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**GENERAL INSTRUCTIONS
FOR
INSTALLATION, MAINTENANCE
AND OPERATION
OF**

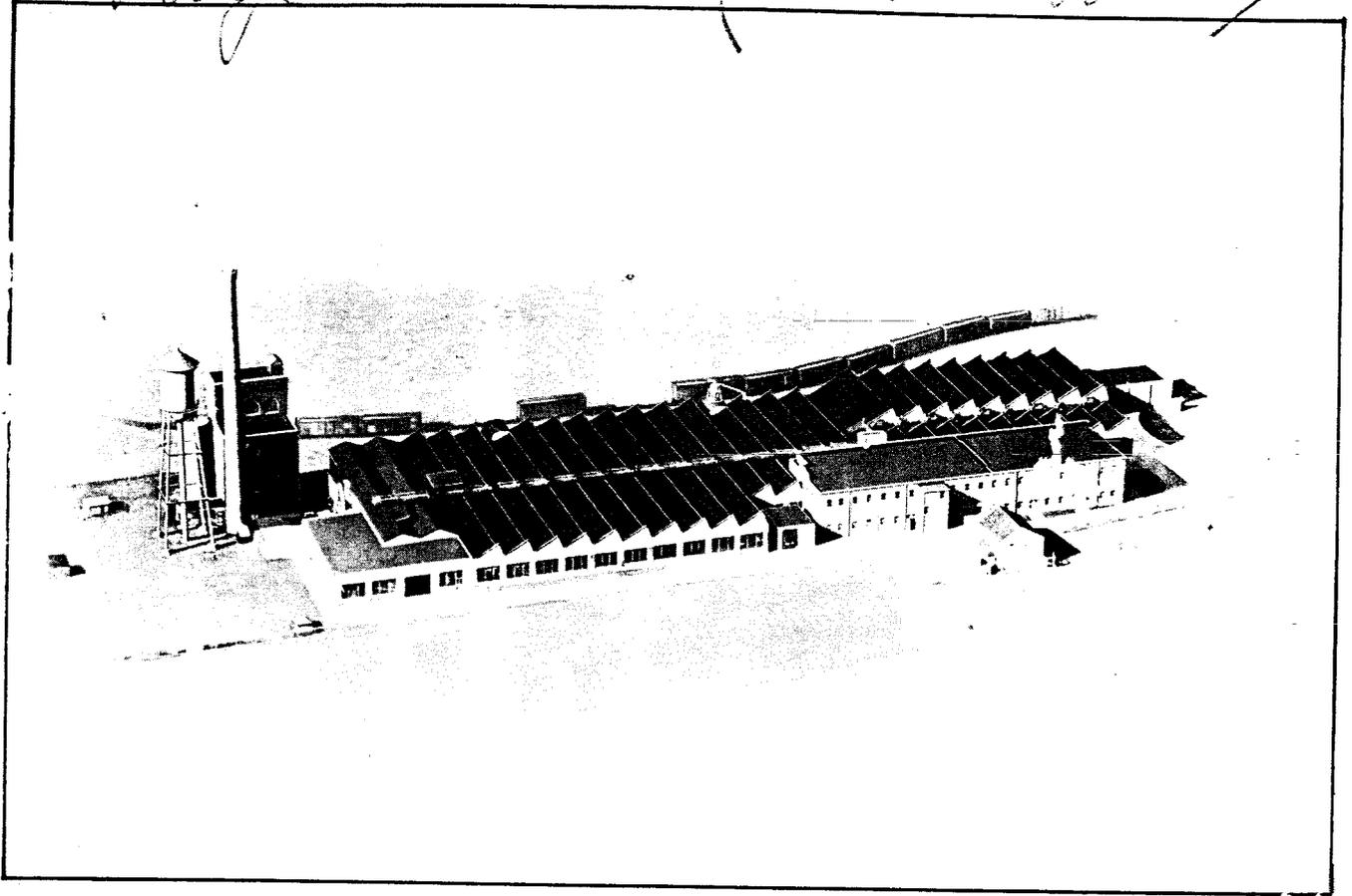
**T Y P E
S P**

Simplex

**SOUND
PROJECTOR**

PRICE 50 CENTS

**INTERNATIONAL PROJECTOR
CORPORATION**



HOME OF SIMPLEX EQUIPMENT

The newest, largest and most modern factory of the oldest manufacturer of standard, professional Motion Picture Projectors in the world. Here, there will continue to be originated and perfected, methods and standards that have given us an international leadership in the motion picture field for over forty years. A thoroughly progressive spirit enables us to give theatre owners the highest possible value at the lowest possible cost. No other firm has facilities that are at all comparable for the economical and efficient manufacture of motion picture equipment and parts.

Simplex service supplements *Simplex* quality. Exhibitors know they can rely upon *Simplex* distributors for satisfactory installation of *Simplex* equipment, for advice and help when emergencies arise and for prompt delivery of *GENUINE SIMPLEX PARTS* when needed. *GENUINE SIMPLEX PARTS* always give the greatest value and are absolutely essential for best results with *SIMPLEX PROJECTORS*.

F O R E W O R D

The Simplex Type SP Sound Projector is unquestionably the finest combined portable motion picture and sound reproducing unit yet developed. It embodies a great many marked improvements in design and construction and means for positive and perfect lubrication, and the results obtained both as to motion picture projection and sound reproduction leave nothing to be desired.

The equipment is manufactured and tested with the utmost care, as is the case with all products manufactured by the International Projector Corporation, viz. E-7, Super Simplex, SI, Simplex-Acme and Sound Equipments.

The system of framing mechanism and shutter synchronizing employed facilitates manipulation and registration. The intermittent movement is hardened and ground throughout. Drive shafts are ground to accurate dimensions and lubricated through porous hydraulically moulded bearings by a system of ducts or channels in their support castings. The oil ducts hold a large supply of oil, thus assuring complete and perfect lubrication at all times. The lens focusing device is so constructed that extreme sharpness may be maintained in the projected picture. The sound reproducing system has been simplified to the utmost degree.

The equipment is directly connected to its driving motor as is the take-up magazine assembly, thus eliminating all belts or chains and the occasional difficulties which go with them.

If this equipment is properly installed and cared for, satisfactory operation and long life may be expected. But as is general with all sound reproducing systems many conditions arise through errors in operation or improper handling which can impair the efficiency of the best constructed and finest equipment. It is the object of this book to set forth complete and accurate instructions for the installation and operation of this equipment and if the instructions are carefully followed at all times none but the finest results, both as to projected picture and sound response, will be obtained.

The following brief outline is an explanation of the elements which go into the construction of sound reproducing equipment together with their function. There is nothing complicated about this, yet extreme care must be taken to see that all adjustments are accurately made inasmuch as each of the various elements has a definite relation to the other and only by the proper combination of settings can the entire assembly be made to reproduce properly all that is recorded in the sound track on the film.

The exciter lamp furnishes illumination to a slit mounted directly behind the condenser lens in the optical system and the image of this slit is projected by the small short focal length objective lens mounted in front of the optical system to the sound track on the film. The line of light thus projected to the film is known as the "scanning beam". It naturally follows that all of the elements comprising this system must be in accurate alignment and adjustment in order that the finest possible results may be obtained and instructions are incorporated herein for these adjustments.

The sound track passing through the scanning beam continually varies the amount of light falling on the photo-electric cell, thus varying the current in the photo-electric cell circuit feeding the amplifier. These minute currents are then greatly amplified, first, by a voltage amplifier and then, still further, by a power

amplifier, both incorporated in the one unit. The greatly amplified current is then passed to the voice coil of the loud speaking units and there changed to mechanical energy which moves the cone of the loud speaker reproducing audible sound waves.

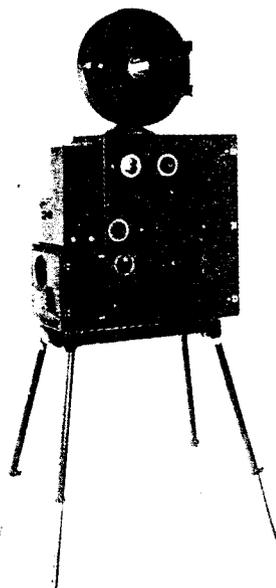
All parts of the sound reproducing system must be kept scrupulously clean and adjustments once made correctly should be securely locked. Dirt allowed to gather on the sound optical system or aperture plate will result in very poor quality of sound reproduction. If the sound optical system is out of focus only a few thousandths of an inch the same poor results will be obtained.

The exciter lamp bulb should be kept clean and polished and should be replaced when it becomes discolored. The front and rear lenses of the optical system should be kept perfectly clean. The photo-electric cell also should be kept perfectly clean and polished if the best results are to be obtained.

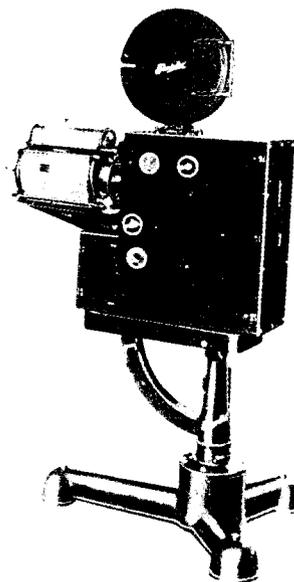
While provision has been made as above stated for perfect lubrication of this equipment, we wish to emphasize the absolute necessity for using only SIMPLEX OIL. This oil has been especially selected for this purpose and is of the correct quality and viscosity to be properly absorbed by the bearings fed from the oil ducts. NO OIL HOLES ARE PROVIDED FEEDING OIL DIRECTLY TO THE SHAFTS except in the case of the intermittent movement which runs in an oil bath. Thus the oil must be of the correct viscosity to properly filter through the bearings to the revolving members.

It is recommended that this book be carefully read from beginning to end so that the projectionist may become thoroughly familiar with any difficulties which may arise and the remedies therefor.

Rotary converters supplied for the operation of Type SP Projectors when the power supply is 105 - 125 volts DC, frequency changers furnished when the power supply is 105 - 125 volts AC, 25 cycles are especially designed for this purpose. They will satisfactorily handle the starting current of the projector motor. Converters are provided with an adjustable resistor by means of which the speed may be so regulated as to furnish the correct projector speed for proper sound reproduction. These special machines should be insisted upon inasmuch as difficulty may be experienced with other devices not properly designed for the job.



SIMPLEX TYPE SP PROJECTOR
equipped with incandescent lamp



SIMPLEX TYPE SF
ARC PROJECTOR

ILLUSTRATIONS

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PRACTICAL PROJECTOR HINTS

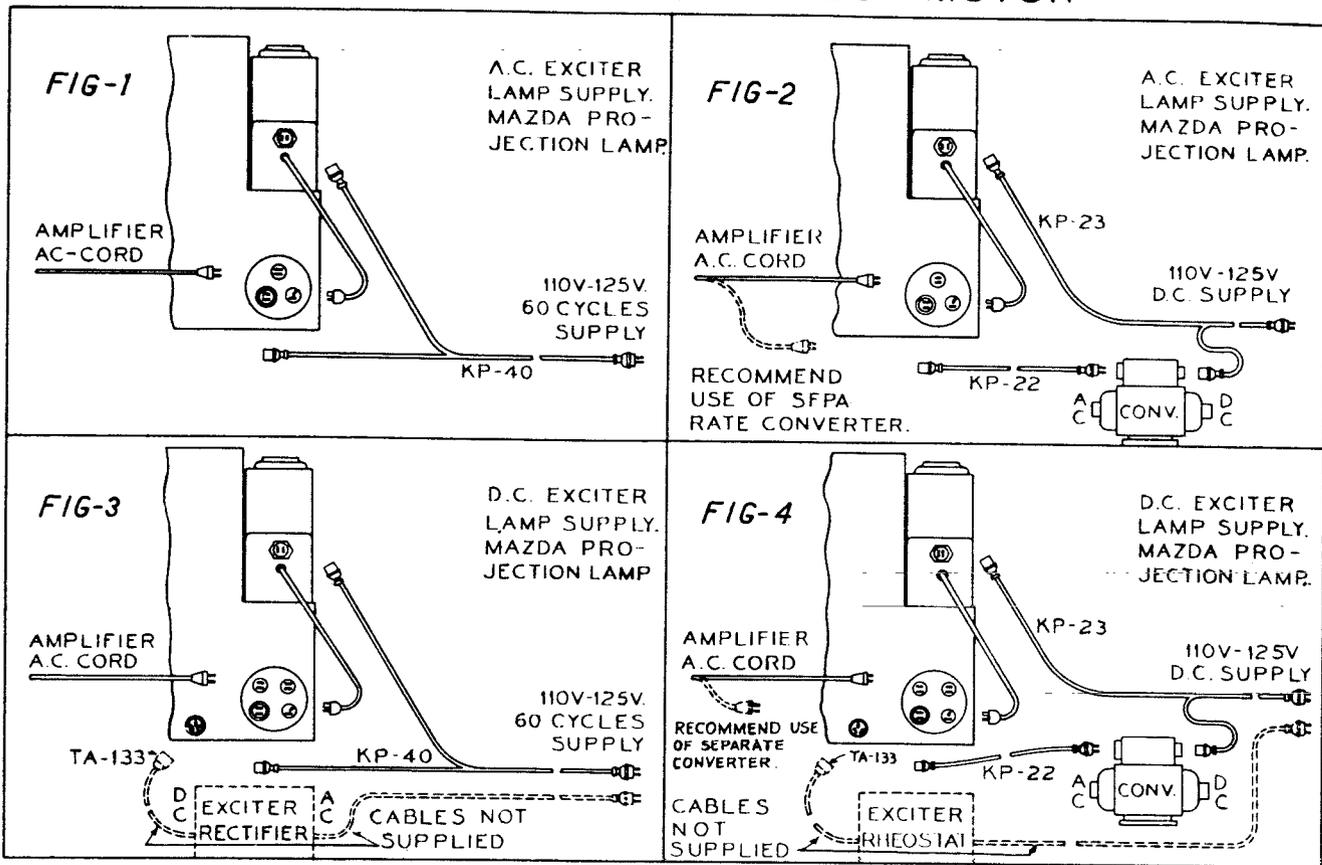
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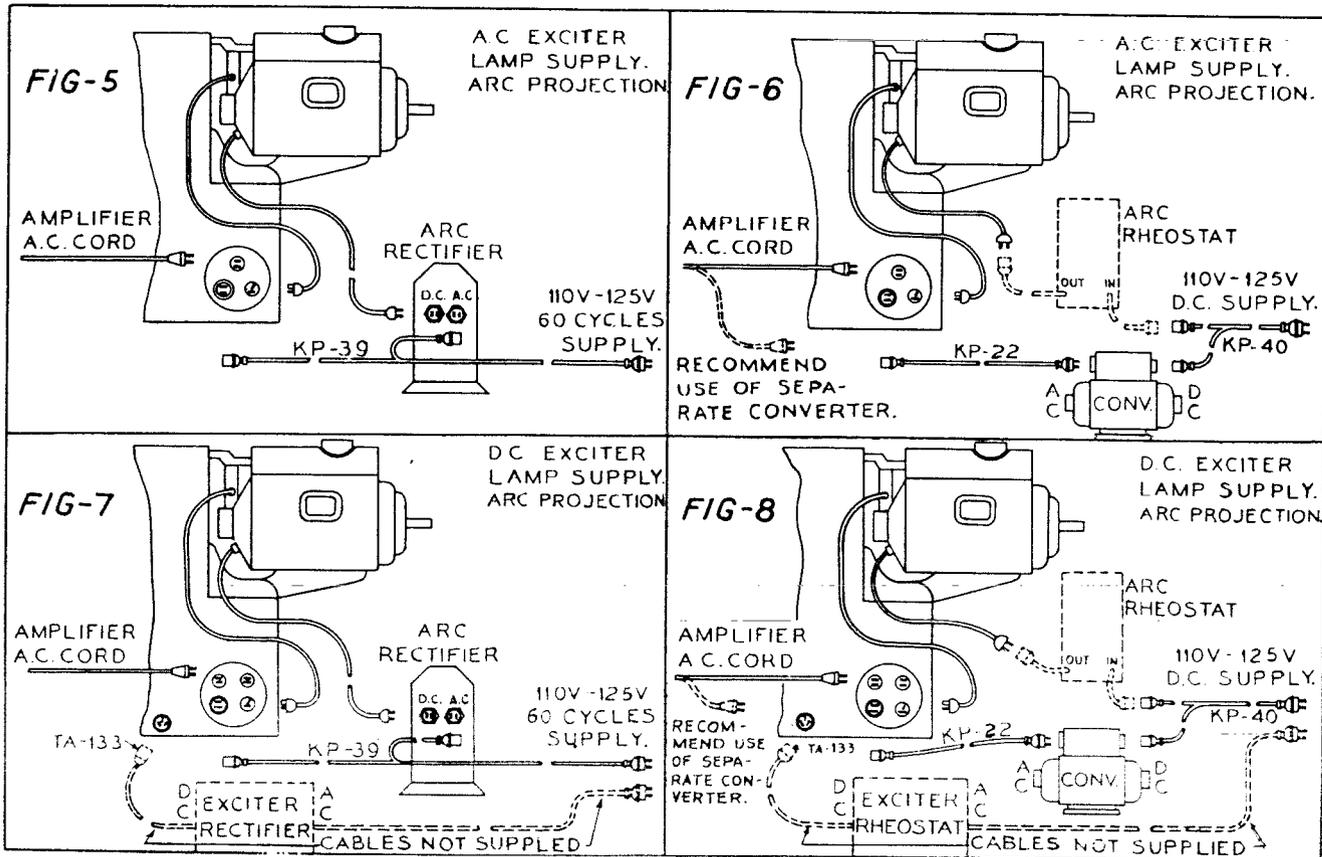
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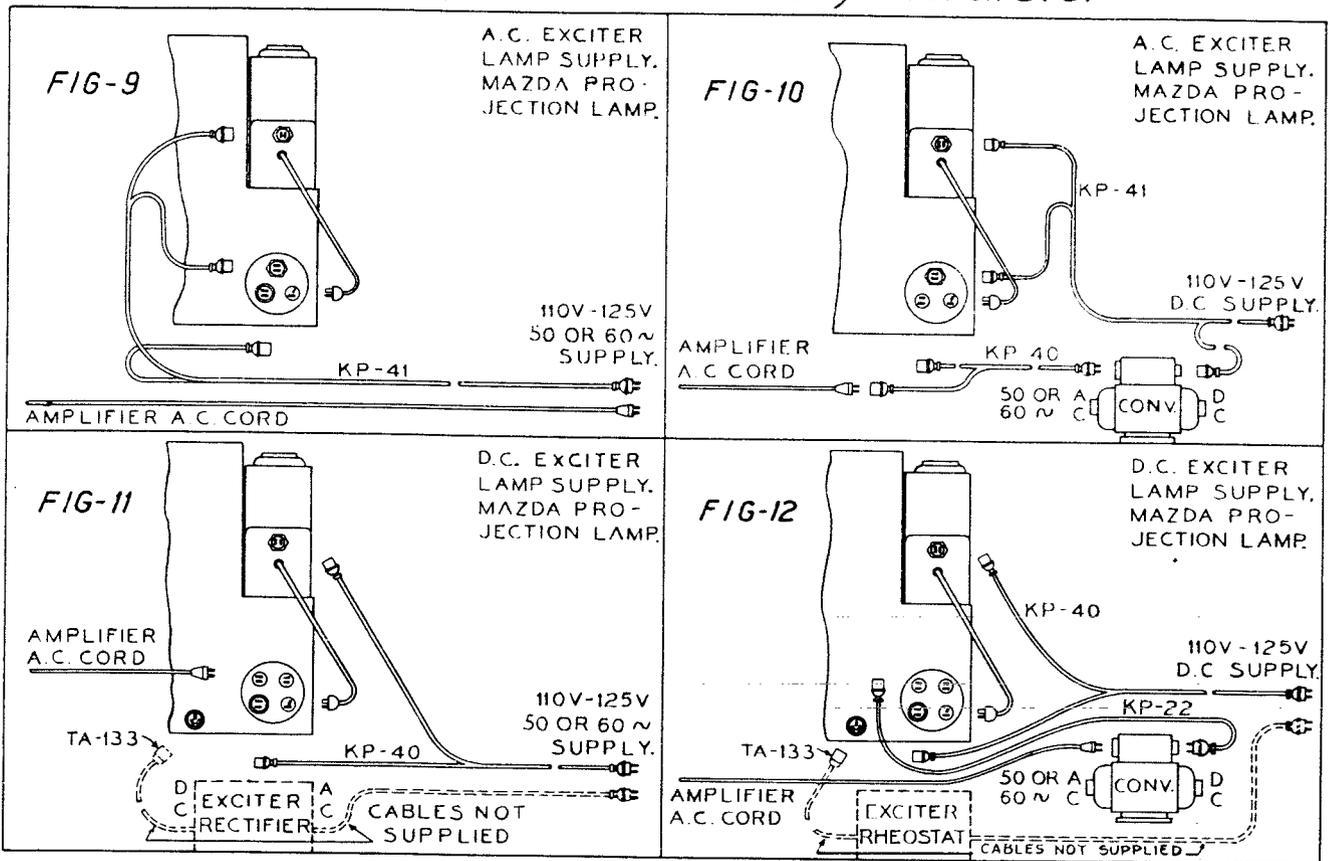
TYPE-SPS-USING 110/125V 60~ MOTOR



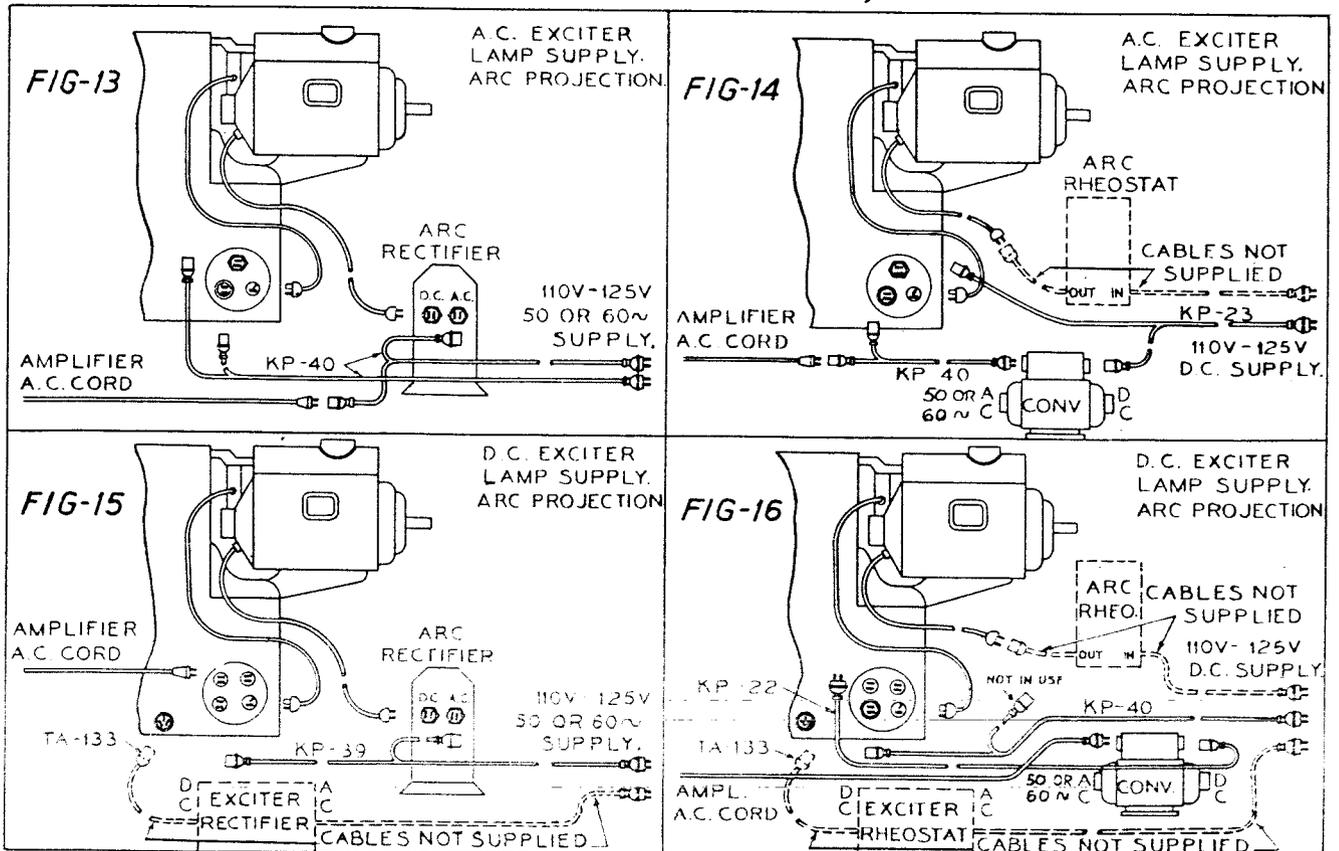
TYPE-SPS-USING 110/125V 60~ MOTOR



* TYPE-SPU- (UNIVERSAL MOTOR) A.C. OR D.C.

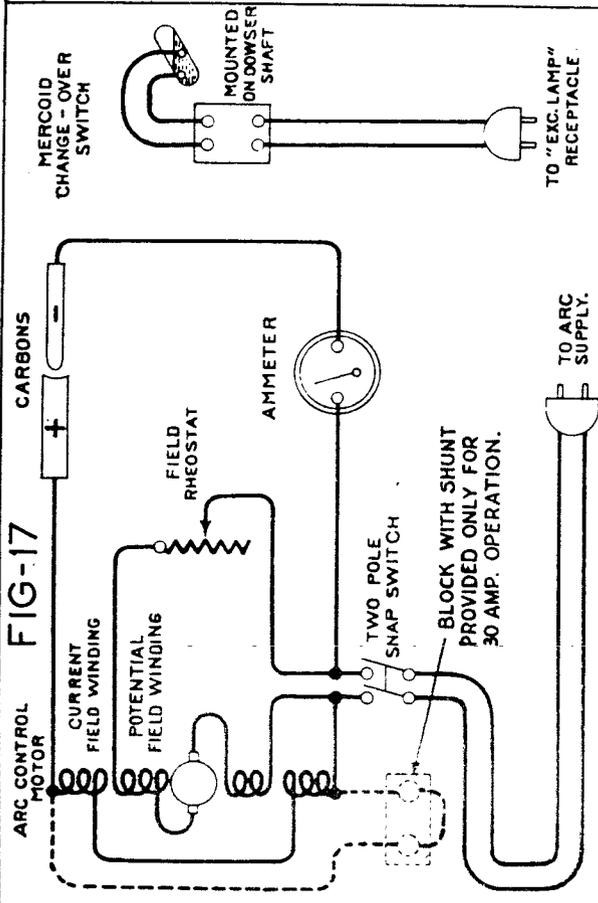


* TYPE-SPU- (UNIVERSAL MOTOR) A.C. OR D.C.



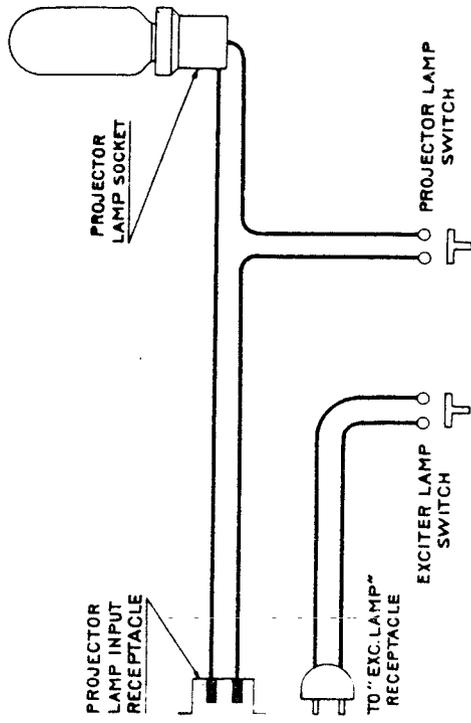
* Instructions for type SPU motors (no longer available) apply only to older projectors.

FIG-17



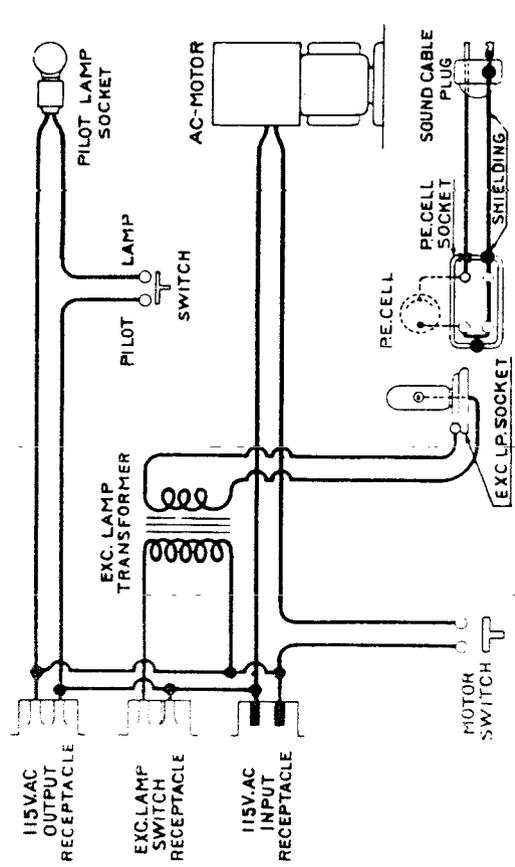
ARC LAMPHOUSE WIRING

FIG-18



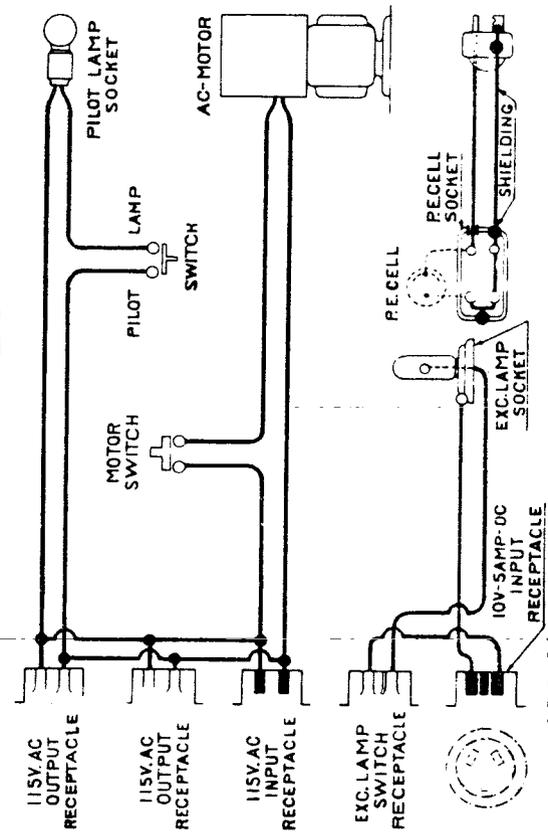
INCANDESCENT LAMPHOUSE WIRING

FIG-19



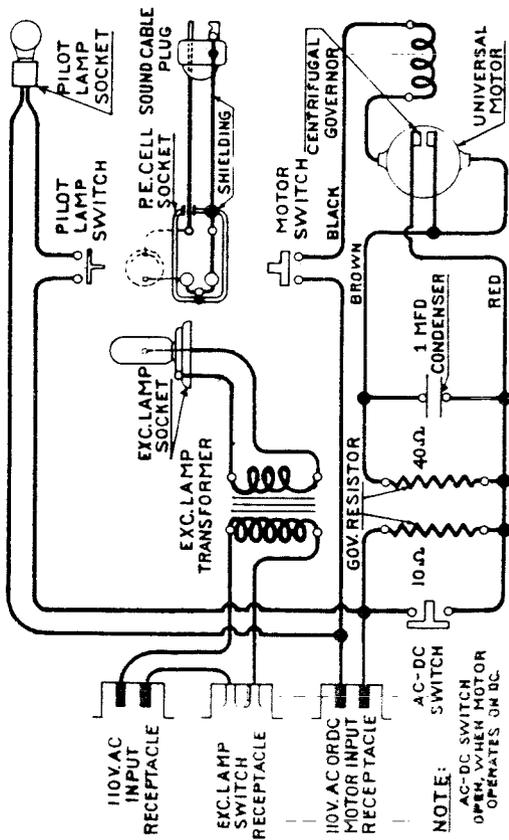
TYPE SPS 60W PROJECTOR WIRING - A.C. EXCITER LAMP
SPF 50W

FIG-20



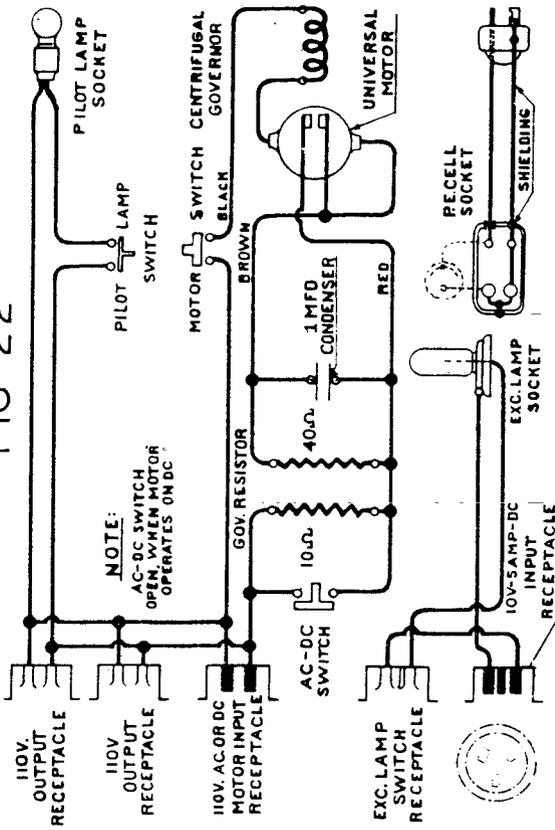
TYPE SPS 60W PROJECTOR WIRING - D.C. EXCITER LAMP
SPF 50W

FIG-21



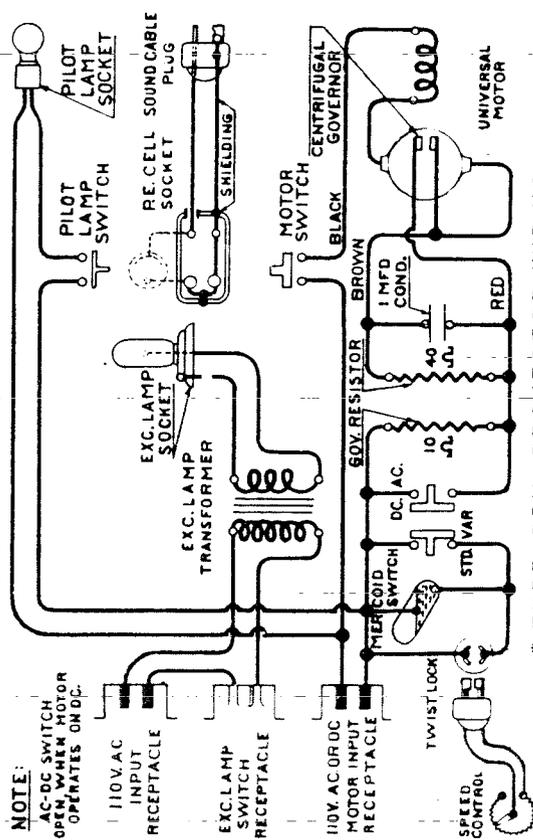
* TYPE · SPU · (UNIVERSAL MOTOR)
PROJECTOR WIRING - A.C. EXCITER LAMP

FIG-22



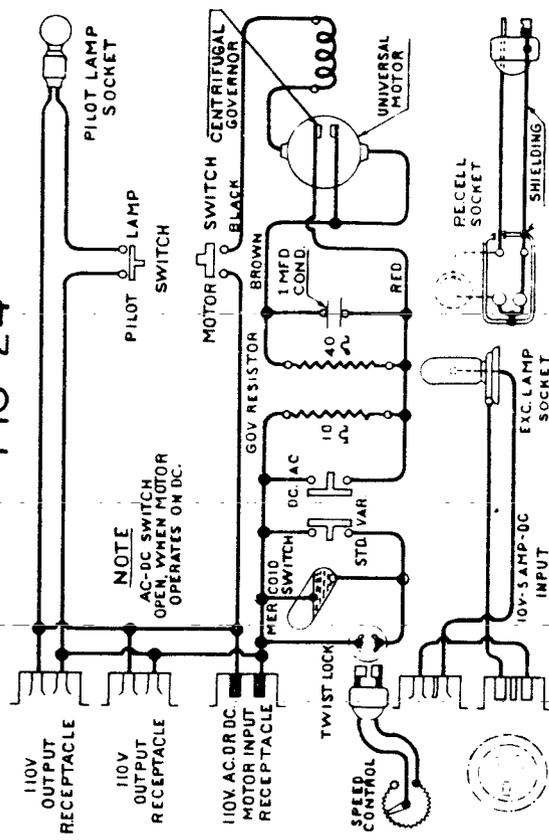
* TYPE · SPU · (UNIVERSAL MOTOR)
PROJECTOR WIRING - D.C. EXCITER LAMP

FIG-23



* TYPE · SPU · PROJECTOR WIRING
(UNIV. MOTOR WITH VARIABLE SPEED CONTROL)
A.C. EXCITER LAMP

FIG-24



* TYPE · SPU · PROJECTOR WIRING
(UNIV. MOTOR WITH VARIABLE SPEED CONTROL)
D.C. EXCITER LAMP

* Instructions for type SPU motors (no longer available) apply only to older projectors.

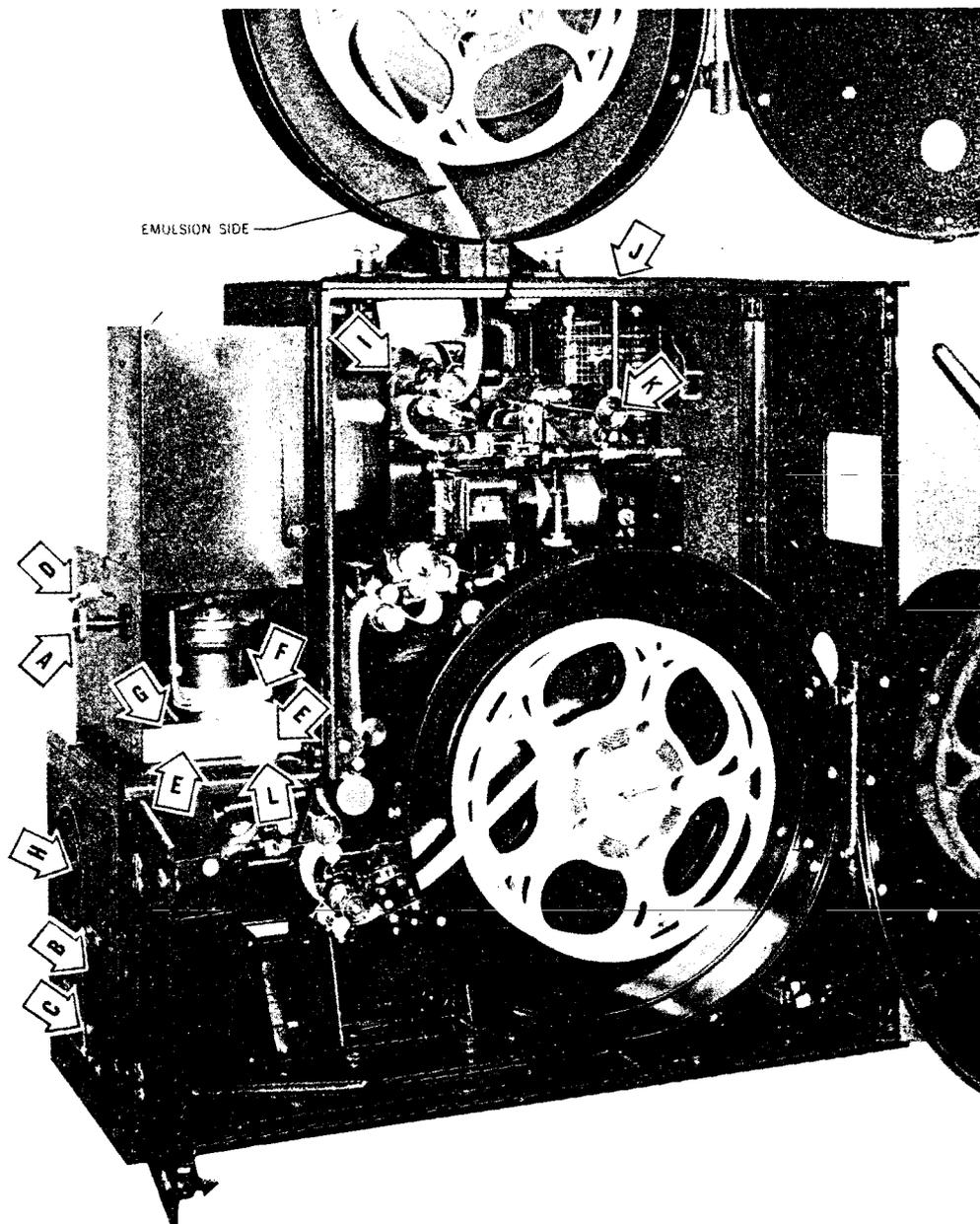


FIGURE 25.

- (A) LAMP HOUSE RETAINING SCREW KNOB
- (B) PILOT LAMP SWITCH
- (C) MOTOR SWITCH
- (D) MAZDA LAMP & EXCITER LAMP SWITCH
- (E) COVER THUMB NUTS
- (F) VERTICAL ADJUSTMENT CLAMP SCREW
- (G) SIDE ADJUSTMENT CLAMP SCREWS (2)
- (H) DRIVE SHAFT HAND KNOB
- (I) AUTOMATIC SAFETY LOOP TRIP
- (J) FOCUSING KNCB (IN TOP OF CASE)
- (K) FRAMING KNOB
- (L) FOCUSING ADJUSTMENT CLAMP SCREWS

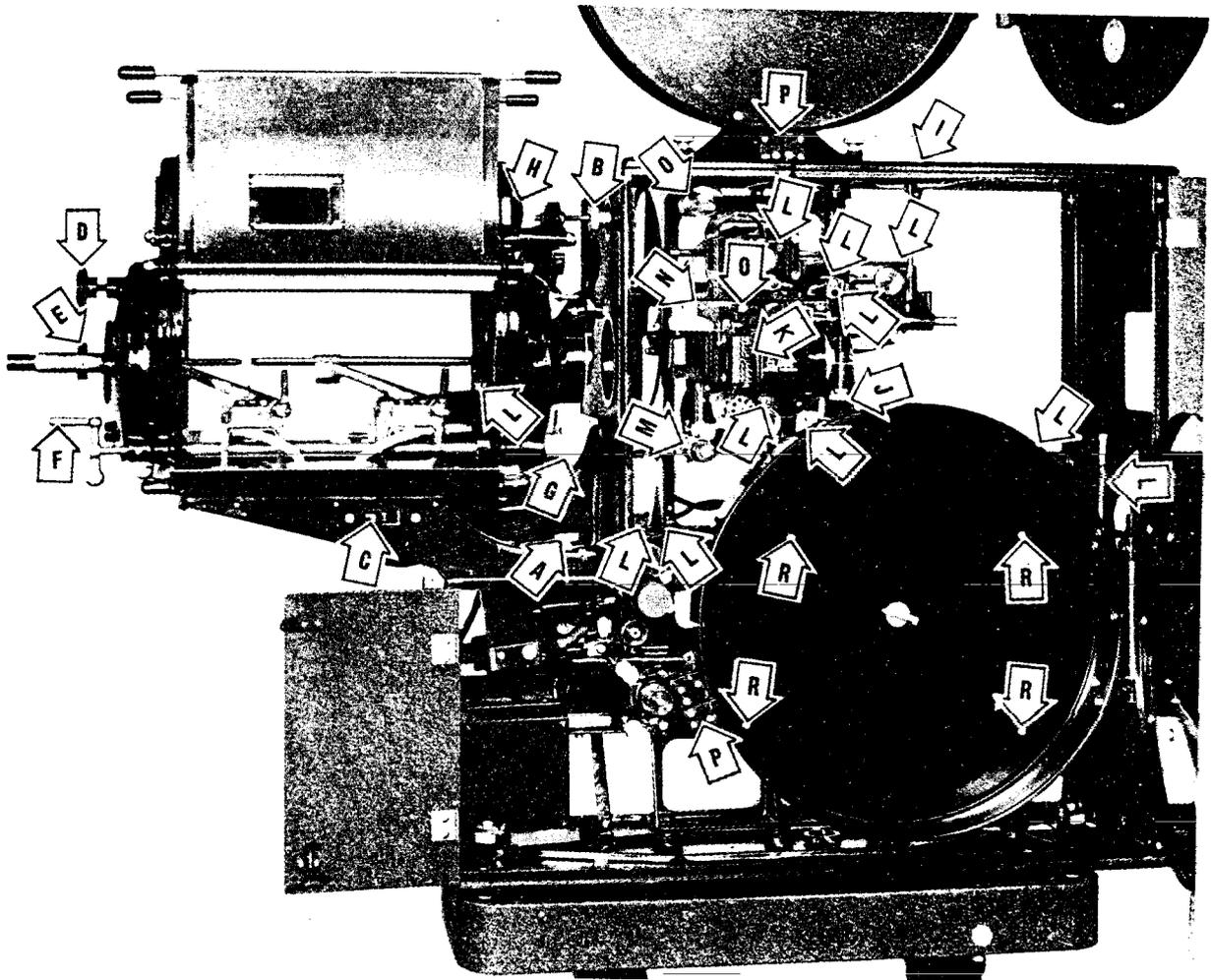


FIGURE 26.

- | | |
|--|---|
| (A) LAMP ASSEMBLY RETAINING THUMB SCREW | (I) FOCUSING KNOB |
| (B) LAMP ASSEMBLY RETAINING & ADJUSTMENT SCREW | (J) LENS HOLDER CLAMP SCREW |
| (C) ARC POWER SWITCH | (K) GATE LATCH |
| (D) MIRROR VERTICAL ADJUSTMENT KNOB | (L) LUBRICATING POINTS |
| (E) MIRROR HORIZONTAL ADJUSTMENT KNOB | (M) INTERMITTENT LOOP FRICTION SPROCKET |
| (F) CARBON FEED CRANK | (N) FILM GATE RETAINING SCREW |
| (G) CARBON FOCUSING KNOB | (O) FILM GATE ROLLER & RETAINING SCREW |
| (H) AUTOMATIC FEED CONTROL RHEOSTAT | (P) MAGAZINE FIRE TRAPS |
| (Q) PILOT LAMP | |
| (R) MAGAZINE RETAINING SCREWS | |

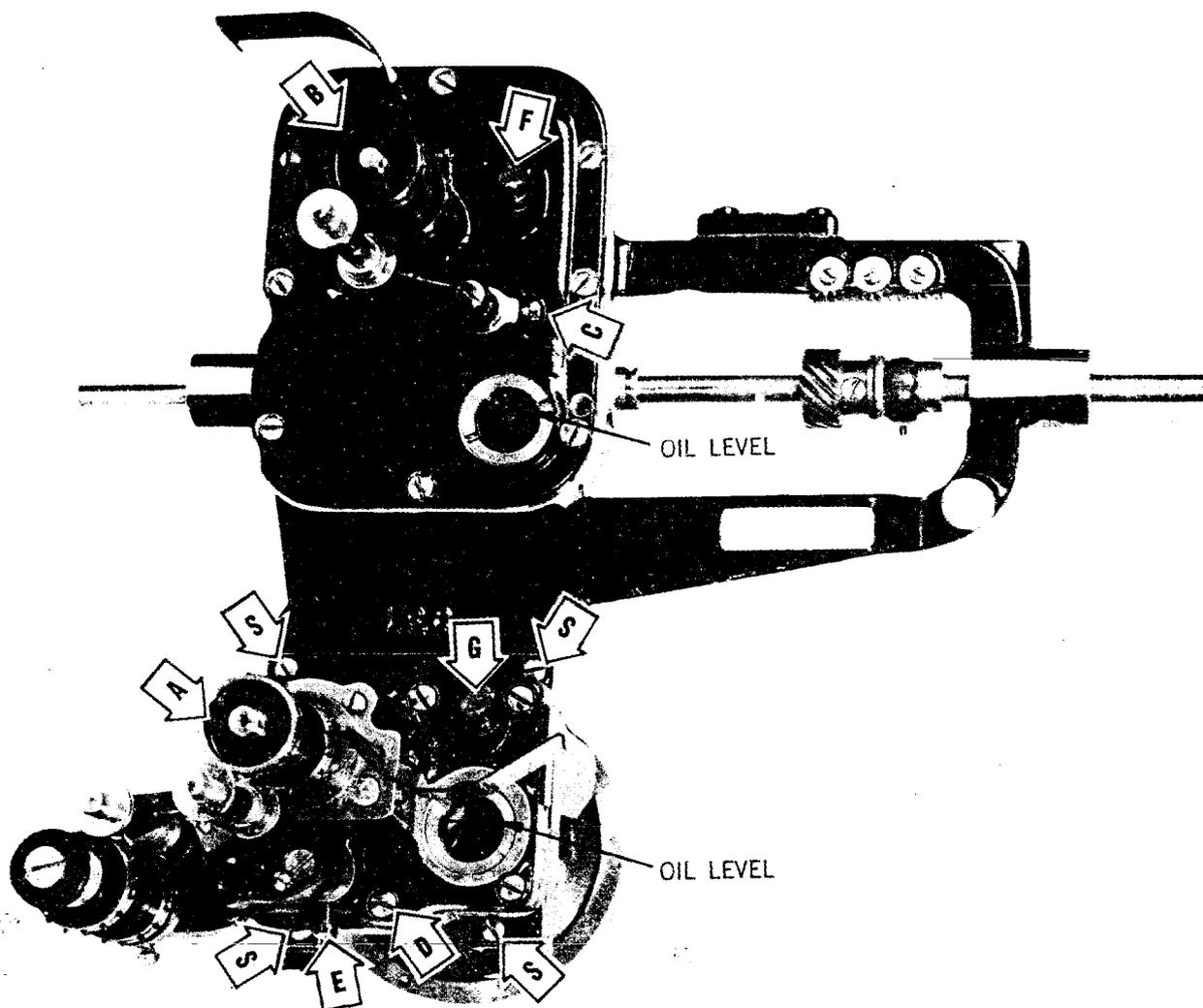


FIGURE 27.

- (A) INTERMITTENT SPROCKET
- (B) UPPER FEED SPROCKET
- (C) UPPER FEED SPROCKET PAD ROLLER SET SCREW
- (D) INTERMITTENT MOVEMENT CASE OIL DRAIN SCREW
- (E) INTERMITTENT PAD ROLLER SET SCREW
- (F) GEAR CASE OIL FILLING CUP
- (G) INTERMITTENT MOVEMENT CASE OIL FILLING CUP
- (S) INTERMITTENT MOVEMENT RETAINING SCREWS

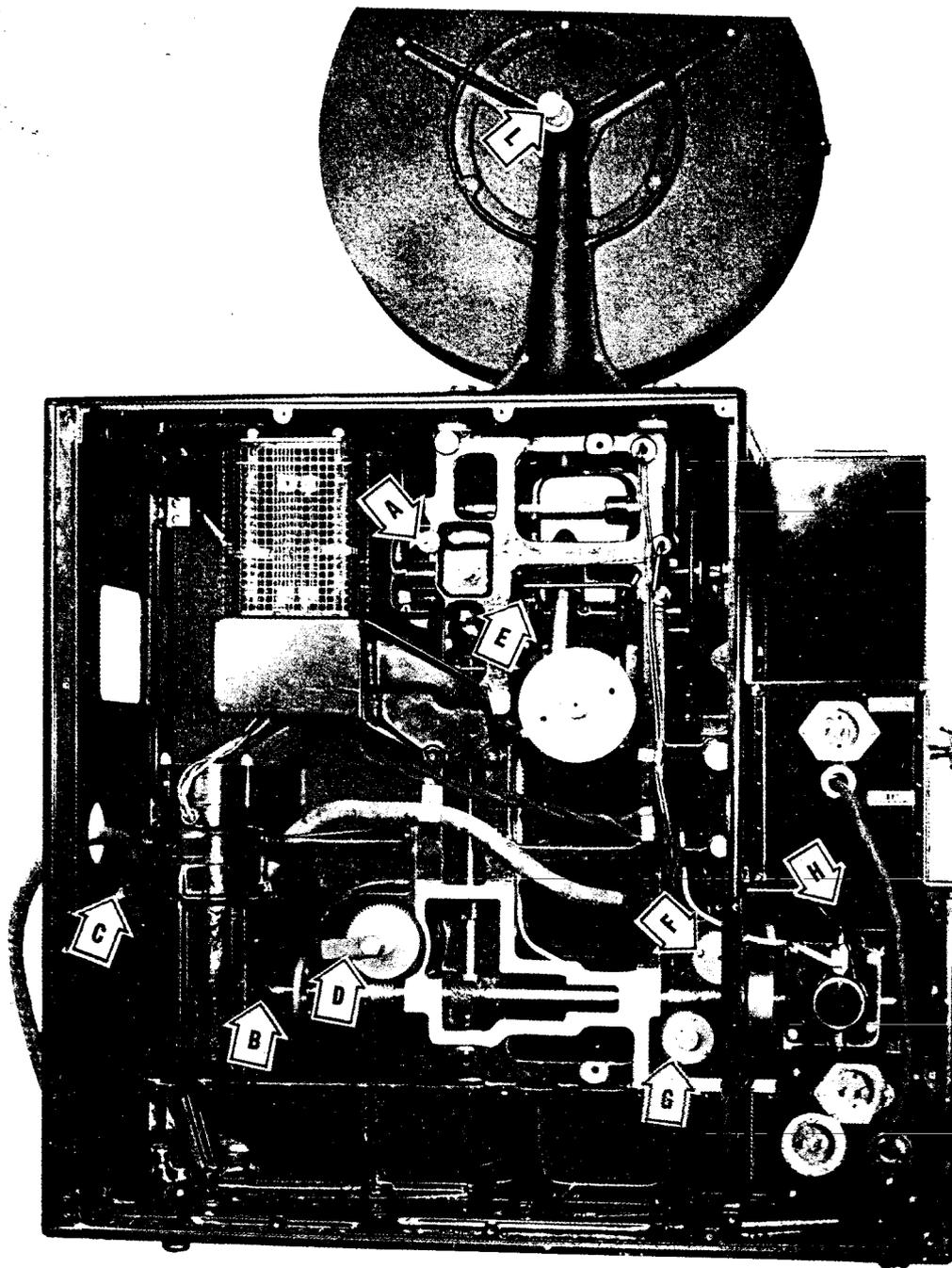


FIGURE 28.

- (A) FRAMING HANDLE FRICTION ADJUSTMENT
- (B) GEAR BOX (SPU TYPE PROJECTORS ONLY)
- (C) HORIZONTAL ADJUSTMENT CLAMP SCREW
- (D) TAKE UP TENSION ADJUSTING NUT
- (E) AUTOMATIC SAFETY LOOP TRIP ON FIRE SHUTTER
- (F) SOUND SPROCKET GEAR
- (G) HOLDBACK SPROCKET GEAR
- (H) LAMPHOUSE VENTILATING FAN
- (L) UPPER MAGAZINE OIL CUP

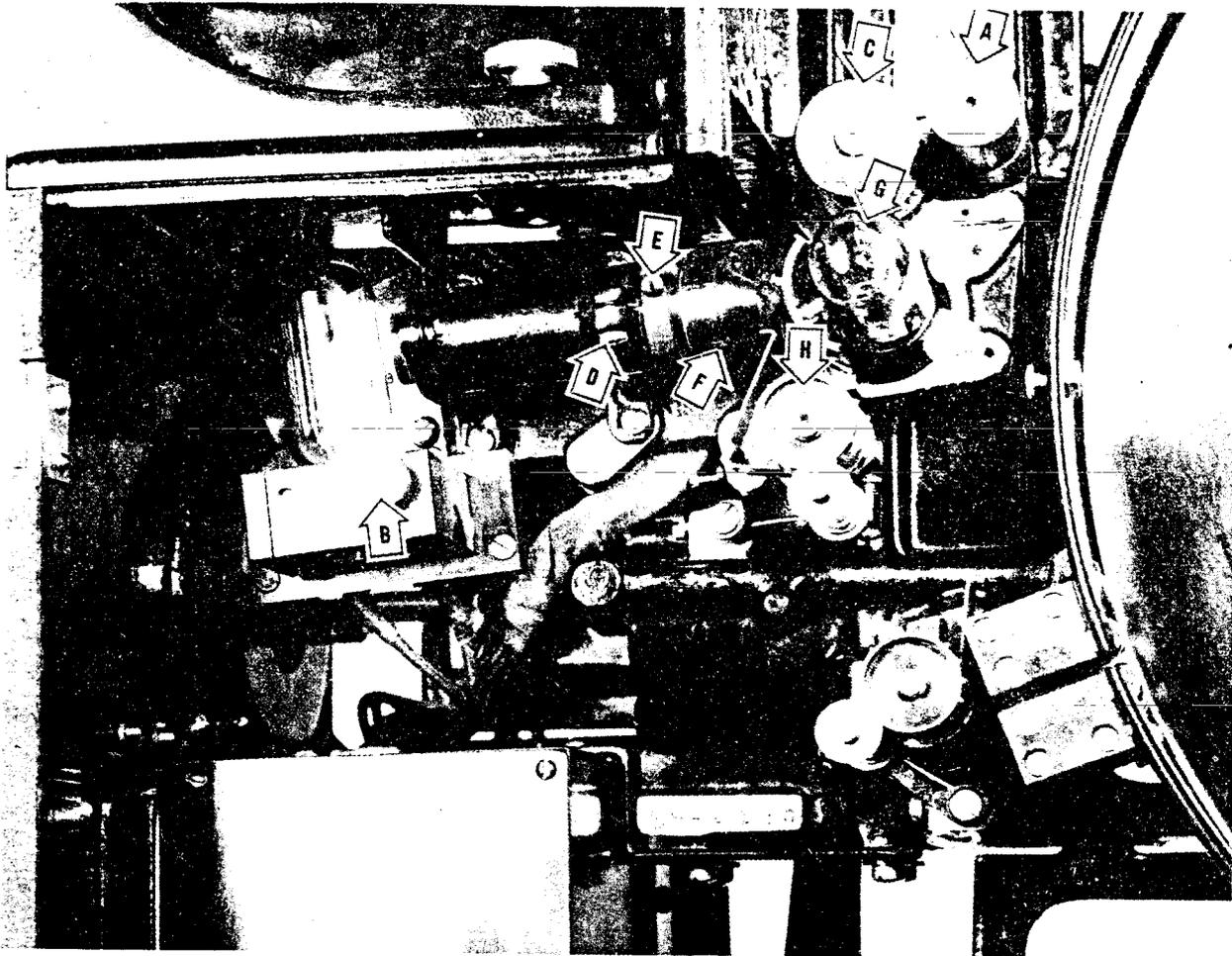


FIGURE 29.

- (A) SOUND IDLER ROLLER
- (B) EXCITER LAMP CLAMP NUT
- (C) SOUND ADJUSTMENT FLANGE
- (D) OPTICAL BARREL CLAMP SCREW
- (E) OPTICAL FOCUSING ADJUSTMENT CLAMP SCREW
- (F) FOCUSING SCREW (REAR OF OPTICAL BARREL)
- (G) P. E. CELL
- (H) SOUND SPROCKET

INSTRUCTIONS FOR INSTALLATION AND OPERATION OF
SP PROJECTOR AND SOUND EQUIPMENT

SECTION 1. SETTING UP COLLAPSIBLE STAND #OP-1. If the collapsible stand forms a part of this equipment, insert the four tubular legs in their respective sockets and tighten the thumb screws. Level off the stand, being sure that all clamp screws on the legs are firmly tightened before the projector is placed upon the stand. The top of the stand is provided with four pockets into which the four feet of the projector should set. Note the two holes near each end of the stand through which the wing screws are passed to fasten the projector to the stand. Further tilt and height adjustments are made by telescoping the legs to the required angle and length.

SECTION 2. SETTING UP PEDESTAL #OP-15. When the pedestal is part of the equipment it will be received in four sections. Set the base on the Projection Room floor with the longest leg away from the screen. Insert the column into the base with the attached quadrant above the long leg of the base and tighten the two wing nuts provided to keep the column from turning. Remove the tilt adjusting hand screw and the nut, washer and spring assembly from the quadrant. Note the relative positions of the nut, washer and spring as they are removed. Insert the quadrant bar into the column quadrant and replace the washer, spring, nut and hand screw. The washer should contact the quadrant bar on the left (non-operating) side of the projector. Remove the cross shaft (loosen set screws) from the top of the column and position the platform above the column with the shaft holes in the platform aligned with the shaft holes in the column. Insert the shaft, adjusting to a flush condition at both ends, and tighten set screws. Attach the platform to the quadrant bar with the four screws provided. Make sure that the tilting lock is tight and the platform nearly level before mounting the projector.

SECTION 3. ASSEMBLING PROJECTOR TO STAND OR PEDESTAL. Set the projector on top of the stand or pedestal, centering the four feet into the pockets provided. The two feet on the operating side are adjustable

from within the projector and should be so adjusted that all four feet make solid contact with the top of the stand. Then insert the two wing screws through the holes in the platform, from underneath, and gently tighten sufficient to securely hold the projector in place. Attach the upper magazine to the top of the projector, using the knurled hand screws provided. Move the projector to the approximate position desired in front of the Projection Room port hole and allow sufficient room between the wall and the front of the equipment for tilt adjustment if required. Release the photo-electric cell coupling cable from the retaining strap and pull out through the hole provided beneath the lens port in the front of the housing.

SECTION 4. ASSEMBLING LAMP HOUSES TO PROJECTORS.

A. Mazda Equipment. The Mazda Lamp House normally comes attached to the projector. It may be removed by loosening the thumb screw located "A" in Figure 25 and pulling the lamp house back.

B. Arc Equipment. The Arc Lamp House is attached to the projector by two thumb screws on either side of the base (See "A" in Figure 26). A third point of attachment is at the top of the lamp house, above the dowser, (See "B" in Figure 26) where a special thumb nut is provided. This point also has an adjustment for squaring up the alignment of the lamp house.

SECTION 5. CONNECTING PROJECTOR TO POWER SUPPLY.

- Warning!**
1. Make sure that the power supply matches the data on the projector nameplate.
 2. Before connecting the amplifier to the power supply, be sure the power switch on the amplifier is in the "OFF" position and remains so until the speakers are connected. Read Section 3, pertaining to the amplifier, before the connection is actually made.

From the nameplate obtain the type number of the projector (SPS, SPF or SPU) and refer to Figures 1 to 16 which detail the possible connections for each of the types, including the special connections for DC exciter lamp excitation and Mazda or Arc light source. Internal wiring diagrams of the above types, together with the lamp house connections, are shown in Figures 17 to 24 inclusive.

Connections for the Type SPF Projectors, having 50 cycle motors, are the same as for the SPS Type (60 cycle motor) except that the power supply must be 110 - 125 volt, 50 cycles.

* Type SPU Projectors, having a Universal motor, have a switch located immediately above the lower magazine which should be thrown to "DC" when operating from a DC source and to "AC" when operating from an AC source. The Universal motors will give good speed regulation when operated on voltages of 100 - 135 volts, either AC or DC.

When operating SPS or SPF equipment from DC, by means of a converter, the amplifier may be connected to either projector converter as shown on the connection diagrams. However, it is recommended that a separate converter be used for the amplifier whenever possible.

* When the SPU Type Projector is equipped with external speed control, a switch marked "Standard - Variable" and a twist lock connector for the external speed control cable are mounted adjacent to the "AC-DC" switch above the lower magazine. An automatic mercury control switch is also mounted on the shutter shaft so as to short circuit the external speed control if at any time the speed should be brought to a dangerously low value (See Figures 23 and 24).

SECTION 6. CONNECTING AMPLIFIER TO POWER SUPPLY.

Caution! 1. Never connect the amplifier to direct current.

2. Connect speakers, as per Part 3, to the amplifier before turning "ON" amplifier.

Locate the amplifier on a suitable stand or table between the two projectors

* Instructions for type SPU motors (no longer available) apply only to older projectors.

at the most convenient height for easy manipulation of the controls. Insert the polarized plugs on the photo-electric cell cables from each projector into the receptacles provided at each end of the amplifier. Connect speakers as instructed in Section 3. Connect power cable to the nearest source of 110 - 115 volt, 50 or 60 cycle power, or to one of the projectors if the amplifier connection is shown on the proper projector power connection in Figures 1 to 16. When 110 - 125 volt DC is the power source, a separate DC to 60 cycle, 110 - 125 volt converter should be used for the amplifier. In this case the amplifier power cable is attached to the AC outlet on the converter.

* Figures 5, 7, 9 and 11 show the amplifier and SPU (Universal motor) projector connected to a 50 or 60 cycle power supply. Since it is also possible to operate the SPU projector from other frequencies, such as 25 and 40 cycles, it must be kept in mind that when such cases do occur the amplifier must not be connected to this source but to 50 or 60 cycle only. In these cases a frequency converter will be required for the amplifier which will convert the supply frequency to 50-60 cycles, 110 - 125 volts.

SECTION 7. PROJECTOR POWER CONTROLS. The pilot lamp is controlled by the switch shown at "B" which is adjacent to the projector motor control switch "C" in Figure 25.

The Mazda lamp house is equipped with a switch at "D" in Figure 25 which turns on the sound exciter lamp and the projection Mazda lamp simultaneously.

On the Arc lamp equipment the arc supply is controlled by the snap switch "C" in Figure 26, and the exciter lamp is controlled by a switch attached to the Arc lamp dowsler at "B" in Figure 26. See Section 9 for description of the Arc lamp adjustment and controls.

SECTION 8. LUBRICATION. While the projector bearings have been thoroughly lubricated before shipment, it is a good practice to lubricate all the points thoroughly, fill the intermittent movement (drained

before shipment) and the upper gear box to a point half-way up their respective sight glasses. The projector is equipped with bearings which normally require very little lubrication. No oil holes reach the spindles or shafts but the oil seeps through the bearings, thus filtering the oil and at the same time providing adequate lubrication. Oil tubes are provided for all bearings which would otherwise be inaccessible from the operating side and all oiling points are distinctly colored to facilitate locating. See Figure 25 or the oiling chart inside the operating side door for the location of all oiling points. The sight glass in the upper gear box may be made accessible for viewing by turning the framing knob. It is recommended that the oil be used sparingly at each lubricating period, but the frequency of lubrication should be adjusted in keeping with the amount of use. Lubrication of all bearings and inspection of the oil levels in the gear box and intermittent movement prior to each show (of 3 to 5 hours running time) will be entirely sufficient.

Where Arc Equipment is used, the motor oil cup should be supplied occasionally with a few drops of oil. The feed screw and associated bearings and gears are preferably left dry as a lubricant defeats its purpose by assisting in the accumulation of carbon, dust, etc. The lamp house should be cleaned after each show, and at this time the feed screw should be well brushed throughout its working length.

If the equipment is to be stored for any length of time, all bright metal parts which may be subject to rust, especially in more humid climates, should be well cleaned to remove all dirt and moisture and immediately thinly coated with a half and half mixture of clean petrolatum and Simplex Oil

SECTION 9. ARC EQUIPMENT ADJUSTMENTS.

The mirror is not adjustable in respect to focus as this distance was fixed in the design of the assembly. The top knob, "D" in Figure 26 adjusts the vertical angularity of the mirror and the side knob, "E", adjusts the horizontal angularity. The hand feed is controlled by the bell

crank handle at "F" which adjusts both carbons, and the crater focus is adjusted by the knob at "G" which also adjusts both carbons simultaneously. The bell crank handle is also used for striking the arc by turning the handle counter-clockwise. The friction adjustment on the feed screw drive is adjusted by the nut located within the focusing knob, "G", and it may be reached with a socket wrench. The automatic feed motor is regulated by the speed control rheostat at "H" in Figure 26.

The mirror is removed by bringing the negative carbon jaw as far away from the mirror as possible. Now swing the mirror horizontally by turning the knob "E" counter-clockwise so that the spring clip at the near side of the mirror can be brought back to clear the edge of the mirror. Hold the mirror by the center and withdraw from the spring clip. If the mirror cannot now be removed due to contact with the top turn the knob "D" counter-clockwise slowly, swinging the mirror holder back slightly until the mirror is free. Hold the mirror at all times and insure that it is free of any strains to avoid damage.

Replace the mirror in the reverse manner. The spring clip may be pulled back with a small screw driver and held by a finger just prior to setting the mirror back into its final position. Final adjustment may be made by striking the arc and running the machine without film (after insertion of lens).

The lamp normally burns approximately 21 amperes, using a 7 millimeter diameter negative and a 10 millimeter diameter positive. The numbers "7" and "10" are stamped upon the respective negative and positive jaws.

When it is desired to burn 30 amperes, it is required that the carbon jaws be changed to accommodate an 8 millimeter diameter negative and a 12 millimeter diameter positive. A shunt across the carbon feed motor series field must also be installed. These parts may be obtained upon order.

The arc rectifier (AC power supply) or the ballast resistance (when the power

supply is DC) should be adjusted accordingly.

To place the lamp in adjustment, turn the bell crank until the carbon jaws are approximately 4" apart. Insert a positive carbon with its face 3-5/8" from the center front face of the mirror. Insert a negative carbon with face 1/4" from positive carbon. Set focusing knob "I" in Figure 26 to mid-position. Loosen lens lock nut "J" in Figure 26 and insert lens. Strike arc, quickly withdraw by reversing the handle one full turn and let burn a short while to burn in, keeping the distance regulated by hand to approximately 1/4". Start motor, open dowser and focus the image of the aperture upon the screen by moving the lens back and forth and lock into position when the approximate location has been found. Fine adjustment for good definition may then be made with the focus adjusting knob.

Adjust the horizontal and vertical mirror controls and the arc focus adjustment until the light upon the screen is evenly centered with a minimum of color in the corners. Vary the hand feed adjustment either way until the arc burns quietly without undue turbulence. Under this condition adjust the arc imaging mirror on the outside of the door until the image of the bright edge of the positive is in line with one of the lines on the image card. The image of the end of the negative carbon should then align with the other line on the image card. If the negative image does not line up reasonably well, readjust by operating the carbon feed handle and the carbon focusing adjustment simultaneously until both line up. Then vary the focusing knob only for the best results on the screen and reset the image mirror so that the carbon images coincide with the lines on the image card. Shut down the machine, close dowser, stop motor and shut off arc. Without further disturbing the arc adjustment, open arc lamp door and adjust the carbon setter pointer, which is attached to the ash pan, so that its tip is in line with the tip of the positive carbon. This can then be used as a permanent guide for the future insertion and location of new carbons.

The automatic feed control is adjustable and should be set after a pair of new carbons have been well burned in and properly located. After adjusting the ballast resistance or rectifier for approximately the right current, the feed regulator may then be adjusted so that the rate of feed holds the carbon image on the lines of the image cards.

Ordinarily the mirrors may be easily cleaned without removal from the lamp house. Use a clean, soft cloth with clean, water. Mild soap or Bon Ami is also satisfactory where a more thorough job is required. Soap, soap powders and cleaners which contain abrasives must be avoided.

SECTION 10. MAZDA EQUIPMENT ADJUSTMENTS.

The Mazda lamp house is adjusted at the factory for use with the 1000 watt and 1500 watt, 110 - 125 volt Mazda lamps. If adjustments should be required at any time, they may be quickly made by removing the side cover (remove thumb nuts at "E" in Figure 25). The vertical adjustment of the lamp is made by raising the lamp socket after slightly releasing the clamp screw at "F" in Figure 25. Since the plane of the filaments is set at the proper focal distance from the aperture. Loosen the clamp screws at "L", Figure 25 to adjust focal distance. The side adjustments may be made by releasing the two long hexagonal headed screws located on the lower front of the lamp house, or if the lamp is attached to the projector they may be reached from inside the projector (See "G" in Figure 25).

The mirror may be removed for cleaning by releasing the set screw immediately above the condenser and the top condenser retaining clip will then slide up to release the condenser. The mirror, lamp and condenser may be cleaned with a soft cloth and mild soap or Bon Ami. Do not use soap powders or cleaners which may scratch the glass surfaces.

Adjustments should be made with the lamp turned on and the machine running without film. Focus the lens on the aperture. Make sure that the plane of the filaments is at right angles to the optical

axis through the aperture center. Adjust the lamp vertically and sideways for the most even distribution of light on the screen.

SECTION 11. LENSES AND LINING UP PROCEDURE. The lens holder of this projector will accommodate the 2-25/32" diameter of the Series 2 type lenses. An adapter is provided to accommodate the smaller 2-1/32" diameter of the Series 1 type. A projection table showing the size of screen images at different distances with lenses of different focal lengths is given on a rear page of this book. When the projector is used for portable work under varying conditions, considerable convenience will be found when the kit contains several sets of lenses of assorted focal lengths.

When ready to insert the lens in the lens holder, release the lens clamp and insert lens with the back toward the film. An approximate focus may be found without the use of film by focusing on the edge of the aperture. After film is inserted, the focus may be refined by hand or by use of the focusing knob. Keep the lens clamp tightened at all times when not adjusting by hand to avoid accidental displacement of the lens and the consequent damage.

Cleanliness of the lenses is important if the most efficient transmission is to be obtained. Use only lens tissue or soft lens cloths for polishing.

SECTION 12. THREADING. A pilot lamp has been provided just above the gate and is controlled by the pilot lamp switch located just above the motor switch. This lamp serves to facilitate threading and when the gate is open light is reflected through the aperture and film to facilitate the locating of the film in the frame at the aperture.

Before threading the film into the projector, set the framing knob at a central position and set the intermittent by turning the projector over by hand (use knob located at "H" in Figure 25) until the intermittent sprocket turns and then stop turning just as the sprocket stops. Place the full reel in the upper magazine with the free end to the left (emulsion

side toward the lamp house) and pull down about 5 feet. Open the light shield, gate and pad rollers and place an empty reel in the lower magazine. Thread the film around the sprockets, through the gate and around the sound system sprockets as shown in Figure 25 or on the instruction sheet located inside the projector door. Adjust a single frame over the aperture so that it approximately registers there-with and close the gate. Close the pad rollers on the sprockets after forming the loops as shown, working from the top of the projector downward. Attach the free end to the take-up reel and pull up tight in a clockwise direction. Also take up slack in upper magazine so that no slack film is located between the reel and the top sprocket. When the film is correctly threaded, proper synchronization will be obtained between the projected picture and the sound response, inasmuch as the correct length of film is then provided between the picture projection aperture and the sound reproducer scanning beam.

Inspect the sprockets and make sure that the teeth properly engage the film sprocket holes and that all pad rollers are closed. The leader should now be run down by starting the motor and running a few feet down until the figure 5 appears at the aperture. The projector is now ready for operation and normal operation may be resumed by lighting the projection lamp, starting motor and opening the dower. If it is a trial run for testing focus and sound, the focus should be sharpened while on the titles and the sound volume may be adjusted at the amplifier.

SECTION 13. FIRE SHUTTER SAFETY TRIP. In addition to the governor controlled fire shutter which opens when the machine speed has risen to approximately two-thirds normal, an additional safety device has been incorporated which trips the fire shutter closed whenever the loop between the upper feed sprocket and the film gate exceeds a certain amount. This excessive loop will form whenever the film breaks at or adjacent to the aperture above the intermittent sprocket. This loop trip is shown at "I" in Figure 25 and the trip engagement with the fire shutter control

is shown at "E" in Figure 28. Whenever the fire shutter is tripped by this safety device, it is necessary to stop the motor and bring the projector to a full stop. The trip is then automatically reset and the fire shutter will open normally when the motor is again started.

PART 2

INSTRUCTIONS FOR REPLACEMENT OF PARTS AND MAINTENANCE

SECTION 14. LUBRICATION. As previously recommended, it is highly desirable that only genuine Simplex oil be used in the bearings of this projector. Simplex oil not only has the correct viscosity for the bearings but also a flatness of viscosity which insures little change between winter and summer. Furthermore, it is compounded with corrosion resistance inhibitors and film strength elevators which reduce corrosion and wear to a minimum. It is not advisable to mix other oils, either heavier or thinner, with Simplex oil as their constituents may not be chemically compatible and acid forming or sludge forming may result which will either aggravate corrosion or impede the flow of the oil into the bearings.

Do not neglect to occasionally oil the upper magazine spindle at the oil cup provided.

Use only clean oil. Keep all containers tightly sealed from exposure to air or dust and free of water due to condensation. Never open a chilled container in a warm room. Wait until it has warmed to room temperature. Occasionally clean the oil cans by washing out with carbon tetrachloride and rinsing with clean oil.

* The motors on SPU type projectors ordinarily do not require attention oftener than once a year, assuming that they have seen heavy service during this period. At this time the gear box ("B" in Figure 28) should be checked and fresh grease added. The filling screw (painted red) may be located by removing the lower magazine (remove the four screws visible in Figure 26). Fill with the light gear grease commonly used for oscillating elec-

tric fans. It may be obtained from your nearest Simplex agency.

SECTION 15. CLEANING. Before each show the film gate and shoes at the projector aperture, and the film shoes at the sound aperture, should be wiped free of dirt and oil which has collected from the film. Occasionally all sprockets and pad rollers should be brushed with a small brush (a cheap tooth brush is satisfactory) dipped in carbon tetrachloride and the other parts wiped clean of accumulated dust and film dirt.

The sound optical system should have the lenses at each end of the lens tube cleaned occasionally with a piece of soft lens tissue wrapped around the end of a toothpick. These points should be immediately inspected for dirt should a noticeable depreciation in sound volume take place over a short period of time. The exciter lamp and the photo-electric cell should also be kept free from exterior discoloration due to dirt.

Occasionally the fire valves (shown at "P" in Figure 26) should be removed and cleaned free of film dirt and oil, thus eliminating possible damage to film and insuring that they will function efficiently in snuffing out fire from the magazines.

SECTION 16. REMOVING FILM GATE AND COMPONENTS. Remove shutter guard. Remove screw located at "N" and the screw within the film guide stud at "O" in Figure 26. The film gate may now be withdrawn.

The aperture plate and track assembly is normally supplied to properly mask sound film. It may also be obtained in the full width for silent film only. A special gate with a special slip-in type aperture for use with either sound or silent film may be supplied upon order. After the film gate is removed, the method of changing the aperture, tracks, shoes, etc. will be obvious to anyone without special instruction.

When assembling new film shoes on the film gate door, or when adjusting the gate tension, care must be taken not to screw the tension adjusting screw too far in

* Instructions for type SPU motors (no longer available) apply only to older projectors.

so that the under side of the spring contacts the cross bar, thereby locking the shoes. The shoes now will not give when the gate is closed. Not only is there danger of damaging the gate, but if an attempt is made to run film under this condition the excessive tension will be detrimental to the film and intermittent movement.

SECTION 17. REMOVING SHUTTER GUARD. Remove the screw at the bottom of the guard, near the tension sprocket, and the screw just back of the light hole (below the pilot lamp). Grasp guard and pull directly out.

SECTION 18. SHUTTER ADJUSTMENT. The shutter is clamped by means of two hub clamp screws to a collar that is retained on the shutter shaft by a set screw which engages a slot in the shaft.

To adjust the shutter for proper timing with the intermittent movement, loosen the two clamp screws on the shutter so that the shutter may be turned easily on the stationary shaft. Turn the projector over by hand in the normal direction until the intermittent sprocket stops moving. Then continue to slowly turn, and stop when the sprocket tends to move again. The loose shutter may then be turned, without disturbing the projector, until the heads of the two clamp screws are available and the bottom of the nearest blade just starts to cut across the aperture. Tighten the clamp screws securely.

To further check the adjustment, a film with plenty of titles should now be run. Observe the top right corner of the screen for travel ghost at the bottom of the letters and the top of the letters at the lower left corner of the screen. If travel ghost appears at the bottom of the letters, the machine should be stopped and the shutter loosened and turned very slightly in a clockwise direction (as viewed from the rear of the machine, looking toward the screen). If travel ghost appears at the top of the letters, the

shutter should be moved slightly in a counter-clockwise direction. After the adjustment is complete, the clamp screws should be securely tightened.

SECTION 19. REPLACING UPPER FEED SPROCKET. Loosen the sprocket stripper plate set screw and move stripper plate slightly to clear sprocket when it is pulled from the shaft. Remove sprocket retaining set screw and pull sprocket from shaft. Do not tap end of shaft to remove sprocket as the driving gear may be injured. Replace sprocket in the reverse manner. Before tightening the set screw, check to insure there is a slight amount of sprocket shaft end play. Reset the stripper plate before operating the projector.

SECTION 20. REPLACING LOWER HOLDBACK SPROCKET. Loosen lower holdback sprocket stripper plate set screw. Remove sprocket retaining set screw and pull sprocket from shaft while holding the stripper plate to one side. Replace sprocket in the reverse manner. Before tightening the sprocket set screw, check to insure there is a slight amount of sprocket shaft end play. Reset the stripper plate before operating the projector.

SECTION 21 REPLACING INTERMITTENT SPROCKET Remove the shutter guard. Frame the movement to the rear of the projector. Loosen sprocket stripper plate set screw and lower long end so that the sprocket may be pulled from the shaft without interference. Before removing the sprocket, note the amount of shaft end play and also the freeness of the projector by turning it over by hand. Remove sprocket retaining screw and pull sprocket from shaft.

Replace sprocket so that the word "SIMPLEX" is in the legible position as viewed from the operating side. Replace sprocket retaining screw and adjust end play to a minimum, consistent with a free turning machine, before the final tightening. Replace sprocket stripper plate before resuming operation.

SECTION 22. REPLACEMENT OF FILM LOOP

FRICION SPROCKET. Remove lock screw ("M" in Figure 26) and remove adjustment thumb nut, spring and collar. Note the pin in the face (felt side) of the collar and the key pin through the shaft. Do not permit these pins to become lost. Remove sprocket and felt pads. Clean pads in carbon tetrachloride and lubricate with Simplex oil.

Replace pads and sprocket in reverse manner. Locate key pin in shaft and put on the collar, locating small pin in hole in the felt. Assemble spring, thumb nut and lock screw. Adjust tension until it is smoothly and barely discernible. Too much tension will cause excessive flutter. Tighten the lock screw.

SECTION 23. REPLACING SOUND SPROCKET. Release stripper plate screw and withdraw stripper plate from projector. Remove sprocket retaining screw and sprocket. Replace by reversing the order. The sprocket should be assembled upon the shaft with the work "SIMPLEX" in the legible position from the operating side of the projector. Check the shaft end play and adjust to the minimum amount consistent with free running of the projector (try by hand) before tightening the sprocket retaining screw. Replace the stripper plate before operating the projector.

SECTION 24. PAD ROLLER REPLACEMENT & ADJUSTMENT. The top feed sprocket, sound sprocket and holdback sprocket pad roller arms are practically identical. The rollers may be replaced without removing the arm assembly by unscrewing the knurled thumb knobs (counter-clockwise).

The arm assemblies may be removed by releasing the set screw in the frame adjacent to the main pad roller bearing stud and withdrawing the entire assembly.

To reassemble in the projector, turn the bearing stud so that the spring rests against the flat on the stud and place the assembly in the projector. With a large screw driver, which will fit the slot in the main bearing stud, hold the stud in place and turn so that the rollers come up to the sprocket. With the other hand open the roller arm away from the sprocket, meanwhile keeping the main bearing stud from turning, and it will be noticed that

the arm will not stay open. Then continue to turn the main bearing stud with the screw driver until a position is found which will permit the arm to remain open and will hold in the closed position at the sprocket. At this point securely tighten the main bearing stud set screw.

The rollers should be adjusted so that they clear the sprocket rims by two thicknesses of film. This is accomplished by threading two thicknesses of film around the sprockets and then adjusting the round head spacing screw and its associated lock screw (threaded against each other in the same tapped hole) until the rollers just turn without appreciable drag against the film.

The pad roller assembly associated with intermittent sprocket and the film loop friction sprocket is a duplex assembly consisting of the main pad roller arm and bearing stud which carries the pad rollers for the friction sprocket and an auxiliary arm which carries the pad rollers for the intermittent sprocket.

The rollers for the film loop friction sprocket may be replaced by removing the shaft from the arm (to release inside roller) by loosening the shaft set screw and withdrawing the shaft. The outside rollers are released by unscrewing the knurled thumb knobs. The inside roller on the intermittent pad roller shaft is removed by releasing the set screw on the eccentric collar and removing the collar.

After the assembly of the rollers on the arms, the action of the intermittent arm in respect to the main arm is adjusted. With the tension sprocket roller shaft assembled in the main arm, tighten the set screw lightly. Press the intermittent rollers down until the eccentric collar hits the pin protruding from the main arm near the main bearing. If the intermittent roller arm does not remain down, release the set screw on the tension sprocket roller arm and readjust until the intermittent roller arm will remain down and spring up when raised from the pin by about 1/4". Tighten the set screw and place the assembly in the projector. Place the intermittent roller arm in the downward position and

adjust the main arm for opening and closing against the tension sprocket in the same manner as given for the upper feed sprocket, etc. arms. The clearance for two thicknesses of film is adjusted first on the tension sprocket by adjusting the round head spacer screw at the end of the main arm and its associated lock screw. When this is satisfactory, the clearance to the intermittent sprocket is adjusted by releasing the set screw on the eccentric collar and turning this collar until the pad rollers nicely clear the intermittent sprocket by two thicknesses of film. The set screw is then tightened securely.

SECTION 25. INTERMITTENT MOVEMENT. We do not recommend that repairs or adjustments be attempted upon the intermittent movement other than the changing of the intermittent sprocket. The nearest service station will promptly and economically make all necessary repairs with a precision that cannot be approached by other means.

The intermittent movement may be removed by removing the 4 screws shown at "S" in Figure 27. The movement is then lowered so that it may be brought out on the operating side of the projector.

When reassembling the movement into the projector, care must be observed when meshing the flywheel gear with the oblique shaft gear. After the movement is approximately located, insert the four retaining screws and tighten sufficiently to hold the movement in place and yet permit it to move sideways. The flywheel gear should then be brought into tight mesh with the oblique shaft gear and lightly held while the top and bottom screws on the right side are tightened fairly tight. Check the back lash and readjust if necessary to obtain the minimum amount consistent with free turning of the machine. Lightly tighten the top and bottom screws at the left side and again check for tightness. Tighten all four screws securely when the adjustment has been satisfactorily completed.

After the assembly has been completed, the shutter timing must be checked to insure that the shutter is in phase with

the intermittent sprocket. (See Section 19.)

The movement may be drained of oil by removing the screw at "D", Figure 27.

SECTION 26. FRAMING TENSION. The knob and shaft controlling the framing is provided with a friction device which provides sufficient friction to prevent the framing from shifting from a set point. This adjustment is made by a self-locking nut on the end of the shaft ("A" in Figure 28). Turning the nut clockwise will increase the tension.

SECTION 27. TAKE-UP TENSION ADJUSTMENT. The take-up tension of the lower reel is adjusted by holding lever "D" in Figure 28, which is attached to the adjusting nut, and turning the lower reel spindle from the operating side of the projector. Turning the spindle clockwise increases the tension.

To correctly adjust the tension, loosen the tension several turns and place on the take-up spindle a full reel of film of the largest size normally used. Alternately start the motor and adjust the tension to a point where upon starting the motor the heavy reel will start to slowly turn and gradually accelerate to full speed. Since the tension provides a torque sufficient to bring a fully loaded reel up to speed, there is sufficient reserve to insure that a full reel will not slow down to a stop.

SECTION 28. MOTOR COUPLING. The motor coupling may be removed for replacement of the flexible material by removing the shaft retaining screws and lockwashers at either end. The coupling may then be slid along the shaft so that the flexible element may be withdrawn and replaced. At this time it is well to check the alignment of the shafts with a short straight edge.

The AC motors are adjustable vertically at the four corner mounting springs. The holes in the lower ends of the springs are slotted. Slots are provided in the motor base for horizontal adjustment.

The DC (Universal) motors are clamped

and hold by a clamp screw ("C" in Figure 28). Horizontal alignment is accomplished by releasing this screw and turning the motor either way. The vertical adjustment is accomplished by varying the adjustable support stud which is located on the bottom end of the motor.

SECTION 29. SOUND ALIGNING FLANGE. The sound aligning flange ("C" in Figure 29) has been adjusted at the factory and normally should not be disturbed as it controls the location of the sound track with respect to the optical system.

In case it has been disturbed for some reason, it may be set quickly and roughly by running a sound film and listening for sprocket hole or frame line noises. Turning the adjusting screw, located in the center of the front flange, clockwise will bring in the sprocket hole noise, and turning the screw counter-clockwise will bring in the framing line noise. More refined adjustments may be made by using one of the standard buzz track test reels which has a 300 cycle tone on the picture side of the track and a 1000 cycle tone on the sprocket hole side. When properly adjusted, neither note will be heard.

The inside flange should move freely under its slight spring tension, keeping the guiding edge of the film against the outside flange at all times.

When the flanges have suffered severe wear, they may be replaced or rotated 180° to present a fresh wearing face. Remove the adjustment screw and the outside flange will pull off the shaft. Note that the end is keyed to prevent turning. The inside flange is connected to a small lever which extends to the right of the flange where it is loosely fastened to the frame by another screw. When this latter screw and stop nut is removed, the inner flange may then be removed. The small spring is the inner flange thrust spring and the large spring the adjustment tension spring. When reassembling the flanges with the thrust spring, care must be taken to insure that the inner flange is free at all times.

SECTION 30 SOUND ROLLER. The sound roller ("A" in Figure 29) associated with the

sound system may be replaced by releasing the collar set screw located at the opposite end of the shaft and removing the collar. When replacing the roller and shaft, end play should be adjusted to the minimum consistent with free turning.

SECTION 31. EXCITER LAMP ADJUSTMENT. The exciter lamp assembly is a removable unit which permits prefocusing of the exciter lamp. At least one spare exciter lamp socket should always be on hand with an exciter lamp set up and prefocused, ready for immediate use.

To remove the assembly from the projector, grasp the base and pull directly outward. Loosen the clamp nut ("B" in Figure 29) and insert lamp with the base prongs in the slots provided. Push lamp down against contact spring and tighten the clamp screw slightly.

Replace the assembly in the projector, pushing it in as far as it will go. Remove the photo-electric cell shield by pulling it directly outward. Light the exciter lamp and a bright oval of light will be seen on the photo-electric cell cathode plate. Loosen the exciter lamp clamp screw and push it up or down until the oval spot on the cell cathode is bisected by the anode rod. At this point tighten the clamp screw sufficiently to hold the lamp in its adjusted position.

SECTION 32. SOUND OPTICAL SYSTEM. The optical system has been adjusted at the factory and, except for accidental damage or rough handling, there should be no reason for further adjustments.

The azimuth adjustment is made by hand. Release the clamp screw "D" in Figure 29 and turn the lens barrel either way to adjust. If the azimuth is badly out of adjustment it may be necessary to also loosen clamp screw "E" in order to be able to turn the barrel sufficiently. The focusing adjustment is made by releasing the clamp screw "D" in Figure 29 and turning the focusing adjustment thumb screw which is located directly behind the lens barrel (near the film end).

A good focus may be obtained by threading five or six feet of 9,000 cycle

film into the projector, with the emulsion side toward the lamp house at the film gate. Remove the photo-electric cell and insert in its place a clean white paper or card, held vertically. The projector is now turned, by means of the hand knob, slowly and carefully in a counter-clockwise direction, while at the same time carefully watching the screen set up in place of the photo-electric cell. If the optical system is correctly adjusted, a pronounced blinking in and out of one dark line and one light space, due to the lines on the 9,000 cycle film, should be observed. This blinking effect should not appear to travel up or down.

If this effect is not obtained with the present setting, loosen the focusing adjustment clamp screw and rotate the knurled focusing thumb screw in either direction until the proper blinking effect is obtained.

SECTION 33. PHOTO-ELECTRIC CELL. There are no adjustments pertaining to the photo-electric cell or its mounting. It is simply and easily removed by removing the photo-electric cell shield (pull directly outward) and then pulling the cell directly outward. When replacing the cell, it should be turned so that the cathode plate faces the exciter lamp and optical assembly. Push back as far as it will go before replacing the shield.

Note that the photo-electric cell shield has a locating notch at the open end and a hole for the light beam from the optical system. When replacing the shield, turn the light hole toward the optical system and push the shield well back, turning slightly to engage the aligning notch.

PRACTICAL PROJECTOR HINTS

SECTION 34. POOR DEFINITION-caused by:

1. Lens not correctly focused - Move lens focusing carriage to center of travel. Push lens into approximate focus. Lock lens and focus accurately with focusing knob.
2. Lens in backwards - High grade lenses are usually marked "front" and "back" or carry the manufacturer's name at the front. See that lenses are inserted

accurately with "front" toward the screen.

3. Dirty lens - Clean lens carefully with lens tissue.
4. Oil on lens - See 3.
5. Lens combinations improperly assembled - When disassembling lens for cleaning, the elements should be laid out in a row in the order in which they are removed from the lens barrel. A good rule to remember is that all major convexes point toward the screen when assembling projection lenses.
6. Buckled Film - Buckled film is usually caused by having been run on projectors not equipped with rear shutters due to the excessive heat from the lamp. This effect is observed on the screen as an in and out of focus effect, more particularly towards the center of the screen. The remedy for this is to obtain a new print from the film exchange.
7. Travel Ghost-Poor definition is sometimes caused by the revolving shutter not being accurately synchronized with the intermittent movement. The remedy is to set the shutter correctly.
8. Imperfect print lacking sharpness - It is impossible to focus sharply a print of this character.

PICTURE JUMP

1. Prints made on improperly registering negative or printers-Obtain new print.
2. Damaged perforations - Remove damaged section or obtain new print.
3. Loss of upper or lower loop, causing film to draw taut at either upper or lower end of gate - Increase loop size to proper length. See Figure 25.
4. Unprocessed film, causing emulsion to gather on the tension shoes and film guides - Use only film that has been processed. Keep film guides and tension shoes clean, using only soft metals to remove accumulated emulsion. Never use sharp, hardened tools for this purpose.
5. Accumulation of wax or dirt on the intermittent sprocket-The intermittent and all sprockets should be kept scrupulously clean. Use stiff toothbrush with projector at rest.
6. Worn sprockets, tension shoes, pressure pads, film guides, etc. - All parts should be replaced when wear is evident.

7. Worn intermittent movement parts - Movement should be regularly inspected, and overhauled when necessary.
8. Vibration of entire equipment-Apparatus should be firmly secured on level floor.
9. Lens loose in mount, or loose elements in lens - See that lens is tightly assembled and solidly locked in lens holder.

POOR ILLUMINATION (Assuming illuminant is of satisfactory brilliancy for size picture projected.)

A - MAZDA -

1. Lamp blackened due to age-Replace with new lamp.
2. Use of higher voltage lamp than voltage of current supply - Use lamp of correct voltage.
3. Improperly adjusted lamp.
4. Dirty condensers or mirrors - Mirrors and condensers should be scrupulously clean. Use lens tissue.
5. Dirty lens-See 3, "Poor Definition" .

B - ARC LAMP -

1. Dirty reflector - Reflector should be kept scrupulously clean with lens tissue.
2. Badly pitted reflector or deteriorated silver backing - Replace reflector.
3. Arc not in correct position with relation to projector aperture - See Arc Lamp Instructions.
4. Improper Length of arc gap - See Arc Lamp Instructions.
5. Reflected image of arc not properly covering aperture - Adjust reflector.

PART 3

INSTRUCTIONS FOR AMPLIFIER & SPEAKER

CONNECTIONS AND ADJUSTMENTS

AMPLIFIER AND SPEAKER

1. *CAUTION: Always have speaker connected to amplifier before applying alternating current to the amplifier. NEVER connect the amplifier to DIRECT CURRENT.*
2. In many cases three-wire cable will be used for connecting the speaker to the amplifier, and when ordered will be supplied with the plugs properly connected

to attach one end to the amplifier, the other to the speaker. Where speaker wires are run in conduit, however, great care must be taken to see that the ends of the cables are properly polarized for connection into the amplifier and speaker; otherwise serious damage will result.

3. The speaker is equipped with a three-wire "Y" type polarized male plug. Looking at the face of this plug, it will be noted that the red wire from the speaker is connected to the 8 o'clock position, the light wire is connected to the 4 o'clock position and the black wire to the 12 o'clock position. The black and light wires are voice coil connections, while the black and red wires are field coil connections.

4. The amplifier is equipped with a three-wire "Y" type polarized female receptacle. It is better to run three different colored wires so that there is no possible chance of error. Connect a three-wire female "Y" type connector to the speaker end of the three wires from the conduit, ready to plug into speaker. This may be done without regard to polarization, except that if colored wires are used the red wire should be connected to the 4 o'clock position, the light wire to the 8 o'clock position and the black wire to the 12 o'clock position looking at the face of the female plug. At the amplifier end of the speaker cable a three-wire "Y" type male plug must be connected and great care must be used to make these connections accurately. If three colored wires have been used, connect the red wire to the 8 o'clock position, the light wire to the 4 o'clock position and the black wire to the 12 o'clock position. If three black wires have been used, it will be necessary to ring through from the speaker end and connect the 12 o'clock position wire from the speaker end to the 12 o'clock position wire at the amplifier end, the 8 o'clock position wire at the speaker end to the 4 o'clock position wire at the amplifier end and the 4 o'clock position wire at the speaker end to the 8 o'clock position at the amplifier end. All that is necessary now is to plug the male plug into the female speaker receptacle on the amplifier

and connect the speaker end to the speaker male plug.

5. The amplifier is designed to drive either one or two speakers, and in order that the impedance may be properly matched a switch is provided on the amplifier marked "1" and "2". If only a single speaker is used, this switch should be left permanently in the "1" position. If two speakers are used, the switch should be left permanently in the "2" position. If two speakers are required, they should be ordered special so that they may be supplied with the correct field windings and the field current provided by the amplifier used, thus effecting a slight saving in the cost of installation. Care must be taken to order the correct type of speakers for each installation.

6. When two speakers are used, the voice and field coils respectively of the two speakers are connected in parallel to the amplifier output and field supply. Connections may be made by means of the "Y" cable supplied. If three separate wires are used, care should be taken to connect like colored wires of the speakers together.

7. It would be difficult to set down any specific instructions with regard to the position or method of mounting the speaker and baffle at the screen location. This must be left to the judgement of the installation engineer.

NP-30 AMPLIFIER

8. The amplifier should be mounted on a suitable stand between and in front of the two projectors so that the various controls are easily accessible to the projectionist. A two-wire rubber covered cable will be found attached to the amplifier which is plugged into any available 105 - 125 volt AC, 50 or 60 cycle source **BUT NOT BEFORE THE SPEAKER IS CONNECTED.** If the average AC line voltage is between 100 - 110 volts, connect the red and black wire to the 105 volt terminal on the terminal strip under the chassis. For a 110 - 120 volt line, connect to the 118 volt terminal. For 120 - 130 volts, connect to the 130 volt terminal.

9. Plug the photo-electric cell leads from each projector into the two-wire receptacles provided at each end of the amplifier. Close amplifier line switch to "ON" position, thus placing amplifier in operation. Be sure that all tubes are firm in their sockets, and allow a few moments for the amplifier tubes to heat up. Adjust the volume control knob for adequate volume with the "High Frequency" and "Low Frequency" knobs set on "0".

10. Throw the "exciter lamp" switch on projector to the "ON" position, thus lighting exciter lamp. Take a wooden toothpick and quickly move it vertically up and down between sound optical system and sound aperture plate when a sharp click should be heard coming from the loud speakers. If a click is heard, sound reproducing circuits are completed. Repeat same procedure on second projector.

11. The NP-30 Amplifier is designed primarily for photo-electric cell operation, but a jack has been provided on the left end into which a high impedance microphone or phonograph pickup may be plugged. It is not possible, however, to use either of these attachments when reproducing sound from motion pictures; only one input can be used at a time - either motion picture, microphone or phonograph. Microphones may be procured from the International Projector Corporation or our authorized distributors, as may also the single or double turntables with pickups properly matched for the amplifier. These turntables may be either 78 or 33-1/3 RPM, or both, as desired.

12. The amplifier is an all AC operated three stage unit with a gain of 95 db to a 500 ohm load and with a power output of 15 to 20 watts. The frequency response is flat within 2 db from 50 to 10,000 cycles with the "HF" and "LF" control knobs set on "0". The volume control provided does not affect the frequency response characteristic of the amplifier, and is electrically and mechanically quiet in operation.

13. "High Frequency" and "Low Frequency" control knobs are provided for independent

adjustment of the high and low end response respectively. When both are set on "0", the response is essentially flat as pointed out above. Clockwise rotation increases the response, whereas counter-clockwise rotation decreases the response as referred to the "flat" characteristic. The setting of the knobs will be determined by the acoustics of the auditorium. Therefore, with the volume control set for adequate level, adjust one or both knobs to obtain highest quality reproduction.

14. Provision is made for balancing photo-electric cell sensitivity by means of a screw driver control which adjusts the polarizing voltage of one of the photo-electric cells from 90 to 70 volts. The voltage for the other photo-electric cell input is fixed at 80 volts. This control is at the left-hand end of the amplifier and is marked "Projector A". In connection with this control where photo-electric cells do not have the same gain, insert the cell having the lower gain in the projector connected to "Projector B" receptacle. Balancing can best be accomplished by means of a power level indicator and an S.M.P.E. standard test reel of a length of 1000 cycle constant frequency film. However, where instruments and test films are not available, satisfactory results can be obtained by using two reels of some particular feature and switching back and forth while the projectors are running, turning the balancing control to the position where the output of the photo-electric cells of both projectors is matched.

15. Two speaker receptacles are provided, one three-wire "Y" type receptacle for stage speaker, one 5-prong receptacle to permit the use of a monitor speaker.

16. A toggle switch is incorporated to connect the speaker receptacles to either 500 or 250 ohm output so that either one or two speakers may be used.

17. The amplifier is designed to withstand reasonable overloads without impairing operation as ample safety factor is provided in oversized condensers and transformers.

18. Photo-electric cells are coupled thru

a low capacity photo-electric cell cable permanently connected to the projector. The cable is of special construction, obtaining minimum electrostatic capacity without introducing noise due to vibration. It is covered with a heavy jacket for maximum strength and wear and protection against moisture and oil.

19. The amplifier is properly fused with a 2 ampere plug fuse replaceable from the top of the chassis. FUSES OF GREATER CAPACITY SHOULD NOT BE USED.

20. Tubes used in the amplifier are as follows:

- 1 Type 6J7
- 1 Type 6SN7
- 2 Type 6L6
- 1 Type 5Z3

21. The speaker is extremely rugged in construction, and will handle the full rated output of the amplifier. The second speaker provides additional distribution.

SERVICE NOTES ON SOUND SYSTEM

NO SOUND:

1. If all filaments in amplifier tubes are not lighted:

- (a) AC supply plug may be out of receptacle or making poor contact.
- (b) Fuse on amplifier may be burned out or not making contact. Either replace fuse or screw in tightly. If fuse is blown, replace only once. If second fuse blows this is evidence of a short circuit or overload somewhere in the system and amplifier circuits should be carefully analyzed, calling service man for this purpose if necessary.
- (c) AC line switch not turned "ON" or defective.
- (d) Open circuit in primary of power transformer.

2. If all tubes light and no sound:

- (a) Remove microphone or phonograph pickup plug from jack. (No photo-electric cell reproduction may be obtained with either of these plugs in amplifier.)
- (b) Volume control knob improperly set or potentiometer defective.

- (c) Burned out exciter lamp. Replace with new lamp. (Extra prefocus lamps in prefocus sockets should be kept on hand at all times.)
- (d) Improperly adjusted exciter lamp.
- (e) Defective photo-electric cell. Replace with new cell.
- (f) Tubes not properly seated in tube sockets.
- (g) Defective tubes. Replace each tube separately with tube of known good quality.
- (h) Grid clip not attached to screen grid tube.
- (i) Scanning beam from optical system completely obstructed by foreign material in sound aperture plate.
- (j) Photo-electric cell cable not plugged into amplifier or making poor contact.
- (k) Speaker cable disconnected from amplifier.

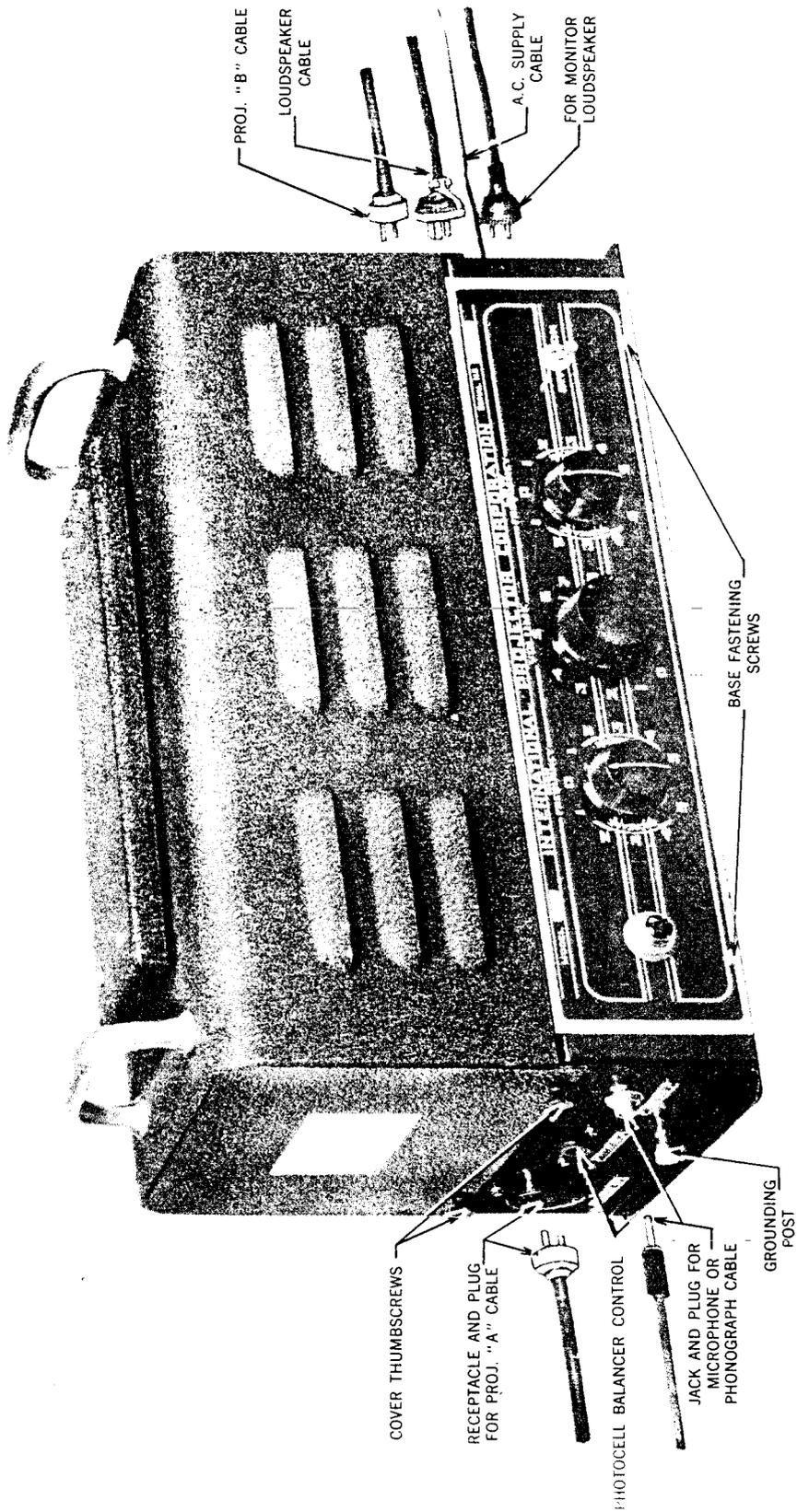
POOR QUALITY OF SOUND REPRODUCTION

- (a) Be sure film is properly threaded in projector (See Chart) and all pad rollers and tension shoes are properly closed, forming accurately sized loops.
- (b) Dirt or oil on surfaces of optical system lenses. Clean carefully with lens tissue, without removing optical system.
- (c) Optical system improperly focused.
- (d) Exciter lamp out of adjustment.
- (e) Defective exciter lamp. Replace with new lamp.
- (f) Defective or ionized photo-electric cell. Replace with new cell.
- (g) Defective tubes. Replace each tube separately with new tube until defective tube is located.
- (h) Poor connection between tube prongs and socket contacts. See that all tube prongs are kept clean.
- (i) Accumulation of dirt on sound sprocket, lateral guide roller, scanner drum or pad rollers. These parts should be kept scrupulously clean.
- (j) Worn or hooked sound sprockets. Replace with new sprockets.
- (k) Poorly recorded sound. This would be evidenced by satisfactory response from some reels and poor response from other reels, all run on the same projector.
- (l) Lack of high frequency response.

- "HF" control improperly set.
- (m) Lack of low frequency response. "LF" control improperly set.
- (n) Foreign material between pole and voice coil of speaker. This gap should be blown out occasionally with bellows being careful not to damage cone or voice coil.
- (o) Extremely low volume with amplifier gain set above normal. Open circuit in field coil of speaker, or poor contacts in speaker coupling line.
- (p) Speaker impedance matching switch set at position "1" when two speakers are being used, or position "2" when only one speaker is in use. This switch should be set at position "1" for one speaker or position "2" for two speakers.

HUM:

- (a) 60 cycle AC hum. It may be sometimes necessary to ground the amplifier, and a ground terminal is provided on the chassis for this purpose.
- (b) If hum persists after grounding, replace rectifier tube.
- (c) Defective amplifier tubes. Replace each tube separately with tube of known good quality.
- (d) Sprocket hole hum (96 cycle note). Lateral guide roller improperly adjusted or film improperly threaded in projector.
- (e) Frame line hum (24 cycle note). Lateral guide roller improperly adjusted defective sound print or film not threaded correctly in projector.
- (f) Hum is sometimes caused by defective connection between filament and support post of exciter lamp.
- (g) In phonograph record reproduction, unshielded lead between pickup and amplifier; the same applies to microphone cable.
- (h) Hum may also be caused by pickup from rotating electrical equipment or stray currents from other electrical equipment, such as transformers, etc., adjacent to the amplifier or projector. If grounding such equipment does not relieve the condition, it should be re-located away from the amplifier and projector.



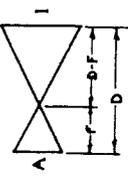
NP-30 AMPLIFIER

PROJECTION TABLE

SHOWING SIZE OF SCREEN IMAGES AT DIFFERENT DISTANCES WITH

LENSES OF DIFFERENT FOCAL LENGTH

SIZE OF PICTURE APERTURE: 0.825" X 0.600"



$IMAGE \text{ --- } I = \frac{A(D-F)}{F}$
 $LENS \text{ FOCUS --- } F = \frac{A \cdot D}{I + A}$
 $DISTANCE \text{ --- } D = \frac{A}{F(I+A)}$

CONVERT ALL DIMENSIONS TO INCHES

A = APERTURE - HEIGHT OR WIDTH
 F = LENS FOCUS
 D = DISTANCE FROM SCREEN TO APERTURE
 I = SCREEN IMAGE - HEIGHT OR WIDTH

E.F. IN.	25'	30'	35'	40'	45'	50'	55'	60'	65'	70'	75'	80'	85'	90'	95'	100'	105'	110'	115'	120'	125'	130'	135'	140'	145'	150'	155'	160'	165'	170'		
2"	7.5	8.9	10.4	11.9	13.4	14.9	16.5	17.9	19.5	20.9	22.5	24.0	25.5	27.0	28.5	30.0	31.5	33.0	34.5	36.0	37.5	39.0	40.5	42.0	43.5	45.0	46.5	48.0	49.5	51.0		
2 1/2"	10.2	12.3	14.4	16.4	18.4	20.5	22.6	24.6	26.6	28.6	30.7	32.7	34.7	36.7	38.7	40.7	42.7	44.7	46.7	48.7	50.7	52.7	54.7	56.7	58.7	60.7	62.7	64.7	66.7	68.7	70.7	
2 3/4"	6.5	7.9	9.2	10.6	11.9	13.2	14.6	15.9	17.2	18.5	19.9	21.2	22.6	23.9	25.2	26.5	27.8	29.1	30.5	31.8	33.2	34.5	35.8	37.1	38.4	39.7	41.0	42.3	43.6	44.9	46.2	
2 3/8"	9.2	10.9	12.7	14.6	16.4	18.2	20.1	21.9	23.6	25.5	27.4	29.2	31.1	32.9	34.7	36.6	38.4	40.2	42.1	43.9	45.7	47.5	49.3	51.1	52.9	54.7	56.5	58.3	60.1	61.9	63.7	
2 1/2"	9.9	7.1	8.3	9.6	10.7	11.9	13.1	14.4	15.6	16.7	17.9	19.1	20.3	21.5	22.7	23.9	25.1	26.4	27.6	28.8	30.0	31.2	32.4	33.6	34.8	36.0	37.2	38.4	39.6	40.8	42.0	
2 3/4"	8.1	9.8	11.4	13.1	14.7	16.4	18.1	19.7	21.4	23.0	24.6	26.3	27.9	29.5	31.1	32.7	34.3	35.9	37.5	39.1	40.7	42.3	43.9	45.5	47.1	48.7	50.3	51.9	53.5	55.1	56.7	
2 3/8"	5.4	6.5	7.5	8.7	9.7	10.8	11.9	13.0	14.1	15.2	16.3	17.4	18.5	19.6	20.6	21.7	22.8	23.9	25.0	26.1	27.2	28.3	29.4	30.5	31.6	32.7	33.8	34.9	36.0	37.1	38.2	
2 1/2"	7.4	8.9	10.4	12.0	13.5	14.9	16.4	17.9	19.4	20.9	22.4	23.9	25.4	26.9	28.4	29.9	31.4	32.9	34.4	35.9	37.4	38.9	40.4	41.9	43.4	44.9	46.4	47.9	49.4	50.9	52.4	
3"	4.9	5.9	6.9	8.0	8.9	9.9	10.9	11.8	12.9	13.9	14.9	15.9	16.8	17.8	18.9	19.9	20.8	21.8	22.8	23.8	24.8	25.8	26.8	27.8	28.8	29.8	30.8	31.8	32.8	33.8	34.8	
3 1/4"	6.8	8.2	9.6	10.9	12.3	13.6	15.0	16.4	17.7	19.1	20.6	21.9	23.3	24.6	26.0	27.4	28.7	30.1	31.4	32.7	34.1	35.4	36.7	38.0	39.3	40.6	41.9	43.2	44.5	45.8	47.1	48.4
3 1/2"	4.5	5.5	6.4	7.3	8.2	9.1	10.0	11.0	11.9	12.8	13.7	14.7	15.6	16.5	17.4	18.4	19.3	20.2	21.1	22.0	22.9	23.8	24.7	25.6	26.5	27.4	28.3	29.2	30.1	31.0	31.9	32.8
3 3/4"	6.2	7.5	8.8	10.1	11.4	12.6	13.8	15.1	16.4	17.6	18.9	20.2	21.5	22.8	24.1	25.4	26.7	28.0	29.3	30.6	31.9	33.2	34.5	35.8	37.1	38.4	39.7	41.0	42.3	43.6	44.9	46.2
3 1/2"	4.2	5.1	5.9	6.8	7.8	8.5	9.3	10.2	11.1	11.9	12.8	13.6	14.5	15.4	16.2	17.0	17.9	18.8	19.6	20.5	21.4	22.2	23.0	23.9	24.8	25.6	26.5	27.3	28.2	29.0	29.8	30.6
3 3/8"	5.6	7.0	8.2	9.3	10.5	11.7	12.9	14.1	15.3	16.4	17.6	18.8	20.0	21.2	22.3	23.5	24.6	25.8	26.9	28.0	29.1	30.2	31.3	32.4	33.5	34.6	35.7	36.8	37.9	39.0	40.1	41.2
3 1/2"	3.9	4.7	5.5	6.3	7.1	7.9	8.7	9.5	10.4	11.1	11.9	12.7	13.5	14.3	15.1	15.9	16.7	17.5	18.3	19.1	19.9	20.8	21.6	22.5	23.3	24.1	24.9	25.7	26.5	27.3	28.1	28.9
3 3/4"	5.4	6.5	7.6	8.7	9.8	10.9	12.0	13.1	14.2	15.3	16.4	17.5	18.6	19.7	20.7	21.8	22.9	23.9	25.0	26.0	27.1	28.1	29.1	30.1	31.1	32.1	33.1	34.1	35.1	36.1	37.1	38.1
4"	3.7	4.4	5.2	5.9	6.7	7.4	8.1	8.8	9.6	10.4	11.1	11.9	12.7	13.5	14.2	14.9	15.7	16.4	17.2	17.9	18.7	19.5	20.2	21.0	21.7	22.4	23.1	23.8	24.5	25.2	25.9	26.6
4 1/4"	3.0	3.6	4.1	4.7	5.2	5.7	6.2	6.7	7.2	7.7	8.2	8.7	9.2	9.7	10.2	10.7	11.2	11.7	12.2	12.7	13.2	13.7	14.2	14.7	15.2	15.7	16.2	16.7	17.2	17.7	18.2	18.7
4 1/2"	3.5	4.2	4.9	5.6	6.3	7.0	7.7	8.4	9.1	9.8	10.5	11.2	11.9	12.6	13.3	14.0	14.7	15.4	16.1	16.8	17.5	18.2	18.9	19.6	20.3	21.0	21.7	22.4	23.1	23.8	24.5	25.2
4 3/4"	4.8	5.7	6.7	7.7	8.7	9.6	10.6	11.6	12.5	13.4	14.4	15.4	16.4	17.4	18.4	19.3	20.2	21.2	22.1	23.0	23.9	24.8	25.7	26.6	27.5	28.4	29.3	30.2	31.1	32.0	32.9	33.8
4 1/2"	3.5	3.9	4.6	5.3	6.0	6.6	7.3	7.9	8.5	9.2	9.8	10.6	11.3	11.9	12.6	13.3	13.9	14.6	15.3	15.9	16.5	17.2	17.9	18.6	19.2	19.9	20.6	21.2	21.9	22.6	23.2	23.8
4 3/8"	5.1	3.7	4.4	5.0	5.6	6.3	6.9	7.5	8.1	8.7	9.4	10.0	10.6	11.2	11.9	12.5	13.2	13.8	14.5	15.1	15.8	16.4	17.1	17.8	18.4	19.1	19.8	20.5	21.2	21.8	22.5	23.1
4 1/2"	4.3	5.1	6.0	6.9	7.8	8.6	9.5	10.3	11.2	12.0	12.9	13.8	14.7	15.6	16.4	17.3	18.2	19.0	19.9	20.8	21.7	22.6	23.4	24.3	25.2	26.0	26.9	27.7	28.6	29.4	30.3	31.1
5"	2.9	3.5	4.2	4.8	5.5	6.2	6.9	7.6	8.3	8.9	9.7	10.5	11.1	11.9	12.7	13.4	14.2	14.9	15.6	16.4	17.1	17.9	18.6	19.4	20.2	21.0	21.7	22.5	23.2	24.0	24.7	25.4
5 1/4"	4.1	4.9	5.7	6.5	7.4	8.2	9.0	9.8	10.6	11.4	12.2	13.0	13.8	14.6	15.4	16.2	17.0	17.8	18.6	19.4	20.2	21.0	21.8	22.6	23.4	24.2	25.0	25.8	26.6	27.4	28.2	29.0
5 1/2"	2.8	3.4	4.1	4.8	5.5	6.2	6.9	7.6	8.3	9.0	9.7	10.4	11.1	11.8	12.5	13.2	13.9	14.6	15.3	16.0	16.7	17.4	18.1	18.8	19.5	20.2	20.9	21.6	22.3	23.0	23.7	24.4
5 3/4"	3.9	4.6	5.4	6.2	7.0	7.8	8.6	9.4	10.1	10.9	11.7	12.5	13.3	14.1	14.8	15.6	16.4	17.2	18.0	18.8	19.5	20.3	21.1	21.9	22.6	23.4	24.2	25.0	25.8	26.6	27.4	28.2
6"	2.7	3.2	3.8	4.3	4.8	5.4	5.9	6.5	7.0	7.6	8.1	8.6	9.2	9.7	10.3	10.8	11.4	11.9	12.4	13.0	13.5	14.1	14.6	15.2	15.7	16.3	16.8	17.4	17.9	18.5	19.0	19.5
6 1/4"	3.7	4.4	5.2	5.9	6.7	7.4	8.3	8.9	9.7	10.5	11.1	11.9	12.7	13.4	14.2	14.9	15.6	16.4	17.1	17.9	18.6	19.4	20.2	21.0	21.8	22.6	23.4	24.2	25.0	25.8	26.6	27.4
6 1/2"	2.6	3.1	3.6	4.1	4.6	5.2	5.7	6.2	6.7	7.2	7.7	8.3	8.8	9.3	9.8	10.3	10.9	11.4	11.9	12.4	12.9	13.5	14.0	14.5	15.1	15.6	16.1	16.6	17.1	17.6	18.1	18.6
6 3/4"	3.5	4.2	4.9	5.7	6.4	7.1	7.8	8.5	9.3	10.0	10.7	11.4	12.1	12.8	13.5	14.2	14.9	15.6	16.4	17.1	17.8	18.5	19.2	19.9	20.6	21.3	22.0	22.7	23.4	24.1	24.8	25.5
7"	2.4	2.9	3.4	3.9	4.4	4.9	5.4	5.9	6.4	7.0	7.4	7.9	8.4	8.9	9.4	9.9	10.4	10.9	11.4	11.9	12.4	12.9	13.4	13.9	14.4	14.9	15.4	15.9	16.4	16.9	17.4	17.9
7 1/4"	3.4	4.0	4.7	5.4	6.1	6.8	7.5	8.2	8.9	9.6	10.0	10.9	11.6	12.3	13.0	13.6	14.3	15.0	15.7	16.4	17.1	17.8	18.4	19.1	19.8	20.5	21.2	21.8	22.5	23.3	24.0	
7 1/2"	2.3	2.8	3.3	3.8	4.3	4.7	5.2	5.7	6.2	6.7	7.1	7.5	8.1	8.6	9.0	9.5	10.0	10.4	10.9	11.4	11.9	12.4	12.9	13.3	13.8	14.3	14.8	15.3	15.8	16.3	16.8	17.3
7 3/4"	3.2	3.9	4.5	5.2	5.9	6.5	7.2	7.8	8.5	9.2	9.8	10.4	11.1	11.8	12.4	13.1	13.8	14.4	15.1	15.7	16.4	17.1	17.7	18.4	19.1	19.8	20.5	21.2	21.9	22.6	23.3	

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