ND" AMPLIFIER



DE VRY CORPORATION  
1111 ARMITAGE AVE.  
CHICAGO, ILLINOIS, U. S. A.

Branch Offices:

52 Vanderbilt Avenue  
New York City

5628 Hollywood Blvd.  
Hollywood, California

TABLE OF CONTENTS

	Page
FOREWORD.....	1
I. UNPACKING EQUIPMENT.....	2
A. Projector.....	2
B. Lamphouse.....	2
C. Amplifier and Speaker.....	2
D. Speaker Cones - Voice Coils.....	2
E. Spare Parts Box.....	2
II. INSTALLATION.....	3
A. Projector.....	3
B. Upper Magazine.....	3
C. Small Parts.....	3
1. Framing Knob.....	3
2. Silent Aperture.....	3
D. Amplifier.....	3
E. Speaker.....	5
F. Hooking-Up Complete Outfit.....	5
1. Projector.....	5
2. Amplifier.....	5
3. Speaker.....	5
III. OPERATING EQUIPMENT.....	5
A. Projector Power Supply Data.....	5
B. Focusing on Screen Before Threading.....	5
C. Threading.....	8
D. Checking Film Threading.....	11
E. Framing Film at Aperture.....	11
F. Operating the Amplifier.....	11
1. Power Data.....	11
2. Amplifier Controls.....	11
(a) "OFF-ON" Switch.....	11
(b) Master Control.....	11
(c) Bass Control.....	12
(d) Treble Control.....	12
3. Fuse.....	12
4. Amplifier Operating Aids.....	12
G. Projector Routine Step By Step.....	12
IV. PROJECTOR MAINTENANCE.....	14
A. Cleaning.....	14
1. Projection Lens.....	14
2. Condenser-Reflector.....	14
3. Sound (Slit) Lens.....	14
4. Sound Drum.....	14
5. Aperture Plate.....	14
6. Film Guide Rollers.....	14
7. Film Guide Rails.....	14



T A B L E O F C O N T E N T S

	<u>Page</u>
8. Film Shoes.....	14
9. Film Sprockets.....	15
10. Film Idler Rollers.....	15
11. Fire Trap Rollers.....	15
12. Projector Case (Bottom).....	15
B. Lubrication of Parts.....	15
(See Lubrication Charts, Pages 38,39,40)	
C. Adjustments and Removal of Parts.....	15
1. Condenser-Reflector Assembly.....	15
(a) Adjustments.....	15
(b) Parts Replacements.....	16,17
2. Ventilating Motor Assembly.....	17
(a) Adjustments.....	17
(b) Parts Replacements.....	17
3. Take-Up Assembly.....	17
(a) Adjustments.....	17
(b) Parts Replacements.....	17
4. Feed Magazine Assembly.....	18
(a) Adjustments.....	18
(b) Parts Replacements.....	18
5. Drive Motor Assembly.....	18
(a) Adjustments.....	18
(b) Parts Replacements.....	18,20
6. Feed Sprocket Assembly.....	20
(a) Adjustments.....	20
(b) Parts Replacements.....	20
7. Sound Sprocket Assembly.....	20
(a) Adjustments.....	20,21
(b) Parts Replacements.....	21
8. Film Gate Assembly.....	21
(a) Adjustments.....	21
(b) Parts Replacements.....	21,22
9. Take-Up Chain Idler Assembly.....	22
(a) Adjustments.....	22
(b) Parts Replacements.....	22
10. Sound Sprocket Chain Idler Assembly.....	22
(a) Adjustments.....	22
(b) Parts Replacements.....	22
11. Intermittent Movement Assembly.....	23
(a) Removal of Intermittent Unit.....	23
(b) Repairing-Replacing Intermittent Parts.....	23,24,25
12. Sound Filter Assembly.....	25
(a) Adjustments.....	25
(b) Parts Replacements.....	25
13. Chain Idler Assembly.....	25
(a) Adjustments.....	25,26
(b) Parts Replacements.....	26
14. Photo-Cell Mount Assembly.....	26
(a) Adjustments.....	26
(b) Parts Replacements (Photo-Cell).....	26
15. Shutter Assembly.....	26
(a) Adjustments.....	26,27
(b) Parts Replacements.....	27

T A B L E O F C O N T E N T S

	<u>Page</u>
16. Exciter Lamp Assembly.....	27
(a) Adjustments.....	27
(b) Parts Replacements.....	27,28
17. Floating Film Idler Assembly.....	28
(a) Adjustments.....	28
(b) Parts Replacements.....	28
18. Lens Mount Assembly.....	28
(a) Adjustments.....	28
19. Holdback Sprocket Assembly.....	28
(a) Adjustments.....	28
(b) Parts Replacement.....	28,29
20. Sound Adjustment Roller Assembly.....	29
(a) Adjustments.....	29
(b) Parts Replacements.....	29
21. Aperture Plate Assembly.....	29
(a) Adjustments.....	29
(b) Parts Replacements.....	29
V. AMPLIFIER MAINTENANCE.....	30
1. Inspection of Tubes.....	30
2. Prolonging Life of Tubes.....	30
3. Dirt in Amplifier.....	30
4. Loss of Sound.....	30,31
5. Checking Amplifier for Trouble.....	31
6. Poor Quality of Sound.....	32
7. Type of Tubes Used in Amplifier.....	32
8. Amplifier Voltage Analysis.....	33

ILLUSTRATIONS - CHARTS - DIAGRAMS

Figure 1 - Complete Projection Outfit.....	4
Figure 2 - Hook-up of Equipment.....	6
Figure 2A - Arrangement for Operating.....	7
Figure 3 - Threading Illustration.....	9
Threading Chart.....	10
Figure 4 - Location of Switches, etc.....	13
Figure 5 - Adjusting Chains, etc.....	19
PROJECTOR WIRING DIAGRAM.....	34
AMPLIFIER WIRING DIAGRAM.....	35
SERVICE TROUBLE - REMEDY CHART.....	36,37
LUBRICATION CHART AND ILLUSTRATION.....	38,39,40
SCREEN DIMENSIONS CHART.....	41



## TABLE OF CONTENTS

## MAIN PROJECTOR ASSEMBLIES LISTED IN PARTS LIST CATALOG

Part Number	Description	Parts Analysis Page No.	Drawing Page No.
	Important Information	1A	None
1001	Condenser - Reflector Assembly	2A	3A
1005	Ventilating Motor Assembly	4A	4A
1430	Upper Case Assembly	5A	6A
1440	Lower Magazine Assembly	7A	8A
1450	Take-up Assembly	9A	10A
1470-A	Feed Magazine Assembly	11A	12A
1530-A	Drive Motor Assembly	15A	16A
2211	Lamphouse Assembly	17A	17A
2216	Feed Sprocket Assembly	18A	19A
2220	Sound Sprocket Assembly	21A	22A
2230	Film Gate Assembly	23A-25A	24A-25A
2259	Take-up Chain Idler Assembly	26A	27A
2259-A	Sound Sprocket Chain Idler Assembly	26A	27A
2263	Intermittent Movement Assembly	28A-29A	30A
2290	Sound Filter Assembly	36A	36A
2305	Chain Idler Assembly	37A	37A
2313	Photo Cell Mount Assembly	38A	38A
2330	Shutter Assembly	39A	40A
2340	Exciter Lamp Assembly	42A	43A
2350	Floating Film Idler Assembly	44A	44A
2367	Oiler Assembly	45A	45A
2379	Lens Mount Assembly	46A	46A-47A
2380	Holdback Sprocket Idler Assembly	48A	49A
2394	Sound Adjustment Roller Assembly	50A	50A
2395-A	Lower Fire Valve Assembly	51A	51A

Continued on Next Page

## TABLE OF CONTENTS - Continued

Part Number	Description	Parts Analysis Page No.	Drawing Page No.
2404	Aperture Plate Assembly	52A	53A
2420	Aperture Release Assembly	54A	54A
2420-A	Film Gate Trigger Assembly	55A	55A
OFA-A	Film Guide Roller Assembly	56A	56A
SUB-ASSEMBLIES LISTED IN PARTS CATALOG			
1001-A	Condenser Assembly (Sub-Assembly 1001)	2A	4A
2224	Feed Chain Sprocket Assembly (Sub-Assembly of 2216)	20A	20A
2280	Intermittent Unit (Sub-Assembly 2263)	31A-32A	33A-34A-35A
2331-A	Shutter Blade Assembly (Sub-Assembly of 2330)	41A	41A
2370	Motor Chain Idler Roller (Sub-Assembly of 1530)	15A	16A
2390	Sprocket Idler Assembly (Sub-Assembly of 2216, 2220, 2280)	18A	20A
2393	Feed Shaft Assembly (Sub Assembly of 1470-A)	13A	13A
2395	Upper Fire Valve Assembly (Sub-Assembly of 1470-A)	14A	14A
ND	Amplifier Complete (30 Watts)	57A-58A 59A-60A	27
ND-12	Loud Speaker Complete	61A	None
	Numerical List of Projector Assemblies listed on Master Drawing.	62A	**
	Numerical List of Parts and Complete Units as Listed on Master Assembly Drawings.	63A-64A	**
	**MASTER ASSEMBLY DRAWINGS (Front and Rear Views) Bound to the INSIDE BACK COVER.		



## INSTRUCTION MANUAL

### DE VRY 35MM. MOTION PICTURE SOUND PROJECTION EQUIPMENT

#### FOREWORD

The purpose of this Manual is to fully acquaint the operator with the simplest, yet best means of installing, operating and maintaining DeVry 35mm. Motion Picture Sound Equipment.

#### SECTION I

This section explains in detail how the equipment is packed at the factory for shipment. This information should be of great help to the person or persons doing the unpacking.

#### SECTION II

In this section the installation of the equipment, prior to operating, is fully explained.

#### SECTION III

Read the contents of this section carefully. It explains in fullest detail all the steps required for the operation of the projection and sound equipment.

#### SECTION IV

This section covers the maintenance of the projector. Complete information on cleaning, adjusting and removing parts for replacement are outlined.

#### SECTION V

This section contains the necessary facts on servicing the DeVry Model "ND" Amplifier. Consult this section if and when trouble occurs in the amplifier.

The balance of the instructional material includes the Projector Wiring Diagram, Amplifier Wiring Diagram, Lubrication Charts, Service Trouble Charts and a Chart on Screen Dimensions.

NOTE: The Parts List Catalog, complete with Analysis and

#### G U A R A N T E E

DE VRY CORPORATION guarantees all parts and spare parts used in this equipment (with the exception of gaseous tubes and Mazda lamps), and agrees to replace at its own expense, without delay, all items found to be defective as to design, material or workmanship, within the period of one year from date of shipment.

DE VRY CORPORATION  
1111 Armitage Ave.  
Chicago (14), Ill.



## I. UNPACKING THE EQUIPMENT

### A. Projector

The projectors are shipped partially knocked down to facilitate packing. The upper magazine is packed in a separate carton with one 2000 ft. reel. The mechanism and lower magazine of each projector is permanently fastened together and shipped as one unit in a strong wooden box. This should be unpacked carefully and set in an upright position. The smaller parts are packed inside the projector case and magazines. In the lower magazine will be found the second 2000 ft. reel, 25 ft.-10 ft. duplex projector-amplifier power supply cable with twist lock polarized connections and the photo-electric cell cable. In the mechanism case you will find the framing knob and the silent aperture mask each contained in a separate envelope.

### B. Lamphouse

The lamphouse is mounted as a permanent part of the mechanism case. The lamp is packed inside the lamphouse in a corrugated container but is not fixed in its socket. Since the lamp is set and refocused before leaving the factory, do not disturb the lamp socket, reflector or condenser setting. In inserting the lamp, be sure that the smaller and larger portions of the pre-focus arrangement engage in the identical slots of the prefocused lamp socket. Once this is done a twist in a clockwise direction will securely fix the lamp in place.

### C. Amplifier and Speaker

In a separate carton you will find the speaker unit with the amplifier enclosed therein. A 100 ft. speaker cable is inside the speaker case door.

### D. Speaker Cones and Voice Coils

One extra speaker cone and voice coil is packed in the Spare Parts Box in such a manner as to prevent damage during shipping.

### E. Spare Parts Box

The spare parts box is packed in a separate carton. A list of all parts and accessories contained in this parts box plus other parts, such as cones and voice coils, 2000 ft. reels, etc. are designated on an index card located inside the cover.

## II. INSTALLATION SET-UP

After unpacking and checking each assembly the installation set-up follows. Figure 1 shows all the parts and units of a complete installation unpacked and ready for assembling. The first step is to set up the projector.

### A. Projector

The projector should be placed on a substantial table or base at the desired height to permit full screen coverage, bearing in mind that the best reflected screen image is obtained by having the projector mounted slightly higher than the center of the screen so that as much light as possible will be reflected into the audience. This condition is optional for short throws.

### B. Upper Magazine

The upper magazine is then mounted to the projector frame by fitting the support bracket of the magazine over the threaded studs located at top of frame and screwing the knurled nuts on the studs. This will hold magazine rigidly in place. (See A, Figure 3).

### C. Small Parts

#### 1. Framing Knob

The framing knob is packed in an envelope inside the projector head, and to mount it merely place it over the framing shaft with the set screw in line with the flat on the shaft and then thoroughly tightening the screw. (See Figure 3).

#### 2. Silent Mask (Optional)

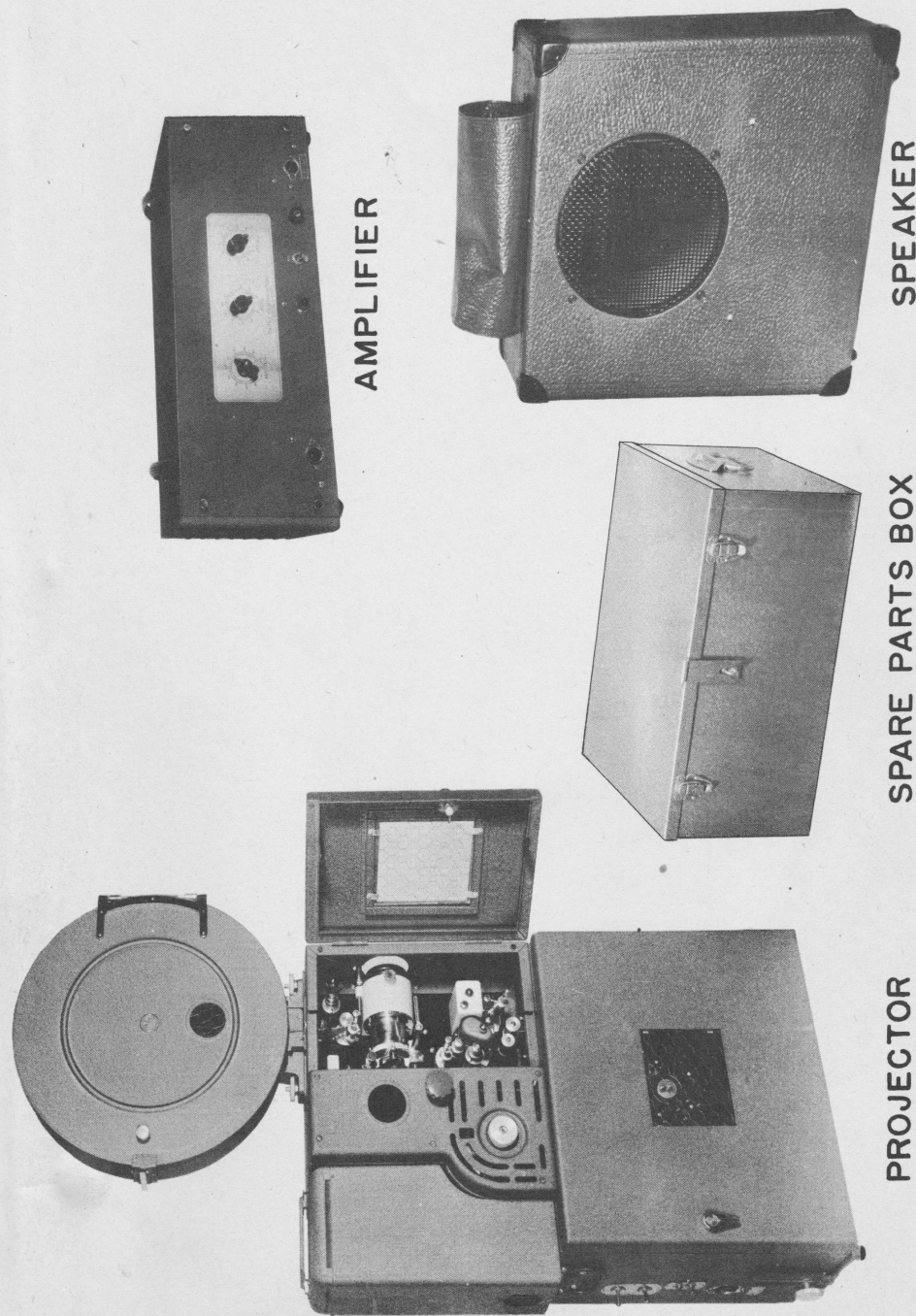
The silent aperture mask is packed in an envelope inside the projector head. This mask is to be inserted in the aperture ONLY WHEN SHOWING SILENT FILMS. Projectors are shipped with the sound mask inserted in the aperture. The silent mask is installed by first removing the sound mask (Figure 3) by grasping the knob and pressing toward rear or the left of the projector and withdrawing mask. Insert silent mask by merely pushing it into the slot provided until it is automatically locked in place. Before removing or inserting masks see that these parts are thoroughly cleaned of all accumulation of emulsion so that they will snap firmly into the guide rails.

### D. Amplifier

The amplifier is placed to the right front of the projector as shown in Figure 2A. It is advisable to keep the amplifier clear of miscellaneous objects in order to allow for a free circulation of air around the tubes, which operate at fairly high temperature. The distance the amplifier can be placed from the projector is limited to the length of the photo-electric cell cable.



FIGURE 1



## E. Speaker

The speaker should be placed beneath the screen or if this is not possible, at either side, with the cone opening facing the center of the audience. The flap covering the speaker cone is to be fastened to the top of the case by means of the snap buttons provided for this purpose.

## F. Wiring (Refer to Figures 2 and 2A)

## 1. Projector

The end of the 25 ft. projector cord with the large female twist lock plug is to be inserted into its receptacle at the rear of the projector case. The shorter length cable with the smaller twist lock plug is to be connected in its proper receptacle located in the rear of the amplifier. Opposite end of the cord is to be connected to power supply, 115 volts 60 cycle A.C. Thus, providing complete power supply for the operation of the entire equipment.

One end of the photo-electric cell cable is to be inserted into receptacle located at front of projector case and locked into place with lock ring mounted to socket. Opposite end of cable to be inserted into single pin receptacle located on front panel of amplifier marked P. E. Cell.

## 2. Amplifier

The amplifier power supply is provided as described above in Section F-1.

## 3. Speaker

The speaker cord plug is to be inserted into the 4 prong receptacle located at the rear of the amplifier.

## III. OPERATING EQUIPMENT

## A. Power Supply Data

The power source must supply 115 volts 20-25 amperes minimum. If projector is to be used beyond the distance possible with available length of power cords supplied, the extension cable used must have the same current carrying capacity as the heavy duty cable furnished with the projector or the resultant line loss will affect the illumination and constant speed of drive motor.

## B. Focusing on Screen Before Threading Film

Snap the motor and lamp switches to the "On" position. (Switches are located at the rear of projector). See Figure 4. With the light being projected on the screen, loosen the knurled tilting lock (Figure 4) and raise the projector until the light is centered on the screen. Lock tilting bracket in this position. It will greatly facilitate the film frame alignment if the lens is adjusted to near focus while the light is being projected. This is done by loosening the knurled clamping screw "F" Figure 3 and turning focusing knob (Figure 2) until the projected image of the aperture on the screen is sharp and distinct.



FIGURE 2

6

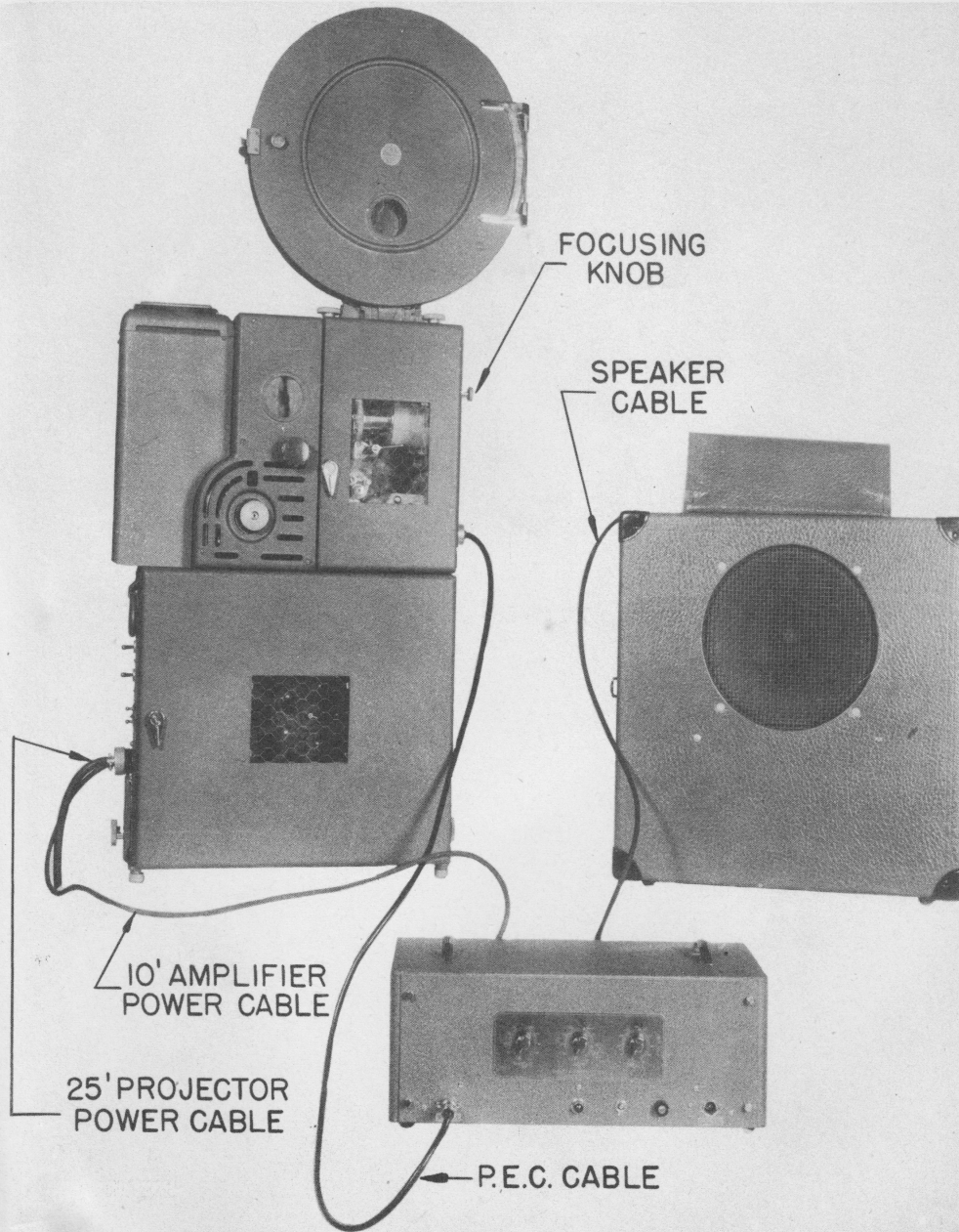
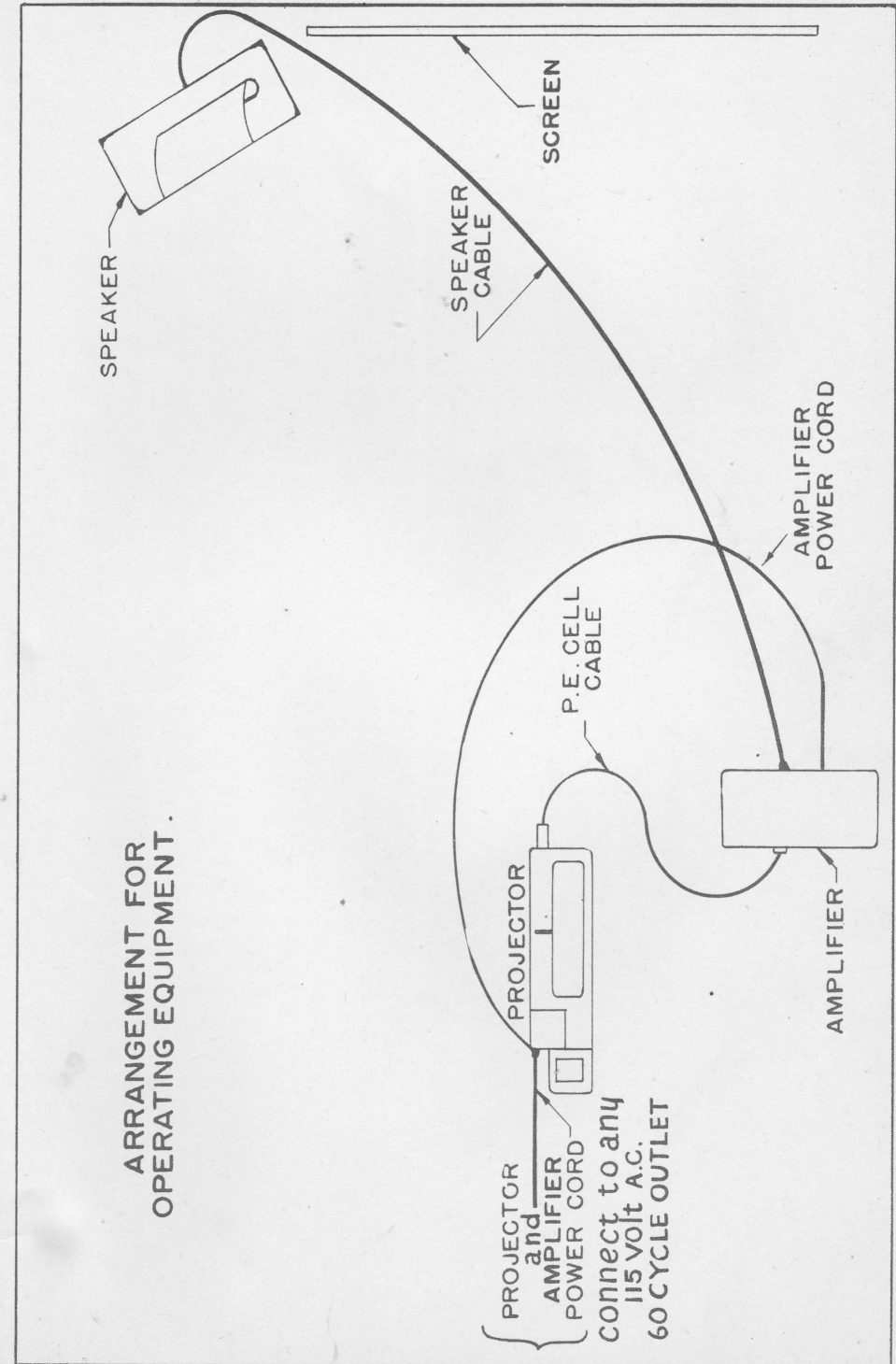


Figure 2A

7





C. Threading - Refer to Page 9 and Threading Chart, Page 10

1. Place reel of film on feed shaft in upper magazine. Lock reel in place. **IMPORTANT:** Reel must be placed into the upper magazine so that the emulsion (dull) side of film is toward the light source. The image should be upside down with the sound track or scanned area on the right side (toward operator) when film is in the projector. Feed reel turns in COUNTER-CLOCKWISE DIRECTION.

2. Turn Pilot Light Switch (located on rear of projector, (See Figure 4) to the ON position. This lights both the Threading Lamp "A" and Aperture Framing Lamp not shown in photograph.

3. Open upper Fire Guard "B" by placing right index finger under top of case and moving the metal guard to your left.

4. Draw out 6 to 8 feet of film leader and pass film between upper fire rollers "C" and around rear or left side of the guide roller "D", over and between the feed sprocket "E" and idler "F". Open idler "F" by pulling outward on Idler Knob "G" and lower idler away from sprocket. After checking to see that all film perforations are fully engaged in the sprocket teeth, close idler "F" by merely pushing it against the sprocket where it locks automatically.

5. Open the Film Gate "H" by moving Trigger "I" upward. Leave a "LOOP OF FILM" of approximately the size shown in Figure 3 between the feed sprocket "E" and the film gate. After forming the "Loop", lay the film in the film gate, being certain that the film lies perfectly flat over the aperture and that it is between the guide rollers at top of film gate and engages the Intermittent Sprocket "J" at the bottom of the gate. While holding film in this position, lock gate by lowering Trigger "I".

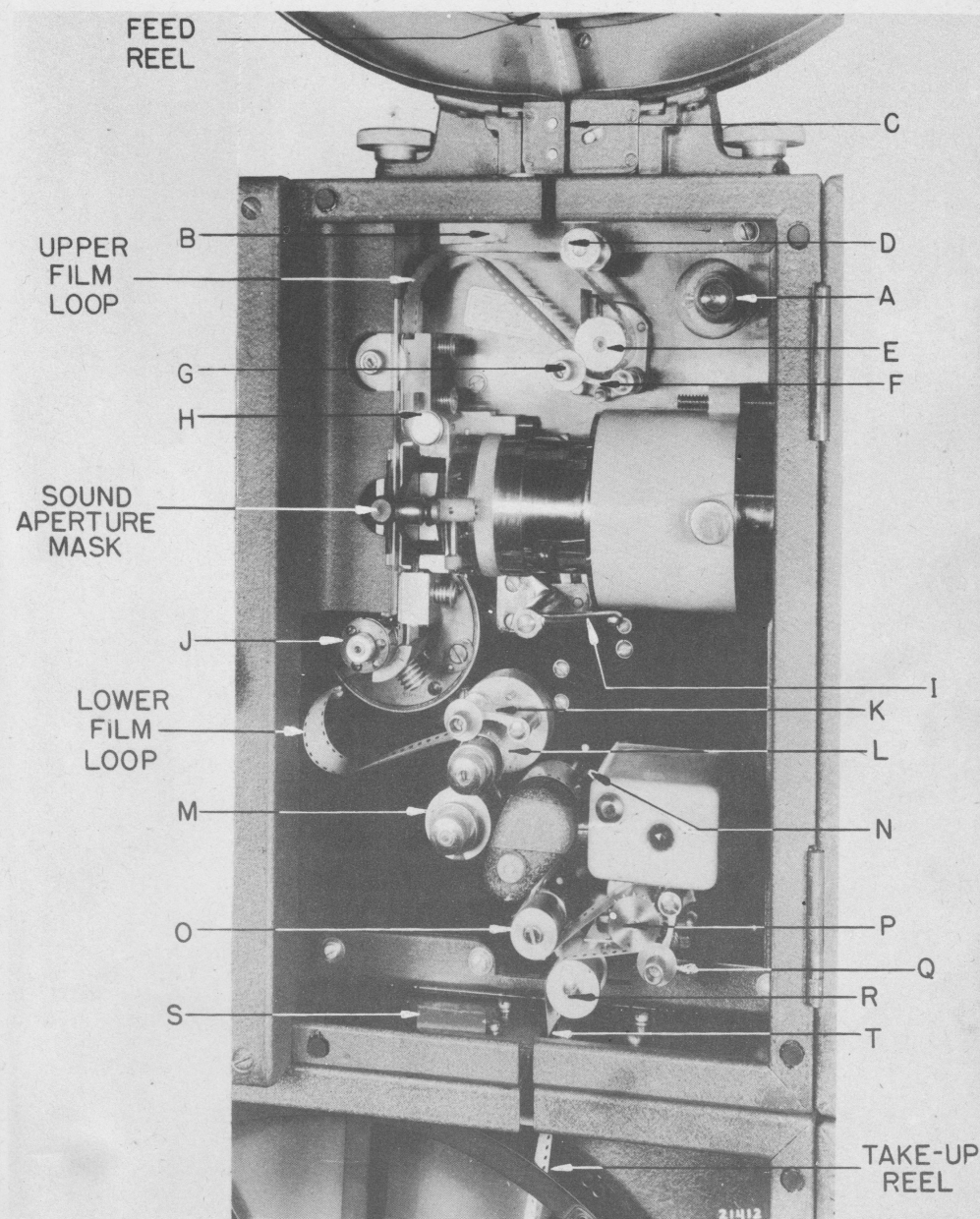
6. Open Idler "K" by pulling out the knob on end of idler and raise idler up and away from the holdback sprocket "L". Form a LOWER LOOP OF FILM of about the size shown in Figure 3 and pass film over and around the holdback sprocket "L". After checking to see that film engages all sprocket teeth, lock idler back into position over the sprocket.

7. Pass film under the Sound Adjustment Roller "M", over the Rotating Sound Drum "N", under the Floating Roller "O", over and between the Sound Sprocket "P" and Idler "Q". Open Idler "Q" just as you did the other idlers. After checking to see that all film perforations fully engage the sprocket teeth, reset the idler into place over the sprocket.

8. Then pass the film over the Stationary Roller "R". Open the Lower Fire Guard "S" by moving this metal safety device to the left and pass the film down through the Fire Roller "T" into the take-up magazine, and securely fasten the film to the hub of the take-up reel, turning reel in a clockwise direction to take up any film slack.

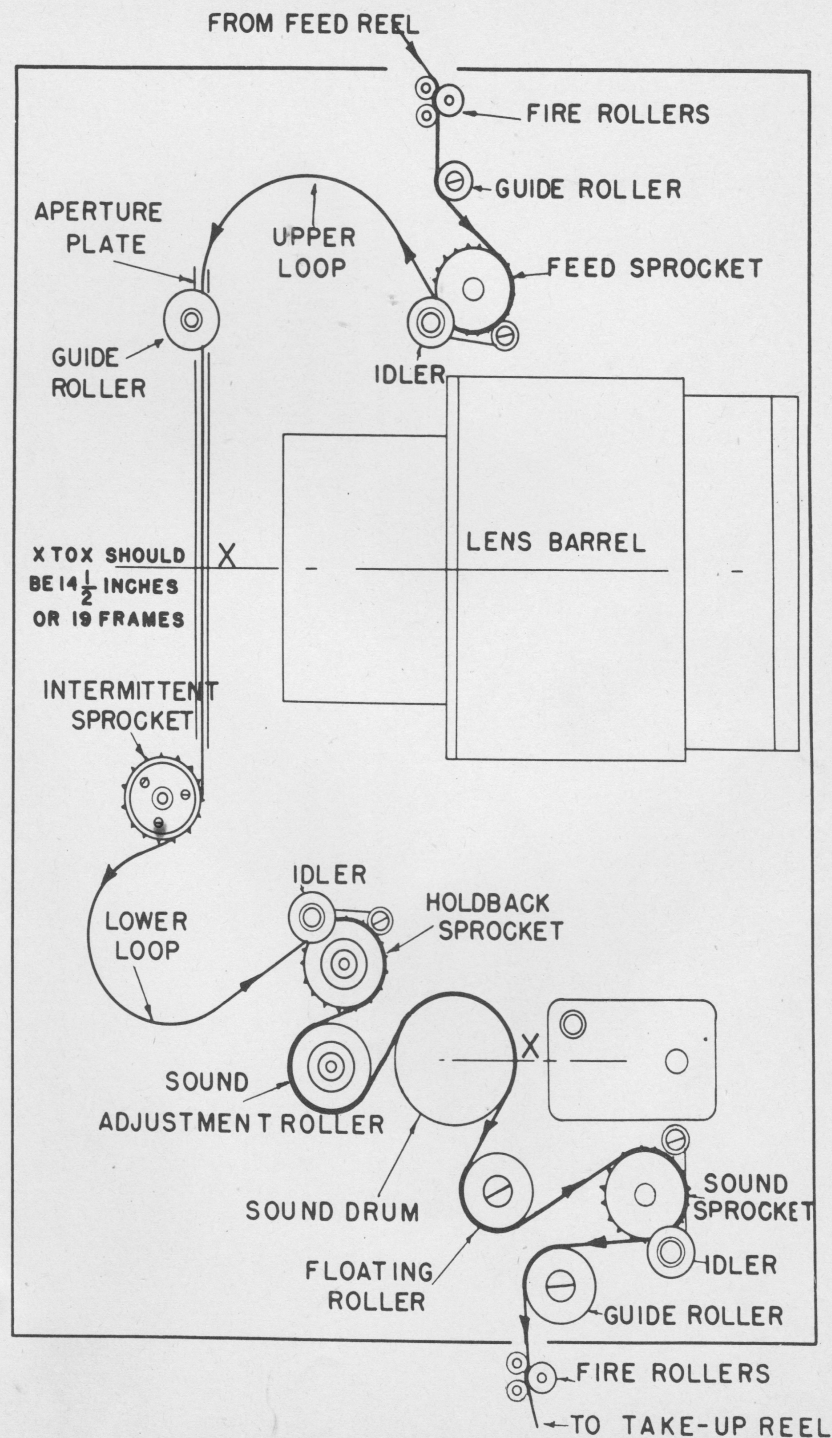
Continued on Page 11

FIGURE 3  
THREADING ILLUSTRATION





# THREADING DIAGRAM



## D. Checking Film Threading

Always check the film path after threading the projector by slowly turning the projector mechanism by hand. To do this, turn motor knob (Figure 3) in a clockwise direction, as indicated by arrow on knob. If knob turns freely and film travels through mechanism without undue strain, and "Loops" are retained, projector is threaded properly.

## E. Framing the Film at Aperture

After checking the film threading the next step is to see that the "film is in frame." This means having one complete picture at the aperture opening before projecting the picture on the screen. Check this by holding film with finger against aperture opening just above the guide rollers, observing whether one complete picture frame is covered at this point. If not, turn Framing Knob until this is accomplished.

Then, turn the Pilot Light Switch to the OFF position and close the mechanism door. When the door is closed, the Fire Guards "B" and "S" are automatically returned to their safety position.

## F. Operating the Amplifier

### 1. Power Data

The model "ND" Amplifier is designed to operate ONLY on 105-125 volt, 50-60 cycle A.C. The line tap is connected for 115 volts.

If D.C. is the only power available, it is necessary to use a converter to change the 110 volts D.C. to 110 volts A.C. in order to operate the amplifier.

The amplifier draws 185 watts, therefore, at least a 200 watt converter will be required. Due to the extreme sensitivity of the "ND" amplifier, we recommend that the converter used be equipped with a suitable filter unit.

When using a converter, the D.C. side of the converter is connected to the power source and the amplifier power cord to the A.C. side of the converter.

### 2. Amplifier Controls

#### (a) OFF-ON Switch

This is the main amplifier switch. When in the ON position, tubes will light provided amplifier is being supplied proper power.

#### (b) Master Control

This control regulates the volume of the sound. Turning control to the right or in a clockwise direction increases the volume, while turning control to the left or in a counter-clockwise direction decreases the volume.



### (c) Bass Control

This control regulates the low frequency response. To increase low frequency response, turn control to the right; to decrease, to the left.

### (d) Treble Control

This control regulates the high frequency response. To increase the high frequencies, turn control to the right; to decrease, turn control to the left.

### 3. Fuse

The fuse is of 3 ampere capacity and if replaced, new fuse should not exceed this ampere rating. The fuse protects the amplifier against any sudden surge of current or abnormality which might occur and cause damage to the amplifier.

### 4. Amplifier Operation Aids

Always turn the main amplifier switch to the "ON" position several minutes before starting the show, to allow time for the tube filaments to warm up and reach the proper operating temperature.

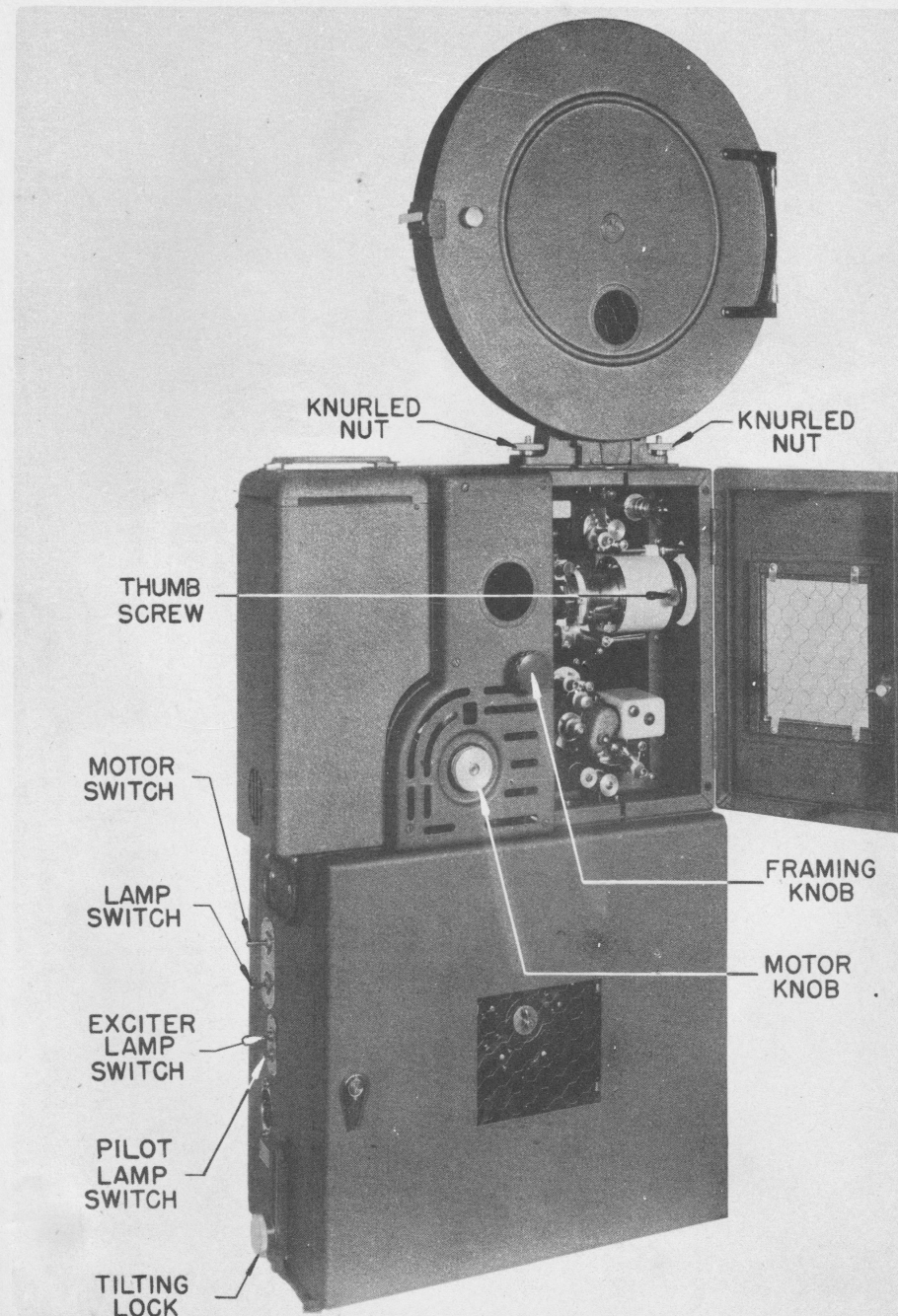
If it becomes necessary to stop projecting in the middle of a reel, always shut off the volume before turning off the motor and always start the motor before turning on the sound again.

Never install the amplifier near or over a radiator, other heating unit or where the ventilation is poor.

### G. Projection Routine Step By Step

1. Hook-up Projector, Amplifier and Speaker, as specified in Section "F" on Page 5.
2. Turn Main Amplifier Switch to "ON" Position.
3. Focus light on screen, as outlined in Section "B" on Page 5.
4. Turn Pilot Light Switch "ON".
5. Thread film into projector (See Page 8).
6. Check Threading (See Page 11).
7. Frame film at aperture opening (See Page 11).
8. Turn Pilot Light Switch "OFF".
9. Turn Exciter Switch "ON".
10. Turn Motor Switch "ON".
11. Turn Lamp Switch "ON".

## FIGURE 4





#### IV. PROJECTOR MAINTENANCE

##### A. Cleaning

One of the most important contributing factors to superb projection is thorough cleanliness of the equipment. Make it a point to keep both the projector and amplifier scrupulously clean at all times.

##### 1. Projection Lens

Oil on a lens surface seriously impairs the definition (focus) of the screen image. It is important to keep the lens scrupulously clean. The best cleaning preparation consists of a mixture of half clean water and half GRAIN alcohol used with a soft cloth. Clean the lens when it is cold.

##### 2. Condenser Lenses and Reflector

In cleaning condenser lenses or reflector, be careful not to remove, loosen or in any way disrupt the original set-up of these units. To clean use clean damp cloth, then polish with clean dry cloth.

##### 3. Sound (Slit) Lens

Wrap clean dry cloth around match stick and clean slit lens.

##### 4. Sound Drum

Remove accumulated emulsion, dirt, etc. Clean by holding dry cloth around entire surface of drum and turn flywheel by hand.

##### 5. Aperture Plate

Remove film gate. Put clean cloth on match stick and pour small amount of carbontetrachloride or grain alcohol onto cloth. Rub cloth over plate until all accumulated foreign substances are removed.

##### 6. Film Guide Rollers

Remove film gate. To clean, turn film guide rollers by hand while holding cloth saturated with carbontetrachloride or grain alcohol over rollers.

##### 7. Film Guide Rails

Use clean cloth dampened with small amount of fine machine oil and lightly rub each rail in vertical direction until rails are cleaned.

##### 8. Film Shoes

With film gate removed, rub cloth saturated with carbontetrachloride against each individual shoe.

##### 9. Film Sprockets

Open all film idlers. Then, with old, dry toothbrush, gently clean each sprocket. Turn motor knob by hand to rotate sprocket for thorough cleaning.

##### 10. Film Idler Rollers

To clean, use clean, dry toothbrush. Be sure that all emulsion is removed from undercut part of rollers.

##### 11. Fire Trap Rollers

Clean by placing cloth saturated with carbontetrachloride between rollers, and turn large roller until rollers are free of foreign substances.

##### 12. Projector Case (Bottom)

After each oiling of the projector it is a wise procedure to take a dry cloth and clean case of any overflowed oil.

##### B. Lubrication of Parts

See Lubrication Chart on Pages 38, 39, 40.

##### C. Adjustments and Removal of Parts for Replacement

##### 1. Condenser-Reflector Assembly (Part No. 1001)

Refer to Parts Analysis and Drawings on Pages 2A and 3A.

NOTE: This assembly, in conjunction with the projection lamp and projection lens constitutes the optical train by which light is sent forward to the screen. It is meticulously set at the factory and should never be tampered with. However, if either condenser lens or reflector are replaced and the light on the screen is below maximum brilliance, the optical system requires realignment.

##### (a) Adjusting Optical System

Remove lamphouse cover by grasping same with palms of both hands and forcing upward. Remove lamphouse baffle (Part No. 2200, as shown on Master Drawing in rear of book) by forcing upward.

##### (1) Lateral Adjustment of Condenser Assembly

To do this, loosen the two screws (685) and move entire assembly (1001-A) in or out. While doing this, observe if even coverage of screen illumination is obtained. If not, adjust condenser assembly and lock in the position that allows maximum screen brilliance, even though the light on the screen is of unequal proportions. Proceed further by adjusting the projection lamp and lamp socket.



## (2) Adjusting Projection Lamp and Socket

(a) Vertical adjustment of the lamp (479-R) is accomplished by loosening the two knurled screws (8544) and moving the lamp socket (202-A) up or down until the lamp filaments are optically centered.

(b) Lateral alignment of the lamp socket (202-A) is achieved by loosening the four screws (881) which holds socket and lamp to the lamp yoke support (2202). Then, move entire assembly in or out until screen illumination is increased and equal distribution of light is obtained. Continue realignment by adjusting the reflector.

## (3) Reflector (Part No. 583)

To adjust reflector, loosen the two screws (881) and move entire assembly in or out until maximum screen illumination with equal distribution of light is obtained.

NOTE: When performing any of the above adjustments, bear in mind that maximum screen illumination must at times be sacrificed to obtain equal distribution of light on the screen. Be sure to securely tighten all adjustment screws before replacing baffle and lamphouse.

## (b) Removal of Parts for Replacement

### (1) Projection Lamp (Part No. 479-R)

Remove lamphouse (2211) by grasping same with palms of both hands and forcing upward. The lamp is then removed by grasping top of lamp with one hand, pressing downward towards socket and turning lamp to the left or counter-clockwise until it releases. To install new lamp insert the lamp in the socket, setting the ears on the lamp base into their respective slots in the socket and press the lamp well downward, turning it as far as it will go to the right or in a clockwise direction. When the lamp bulb is released, the filament will then assume its correct position on the optical axis of the projector. These lamps are of the prefocused type and, therefore, no adjustment of the optical set-up is required.

### (2) Condenser Assembly (Part No. 1001-A)

Remove lamphouse, then remove projection lamp. Loosen the two screws (685) which allows assembly to slide out. Then to remove the prismatic condenser lens (581-A), take out the wire ring retainer (1170) and pull the lens from the condenser housing (1171-B); then slide condenser spacer (1169) from the condenser housing. Then, the plain condenser lens (587) will slide out of the condenser housing.

Replace lenses and reverse above procedure to reassemble. NOTE: Adjust optical alignment as specified under Section "a" above.

## (3) Parabolic Reflector (Part No. 583)

With projection lamp removed, take out the two screws (881) which holds the reflector ring (2296) to the assembly. Remove ring. Then reflector is withdrawn from the reflector ring by removing screws (809) and nuts (981). This frees the reflector clips (2299), and reflector can then be removed. Replace new reflector and reverse above procedure. NOTE: Adjust optical alignment as specified under Section "a" above.

## 2. Ventilating Motor Assembly (Part No. 1005)

Refer to Parts Analysis and Drawing on Page 4A.

(a) Adjustments (None required).

(b) Replacing Motor Brushes (Part No. 7262)

Remove lamphouse cover, loosen the three screws (685) which holds motor assembly to case. Then unscrew the two black fibre brush holders at each end of the motor, remove old brushes; insert new brushes and reverse above procedure.

(c) Removing Ventilating Motor

Remove the two wires from projector terminal strip. See Projector Wiring Diagram. Remove the three screws (685) found in lower magazine. This releases motor (7237-A), bracket (7021) and ventilating fan (2210) from mechanism. To remove ventilating fan (2210) from motor shaft, loosen set screws on fan and pull fan off shaft. Remove bracket (7021) from motor by unscrewing the three (806) screws. Replace motor and reverse above procedure.

## 3. Take-Up Assembly (Part No. 1450)

Refer to Parts Analysis and Drawing on Pages 9A-10A.

(a) Adjustments (None required).

(b) Parts Replacements

### (1) Friction Tips and Springs

The only parts that will wear and require replacement are the rawhide friction tips (2151) and the friction springs (86). To replace these, remove friction plunger wheel (1466) by removing knurled screw (1114) and loosening the two set screws (841); then pull plunger wheel off the shaft (1463). Then the friction tips and spring are pulled out of the plunger wheel. Replace new springs, friction tips - and reverse above procedure.



#### 4. Feed Magazine Assembly (Part No. 1470-A)

Refer to Parts Analysis and Drawing on Pages 11A-12A-13A

##### (a) Adjustments

If the tension of the feed shaft assembly (2393) is too great, the film will tear as it is fed to the feed sprocket; if tension is too weak, the film will over-run the feed reel. To adjust tension, loosen the lock nuts (1336 and 1346) and increase or decrease the tension on the spring (1105) as needed, then tighten the lock nuts.

Periodically tighten the screws (684) which hold the feed shaft to the feed magazine. Also tighten knurled nuts (2107) which should rigidly hold feed magazine to case, and screws (860) which holds Fire Valve Assembly to magazine.

##### (b) Parts Replacements

The only part that ever need be replaced is the tension spring (1105). To remove spring, take off the two lock nuts (1336 and 1346), washer (9156) and flange (1343), and pull spring off shaft (1337). Put on new spring and reverse above procedure. See paragraph "a" above.

#### 5. Drive Motor Assembly (Part No. 1530-A)

Refer to Figure 5 on Page 19.

##### (a) Adjustments

The General Electric Motor (Model No. 5KH33BB61A) supplied with the DeVry Projector will give years and years of satisfactory service, without requiring adjustment of any kind. Oil as specified in the Lubrication Chart and no trouble will be encountered.

##### (1) Motor Chain Idler Roller Assembly (2370-A)

Slack in the motor drive chain (2114) can be adjusted by loosening the two screws (798) and moving the entire assembly to your left, while holding idler roller bracket (2314) until proper tension is achieved. Then tighten the screws (798).

Caution: Be sure to leave a little slack in chain, as if it is too taut it will cause undue wear on the rollers, chain and shaft bearings.

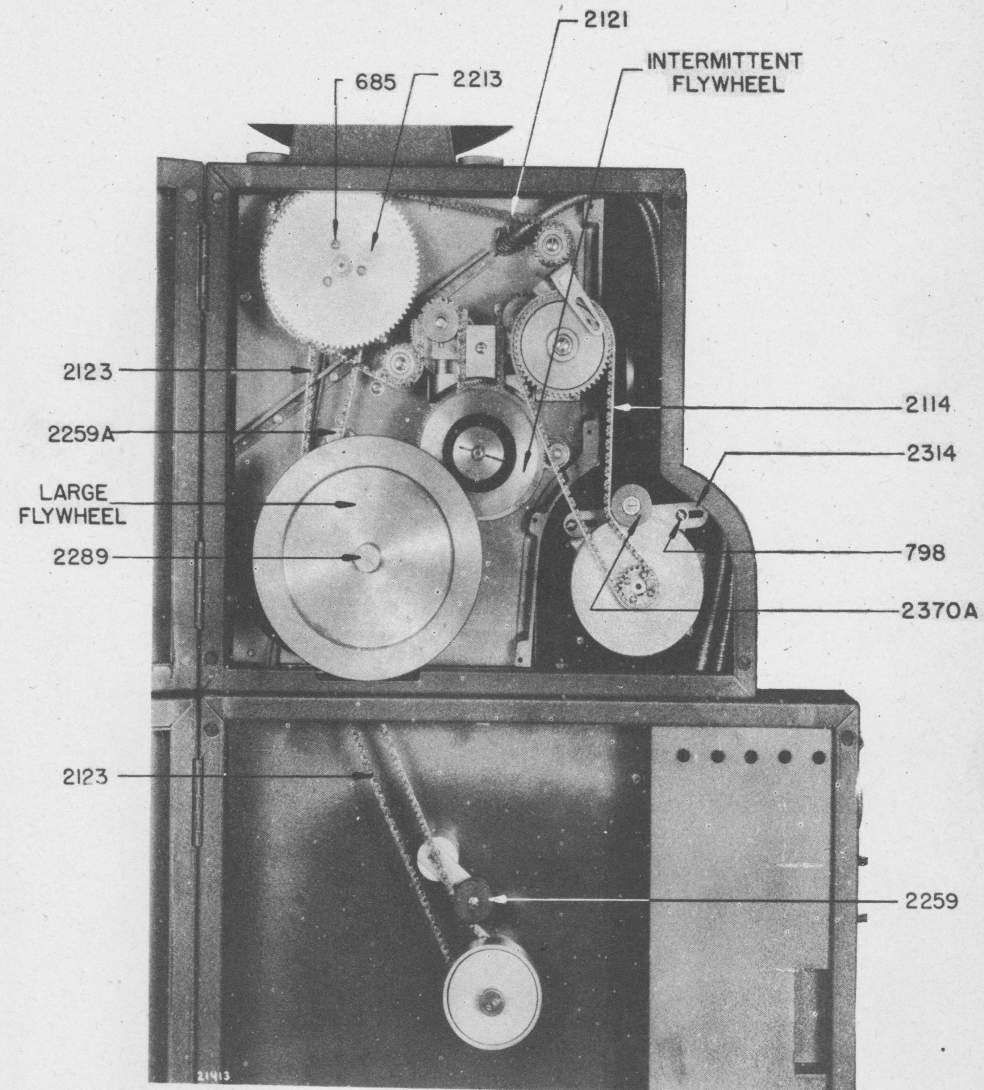
##### (b) Removal of Motor for Replacement

See Pages 15A and 16A

Disconnect the wires that run from projector terminal strip to the motor. See Projector Wiring Diagram. Then remove the motor drive chain (2114) by loosening the chain idler roller assembly (2370-A).

Continued on Page 20.

## FIGURE 5





To do this, loosen the two screws (798) and remove the chain from the motor sprocket (1304-A). Remove the stationary door on upper case. Then remove the four nuts (994) and the four bolts (999) from the motor base and lift motor out of case.

(c) Removal of Idler Roller for Replacement

Refer to Drawing on Page 16A

To remove the idler roller (2370), take out the 5220 screw and pull roller off shaft 2285. Put on new roller and reverse above procedure to reassemble.

6. Feed Sprocket Assembly (Part No. 2216)

Refer to Parts Analysis and Drawing on Pages 16A and 19A.

(a) Adjustments

(1) Feed Sprocket (Part No. 2217)

The feed sprocket (2217) might become loose and go out of line. To adjust, center the sprocket according to the stripper plate 1236 and tighten set screw on the sprocket. Caution: Be careful when tightening the set screw as it must line up with the "flat" on the feed sprocket shaft (2212). Periodically tighten the three screws (877) on rear plate.

(b) Parts Replacement

(1) Feed Sprocket (Part No. 2217)

To remove the feed sprocket (2217) bend the stripper plate (1236) away from the sprocket. Loosen set screw in center of sprocket and pull sprocket off shaft (2212). When replacing new sprocket, be sure the set screw is in line with the "flat" on the shaft. Replace sprocket and reverse above procedure.

(2) Feed Sprocket Idler (Part No. 2390)

Refer to Drawing on Page 20A.

Loosen the screw (5222-A) which holds idler in place in the center of the idler arm stud (5183-A) and remove the idler. When inserting new idler, set in same position as idler withdrawn and tighten with the same screw (5222-A).

7. Sound Sprocket Assembly (Part No. 2220)

Refer to Parts Analysis and Drawings on Pages 21A and 22A

(a) Adjustments

(1) Sound Sprocket (Part No. 2217)

In the event that the sound sprocket (2217) becomes loose and goes out of line, adjust by centering the sprocket according to the stripper plate (1236) and tighten the set screw on the sprocket. Caution: Be careful when tightening the set screw as it must line up with the "flat" on the shaft. Periodically tighten the three screws (877) on the rear plate.

(b) Parts Replacement

(1) Sound Sprocket (Part No. 2217)

To remove the sound sprocket (2217), bend the stripper plate (1236) away from the sprocket. Loosen the set screw located in center of sprocket and pull sprocket off shaft (2219). When replacing new sprocket, be sure set screw is in line with the "flat" on the shaft.

8. Film Gate Assembly (Part No. 2230)

Refer to Parts Analysis and Drawings on Pages 23A, 24A, 25A

(a) Adjustments

(1) Aperture Film Shoe (Part No. 1038)

The tension springs on the aperture film shoe (1038) are meticulously adjusted before leaving the factory to accommodate new, old or oily prints. This precise adjustment minimizes the wear on the sprocket guide rails and on the film itself and assures a rock steady picture. The tension on the springs (1039) can be quickly adjusted to meet any film situation by merely releasing the lock tension screw (1047) and turning knurled nut (1045) upward to increase tension, downward to reduce tension.

(b) Parts Replacement

(1) Upper Film Shoe (Part No. 1429)

Remove the two screws (5220) and slide the washers (968) and springs (1431) and the washers (965) off the stud (1593). Then unscrew the studs from the film shoe mounting plate (2232) and remove the shoe (1429) from the plate. Replace shoe and reverse above procedure.

(2) Aperture Film Shoe (Part No. 1038)

Withdraw the film gate bracket (1448-A) from the mounting plate (2232) by removing the four screws (853), the lock tension screw (1047) and the yoke retaining screw (1041). Then withdraw the two tension springs (1039) and take out the two screws (740) and pull aperture film shoe from plate. Replace new shoe and reverse above procedure.

(3) Lower Film Shoe (Part No. 2233)

Take out the screw (5222) and remove the washer (968), the spring



(1431) and the washer (965). Then, unscrew the film shoe stud (1593) and remove shoe. Replace new shoe and reverse above procedure.

#### (4) Intermittent Sprocket Shoe (Part No. 2228)

Take out the screw (5220) and remove the washer (2225) and the spring (2226), then slide shoe off of the sprocket shoe stud (2227). Replace shoe and reverse above procedure.

#### 9. Take-up Chain Idler Assembly (Part No. 2259)

Refer to Pages 12, 26A and 27A

##### (a) Adjustments

Only adjustment necessary is if slack occurs in take-up chain (2123). See Figure 5. To adjust, loosen lock screw (838) and set until enough slack has been removed, then tighten the screw. Note: Be sure to leave a little slack in chain, as if it is too tight it will cause undue wear on the rollers, chain and shaft bearings.

##### (b) Parts Replacement

##### (1) Chain Idler Roller (Part No. 1458)

Remove the screw (5220) and pull idler roller (1458) from the stud (2256). Replace new roller and reverse above procedure.

#### 10. Sound Sprocket Chain Idler Assembly (Part No. 2259-A)

Refer to Pages 12, 26A and 27A.

##### (a) Adjustments

Only adjustment necessary is if slack occurs in sprocket chain (2122). See Figure 5. To adjust, loosen lock screw (838) and set until enough slack has been removed, then tighten the screw. Note: Be sure to leave a little slack in chain, as if it is too tight it will cause undue wear on the rollers, chain and shaft bearings.

##### (b) Parts Replacement

##### (1) Chain Idler Roller (Part No. 1458)

Remove the screw (5220) and pull idler roller (1458) from the stud (2256). Replace new roller and reverse above procedure.

#### PLEASE NOTE

WHEN ORDERING REPLACEMENT PARTS for the projector, ALWAYS give the SERIAL NUMBER of the projector, the PART NUMBER and DESCRIPTION of PART wanted. Do the same for the AMPLIFIER and SPEAKER.

#### 11. Intermittent Movement Assembly (Part No. 2263)

Refer to Illustration on Page 12 and Pages 28A-35A

The most important part of this assembly is the intermittent unit, Part Number 2280. With any degree of care and proper lubrication (See Lubrication Chart), this unit will give long trouble-free service without requiring adjustment or replacement. However, if trouble does occur, we recommend that a complete new unit be installed as few persons have the necessary experience to make adjustments and parts replacements with the accuracy required for perfect operation. Nevertheless, we give below, the instructions for repairing and replacing individual parts of the intermittent unit.

##### (1) Removing the Intermittent Unit

Remove red framing knob and stationary front door of upper case. Remove the large flywheel by taking out the screw (2289). Then loosen the drive chain (2121) by removing the three screws (685) which holds the large chain sprocket (2213). Pull the sprocket off its shaft, which in turn frees the drive chain. Then, loosen the two screws, S-728-BB (See Page 33A) which holds clamps C-294-BB (See Page 35A). Turn clamps toward the center of the movement and tighten the S-728-BB screws.

Now, complete Intermittent Unit can be removed from the mechanism by grasping the intermittent flywheel (See Page 12) and pushing the unit out of its mount. Hold back end of unit for steadiness to prevent damage. Insert new intermittent unit and reverse above procedure. Note: To facilitate replacement of the unit, use screw driver or blunt object and press back the friction plunger (2143). Note: Before removing the intermittent unit, turn framer knob 2356 (See Page 30A) to a maximum position in either direction. Note position of framing gear 2279 (See Page 30A) so that new unit can be inserted in the same position, thereby retaining proper synchronization with the shutter. Note: If synchronization is disturbed, it is necessary to retime the shutter. Refer to Shutter Retiming Instructions.

##### (2) Repairing or Replacing Individual Parts of the Intermittent Unit

##### (a) Fitting the Flywheel Shaft (Part No. S-726-BB)

The flywheel shaft should be inserted into the B-246-BB removable bearing with a sliding fit but without lateral movement. A split lap for lapping the bore of the bearing will be found in the spare parts box along with Arkansas powder. A small amount of oil and Arkansas lapping powder should be applied to the lap. A lathe is necessary for this operation. Great care must be used so that the bore is not overlapped. Same should be checked with the shaft several times during this process. A brush (found in spare parts box) used with Oleum Spirits or gasoline or any other good cleaning



agent can be used to clean out the Arkansas powder after each lapping. If the slightest particle of this emery compound is left in the bore, the shaft will bind in operation.

(b) Fitting the Cam Shaft (Part No. C-301-BB)

The above procedure should be followed in fitting the cam shaft. Should the bearings be worn over size, they should be replaced.

(c) Fitting the Flywheel Shaft and Cam Gears

When new, the cam gears (G-186-BB) will fit tightly and must be lapped to fit. The same mixture of Arkansas powder and oil should be used. The flywheel shaft should be held in a lathe collet. With the cam in position, a small quantity of the abrasive should be applied evenly to the gears. The gears should then be run in mesh at slow speed. It is very important that the abrasive does not find its way into the bearings during this operation. After the gears have run in mesh for about a half-a-minute, they should be checked. It is very important that these gears are not lapped too much as this will result in back-lash.

After the gears have been lapped so that they run smoothly and without any high points or backlash, the case part of the Intermittent is ready for assembly. After all parts and bearings have been thoroughly cleaned with brushes, replace the flywheel shaft and cam shaft in their respective holes. In order that they be placed back in the same mesh, the face of the flywheel shaft gear should be marked at the time they are lapped. The lock nuts for both shafts should be adjusted so that the shafts run freely but do not have any end play. The assembled case should now be allowed to run in while the arm is being assembled.

(d) Assembling the Double Bearing

If either of the bearings in the arm (inner B-248-BB or outer B-249-BB) are worn they should be replaced. Next, the star shaft S-730-BB must be fitted to these bearings in much the same manner that the flywheel shaft and cam shaft were fitted. When this has been accomplished, check the sprocket S-750-BB, making sure it is a good push fit on the star shaft. If it fits too tightly, it should be opened slightly with the lap. The sprocket should absolutely not be forced onto the shaft. As these are very accurate parts, great care must be exercised that they are not sprung out-of-true.

After assembling the star in the bearings with the sprocket in place, place the aluminum collar C-295-BB on the end of the star shaft. After tightening this collar in place, the star shaft should turn freely and without end shake. Now the taper pin holes in the sprocket and star shaft must be reamed in line so as to allow the taper pins (P-350-BB) to seat properly and hold the sprocket firmly in place. A taper pin broach for this work will be found in the Spare Parts Box. The film stripper S-731-BB is put on last.

The arm is now ready to be assembled to the case. Place the cover and arm (A-192-BB) over the opening of the case and make certain the star head is turned so that it will not come in immediate contact with the cam. There is a hole provided in the cover arm which should be fitted over the dowel pin on the case. With this eccentric, adjustment can be made between the star radii and the cam. Before tightening the case cover screws, make sure the adjustment between the star and cam is such as to allow free action without shake.

The unit is now ready for the running-in period. Place the assembled movement in the projector and allow to run for a period of three hours with the oil up to the oil line. If the unit is not assembled right or the parts misfit, it will be apparent during the break-in period.

(e) Intermittent Sprocket (Part No. S-750-BB)

The intermittent sprocket is replaced by following the instructions given in the preceding paragraphs. This, of course, necessitates removing the intermittent unit.

12. Sound Filter Assembly (Part No. 2290)

Refer to Parts Analysis and Drawing on Page 36A.

(a) Adjustments (None required).

(b) Parts Replacement

(1) Sound Drum Assembly (Part No. 2361)

To remove, take out the screw (2289) and remove flywheel (2287) from assembly. Push sound drum assembly out. Insert new drum and reverse above procedure.

(2) Ball Bearings (Part No. 2293)

Remove sound drum and flywheel as specified above. Then, remove flywheel bearing mount (2291) from mechanism by taking out the two screws (759) and the one screw (701). With the aid of a steel rod tap bearings out of mount. When replacing new bearings tap gently into place, then reverse above procedure.

13. Chain Idler Assembly (Part No. 2305)

Refer to Parts Analysis and Drawing on Pages 12 and 37A

(a) Adjustments

Only adjustment required would be to ease tension or take up slack in drive chain drive (2121), loosen lock screw (831) and adjust chain idler (2305) until correct tension on the chain is attained - then



tighten screws (831). Caution: Be sure to leave a little slack in chain, as if it is too tight it will cause undue wear on the rollers, chain and shaft bearings.

#### (b) Parts Replacement

If bearing or sprocket shows signs of wear, replace. To remove, take out the screw (5220) and remove sprocket and bearing from stud (2302). Replace new parts and reverse above procedure.

#### 14. Photo-Cell Mount Assembly (Part No. 2313)

Refer to Parts Analysis and Drawing on Page 38A

##### (a) Adjustments

The photo-cell is a very delicate unit and its only adjustment, focusing, should NEVER be changed.

##### (b) Parts Replacement

###### (1) Photo-Electric Cell (Part No. 4453)

Unscrew cover mount stud (2141) and cover lock knob (2140) from photo-cell bracket (2308); remove cover (2307). Pull photo-cell from socket (2311). When inserting new photo-cell, be sure that the three contacts of the cell line up with the three holes in the socket - then reverse above procedure.

#### 15. Shutter Assembly (Part No. 2330)

Refer to Parts Analysis and Drawing on Pages 39A-40A-41A

##### (a) Adjustments

###### (1) Retiming Shutter

This is a delicate operation and the directions as outlined below should be followed explicitly.

(a) Remove red framing knob and the stationary door.

(b) Thread film into projector and frame film as directed on pages 8 and 11.

(c) Remove the two screws (922) and the bearing cap (2323), thereby exposing the shutter gear lock screw (2368) which has a LEFT hand thread.

(d) Just loosen the shutter gear lock screw (2368) by turning it to the RIGHT, using a large screw driver so as to avoid damage to the screw. NOTE: While loosening the gear lock screw, hold the shutter chain sprocket (2327) which is located on opposite side of assembly.

(e) Turn mechanism by hand by turning motor knob to the right until exactly one-half frame of film is pulled down at the aperture framing opening. Then rotate shutter on its shaft in its normal direction until solid part of blade completely covers the light from the condenser. The rib on the shutter blade should line up horizontally with the center of the aperture.

(f) Tighten shutter gear lock screw (turn to LEFT) and replace bearing cap, screws and then the stationary door and framer knob. NOTE: While shutter gears are exposed, observe if lubrication is required. If needed, apply #0 cup grease while bearing cover is off.

##### (b) Parts Replacement

The shutter assembly is a precision apparatus and is assembled with unerring accuracy, at the factory, by men of long experience with the aid of special tools. As such, replacements of parts in the field is not recommended. It is rather unlikely that any parts will require replacement, but if they do, we prefer to have the entire assembly sent to the factory for repair; the customer to pay only for those parts replaced, plus labor charges.

###### (1) Removing Shutter Assembly

(a) Remove fire shutter lever (2319) by unscrewing the lifting stud (3121).

(b) Remove motor drive chain (2114) by loosening the two screws (798) and moving the chain idler (2370-A) to the right and remove chain from the shutter drive sprocket (2327).

(c) Remove drive chain (2122) by unscrewing the three screws (803) and remove feed chain sprocket (2213). Lift chain from shutter assembly.

(d) Remove the bracket on the mechanism plate which covers the bearing (2304) by taking out the screws which hold the bracket to the plate. Now, complete assembly is free and can be withdrawn by removing the four screws (685).

#### 16. Exciter Lamp Assembly (Part No. 2340)

Refer to Parts Analysis and Drawing on Pages 42A-43A

##### (a) Adjustments (None required).

##### (b) Parts Replacements

###### (1) Exciter Lamp (Part No. 399)

To remove the exciter lamp, take off the exciter lamp cover (2335) by unscrewing the screw (10104). Grasp lamp and turn in counter-



clockwise direction until free. When inserting new lamp, be sure the three large holes in lamp base correspond with the pins of the exciter lamp socket. Turn lamp in clockwise direction until it locks. Replace cover.

#### 17. Floating Film Idler Assembly (Part No. 2350)

Refer to Parts Analysis and Drawing on Page 44A

(a) Adjustments (None required).

(b) Parts Replacements

(1) Stationary Idler Roller (Part No. 2349)

Remove the screw (5222-A) and pull stationary idler roller from the stud (2346). Replace roller and reverse above procedure.

(2) Floating Film Idler Roller (Part No. 2351)

Unscrew the idler shaft (2345) from the idler bracket (2343) and pull roller off shaft. Replace roller and reverse above procedure.

#### 18. Lens Mount Assembly (Part No. 2379)

Refer to Parts Analysis and Drawing on Pages 46A-47A.

(a) Adjustments

Only adjustment is the focusing of the lens. This information is fully covered under Section 15 on Page 2.

#### 19. Holdback Sprocket Assembly (Part No. 2380)

Refer to Parts Analysis and Drawing on Pages 48A-49A.

(a) Adjustments

If the tension on the holdback sprocket (517-A) is too great, it may lock and tear the film. To reduce tension on the holdback sprocket, loosen the two adjustment lock nuts (1245 and 1246) until the tension on the spring (111) is reduced, then tighten the two lock nuts.

(b) Parts Replacements

(1) Holdback Sprocket (Part No. 517-A)

Remove the two adjustment nuts (1245 and 1246). Pull sprocket cap (1332) and tension spring (111) off shaft (1325). Then unscrew the extension screw (2375) and remove the micarta washer (1328) and then the sprocket. When inserting new sprocket, place it on the shaft without removing the thrust bearing (1307) which is located at rear of shaft; then reverse above procedure.

#### (2) Sprocket Idler (Part No. 2390) See Pgs 18A-20A

Remove the screw (5222-A) and pull entire sprocket idler assembly off the fixed idler arm stud (5183-A). Replace assembly and reverse above operation.

#### 20. Sound Adjustment Roller Assembly (Part No. 2394)

Refer to Parts Analysis and Drawing on Page 50A.

(a) Adjustments

The only adjustment required is when the sound track does not line up laterally with the slit lens as the film passes over the drum. If this occurs, loosen the two lock nuts (1245 and 1246) and move the roller in or out as the case may be, until properly lined up. Then tighten lock nuts.

(b) Parts Replacements

To replace the roller (1243) and spring (86), unscrew the two lock nuts (1245 and 1246) and remove the roller and spring. Replace new parts and reverse above procedure.

#### 21. Aperture Plate Assembly (Part No. 2404)

Refer to Parts Analysis and Drawing on Pages 52A-53A

(a) Adjustments

(1) Aperture Idler Spacers (Part No. 1580)

If the film does not line up optically with the aperture opening, the idler spacers (1580) should be adjusted. To adjust the spacers, loosen the idler locking nut (1556). Then screw idler bushing (1555) in or out until proper adjustment is reached. Tighten nut.

(b) Parts Replacements

(1) Film Rails (Part No. 1143)

Remove red framing knob and stationary door. Then remove film gate assembly (2230) as previously directed. Proceed by removing the two screws (843 and 684), pull entire assembly (2404) from mechanism. Then, remove the two film rails (1143) by taking out the four screws (919) and the two screws (852). Replace rails and reverse above procedure.

(2) Aperture Idler Spacers (Part No. 1580)

To replace the aperture idler spacers (1580), unscrew the idler locking nut (1556) and the idler bushing (1555). Then, unscrew and pull the spacer shaft (1598) from the aperture plate casting (2236). Aperture idler spacers (1580) will be freed as the spacer shaft is pulled through casting. Replace parts and reverse above procedure.



## V. AMPLIFIER MAINTENANCE

Refer to Amplifier Wiring Diagram on Page 35.

### 1. Inspection of Tubes

A periodic check-up of the tubes in the amplifier system with a normal tube tester should be made at intervals of every 30 to 60 days, depending upon the usage given the amplifier. Deteriorated or noisy tubes should be replaced.

Not all tube testers will indicate a "gassy" tube condition which if present, might cause excessive current drain and result in sound distortion. Therefore, cathode or bias voltage readings should be made periodically on all tubes.

NOTE: For proper voltage readings for all tubes, see voltage chart on page 33.

### 2. Prolonging Life of Tubes

Tube life can be prolonged by always operating the amplifier at its rated line voltage. Over-volting or under-volting tube heaters causes overheating with a resultant deterioration in the life of the tubes. Note: Line tap set for 115 volts, A.C. 50-60 cycle.

### 3. Dirt in Amplifier

Excessive dust, dirt or carbon from the arc lamps should not be allowed to accumulate in the amplifier, as these foreign substances combined with moisture or grease, adhering to switch contacts, socket prongs, etc., can create poor tube socket contact, leakage in wiring or between terminals, which naturally would result in extremely disturbing noises in the loud speakers.

All switches, volume controls, socket prongs, etc. should therefore be kept scrupulously clean. Carbon tetrachloride is commonly used for this purpose.

To guard against overabundance of moisture harming the amplifier, especially when this unit is to be idle for weeks at a time, we recommend the amplifier be turned on at frequent intervals and the tubes left burning for at least half an hour.

### 4. Loss of Sound

If sound should be lost in the system, make these preliminary tests:

- (a) Check to see if Volume Control is ON.
- (b) Determine if power is being supplied to the system and if fuses are good.
- (c) Be sure Exciter Lamp is ON.

If after making all of these preliminary tests and no sound is as yet reproduced from the loud speakers, further probing within the amplifier itself is necessary.

### 5. Checking Amplifier for Trouble

(a) Move the 6N7 driver tube up and down in socket making and breaking contact. If a "plop" is heard in the speaker system, amplifier and speaker are okay from there out. If no sound is heard in speaker, check connections on speaker system, rectifier tubes, output tubes, plate voltage, etc.

(b) If sound is okay from driver stage, move back, stage by stage, until a point is found where no sound is heard when tube is moved in or out of the socket or by touching top grid of tube. This is an ideal, speedy method to use to find bad tubes.

(c) Do not attempt to locate more serious trouble until it has definitely been determined that all tubes are functioning properly and that none are shorted.

(d) If tubes are okay and no sound is as yet reproduced, then check for cathode or bias voltage on each stage. If no cathode voltage is obtained, probe for the following trouble.

- (1) Substitute new rectifier or other interstage tube where cathode voltage reads zero.
  - (2) Determine if plate voltage is open or shorted.
  - (3) Determine if By-pass condenser is shorted.
  - (4) See if screen supply is open or shorted.
  - (5) See if screen By-pass condenser is shorted.
  - (6) Determine condition of cathode resistor.
- (e) If no plate voltage is obtained at any point after rectifier tube is found to be okay, the trouble may be caused by:

- (1) Shorted condenser in amplifier.
  - (2) Short in wiring.
  - (3) Open or shorted power transformer winding.
- (f) No Photo-Electric Cell voltage may be caused by:
- (1) Short in Photo-Electric Cell wiring.
  - (2) Shorted condenser.
  - (3) Open resistor.
  - (4) Shorted cell or cell socket.



## 6. Poor Quality of Sound

This type of trouble may be caused by any or all of the following:

(1) Dirt, dust, grease or oil accumulation on slit lens.  
Remedy is to keep lens scrupulously clean at all times.

(2) Improper alignment of sound track over sound drum.

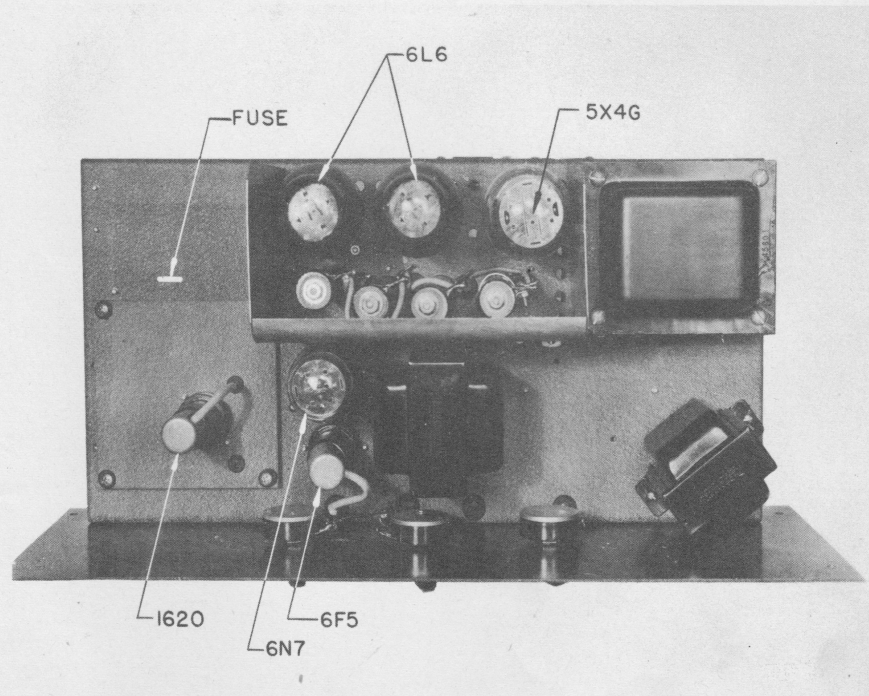
(3) Tension on holdback sprocket of projector too loose, causing slack in the film as it passes over sound drum.

(4) Exciter voltage too low or exciter lamp out of alignment.

(5) Defective photo-electric cell.

(6) Weak or partially shorted tube in sound system.

### Type of Tubes Used in the DeVry Model "ND" Amplifier



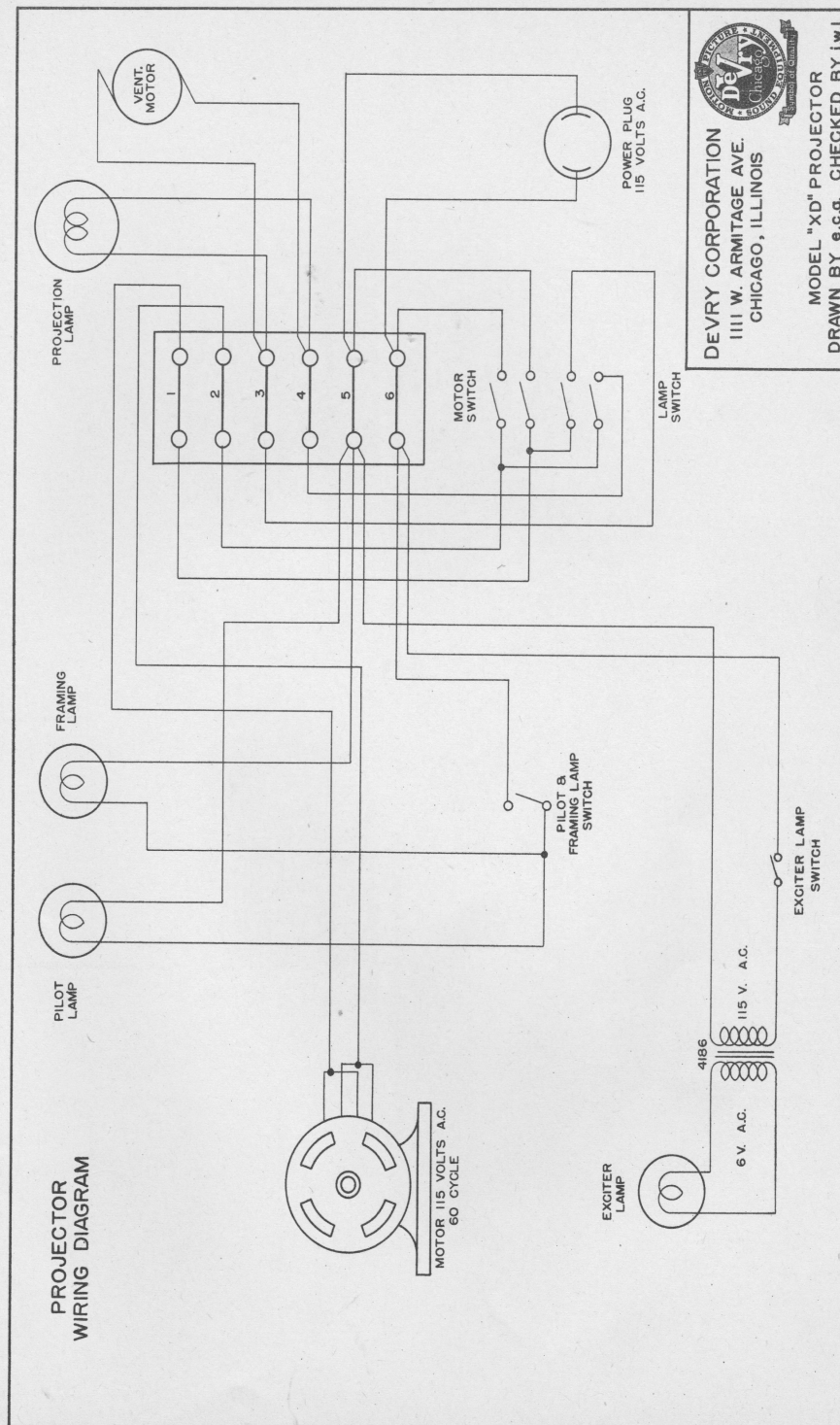
## MODEL "ND" AMPLIFIER VOLTAGE ANALYSIS

In determining the amplifier voltage readings below, the supply voltage was 120 volts A.C., 50-60 cycle - all voltages to ground and no signal.

Voltage readings were taken with a meter of 20,000 ohms per volt. Allowances will have to be made for readings taken with different resistance meters.

<u>Test</u>	<u>Readings</u>
B Plus Rectifier Filament	400 Volts
6L6 Plate	380 Volts
6L6 Screen	300 Volts
6L6 Bias	-24 Volts
6N7 Plate	160 Volts
6N7 Cathode	3 Volts
6F5 Plate	135 Volts
6F5 Cathode	1.25 Volts
6J7 Plate	80 Volts
6J7 Screen	20 Volts
6J7 Cathode	.5 Volts
Cell Voltage	55 Volts





## SERVICE TROUBLES AND REMEDIES

Trouble	Cause	Remedy
Picture "Flutter" (Traveling Ghost)	Shutter out of timing with movement of intermittent.	Retime shutter.
Fuzzy borderline on screen image.	Accumulation of film emulsion on aperture plate.	Clean aperture plate.
"Jumpy" Picture	<ol style="list-style-type: none"> <li>1. Improper tension on main aperture tension shoe.</li> <li>2. Wear in intermittent.</li> <li>3. Improper threading of film.</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust tension of shoe.</li> <li>2. Set eccentric adjustment on intermittent movement. If adjustment is exhausted, replace star and cam.</li> <li>3. Check threading.</li> </ol>
If film over-runs feed reel.	Improper tension on feed reel shaft.	Adjust tension of feed reel shaft.
"Color" on screen or uneven distribution of light.	<ol style="list-style-type: none"> <li>1. Accumulation of dirt, dust, etc. on Optical System, lens, condenser, reflector.</li> <li>2. Condenser-Reflector Assembly out of adjustment.</li> <li>3. Discoloration of Mazda lamp or sagging of lamp filaments.</li> </ol>	<ol style="list-style-type: none"> <li>1. Clean projection lens, condenser lenses, reflector.</li> <li>2. Adjust condenser-reflector set-up; projector lamp.</li> <li>3. Replace lamp.</li> </ol>
Noise and/or tightening of film at fire rollers.	Lack of lubrication and accumulation of foreign substances on fire and micarta rollers.	Place drop of oil on roller shafts. Remove excess oil.
Damage to film perforations.	<ol style="list-style-type: none"> <li>1. Improper tension on film shoe.</li> <li>2. Wear on sprocket teeth.</li> <li>3. Excessive tension on take-up spindle.</li> <li>4. Excessive tension on holdback sprocket.</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust tension on shoe.</li> <li>2. Reverse or replace sprockets.</li> <li>3. Ease tension of take-up plungers.</li> <li>4. Ease tension of sprocket.</li> </ol>

Continued on next page.



## SERVICE TROUBLES AND REMEDIES

Trouble	Cause	Remedy
Audible distortion in sound output.	1. Floating sound roller not functioning properly. 2. Accumulation of foreign substances on sound drum.	1. Correct tension of sound roller, lubricate bearing surface or replace roller. 2. Clean sound drum.
Decrease in sound volume.	1. Dirt, etc. on sound (slit) lens. 2. Sagging of exciter lamp filaments, discoloration of lamp. 3. Breakdown in electrical circuit.	1. Clean sound lens. 2. Insert new exciter lamp. 3. Check amplifier.
Overheating in lamp-house.	Ventilating fan not functioning properly.	Check ventilating motor, clean commutator, replace brushes or replace motor.
Exciter lamp fails to light.	1. Faulty transformer. 2. Faulty switch. 3. Faulty lamp socket.	1. Insert new transformer. 2. Fix or replace switch. 3. Repair lamp socket.
Inability to frame within a range of two picture frames.	Loss of synchronization between framing mechanism and intermittent movement.	Adjust framing device in relation to location of intermittent sprocket.
Scratches in film.	Accumulation of emulsion on entire film path.	Clean film path, rollers, rails, sound drum, etc.
Audible crackling noise in sound system.	Dirty commutator in ventilating motor.	Clean commutator.

We have outlined here Service Troubles and Remedies that will afford quick relief against most of the common causes of projector and sound system troubles. However, every case of trouble is a new and different experience to which well established remedies may or may not apply. The projectionist is urged to exercise patience and common sense.

## LUBRICATION CHART

Refer to Lubrication Illustration on Page 40.

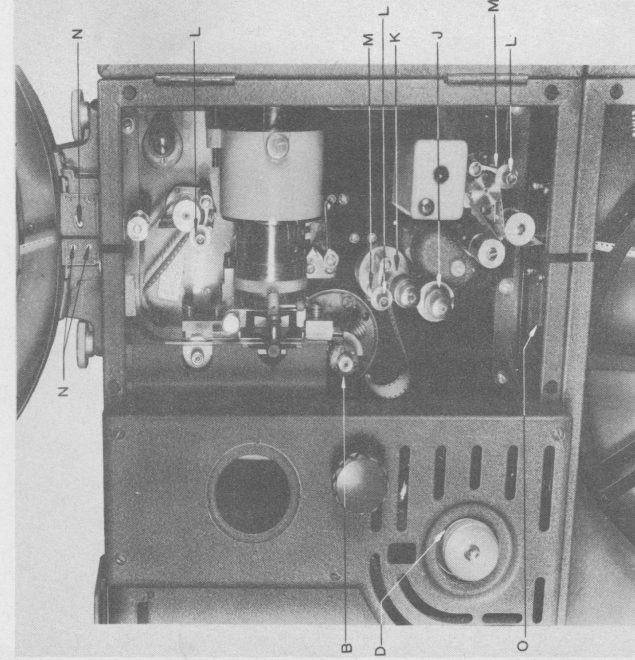
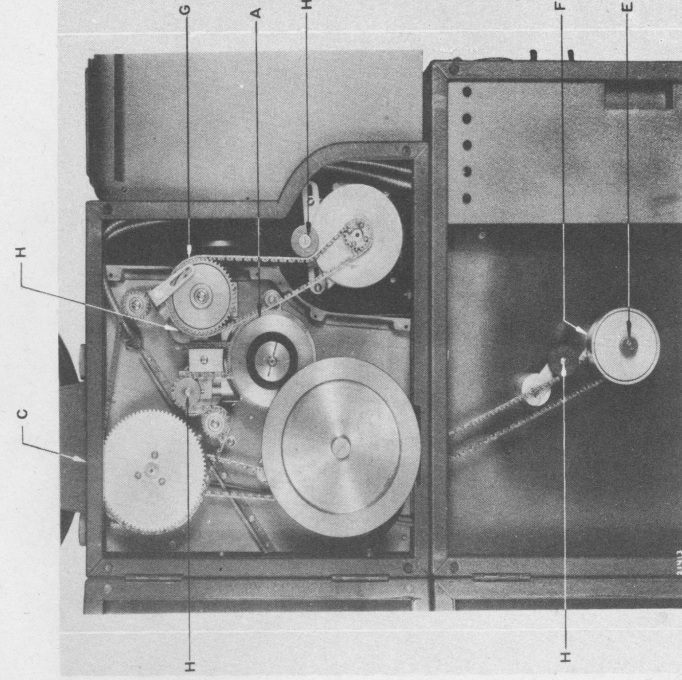
Parts to Lubricate	When to Oil	Where to Oil	Type: Lubrication	Comment
Intermittent Unit	Watch oil level each 8 hour interval of operation.	Oil Cup "A" on rear of Projector Mechanism.	ONLY USE A-1 GRADE Machine Oil. See Specifications at Left.* Use oil specified as other oils will quickly bind up intermittent movement.	Change oil every 100 hours of operation. Do NOT flush out the oil well with kerosene or other liquids.
End Bearing on Sprocket Intermittent	Every 8 hours of operation.	Press oil can against star wheel outer bearing "B" and let oil flow in.	Same as specified for intermittent unit.	Oil sparingly to avoid over flow.
Feed and Sound Sprocket Shafts	Every 8 hours of operation.	Oil Cup "C" at top of Projector Case.	Light Machine Oil - 10-SAE or similar.	Fill Oil Cup.
Drive Motor	Every 8 hours of operation.	Oil Cup "D" at each end of motor. Remove stationary door to place oil in front oil cup.	Light Machine Oil, as above.	Oil sparingly.
Take-up Bearing	Every 8 hours of operation.	Remove knurled screw "E" marked Oil. With pressure oil can force small amount of oil into center of shaft.	Light Machine Oil - 10-SAE or similar.	Oil sparingly. Also place drop of oil between spacer and bearing "F" marked with red paint.
Shutter Assembly	Every 100 hours of operation.	Oil hole "G" marked with red paint on top of housing.	#0 Cup Grease	Use sparingly.

\*Specifications of the Oil To Be Used in Intermittent Unit  
Flash Point not less than 360°  
Pour Point not more than 0° F.  
Viscosity - Saybolt Universal at 100° F.  
Range from 145 to 155 seconds.

Refer to Lubrication Illustration on Page 40.

Parts to Lubricate	When to Oil	Where to Oil	Type: Lubrication	Comment
Ventilating Motor	Every 100 hours of operation	Oil shaft between fan and motor housing. Not shown on illustration.	Light Machine Oil - 10-SAE or similar.	Oil sparingly.
Chain Idler Rollers	Every 8 hours of operation.	Drop of oil between screw and roller "H". Also drop of oil on other side of roller.	Light Machine Oil as above.	Oil very sparingly.
Sound Adjustment Roller	Every 8 hours of operation.	Oil hole "J" on roller marked with red paint.	Light Machine Oil - 10-SAE or similar.	Oil very sparingly.
Holdback Sprocket	Every 8 hours of operation.	Oil hole "K" on sprocket marked with red paint.	Light Machine Oil as above.	Oil very sparingly.
Film Sprocket Idler Rollers	Every 8 hours of operation.	With very small oil can, place drop of oil between lock nut and front roller "L", also between casting and rear roller "M".	Light Machine Oil as above.	Oil very sparingly. Remove excess oil.
Feed Magazine Shaft	Every 100 hours of operation.	Oil cup at top of shaft housing at rear of magazine. Not shown on illustration.	#0 Cup Grease.	Use sparingly.
All Drive Chains	Every 50 hours of operation.	Drop of oil on each chain while projecting or is running.	Standorip #29 or similar.	Oil very sparingly.
Fire Trap Rollers	Every 25 hours of operation.	Drop of oil on each roller bearing "N" supporting fire trap rollers	Light Machine Oil - 10-SAE or similar.	Oil very sparingly. Remove excess oil.
Fire Guards	Every 100 hours of operation.	Place small amount of grease between case and bottom of guard.	#0 Cup Grease.	Remove excess.

## Illustrations for Lubrication Chart





# TABLE OF SCREEN DIMENSIONS FOR 35mm. SOUND FILM

TABLE OF SCREEN DIMENSIONS FOR 35 MM SOUND FILM BASED ON .600" x .825" APERTURE AND HORIZONTAL PROJECTION																										
Lens Size	2.00 In.	2.25 In.	2.50 In.	2.75 In.	3.00 In.	3.25 In.	3.50 In.	3.75 In.	4.00 In.	4.25 In.	4.50 In.	4.75 In.	5.00 In.	5.25 In.	5.50 In.	5.75 In.	6.00 In.	6.25 In.	6.50 In.	6.75 In.	7.00 In.	7.25 In.	7.50 In.	7.75 In.	8.00 In.	
50 Ft.	14.9	13.2	11.9	10.8	9.9	9.1	8.5	7.9																		
55 Ft.	20.5	18.2	16.4	14.9	13.6	12.6	11.7	10.9																		
60 Ft.	22.6	20.1	18.1	16.4	15.0	13.8	12.9	12.0	11.2	10.6																
65 Ft.	24.6	21.9	19.7	17.9	16.4	15.2	14.1	13.1	12.3	11.6	10.9	10.3														
70 Ft.	26.6	23.6	21.4	19.4	17.7	16.4	15.3	14.2	13.3	12.5	11.8	11.2	10.6													
75 Ft.	28.6	25.5	23.0	20.9	19.1	17.6	16.4	15.3	14.3	13.4	12.7	12.0	11.4	10.9												
80 Ft.	30.7	27.4	24.6	22.4	20.6	18.9	17.6	16.4	15.3	14.4	13.6	12.9	12.3	11.7	11.1	10.6										
85 Ft.	32.9	29.2	26.3	23.9	21.9	20.2	18.8	17.5	16.4	15.4	14.6	13.8	13.1	12.5	11.9	11.4	10.8	10.4								
90 Ft.	35.0	31.2	28.1	25.5	23.3	21.6	20.0	18.7	17.5	16.4	15.5	14.7	14.0	13.3	12.7	12.1	11.6	11.1	10.7							
95 Ft.	37.0	32.9	29.6	26.9	24.6	22.7	21.2	19.0	18.5	17.4	16.4	15.6	14.8	14.1	13.4	12.8	12.3	11.8	11.3	10.9	10.5					
100 Ft.	39.1	34.7	31.2	28.4	26.1	24.1	22.3	20.7	19.5	18.4	17.3	16.4	15.6	14.8	14.2	13.6	13.0	12.4	12.0	11.5	11.1	10.7	10.4			
105 Ft.	41.1	36.6	32.9	29.9	27.4	25.3	23.5	21.9	20.6	19.3	18.3	17.3	16.4	15.6	14.9	14.2	13.6	13.1	12.6	12.1	11.7	11.3	10.9	10.6	10.2	
110 Ft.	43.2	38.4	34.5	31.4	28.7	26.6	24.6	23.1	21.6	20.2	19.2	18.2	17.2	16.4	15.6	15.0	14.3	13.8	13.2	12.8	12.3	11.8	11.4	11.1	10.7	
115 Ft.	45.2	40.2	36.2	32.9	30.2	27.7	25.9	24.2	22.6	21.2	20.2	19.0	18.1	17.2	16.4	15.7	15.0	14.4	13.8	13.4	12.9	12.4	12.0	11.6	11.2	
120 Ft.	47.3	41.9	37.8	34.4	31.4	29.0	26.9	25.3	23.6	22.3	21.0	19.8	18.8	18.0	17.1	16.4	15.7	15.1	14.5	13.9	13.4	13.0	12.5	12.1	11.7	
125 Ft.	49.4	43.9	39.5	35.9	32.9	30.3	28.2	26.7	24.6	23.2	21.9	20.7	19.7	18.8	17.9	17.1	16.4	15.7	15.1	14.6	14.0	13.6	13.1	12.7	12.3	
130 Ft.	51.5	45.6	41.1	37.4	34.2	31.6	29.3	27.4	25.6	24.2	22.8	21.6	20.5	19.5	18.6	17.8	17.1	16.4	15.8	15.2	14.6	14.1	13.6	13.2	12.8	
135 Ft.	53.6	47.6	43.0	39.2	35.8	33.0	30.6	28.6	26.7	25.1	23.7	22.4	21.3	20.3	19.4	18.5	17.8	17.1	16.4	15.8	15.2	14.7	14.2	13.7	13.3	
140 Ft.	55.7	49.7	45.0	41.1	37.6	34.6	32.1	30.0	28.0	26.4	24.8	23.3	22.0	20.9	20.0	19.1	18.2	17.4	16.7	16.0	15.4	14.9	14.4	14.0		
145 Ft.	57.8	51.7	46.9	42.9	39.3	36.2	33.5	31.3	29.2	27.5	25.8	24.2	22.7	21.5	20.4	19.5	18.6	17.8	17.1	16.4	15.8	15.2	14.7	14.2		
150 Ft.	59.9	53.7	48.8	44.7	41.0	37.8	35.0	32.7	30.5	28.7	26.9	25.2	23.6	22.3	21.1	20.0	19.1	18.2	17.4	16.7	16.0	15.4	14.9	14.4		
155 Ft.	62.0	55.7	50.7	46.5	42.7	39.4	36.5	34.1	31.8	29.9	28.1	26.3	24.6	23.2	21.9	20.7	19.6	18.7	17.9	17.1	16.4	15.8	15.2	14.7		
160 Ft.	64.1	57.8	52.7	48.4	44.5	41.1	38.1	35.6	33.2	30.9	29.0	27.1	25.4	23.9	22.5	21.2	20.1	19.1	18.2	17.4	16.7	16.0	15.4	14.9		
165 Ft.	66.2	59.9	54.7	50.3	46.3	42.8	39.7	37.1	34.6	32.2	30.0	28.1	26.3	24.7	23.2	21.9	20.7	19.6	18.7	17.9	17.1	16.4	15.8	15.2		
170 Ft.	68.3	62.0	56.7	52.2	48.1	44.6	41.4	38.8	36.3	33.8	31.5	29.5	27.6	25.9	24.3	22.9	21.5	20.3	19.2	18.3	17.5	16.7	16.0	15.4		
180 Ft.	70.4	64.1	58.7	54.1	49.9	46.3	43.0	40.3	37.7	35.1	32.6	30.4	28.4	26.7	25.1	23.6	22.2	20.8	19.6	18.6	17.8	17.0	16.2	15.6		
190 Ft.	72.5	66.2	60.5	55.8	51.5	47.8	44.4	41.6	39.0	36.3	33.7	31.4	29.3	27.6	25.9	24.3	22.9	21.5	20.3	19.2	18.3	17.5	16.7	16.0		
200 Ft.	74.6	68.3	62.5	57.7	53.3	49.5	46.0	43.1	40.4	37.7	35.1	32.7	30.5	28.4	26.7	25.1	23.6	22.2	20.9	19.7	18.8	17.9	17.1	16.3		

## LOUD SPEAKER COMPLETE - PART NO. ND-12

Part Number	Description	Number Required
2366	Bracket - Speaker Cable	4
2689	Cable - Speaker (100 ft.)	1
3860	Case - Speaker	1
4081	Receptacle - 4 Pin Speaker	1
4082	Plug - 4 Pin Speaker	1
4124	Screen - Speaker	1
4185-V	Speaker Unit (A-12 P.M.)	1

### EFFECT OF PROJECTION ANGLE ON SCREEN PROPORTION

The sizes given are correct for horizontal projection. For a given width the height of the picture increases with the projection angle therefore the screen height should be increased accordingly. The following table from "The Cinematographers Book of Tables" gives multipliers to use to correct the screen height to the given conditions.

For example—4" lens, 100 ft. throw, 20 deg. projection angle, screen size from table 14.9 x 20.6 ft., screen height 14.9 ft., and multiplier 4" lens 20 deg. angle 1.093.

14.9 x 1.093 = 16.3 ft. as correct screen height, therefore 16.3 ft. x 20.6 screen should be selected.

Lens	5 Deg.	10 Deg.	15 Deg.	20 Deg.	25 Deg.	30 Deg.
3"	1.0126	1.033	1.063	1.104	1.157	1.225
3½"	1.0113	1.031	1.059	1.097	1.149	1.214
4"	1.0104	1.029	1.056	1.093	1.143	1.207
4½"	1.0096	1.027	1.054	1.088	1.138	1.201
5"	1.0091	1.026	1.051	1.086	1.135	1.196
6"	1.0082	1.024	1.048	1.084	1.130	1.189

Numerical List  
MAIN PROJECTOR ASSEMBLIES  
As Listed on the Two Master Projector Drawings  
Bound to the Inside BACK COVER

Part Number	Description	Parts Analysis Page No.	Assembly Drawing Page No.
1001	Condenser - Reflector Assembly	2A	3A
1005	Ventilating Motor Assembly	4A	4A
1134-B	Mechanism Plate (Not Sold Separately)	None	None
1430	Upper Case Assembly	5A	6A
1440	Lower Magazine Assembly	7A	8A
1450	Take-up Assembly	9A	10A
1470-A	Feed Magazine Assembly	11A	12A
1530-A	Drive Motor Assembly	15A	16A
2211	Lamphouse Assembly	17A	17A
2216	Feed Sprocket Assembly	18A	19A
2220	Sound Sprocket Assembly	21A	22A
2230	Film Gate Assembly	23A-25A	24A-25A
2259	Take-up Chain Idler Assembly	26A	27A
2259-A	Sound Sprocket Chain Idler Assembly	26A	27A
2263	Intermittent Movement Assembly	28A-29A	30A
2290	Sound Filter Assembly	36A	36A
2305	Chain Idler Assembly (2 Required)	37A	37A
2313	Photo Cell Mount Assembly	38A	38A
2330	Shutter Assembly	39A	40A
2340	Exciter Lamp Assembly	42A	43A
2350	Floating Film Idler Assembly	44A	44A
2367	Oiler Assembly	45A	45A
2379	Lens Mount Assembly	46A	46A-47A
2380	Holdback Sprocket Idler Assembly	48A	49A
2394	Sound Adjustment Roller Assembly	50A	50A
2395-A	Lower Fire Valve Assembly	51A	51A
2404	Aperture Plate Assembly	52A	53A
2420	Aperture Release Assembly	54A	54A
2420-A	Film Gate Trigger Assembly	55A	55A
3091	Photo Cell Cable Assembly	None	None
8798	Projector Power Cord Assembly	None	None
OFA-A	Film Guide Roller Assembly	56A	56A

NUMERICAL LIST OF PARTS AND COMPLETE UNITS  
As Listed on the Two Master Assembly Drawings  
Bound to the Inside BACK COVER

Part Number	Description	Number Required
56	Bracket - Projector Tilting	2
95	Screw - Tilting Bracket Lock	2
97	Pads - Tilting Bracket Foot	4
108	Cleat - Single Steel (To Hold Part No. 2608)	2
110	Cleat - Double Steel (To Hold Part No. 2608)	2
135	Spacer - Steel (To Space 1001 Assembly)	4
220	Socket - Framer Light	1
243	Receptacle - Male Projector Twist Lock	1
260	Spacer - Terminal Strip	2
291	Washer - No. 6 Monel Lock (2 for Part No. 220) (2 for 2310) (5 for 108 & 110) (4 for 4186) (2 for 3855)	15
292	Washer - No. 8 Monel Lock (2 for Part No. 243) (1 for 1472) (6 for 2201) (4 for 1001)	13
413	Lamp - Framer (110 Volt 2 cp T-7)	1
422	Lamp - Pilot (115 Volt, 15 Watt S-11 Da-Lite)	1
479-R	Lamp - Mazda Projection (1000 Watt, 115 Volt, T-20 Prefocused)	1
720	Screw - 5/40"x3/4" Fillister Head (To Hold 220)	2
802	Screw - 8/32"x5/16" Round Head (To Hold No. 243)	2
803	Screw - 8/32"x3/8" Round Head (To Hold No. 2201)	6
808	Screw - 6/32"x1/4" Round Head (To Hold No. 4175)	4
810	Screw - 6/32"x3/4" Round Head (To Hold No. 3855)	2
813	Screw - 6/32"x3/8" Round Head (4 for 4186)(2 for 2310)	6
816	Screw - 6/32"x1/2" Round Head (To Hold Nos. 108 & 110)	5
832	Screw - 5/40"x5/16" Round Head (To Hold No. 1215)	2
851	Screw - 8/32"x3/4" Flat Head (To Hold No. 97)	4
877	Screw - 8/32"x5/8" Fillister Head (To Hold No. 1001)	4
883	Washer - Steel (To Hold No. 1472)	1



