



Photo Enlarger • **INSTRUCTIONS**



Models
250
331
347

FEDERAL MANUFACTURING & ENGINEERING CORP.

BROOKLYN 5, N. Y.

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The Figure headings in bold type, under to indicate the illustration in which

WHEN RE-ORDERING PARTS—PLEASE SPECIFY PART NUMBERS

Figure 1A

1. Cord protector and holder #1548.
2. Hexagon cap nuts 6-32 and baffle.
3. Socket 223-1.
4. Reflector spring #8686.
5. Top cover.
6. Parabolic reflector #1229.
7. Federal, G.E., or Westinghouse No. 211, or Wabash No. 10, opal enl. lamp.
8. Lamp Housing #1669-1.
9. Light distribution plate mounting clips and screws #1730 & 6/32 x 1/4 RH.
10. Light distribution plate of Models 331 and 347. Gr. with spot.
11. Thumb nuts #1658 and screws for condenser lens clamps.
12. Condenser lens of models 331 & 347.
13. Condenser lens and lamp housing holder #1650.

14. Upper and lower gate plates #1698.
15. Clamps #1511 and screws for mounting bellows to lower gate plate. 2-56x1/8 RH.
16. Bellows #1580 & spacer #1705.
17. Focusing mount #1501.
18. Square lens board #1670 for F6.3 & F4.5 lenses. #1671.
19. Front thumb screw for lens board. #1523.
20. Objective lens.

}	55 mm.
}	3-1/2" F6.3.
}	3-1/2" F4.5.
21. Red filter. #1545.
22. Shoulder screw #1559 and washer for red filter.
23. Focusing mount post #1506, Nut #1508 8-32x5/16 RH.
24. Stop screw 6-32x1/4 RH.
25. Microfocusing knob. #1579.
26. Enlarger arm. #1662.
27. Enlarger arm sleeve. #1365.
28. Clamping knob for upright post stud. #1253.
29. Clip for attachment cord. #1341.
30. Spring counter-balance. #1680.
31. Metal counter-balance tape.
32. Thumb screws for lamp housing. #1208.
33. Stops to prevent carrier from being inserted upside down.
34. Upright post. #1659.
35. Attachment stud for metal tape.
36. End link of metal tape.
37. Back thumb screws for lens board. #1522.
38. Attachment cord, switch and plug. #1585.

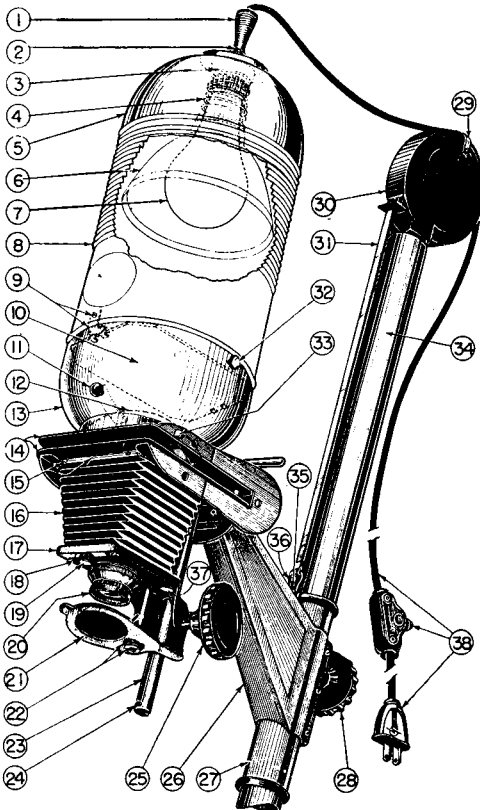


Figure 1A

General view of Models 331 and 347.

Figure 1B

39. End cap of lamp slide tube. #1221B.
40. Lamp slide tube. #1674.
41. Lamp slide tube bushing, #1224, washer and hex nut. #1223.
42. Thumb screw for slide tube. #1653.
43. Top air vent cover. #1232.
44. Top cover. #1652.
45. Socket mounting plate and bushing. 223-10.
46. Light distribution plate for Model 250. #1657.
47. Condenser lens mounting. #1535.
48. Condenser lenses, 4-1/2" x 5-1/2" focus. #1802.
49. Screws, spacers, #1656, and nuts for top air vent cover.
50. Focusing mount post hexagon nut. #1508.

Figure 2

56. Set screws for post base. 1/4-20x 7/16 RH.
57. Wing nuts 1/4-20, screws and washers 1/4-20x1-3/4 FH for post base. #1708.

LEGEND

which the Enlarger parts are listed, are the part is most prominently shown.

WHEN RE-ORDERING PARTS—PLEASE SPECIFY PART NUMBERS

Figure 3A

- 58. Pressure springs for negative carrier.
- 59. Condenser lens clamps for Models 331 and 347. #1673.

Figure 3B

- 60. Condenser lens clamps for Model 250. 6-32x5/16 Washer Hd. Screw. #1652.
- 61. Screws and lock washers for holding condenser lens and lamp housing holder in upper gate plate. 6-32-1/8 RH.
- 62. Condenser lens insulation spacer. #1655.

Figure 4

- 63. Metal lever for removing lower condenser lens.

Figure 5

- 64. Threaded bushing in lamp housing.

Figure 8

- 65. Indicating line on lens.

Figure 9

- 66. Back lens cell.
- 67. Front lens cell.

Figure 10

- 68. Negative Carrier. #1685.
- Upper section of negative carrier.
- 69. Negative plate sliding clamps.
- 70. Negative carrier hinge link and pivot pin
- 71. Negative plate holding lugs.
- 72. Glass negative plates. #1335.
- 73. Shoulder rivets for sliding clamps.
- 74. Pressure release lever and pivot.
- 75. Dustless metal negative plates.

	<i>with pins</i>	<i>without pins</i>
2-1/4x3-1/4	1348	
2-1/4x3-1/4	1347	
1-5/8x2-1/4	1346	
VP 1-5/8x2-1/2	1345	
1/2VP 1-1/4x1-5/8	1344	1527
35mm. 1-7/16x31/32	1334	1525
Bantam ... 1-1/2x1-1/32	1343	1576

- 76. Lower section of negative carrier.
- 77. Pressure release lifting pin.

Figure 11

- 78. Opening for Focusing Target in upper section of negative carrier.
- 79. Built-In Focusing Target and Magnification Indicator. #1675.
- 80. Masks. (Paper) VP—1560 1/2 UP #1562. 2-1/4x2-1/4. #1561. 35mm. #1563.

Figure 13

- 81. Four screws for holding bellows to focusing mount. 6-32x3/8 FH.
- 82. Tension springs. #1519. 6-32x1/4 RH.
- 83. Friction wheel and shaft. #1599.
- 84. Tension spring adjusting screws. #1519.

Figure 14

- 85. Post Base. 241-42.
- 86. Projected image of focusing target.
- 87. Baseboard. #1323.

Figure 15

- 88. 8-32 cap nuts holding swivel assembly #1694 to enlarger arm. 8-32x5/16 RH.
- 89. Swivel locking lever. #1934-2.
- 90. Calibrated swivel dial. #1933.
- 91. Indicating pointer plate. #1932.
- 92. Screws for assembling swivel to enlarger. 8-32x3/8 RH & 1/2 — 8-32 Hex Nuts.

Figure 17

- 93. Filter holder. #1724.
- 94. Shoulder screw #1242 and washer for attaching filter holder to red filter screw. #1559.

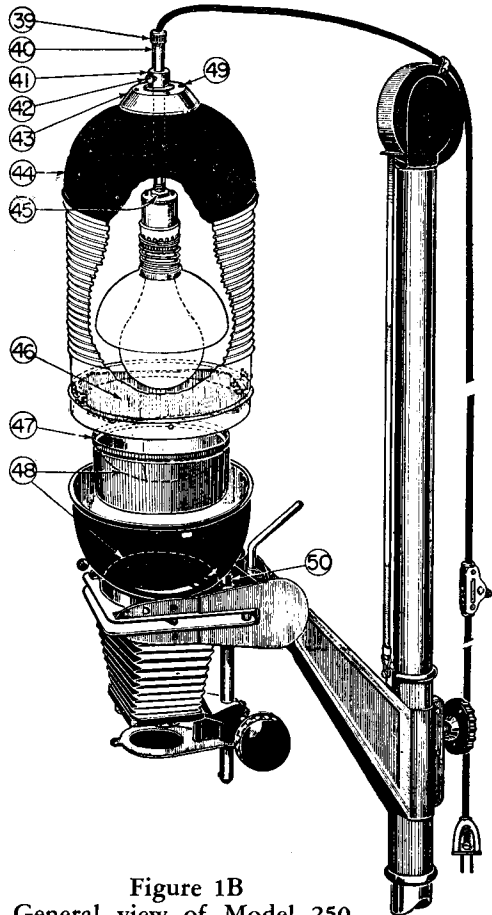


Figure 1B
General view of Model 250.

Instructions

Federal Enlargers, Models 331 and 347, are alike in construction except that the former is equipped with an $f:6.3$ lens, while the lens of the latter is rated at $f:4.5$.

Model 250 is also like Model 331 in construction but has the following additional features: double condenser system, adjustable sliding lamp and reflector. This enlarger also is equipped with a $f:4.5$ lens.

EXCEPT WHERE NOTED, THE INSTRUCTIONS IN THIS BOOK APPLY TO ALL MODELS.

When reference is made to additional information in other paragraphs, you should read the entire section following the paragraph referred to.

ASSEMBLING THE ENLARGER

1. Refer to the Legend and to the Figures to learn the names of the various parts of your Federal Enlarger.

2. Mount the enlarger assembly on the baseboard, by inserting the post (34) in the post base (85) which is bolted to the baseboard. If the post will not enter the hole in the base, loosen the two set screws (56). See Figure 2.

3. Be sure that you push the post all the way down; then tighten the set screws so that the post is held firmly in place. Tighten the four wing nuts (57) that hold the post base to the baseboard. Always be sure that the set screws and the wing nuts are tight, as they keep the enlarger from vibrating.

CLEANING THE LENSES

4. After mounting the enlarger on the baseboard, remove the two thumb screws (32) and take off the top cover (5) and the lamp housing (8).

A metal lever (63) is provided for

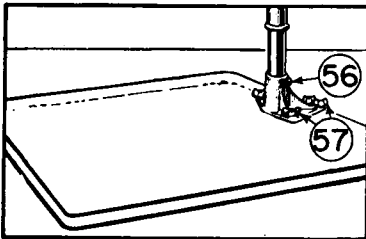


Figure 2

Tighten set screws (56) and wing nuts (57).

5a. MODELS 331 AND 347 ONLY: removing the condenser lens (12). Remove the clamps (59) slip the metal lever between the gate plates, and lift out the condenser lens, as in Figures 3A and 4. Clean the condenser lens thoroughly with a soft, lintless cloth, and place it, flat side down, in the condenser lens holder (13). Centralize the lens and clamp

PHOTOGRAPHIC CLEANLINESS

Keep your Federal Enlarger clean, and it will give you best results.

While assembling the enlarger, clean all the parts listed below, following the instructions in paragraphs 5a, 5b, 8, 15, 22, 36 and 60.

THE FOLLOWING PARTS SHOULD BE KEPT CLEAN AT ALL TIMES:

The numbers in parentheses are the part numbers as marked in the Legend and the Figures.

OBJECTIVE LENS (20).

GLASS NEGATIVE PLATES (72).

PARABOLIC REFLECTOR (6).

LIGHT DISTRIBUTION PLATE (10) or (46).

CONDENSER LENSES (12) or (48).

OPAL ENLARGING LAMP (7).

SMOOTH OPERATION

FOCUSING MOUNT (17) should be kept lubricated with fine oil to assure smooth focusing.

UPRIGHT POST (34) should be lubricated with vaseline occasionally. The enlarger should then be raised and lowered several times so that the vaseline lubricates the inside of the enlarger arm sleeve (27). Wipe off excess vaseline. The enlarger will slide up and down very easily.

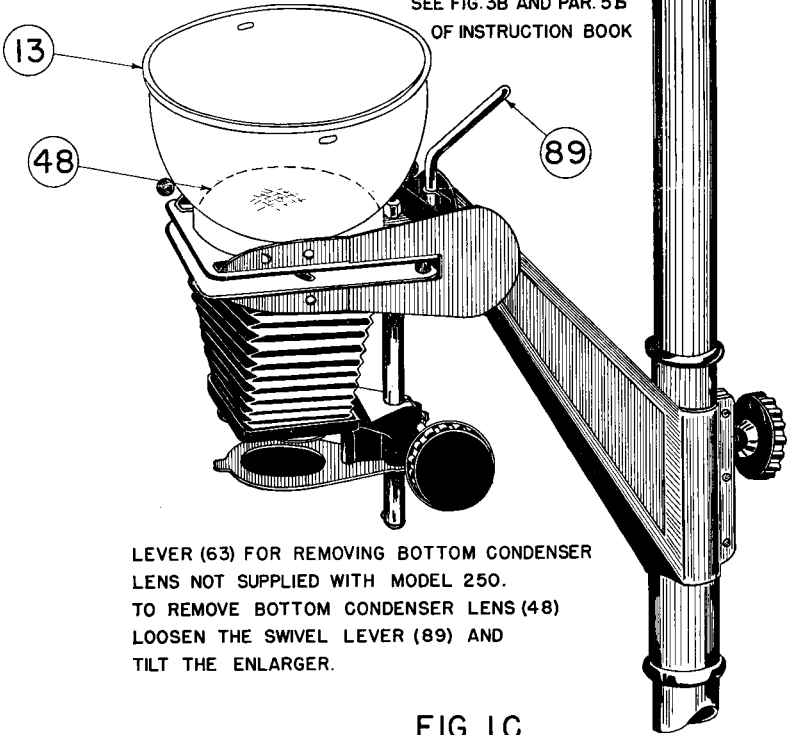
CALIBRATED SWIVEL. A drop of oil between the dial (90) and the indicator plate (91) will keep the swivel operating smoothly.

NOTE

DO NOT REMOVE TOP CONDENSER
LENS FROM THE CONDENSER
LENS MOUNTING (47)

FIRST PLACE THE
LOOSE CONDENSER
LENS (48) FLAT SIDE
DOWN IN THE BOTTOM
OF THE LAMP HOUSING
HOLDER (13)

THEN PLACE THE
CONDENSER LENS MOUNTING (47)
WITH LENS ATTACHED
(FLAT SIDE UP) OVER THE
FIRST CONDENSER LENS
AND CLAMP IN POSITION
SEE FIG. 3B AND PAR. 5b
OF INSTRUCTION BOOK



LEVER (63) FOR REMOVING BOTTOM CONDENSER
LENS NOT SUPPLIED WITH MODEL 250.
TO REMOVE BOTTOM CONDENSER LENS (48)
LOOSEN THE SWIVEL LEVER (89) AND
TILT THE ENLARGER.

FIG. 1C

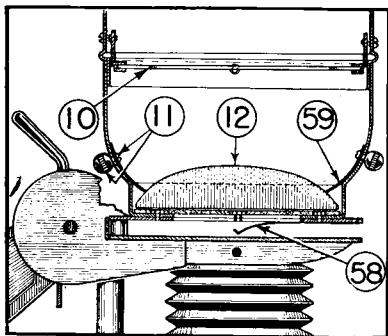


Figure 3A

Condenser lens assembly of Models 331 and 347

it in position with the two clamps, as in Figure 3A.

5b. MODEL 250—Clean the Condenser Lenses (48) thoroughly with a soft lintless cloth and place the unmounted Condenser flat side down in the Condenser Lens Holder. Put the Condenser Lens Spacer with the attached Condenser Lens flat side up as in fig. 3B. Do not remove the mounted lens from the Spacer Ring. Avoid getting finger prints on the Lenses. To clamp Condenser Lenses in place, loosen thumb nuts (11) on the front and back of Condenser Lens Holder and insert the forked ends of the Clamps (60) under the heads of the Screws (11). Press clamps down and tighten nuts.

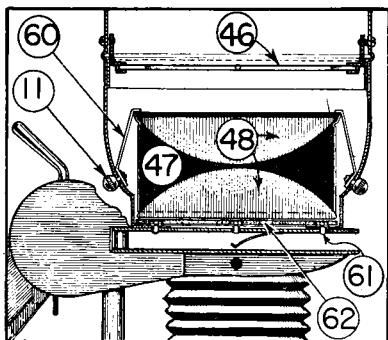


Figure 3B

Condenser lens assembly of Model 250.

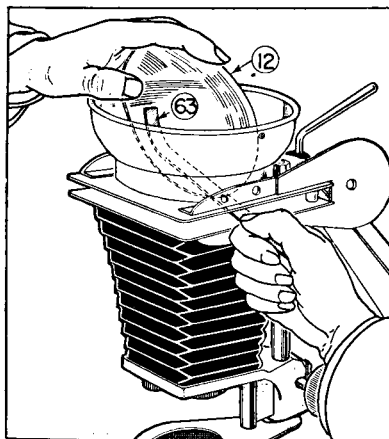


Figure 4

Metal lever (63) used for removing lower condenser lens.

ASSEMBLY OF ILLUMINATION SYSTEM

6. Clean the glass light-distribution plate (10 or 46) and insert it at the bottom of the lamp housing, where it is held in position by the two clips (9). These clips are mounted prong downward, as in Figures 1A and 5. Now replace the lamp housing and the two thumb screws (32).

7. The object of this glass plate is to improve the light distribution from the projection lamp. See paragraph 59a.

8. The inside reflecting surface of the parabolic reflector (6) has been chemically etched. Wash it carefully with soap and water but avoid touching it with your fingers.

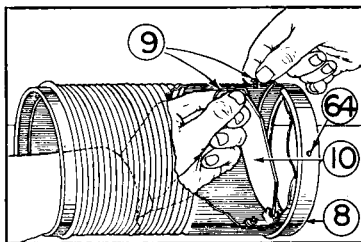


Figure 5

Light distribution plates (10) or (46) are held by clips (9). The best way to remove or replace the clips is shown above.

reflector and the spring (4) on the lamp and screw the lamp tightly into the socket.

9. The end of the spring against the socket must fit **OVER THE SOCKET**. See Figures 1A and 1B. This is most important.

10. Replace the top cover, the lamp and reflector, on the housing.

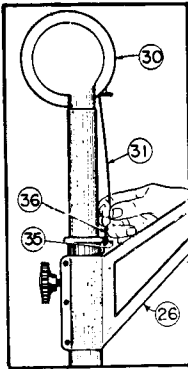


Figure 6
Never let tape snap back suddenly into case.

THE COUNTER-BALANCE

11. To assemble the counter-balance (30) push the mounting bracket of the counter-balance into the top of the post (34) so that it is in the position shown in Figure 6. Pull down the link (36) which is on the end of the metal tape, and hook it to the stud (35) on top of

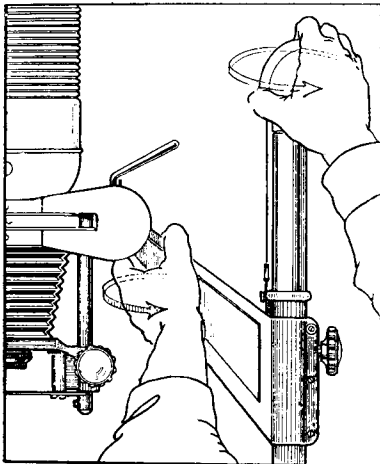


Figure 7
Turn the enlarger arm and counter-balance in same direction.

the enlarger arm as shown in that illustration.

12. Do not at any time pull down the counter-balance tape and allow it to snap back suddenly into the case. If you do, you will break the tape.

13. Never swing the enlarger from side to side when it is at the top of the post. Otherwise the metal tape will kink or break. To swing the enlarger when it is raised high, turn the counter-balance with one hand and turn the enlarger in the same direction with the other hand. See Figure 7.

14. The clip (29) on top of the counter-balance is for holding the electric attachment cord. Snap the cord under the clip as shown in Figure 1A.

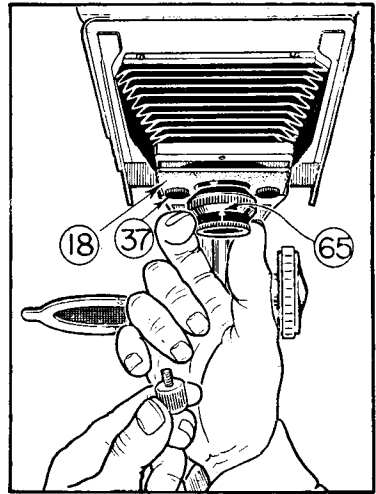


Figure 8

Insert the lens board into the focusing mount. Be sure the indicating line (65) of the lens barrel faces front.

THE OBJECTIVE LENS

15. Remove the objective lens (20) from its package. With soft tissue paper, remove any dust from the surfaces of the lens. Make sure that the front and back lens cells (66 and 67) are screwed tightly into the lens mount.

16. Turn the objective lens carefully into the square lens board. Turn the two thumb screws (37) partly

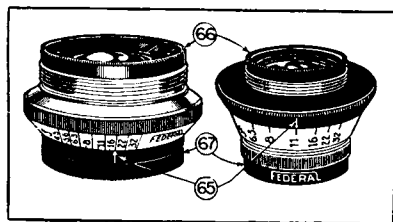


Figure 9

F:4.5 and F:6.3 lenses.

into the back two threaded holes in the bottom of the focusing mount; then place the lens board, with the lens attached, into the square cavity in the bottom of the focusing mount, so that the heads of the thumb screws extend over the back edge of the lens board. Be sure that the engraved indicating line (65) on the lens barrel faces toward the front, so that you can read the markings on the calibrated ring of the iris diaphragm. Then turn the front thumb screw (19) with the thick head, into the threaded hole in the center of the front edge of the focusing mount. Tighten all three thumb screws so that the lens board is firmly held in place. See Figures 8 and 1A.

17. The iris diaphragm of the lens, illustrated in Figure 9, is opened and closed by turning the engraved ring which is clearly marked with the speed rating of the lens for every position of the diaphragm. An easy way to see the calibrations on the ring while in the darkroom is to swing the red filter under the lens, snap on the enlarger light and hold a piece of white paper or a small pocket mirror over the red filter. The reflected light will illuminate the figures on the engraved ring.

18. Always be careful not to loosen the lens cells as you open and close the diaphragm.

THE NEGATIVE CARRIER

19. Federal Enlarger Models 250, 331 and 347 accommodate all negatives from 35 mm and smaller, up to $2\frac{1}{4}$ " x $3\frac{1}{4}$ ", and will enlarge equivalent sections of negatives up to $3\frac{1}{4}$ " x $4\frac{1}{4}$ ".

20. Open the negative carrier. The lower section (76) of the carrier has on it the pressure release lever (74). See Figure 10. The carrier must always be inserted between the gate plates (14) with the lower section DOWNWARD.

21. The glass plates (72) in both the upper and lower sections of the negative carrier are held in place by the sliding clamps (69). Pushing the sliding clamp, with your thumb in one direction, loosens the negative pressure plate; pushing in the other direction firmly clamps the plate.

22. The portion of each glass negative pressure plate which is over the opening in the carrier must be kept spotlessly clean, as every fingerprint or speck of dust will show in your enlargement. To clean these plates, dampen them with a wad of moist cotton and polish them dry with a piece of chamois skin. Use a fine camel's hair brush for removing dry dust particles. When replacing the plates, make sure that they are held firmly by the clamps, before using the negative carrier.

23. Select a good, sharp, clear negative. Place it, dull (emulsion)

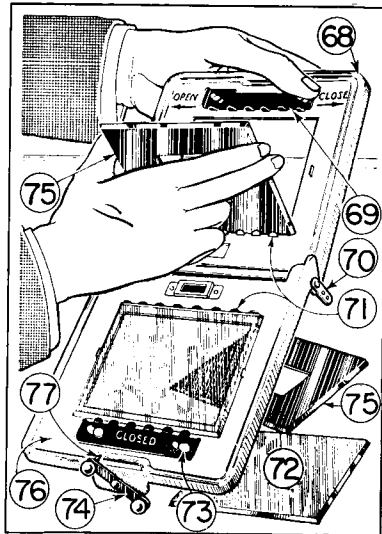


Figure 10

To change negative plates, slide the clamps (69).

side down, on the lower glass plate. If your negative is larger than the opening in the carrier, $2\frac{1}{4}'' \times 3\frac{1}{4}''$, place it so that the portion which you wish to enlarge is framed by the opening. If your negative is smaller than the opening, a mask (80) with a smaller opening must be used to frame it. The proper location of this mask is UNDER the upper glass pressure plate. See Figure 11.

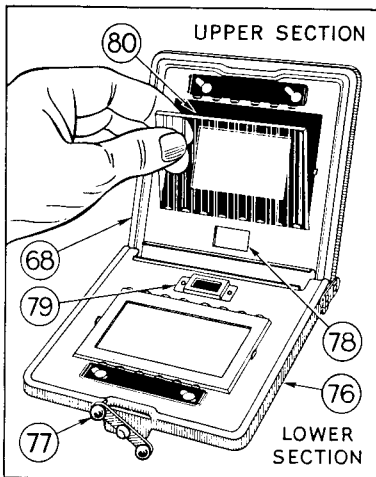


Figure 11

Important: Always insert the mask UNDER glass plate in the upper section of negative carrier.

24. Four masks are furnished as standard equipment with your Federal Enlarger. You can make your own masks, for other sizes, from opaque black paper. Masks must be cut to cover the open space between the negative and the opening in the negative carrier; so that no projected light, except that which must first

pass through the negative, can reach the sensitive bromide paper. You must have a mask for 35mm film, and any other film which is smaller than the opening in the carrier.

25. Close the negative carrier and insert it between the gate plates (14) making sure that the section having the pressure lever is DOWNWARD. Push the carrier ALL THE WAY BACK.

PRESSURE RELEASE LEVER

26. When using strip film, it is unnecessary to remove the carrier from the enlarger to change from one frame to another. Instead, turn the pressure release lever (74) to a vertical position, as in Figure 12. This spreads the plates apart so that film may slide through without scratching. Always turn the pressure lever BACK TO EITHER SIDE, as shown in the right half of Figure 12, so that the film is clamped BEFORE focusing or making an enlargement.

METAL NEGATIVE PLATES

27. Glass negative plates keep the negative absolutely flat while enlarging, and a flat field is necessary when using a fast lens. With large negatives, it is preferable to use glass plates, unless the lens is used at a small opening to increase the depth of focus, thus compensating for the slight warpage in the negative which occurs when using metal plates. But glass plates must be kept spotlessly clean, as every fingerprint and speck of dust will show in your enlargements.

28. Dustless metal negative plates (75) are desirable when working with smaller negatives such as 35mm, Bantam and Half Vest Pocket sizes. In these small sizes film warpage is minimized, and dustless metal plates, which are cut out in the center, have the advantage of remaining clean and dust-free, a most important consideration in making the great enlargements commonly produced from small films.

29. When using metal plates, never leave the enlarger lamp on

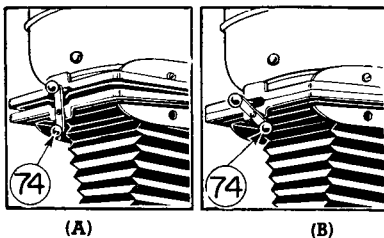


Figure 12

A. Vertical position: Plates open.
B. Swung to one side: Plates clamp.

except while focusing or making an exposure; even a little unnecessary heat may warp the negative and throw it out of focus. When using dustless metal plates in Model 250, keep the lamp at least half way up. 30. A pair of dustless metal plates for 35mm film is furnished as standard equipment with your Federal Enlarger. These plates have no pins to guide the film, so that they may be used to enlarge equivalent sections of larger film. Other size metal plates with or without pins are available at an extra charge. See page 23.

THE IMAGE SIZE

31. These Federal Enlargers will enlarge negatives from 1 time to over 8 times on the baseboard. This means that a 35mm negative can be blown up to as large as 8" x 12", with the 3½" lens which is supplied. With a 2" lens, 16 to 18 enlargements can be made on the baseboard. To make enlargements of 20 times and over, using the standard 3½" lens, see paragraphs 55 to 57.

32. When the enlarger is set in the 1 to 1 position, it may be used in place of a contact printer, as described in paragraph 58.

33. The size of the enlargement you make from a negative varies with the distance of the objective lens from the bromide paper. This distance is regulated by moving the enlarger up or down on its post.

34. To raise the enlarger, first loosen the knob (28). If you have attached the counter-balance tape correctly, the enlarger will move easily on the post. If the enlarger moves only with difficulty, refer back to paragraph 11. The upright post (34) should be lubricated with vaseline occasionally. See page 4.

35. After moving the enlarger, always tighten the knob (28) before focusing, and keep the knob tight while exposing. When the knob is locked, the gate plates are parallel with the baseboard.

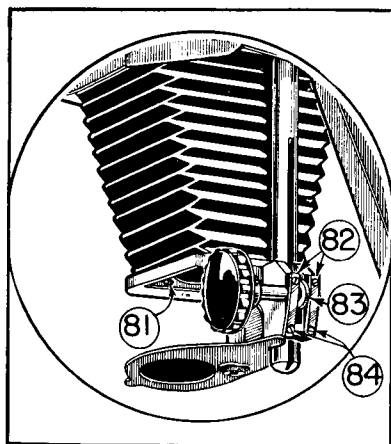


Figure 13
Focusing control.

THE FOCUSING MOUNT

36. The focusing mount (17) rides up and down the focusing mount post (23) as you turn the microfocusing knob (25). This knob should turn freely for accurate focusing. The freedom with which the knob moves is dependent upon the friction wheel (83) which runs in the groove of the focusing mount post. See Figures 1A and 13.

37. The traction between wheel and post is controlled by the screws (84) which tighten or loosen the tension springs (82). If the tension on the springs is too great, the knob will be hard to turn. If it is too little, the friction wheel will slip, and the focusing mount will not hold in focus. Tighten the screws so that the mount will ride easily without slipping. Put a drop of fine oil on the post, the friction wheel and the shaft, to keep the mount working easily and smoothly.

ACCURATE FOCUSING

38. Once you feel that you fully understand the foregoing instructions, you are ready to practice the actual technique of focusing.

39. Place the plug of the attachment cord in any 110 volt A.C. or D.C. receptacle. Turn the iris diaphragm of the objective lens wide

open, (to $f:6.3$ or $f:4.5$). Now darken the room, and snap the switch of the enlarger on.

40. The projected image of the negative will appear on the baseboard. Place a sheet of white paper, the size of the bromide paper you intend using, on the baseboard. The projected image will probably be unrecognizable, as you have not yet focused it.

41. Loosen the knob (28) and slide the enlarger up the post, so that the top of the lamp housing is almost level with the top of the post. See Figure 1B.

42. Now focus the lens by turning the microfocusing knob (25) slowly right or left. Watch the projected image of the negative carefully; when the detail or fine lines of the image are most distinct, the negative is in focus. Practice this several times; to get good enlargements, you must learn to focus accurately. For best results, focus with the diaphragm wide open.

43. After the image is in focus, remove the negative carrier from the enlarger. Leave the light on and examine the white light which is projected on your sheet of white paper. If there are any specks or shadows on the paper, or if you see an uneven distribution of the light, either the ground glass plate, the condenser lens, the lamp, the reflector or the objective lens is not clean. Before proceeding, refer to paragraphs 4-10.

44. If the light appears uneven, with a bright circle in the center, the reflector is not seated properly on the lamp, or the lamp may be off center.

45. The glass bulb of the enlarger lamp is sometimes mounted off center on the brass screw base; this causes the lamp to be off center when screwed into the socket. To test for this condition, raise the bellows not more than half way. If any shadow now appears in the corner of the projected beam, eliminate it by giving the top cover a quarter-turn.

BUILT-IN FOCUSING TARGET

46. Focusing accurately is essential to good enlarging. One of the best means of accurate focusing is the focusing target (79) which is built into the negative carrier.

47. The series of fine lines and other fine detail on this target makes focusing easy. The target is located between two glass plates, its emulsion side down toward the lens, and is so arranged that a negative placed on the pressure plate of the lower section of the carrier, emulsion side down, is on the same plane as the focusing target.

USING THE TARGET

48. Place the negative you wish to enlarge on the negative pressure plate of the lower section of the negative carrier, emulsion side down; close the negative carrier and insert it between the gate plates (14) and push it all the way back, then pull it about $1\frac{1}{2}$ " forward. In this position, the portion of the negative carrier holding the built-in target is directly over the lens. See Figure 14.

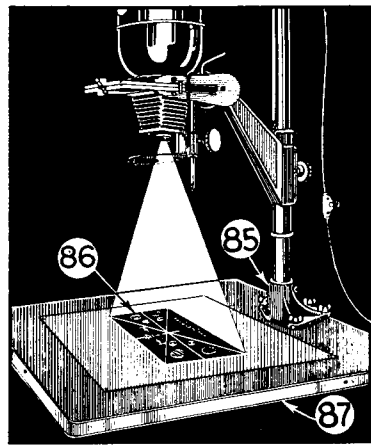


Figure 14

Pull the negative carrier out about $1\frac{1}{2}$ inches so that the focusing target is directly under the lens.

49. Raise the enlarger to the position which gives you the image size you desire, and lock the clamping knob (28). Turn the iris diaphragm

of the objective lens wide open, close down to $f.8$ or smaller, for greater depth of focus, when making exposure. Always make certain that the pressure lever (74) is in a CLOSED position BEFORE focusing. See paragraph 26 and Figure 12. Focus the image of the target carefully as described in paragraphs 38-42. If the carrier projects about $1\frac{1}{2}$ " , the image of the target will be in the center of the baseboard, as in Figure 14.

50. After you focus the image of the target most accurately, push the negative carrier all the way back. The negative is now in focus. Should you find that the enlargement is too small or too large, raise or lower the enlarger on the post, lock the clamping knob (28), then pull the negative carrier about $1\frac{1}{2}$ " out, and refocus on the target.

51. When you decide to change from one size enlargement to another, by moving the enlarger up or down on the post, you will have to refocus the enlarger in each new position.

52. The built-in focusing target will give most accurate results when glass negative pressure plates, or smaller sizes of dustless metal plates, are used in the negative carrier. When the larger sizes of dustless plates are used, and the film may be warped, focusing directly from the negative is absolutely necessary.

53. The target is for use only with such thin films as roll film, strip

film, cut film or film pack negatives, and not with thicker glass plate negatives.

54. To use the built-in target as a magnification indicator, see paragraphs 102-106.

FLOOR PROTECTION

55. It is easy to make enlargements of more than 8 times with the Federal Enlarger, using the standard $3\frac{1}{2}$ " lens. One method is to project over the table edge. To turn the enlarger, move the enlarger with one hand, simultaneously moving the counter-balance in the same direction with the other hand, as in Figure 7, so that you do not kink or break the metal tape. The baseboard of the enlarger is heavy enough to balance it in this position. To be sure that you do not accidentally tip it over, you may, if you wish, place a heavy object on the baseboard.

THE CALIBRATED SWIVEL

56. The calibrated swivel, with its engraved scale, illustrated in Figure 15, allows the head of the enlarger to be swung from vertical to a horizontal position, either left or right, and indicates the degree of the angle attained. When the locking lever (89) is loosened, and the enlarger head turned, the swivel will click into the (0°) vertical, and the (90°) horizontal positions, assuring perfect alignment without checking. Keep the locking lever (89) always in a closed position when using the enlarger. For ordinary use, always be sure the swivel is locked in the zero position.

HORIZONTAL PROJECTION

57. Horizontal projection is useful for making prints, such as photo murals, which are too large to be accommodated on the baseboard. In horizontal projection, the bromide paper is tacked to the wall or to a drawing board. The maximum size of the print, and the magnification that can be obtained, greatly exceed those of floor projection, and horizontal projection is more convenient. When in a horizontal position, the

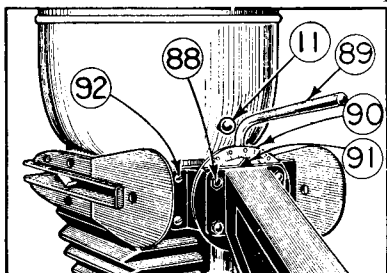


Figure 15

The calibrated swivel. Always keep the lever (89) locked when using the enlarger.

enlarger can also be used to project cut film transparencies. See Figure 16.

PROJECTION PRINTS

58. When the enlarger is lowered so that the negative carrier is about $14\frac{1}{2}$ " above the baseboard, the projected image will be the same size as that on the negative—a ratio of 1 to 1. In this position, the enlarger may be used in place of a contact printer. Using the enlarger in place of a contact printer, it is necessary to use bromide paper for the prints, as contact paper is too slow. Focus with the lens wide open, then step the lens down to about $f:16$ or the prints will come up too fast. Convenient paper holders for this work are available at your dealer.

THE ILLUMINATION SYSTEM

59a. The illumination systems of these enlargers are designed particularly to combine the advantages of condenser and diffused illumination. Best results will be obtained when the enlarger is used as illustrated in Figures 3A and 3B, which show the condenser lenses used with the glass light distribution plate (10 or 46). See paragraph 146.

59b. MODEL 250 ONLY: When the

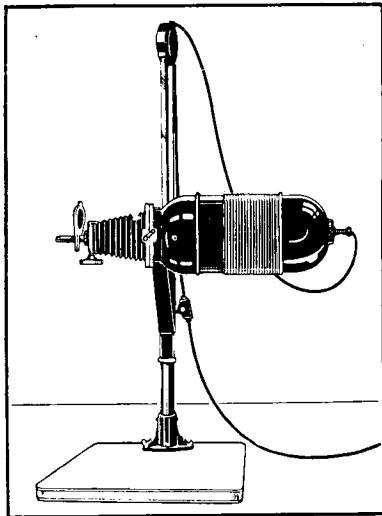


Figure 16
Horizontal projection.

double condenser system is used in the enlarger in combination with the standard $3\frac{1}{2}$ " lens, the lamp slide tube (40) may be lowered all the way down. When using lenses of other focal lengths, or when using inside frost or clear lamps in place of the opal lamp, the lamp slide tube must be adjusted until you get an even distribution of light.

ENLARGING LAMPS

60. This enlarger is designed to give best results when a Federal, Westinghouse, or General Electric No. 211, or a Wabash No. 10 opal enlarging lamp is used. These lamps consume about 75 watts.

61. The G.E. No. 211 lamp has a trade mark stamped on its side; to eliminate its projected shadow, remove the mark by rubbing lightly with a damp cloth.

EXPOSURE DATA

62. The illumination in these enlargers, when used with the condenser lens, light distribution plate, and 75 watt opal enlarging lamp No. 211, is very brilliant. It is therefore necessary to close down the diaphragm to avoid overexposure. It is generally considered good enlarging practice to close down the diaphragm so that the exposure time is never less than 10 seconds.

63. The following information is only approximate and should be supplemented by your own trial exposures. The exposures given are based upon using a new No. 211 lamp on a 120 volt line, with a medium density negative, exposing upon Eastman Kodabrom or Agfa Brovira (medium contrast) developed according to the instructions supplied with the paper. The exposure time for the following enlargement sizes and diaphragm settings is 13 seconds:

<i>Enlargement</i>	<i>Diaphragm</i>
<i>Setting</i>	<i>Setting</i>
$2\frac{1}{2}$ times	$f:22$
4 times	$f:16$
6 times	$f:11$

For enlargements made with the en-

larger raised to the top of the post, set the diaphragm at $f:8$. If your line voltage is less than 120 volts, increase the exposure time slightly.

64. The above information on exposure is for the more experienced worker, so that he may get the feel of the machine. For further data, refer to paragraph 88.

65. It is important to remember that a new lamp produces greater candle power output than an old lamp. As a lamp deteriorates, longer exposures will be required.

DARKROOM TECHNIQUE

66. Enlarging, just as contact printing and other photographic work, must be done in a darkroom—a room into which no white light can penetrate. At night, almost any room or closet, garage or cellar, can be converted into a darkroom by excluding all white light.

67. Bromide printing paper, used for making enlargements, is very sensitive to white light, and must be handled only in a darkroom under a safelight (darkroom lamp, with a red or series OA filter).

68. You will need three or four trays, at least 8" x 10", for developing, fixing and washing; a thermometer, a 16 ounce graduate, a stirring rod and a darkroom lamp, as well as a supply of chemicals and bromide paper.

69. There are many magazines and books on developing and fixing which you can consult. If you have ever developed contact prints, you will find that there is no fundamental difference in developing, fixing and washing enlargements.

OUTLINE OF OPERATIONS

70.

I. First choose a negative for enlargement. (Refer to paragraph 71.)

II. Place in the negative carrier the negative to be enlarged, dull (emulsion) side down. Mask the negative if necessary. (Refer to paragraphs 23-24.) Raise the enlarger to the

approximate height to enlarge the negative to the size you wish, and lock the clamping knob (28). Insert the carrier between the gate plates so that the built-in target is directly over the lens; focus the target on a sheet of white paper the same size as the enlarging paper you intend to use. (Refer to paragraphs 46-53.) Then push the carrier all the way in, and the projected image of the negative will appear on the sheet of white paper. If the size and composition of the image is correct, proceed to the next step.

III. Set the iris diaphragm to the proper position and make a trial exposure, or determine the proper exposure time by any other method. (Refer to paragraphs 62-65 and 88-97.)

IV. Snap the switch off and place a piece of bromide paper over the white paper on the baseboard. You may turn the red filter under the lens and switch the lamp on for a few seconds to place the bromide paper in the correct position. Snap the switch off, swing the red filter out of position, and hold the bromide paper down flat, using a mask or frame, or by any other means. (Refer to paragraphs 75-77.)

V. Make certain that the iris diaphragm is set to the proper position.

VI. Expose the bromide paper. BE SURE THAT YOU DO NOT CAUSE THE ENLARGER TO VIBRATE WHILE YOU ARE MAKING THE EXPOSURE.

VII. Develop, fix and wash the print.

VIII. Dry the print. Large white blotters for drying prints can be obtained from your dealer.

NEGATIVES FOR ENLARGEMENT

71. Pick only negatives which have extreme sharpness of definition. They should be neither too dense (dark) nor too flat (light). There should be good detail in all parts, the darker parts as well as the lighter. The shadows should be clear. There

should be sufficient gradation between the shadows and the highlights. Freedom from scratches, spots, pinholes and fingerprints is of extreme importance, as all such imperfections are greatly magnified in enlarging.

72. Negatives for enlargement of more than 5 times must be exceptionally sharp and clear. The grain in the film will show unless it has been processed in a fine grain developer. There can be no imperfections in a negative intended for great enlargement.

THE RED FILTER

73. The red filter serves as a guide for the placing of the bromide paper in relation to the projected image. The paper will not be fogged if the light is allowed to pass through the red filter for a few seconds only.

74. There is a threaded hole in the head of the screw (22) on which the red filter pivots, to which the Federal Filter Holder (93) is attached with the screw and washer (94). See Figures 17 and 1A. This

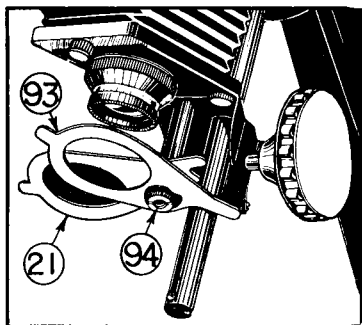


Figure 17

Filter holder for using supplementary filters.

holder is used as a support for gelatin or glass filters, when enlarging on variable contrast papers such as Defender Varigram which requires filters to change the contrast of the paper, and for three color separation work.

SOME PRECAUTIONS

78. The enlarger lamp must always be turned off before you place

the bromide paper on the baseboard, even though you have the red filter under the lens, as the paper may be fogged by stray light.

79. Place your paper on the baseboard, swing the red filter under the lens, and then switch on the light. Snap the switch off as soon as possible, as the paper may be fogged even by the red light, if it remains on too long. Don't forget to turn the iris diaphragm to the proper position, before making an exposure. See paragraph 88.

80. Never shake or vibrate the enlarger while making an enlargement. Place the enlarger on a firm, steady table. Hold the switch so that there is no strain on the cord. Always use a watch or clock while making an exposure. Do not attempt to guess at the time.

81. Always focus the enlarger on a sheet of ordinary white paper, of the same size as the enlarging paper you intend to use, before you place the bromide paper on the baseboard.

BROMIDE PAPERS

82. Remove only one sheet of bromide paper at a time from the envelope in which it is packed. Leave the label on the envelope so that you can see which grade of bromide paper it contains. Develop and fix each enlargement before you remove another sheet, as the second sheet may get fogged from stray light rays if it is allowed to lie around out of the envelope.

83. The best bromide printing papers for the beginner are Eastman Kodabrom, Agfa Cykora, and other papers having similar characteristics.

84. It is good practice to pick out a set of test negatives—thin, medium and dense—for making trial exposures. Also choose a set of negatives with which to test various grades of bromide paper; a soft, flat negative for hard paper; a normal, medium contrast negative for medium paper, and a hard contrast negative for soft paper. Mark the exposure time on

each negative, and use it to test papers to determine their sensitivity and contrast.

85. You can also use these negatives as a guide in checking other negatives, by holding them up to the light, and comparing contrasts and densities with the negatives you wish to enlarge. This will aid you in determining the proper exposure required for the negative, as well as the proper grade of paper to use.

86. The speeds and other characteristics of bromide papers are not as consistent as are the speeds of films. The speeds of the papers listed below are only approximately relative: that is, the fastest papers are given a relative speed rating of 1, the next slower grades are given a relative speed rating of 1½, 2 and 3.

87. The table of relative speeds may be employed in the following manner: if you know the exposure time for Soft Contrast Eastman Kodabrom, with a relative rating of 1, you need simply double the time when working with a Hard Contrast grade of the same paper. Or if you decide to change from one type of paper to another, you can adjust your exposure time accordingly, as a paper with a relative speed rating of 3 takes twice as long to expose properly as a paper with a relative speed rating of 1½, and three times as long as a paper with a relative speed rating of 1:

BROMIDE PAPER SPEEDS

Name	Contrast Grade		
	Soft	Medium	Hard
Eastman Kodabrom.	1	1½	2
Eastman P.M.C.	1	1½	2
Agfa Brovira	1	1½	2
Agfa Cykora	1	1½	2
Defender Velour			
Black	1	2	3

TRIAL EXPOSURES

88. Those who have made contact prints know that before making a print, it is necessary to determine the proper exposure time for the negative. After a little experience, you

may be able to determine exposure time just by looking at the negative, or at the projected image of it when you focus on the white paper.

89. Until you gain this experience, it is advisable to make test exposures on narrow strips of bromide paper. This will save the waste of large sheets of paper improperly exposed.

90. Take a sheet of 5" x 7" medium contrast paper and cut it into five strips which will be about 1¼" x 5". Be sure that you cut the paper in a darkroom, and that you do not expose it to any stray white light. Wrap these strips in a piece of opaque black paper, and replace them in the envelope from which you took the sheet.

91. All the following instructions are based upon the use of the condenser lens (12 or 48), the light distribution plate (10 or 46) as shown in Figures 3A and 3B, and the No. 211 opal lamp. See paragraphs 59a, 59b and 60.

92. Choose a negative you wish to enlarge. This should be a medium contrast negative if used with medium contrast paper. Raise the enlarger so that the top of the lamp housing is level with the top of the counterbalance. Lock the knob (28). Focus the enlarger on a sheet of white paper, using the focusing target. Before you focus be sure the pressure lever is closed. (Refer to paragraph 46.) The enlarger is now set for making a 5 time blow-up.

93. Place the negative which you wish to enlarge in the negative carrier. Frame it with a mask, if necessary. Push the carrier all the way in between the gate plates. Turn off the enlarger lamp and swing the red filter under the lens.

94. Lay one of the strips of bromide paper, emulsion side up, in the center of the baseboard. Switch the enlarger lamp on and a red image will appear; quickly locate the test strip in the center of interest of the image, and turn the light off. Tack the test strip down with two thumb

tacks, so that it will not move. Now close the iris diaphragm down to $f:11$ and swing the red filter out from under the lens. Place a piece of cardboard over the strip of paper, so that two-thirds of it is covered. Now expose it for 3 seconds. Use a watch for timing.

95. Move the cardboard so that two-thirds of the strip is now uncovered, and expose the strip for 3 seconds once more. Then remove the cardboard entirely, and expose the entire strip for 10 seconds.

96. The strip has now had three different exposures. One-third of it has been exposed for 16 seconds: twice for 3 seconds, and finally for 10 seconds; the center third has been exposed for 13 seconds: on the second and third exposures; and the remaining third has been exposed for 10 seconds only.

97. The above instructions are for average medium density negatives, using a new No. 211 lamp on 120 volts, with the condenser lens and the light distribution plate both in use. Remember that a new lamp produces greater candle power output than an old lamp. As the lamp deteriorates, longer exposures will be required.

DEVELOPING THE STRIP

98. Place the bromide strip face up in the developing solution, which should be deep enough to cover the paper completely. Agitate the solution by gently rocking the tray. The image will start to appear in 30 seconds, and should be completely developed in $1\frac{1}{2}$ minutes. The strip should then be fixed and washed. If one of the sections has had the proper exposure, you have found the correct exposure time.

99. If all the sections of the first strip were too dark, you will have to use another test strip—this time making two exposures of 2 seconds, and a final exposure of 4 seconds; the sections of this strip will be ex-

posed, respectively, 8, 6 and 4 seconds. Develop the strip and examine it.

100. If, however, your first trial strip was entirely too light, try another, this time increasing the exposure times—the first two to 5 seconds each, and the third exposure to 20 seconds. The first section will have a total exposure of 30 seconds; the middle section 25 seconds and the last 20 seconds.

101. The above instructions are for average, light and dense negatives respectively, with a fast bromide paper such as Eastman Kodabrom or Agfa Cykora, the diaphragm of the lens set at $f:11$, making 5 times enlargements; using a new No. 211 opal lamp on 120 volts, the condenser and the ground glass plate; and the paper developed for $1\frac{1}{2}$ minutes at 68°F . For very dense negatives, a longer exposure may be required, or else the diaphragm may be opened to $f:8$. See paragraph 116.

SIZE AND EXPOSURE

102. As the enlarger is raised away from the baseboard, to increase the size of the image, the brightness of the image is decreased. Each size of enlargement therefore requires a different exposure. After you have once determined the correct exposure for a negative at one size of enlargement, you can enlarge that negative to another size without any further trial exposures, provided that you use the same grade of paper and set the diaphragm at the same position.

103. For example, suppose that your negative required 10 seconds exposure at $f:11$ for a 5 times enlargement, and you wish to enlarge that negative only three times:

MAGNIFICATION INDICATOR

104. To determine the number of times an image is enlarged by using the built-in focusing target as a magnification indicator, pull the negative carrier forward about $1\frac{1}{2}$ " so that the target is over the lens. Focus the

lens on a sheet of white paper, then measure the distance between the two lines indicated by the arrow heads of the $\frac{1}{4}$ " dimension on the projected image of the target.

105. Divide the distance between the lines of the projected image by $\frac{1}{4}$ " which is the distance between the lines on the target and you have the number of times the negative is magnified for this position of the enlarger. For example, if the lines are one inch apart on the projected image, divide one inch by $\frac{1}{4}$ " which is the size on the target; the answer is 4, and the enlargement is four times. See Figure 14.

106.

EXPOSURE CHART

<i>Linear Times Enlarged</i>	<i>Exposure Factor</i>
1	1
1½	1½
2	2
2½	3
3	4
3½	5
4	6
4½	7
5	8
5½	10
6	12
7	16
8	20
9	24
10	30
11	36
12	44
14	60
16	74
18	90

THE EXPOSURE FACTORS

107. When you know the exposure for one enlargement, and you want to make an exposure for a smaller or greater enlargement, it is easy to make your calculations if you employ the exposure factors in the above chart.

108. For example, the correct exposure for a negative is 10 seconds for a 5 times enlargement with the iris diaphragm opened to $f:11$, and

you want to enlarge it only four times:

109. The factor for a 5 times enlargement is 8; and the factor for a 4 times enlargement is 6.

110. Whether you wish to make a smaller or greater enlargement, you always DIVIDE THE FACTOR OF THE UNKNOWN ENLARGEMENT BY THE FACTOR OF THE KNOWN ENLARGEMENT.

111. In this case you divide 6—the factor of the unknown enlargement of 4 times, by 8—the factor of the known enlargement of 5 times:

$$\frac{6}{8} = ?$$

The answer is $\frac{3}{4}$. You therefore allow $\frac{3}{4}$ as much time for a 4 times enlargement as you did for the 5 times enlargement (with the diaphragm set in the same position for both).

112. Since the exposure for a 5 times enlargement is 10 seconds, then:

$$\frac{3}{4} \times 10 = ?$$

The answer is $7\frac{1}{2}$ seconds, the correct exposure time for a 4 times enlargement from this negative. Remember that you must always use the same diaphragm openings for both enlargements.

113. Let us take another example. You have a negative, the known exposure time of which, enlarging 5 times at $f:11$, is 10 seconds. You wish to make an 11 times enlargement from this negative. You find from the chart that the factor of the known enlargement of 5 times is 8, and that the factor of the unknown enlargement of 11 times is 36.

114. ALWAYS DIVIDE THE FACTOR OF THE UNKNOWN ENLARGEMENT BY THE FACTOR OF THE KNOWN ENLARGEMENT.

Therefore:

$$\frac{8}{36} = ?$$

The answer in this case is $4\frac{1}{2}$. You must, therefore, allow $4\frac{1}{2}$ times as much exposure for an 11 times enlargement as you did for the 5 times enlargement.

115. The exposure of the 5 times enlargement is known to be 10 seconds. Then:

$$4\frac{1}{2} \times 10 = ?$$

The answer is 45 seconds, and that is the time which you must allow for making an 11 times enlargement from that negative. Do not forget that you must use the same diaphragm opening, in this case $f:11$, for both enlargements.

THE IRIS DIAPHRAGM

116. It is generally considered good photographic practice to close the iris diaphragm sufficiently so that the exposure is never less than 10 seconds. The greater the focal length of a lens, the greater will be the negative area which that lens will cover when wide open. However, as the focal length of the lens is increased, the magnification on the baseboard, from any fixed position, is decreased.

117. Federal designed the $3\frac{1}{2}$ " lens system for the widest utility, so that negatives of $2\frac{1}{4}$ " x $3\frac{1}{4}$ " can be fully covered, and at the same time, a magnification of 8 times can be easily obtained on the baseboard. These lenses can be used wide open to cover all size negatives from 35 mm up to $2\frac{1}{4}$ " x $2\frac{1}{2}$ ". For $2\frac{1}{4}$ " x $3\frac{1}{4}$ " negatives, it is good practice to step down the diaphragm one or two stops. Due to the high intensity of the illumination system, there is no practical advantage in using the lens wide open when making an exposure, since the difference of a split second will vary the result much more in a short exposure than in an exposure of at least 10 seconds.

118. This is particularly important if you intend to do dodging, spot printing or other photographic man-

ipulation. It is often desirable to increase the exposure to 30 seconds or more for this work.

119. On the other hand, when using slow papers such as Eastman Vitava Opal or Agfa India Tone, it is usually necessary to speed up the exposure.

120. The following explanation should help you when you wish to increase or decrease the exposure time:

DIAPHRAGM FACTORS

The relative speeds of the various positions of the diaphragm are as follows:

<i>Diaphragm Opening</i>	<i>Speed Factor</i>
$f:4.5$	1
$f:5.6$	1.5
$f:6.3$	2
$f:8$	3
$f:11$	6
$f:16$	12
$f:22$	24
$f:32$	48

121. In the above table, the greatest speed of the lenses, when the diaphragm is wide open is taken to be 1 for the $f:4.5$ lens and 2 for the $f:6.3$ lens. The slowest opening of both is at $f:32$ and has the factor of 48. This means that, during equal lengths of time, only $1/48$ the amount of light will pass through the lens when it is set at $f:32$ as when it is set at $f:4.5$. Similarly, the $f:6.3$ lens is only $1/24$ as fast when set at $f:32$ as when wide open. Always bear in mind that as the f : value of the lens increases, the diaphragm opening becomes smaller: check this by looking at the lens as you turn the diaphragm.

122. To make use of these factors for conversion of exposure times is a simple operation. Just divide the factor of the UNKNOWN opening by the factor of the KNOWN opening.

123. For example, you have a negative, and know that the correct exposure time for it, when making a 5 times enlargement, is 10 seconds

with the diaphragm set at $f:11$. What exposure would it require for a 5 times enlargement at $f:16$?

124. The speed factor of the known opening, $f:11$, is 6, as you will see from the chart. The factor of the unknown opening, $f:16$, is 12. Then, dividing the unknown factor by the known factor:

$$\frac{12}{6} = ?$$

The answer is 2. Multiplying the former exposure time, 10 seconds, by 2, gives you 20 seconds, the time required for a 5 times enlargement from the same negative at the new opening, $f:16$.

125. Let us take another example. Suppose you have made a trial exposure of a negative, and find that it requires 40 seconds at $f:16$. You wish to reduce the exposure time to about 10 seconds, and decide to see if $f:11$ is the correct setting.

126. Instead of wasting time by making another trial exposure, you can get your answer with a few seconds of mental arithmetic. The factor of $f:11$ is 6; dividing it by the factor of the known exposure ($f:16$) which is 12, you will find that the time at $f:11$ is $6/12$, or $1/2$ of 40 seconds, or 20 seconds exposure. This is still too slow. Taking the next faster opening, $f:8$, and dividing its factor by the factor of $f:16$ —that is dividing 3 by 12, we get the answer $1/4$. One-quarter of 40 seconds is 10 seconds, and $f:8$ is the diaphragm setting we want.

EXPOSURE SUMMARY

127. To summarize what must be considered in determining the exposure, let us review all the factors:

I. The Negative

Read paragraphs 71-2 on Negatives for Enlargement. Read paragraphs 88-101 on Making Trial Exposures.

II. The Bromide Paper

The type of bromide paper used is a factor of importance. To

standardize your result, do not keep changing from one type to another. Find which type you like best, and use that almost entirely. Read paragraphs 83-87.

III. The Developer

Most bromide paper, if properly exposed, should remain in the developer for $1\frac{1}{2}$ minutes, with the developer at 65° to 70°F . However, follow carefully the instructions supplied with the type of bromide paper you use, as to the best developer, temperature, and developing time.

IV. The Light Source

For best results, always use Federal, Westinghouse, G.E. No. 211 or Wabash No. 10, Opal Enlarging Lamps. Since a new lamp produces greater candle power output than an old one, longer exposures will be required as a lamp deteriorates. Variations in line voltage will also increase or decrease exposure time. Read paragraphs 62-65.

V. The Iris Diaphragm

The diaphragm controls the speed of the lens. Read paragraphs 116-126.

VI. The Size of Enlargement

Read paragraphs 102-115.

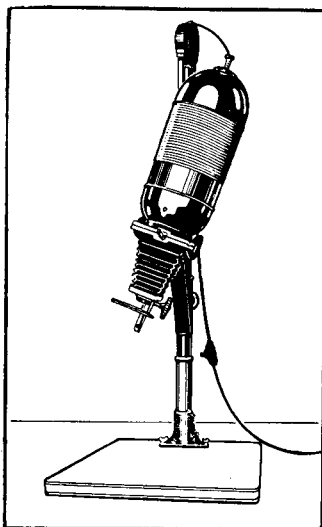


Figure 18
Distortion correction.

DISTORTION CORRECTION

128. The calibrated swivel is particularly useful in correcting linear distortion. By recording the reading on the calibrated dial, the print can readily be duplicated. Tilting the enlarger 5° or 10° foreshortens the image on one side, and lengthens it on the other side. See Figure 18.

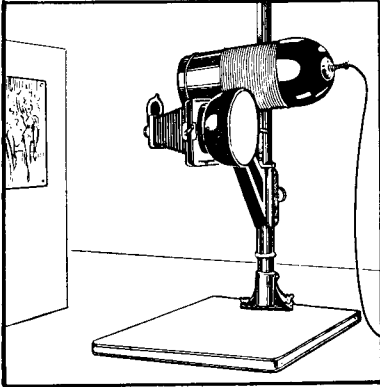


Figure 19

Use as a copying camera.

The diaphragm must be closed down as much as possible to increase depth of focus.

129. If, for instance, you have a negative of a building in which the walls taper, due to holding the camera at an angle, tilting the enlarger will shorten the image in the proper place, bringing the building back to proper perspective.

130. Distortion correction technique can be applied to create inten-

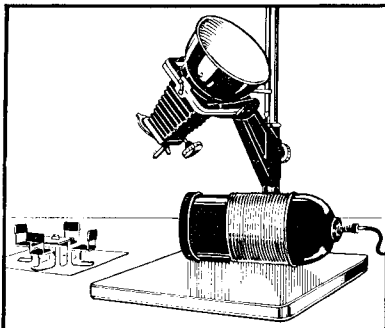


Figure 20

Table-top photography.

tional distortion. A stout person can be made to appear thinner; a short stocky person can be made to appear thinner and taller. You can create caricatures of people, giving them long pointed heads, making them look top heavy, or otherwise exaggerating their features.

USE AS COPYING CAMERA

131. To convert the enlarger into a copying camera, first remove the lamp housing and the condenser system, then swing the enlarger into a horizontal position. The lamp housing, with or without the glass plate, can be used to illuminate the copy, and can be rested on the enlarger arm, as illustrated. See Figure 19 and the detailed instructions below.

TABLE TOP PHOTOGRAPHY

132. The enlarger can be used as a camera for making table top photographs, or still life studies, in black-and-white or color. Figure 20 shows the lamp housing used as a source of illumination for this work; one or two other lights, mounted in reflectors and placed at an angle, are usually required. See the detailed instructions below.

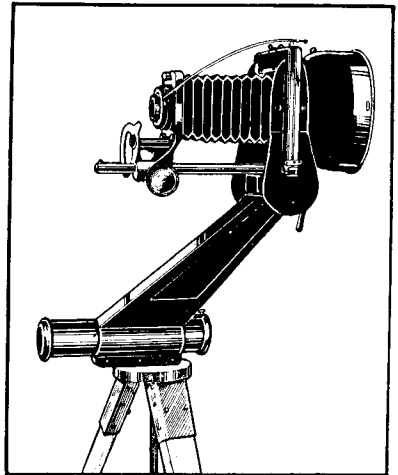


Figure 21

Use as a view camera.

MAKING A VIEW CAMERA

133. The enlarger head and arm

can be mounted on a sturdy tripod and used as a view camera. See Figure 21. Remove the clamping knob; the threaded hole in the arm will fit the mounting screw of the tripod. The complete enlarger, as in Figures 19 and 20, may be placed on the floor, or on a wooden box about 12" high, if no tripod is available. See detailed instructions below.

MAKING A DARKROOM CAMERA

134. All you need to convert the enlarger into a view camera for use in the darkroom is a ground glass plate the same size as the glass negative pressure plates, a $2\frac{1}{4}$ " x $3\frac{1}{4}$ " metal negative plate, a metal light baffle and a light shield which is used to close the opening in the bottom of the lamp housing holder (where the condenser lens is inserted) to prevent the film from fogging while making the exposure. You can make it of cardboard.

135. The camera can be used only in the darkroom, as there is no shutter, and the exposures are made by snapping the light on and off. Slow commercial cut film with a Weston rating between 4 and 8, necessitating exposures of at least two or three seconds, will give best results. Use of slow film also reduces the possibility of fogging.

136. Best film size is $2\frac{1}{2}$ " x $3\frac{1}{2}$ " or $6\frac{1}{2}$ x 9 cm. Film smaller than $2\frac{1}{2}$ " x $3\frac{1}{2}$ " will require a metal negative pressure plate with an opening smaller than $2\frac{1}{4}$ " x $3\frac{1}{4}$ " regularly supplied. One of the smaller Federal dustless metal plates, without pins, can be used. It may be desirable to use smaller film with a lens of shorter focal length than the regular $3\frac{1}{2}$ " lens supplied. You may handle commercial or other orthochromatic cut film under a red safe-light, but you can work with panchromatic film only in total darkness.

137. Remove the lamp housing

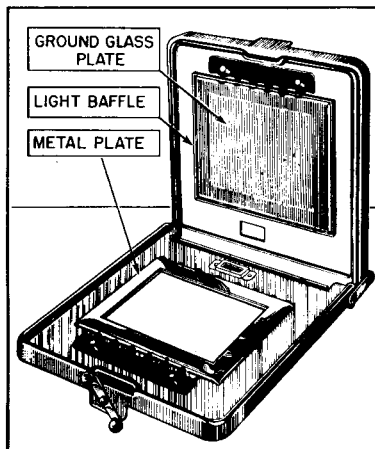


Figure 22

and condenser system, and swing the enlarger to a horizontal position. Insert the metal light baffle, with the side marked "FRONT" toward the sliding clamp, in the upper section of the negative carrier, then nest the ground glass plate inside the baffle, and secure both with the sliding clamp; and place the metal pressure plate in the lower section of the negative carrier. See Figure 22. Push the negative carrier all the way back between the gate plates. It is of the utmost importance to turn the pressure lever (74) so that the carrier is closed before focusing.

138. The lamp housing may be used for illuminating the subject when copying; additional lights are usually required for table top photography.

139. LIGHTS USED IN CONJUNCTION WITH THE LAMP HOUSING MUST BE MOUNTED IN REGULAR REFLECTORS AND SO ARRANGED THAT THEY WILL NOT SHINE DIRECTLY ON THE ENLARGER. THE BACK OF EVERY REFLECTOR MUST BE AHEAD OF THE ENLARGER LENS, TO PREVENT DIRECT RAYS FROM ENTERING THE SIDES OF THE NEGATIVE CARRIER, OR THE FILM WILL BE FOGGED.

140. If more than one light is used, all must be arranged to operate

on one switch, and go on or off at the same instant. After the lights are adjusted to properly illuminate the subject, focus on the ground glass with the lens wide open. A small pocket magnifier may be used to attain sharpest focus.

141. The metal light baffle is used as an extra precaution against fogging by the entrance of stray light into the negative carrier when fast panchromatic film is used.

142. Proper exposure is best determined with a light meter. The diaphragm should be closed down to require an exposure of at least two seconds. When photographing objects very close to the lens, increase the exposure about two times, to allow for the increased distance between lens and film.

143. After the exposure is determined, and the diaphragm set, remove the negative carrier and place the round light shield in the bottom of the lamp housing holder, so that the oblong felt pad cemented to its bottom will enter the oblong opening in the holder. Press the shield against the negative carrier and no light can fog the back of the film.

144. Darken the room completely if you are working with panchromatic film; a red safelight may be used with orthochromatic film. Open the negative carrier and place a piece of $2\frac{1}{2}$ " x $3\frac{1}{2}$ " cut film, emulsion side down, over the opening in the metal negative pressure plate, leaving an

equal border on all sides. Close the carrier carefully so that the film does not move, and clamp it together between your fingers to keep the film in place. Push the carrier all the way back between the gate plates. Be sure to close the pressure lever (70) to clamp the carrier together.

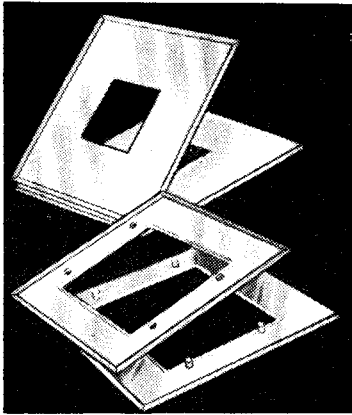
145. Now snap the switch on. Make the exposure, using a watch for timing. Remove the film, develop, fix and wash it. If you are certain of your exposure, a series of shots can be made, each exposed film placed in a light-tight box while awaiting development, and all can be developed at once.

USING OTHER LENSES

146. Your Federal Enlarger can be used with other lenses having a focal length of 2" to 3". It is important to note, however, that **MANY CAMERA LENSES WILL NOT GIVE SATISFACTORY RESULTS WHEN USED FOR ENLARGING.** When using the enlarger with lenses having a focal length of about 2", the light distribution plate may be removed to increase the intensity of the light. If you desire to use the enlarger without a light distribution plate, a General Electric or Westinghouse No. 211 Photo Enlarger Lamp is preferred.

147. Condenser lenses and other accessories for your enlarger are listed in the Federal Bulletin. Write to us, or ask your dealer for a copy.

DUSTLESS METAL NEGATIVE PLATES



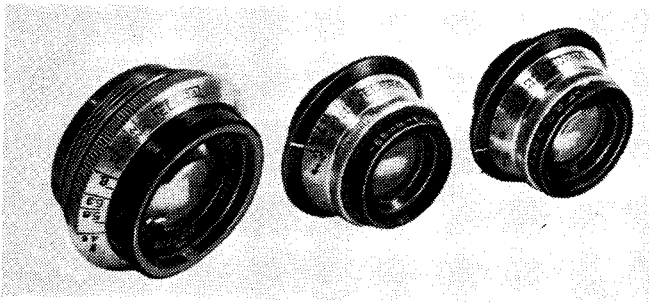
For use in combination with the Federal Convertible Glass or Dustless Metal Plate Negative Carrier which is supplied as standard equipment with your Federal Enlarger.

		With Pins
	2 1/4 x 3 1/4	1348
	2 1/4 x 2 1/4	1347
	1 5/8 x 2 1/4	1346
V. P.	1 5/8 x 2 1/2	1345
		Without Pins
1/2 V. P.	1 1/4 x 1 5/8	1344 1527
35mm	1-7/16 x 31/32	1334 1525
Bantam	1 1/2 x 1-1/32	1343 1526

LENSES

FEDERAL lenses are made from time tested formulae which have been brought up to date by the use of the most modern improvements. The producing of the optical glass and the grinding and precision, polishing of these lenses are performed by the leading manufacturers of precision photographic lenses in the United States.

Extreme accuracy by our own skilled experts is used in making the mountings and Iris Diaphragms. These lenses are then matched and mounted in our own precision Instrument Department and are carefully tested and adjusted for eliminating all forms of aberrations so that they will produce sparkling, clear, and sharply defined enlargements to the corners.



3 1/2" F:4.5 FEDERAL OCTAR, four element ANASTIGMAT LENS
mounted in barrel with Iris Diaphragm
(For enlarging negatives up to 2 1/4" x 3 1/4")

2" (55MM) F:4.5 FEDERAL DECAR ANASTIGMAT LENS
mounted in barrel with Iris Diaphragm
(For enlarging negatives up to 1/2 V.P.) (1 1/4" x 1 5/8")

3 1/2" F:6.3 FEDERAL DECAR ANASTIGMAT LENS
mounted in barrel with Iris Diaphragm
(For enlarging negatives up to 2 1/4" x 3 1/4")

Lenses are equipped with square lens board.

When ordering parts, always mention Model Number, which you will find on the nameplate of your Enlarger and Part Number.