

WARRANTY

We warrant that the equipment built by us will be free from defects of material or workmanship and, if properly used, will do the work for which it is designed.

Any part or parts which, upon our examination, are found to be defective will be replaced or repaired, at our option. Said part or parts must be returned, freight prepaid, to the home plant. The repaired part or parts will be shipped F.O.B. Minneapolis, Minnesota.

This is an unqualified warranty to the original purchaser of the equipment and shall apply for the period of one year from the date of shipment of the equipment from our plant.

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**TWO INSTALLATION BLUEPRINTS ARE FURNISHED
WITH EACH CUSHION INSTALLATION**



LOOK FOR THIS SYMBOL TO POINT OUT IMPORTANT SAFETY PRECAUTIONS. IT MEANS — ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED.

Precautions For the Installation and Operation of Pneumatic Die Cushions

IN ORDER to get efficient and trouble free performance on any pneumatic die cushion installation, it is very important that the pin pressure pad or wear plate of the die cushion unit be parallel with the top of the press bed and adjusted to its correct height relative to the top of the press bed. The maximum amount that the pin pressure pad can be out of parallel with the top of the press bed and still work satisfactorily is 1/64". For this reason it is important that the mounting rods on both the bolster plate mounting and the press bed mounting be checked periodically to make sure all the nuts are tight and that the adjustment at all four corners is uniform. If this adjustment is not maintained, the cylinder will not travel parallel to the piston and as a result cause a breakdown of the cushion cylinder.



When a piece of work jams in a drawing or forming die, do not remove the jammed part by using the die cushion with the air pressure on. **The air pressure should be turned off and system air drained before attempting to remove jammed part from the die.** When a part is removed with the air pressure on, a severe shock is caused against the stop and adjusting nut on the Model "D" and "MD" or on the stop rods on a Model "C" or "H" cushion, which may cause a breakdown of the cushion unit. In addition to this it is very dangerous from the operator's standpoint, as the part sometimes comes loose with so much force it may cause **personal injury**.

It should be remembered that once a pneumatic die cushion has been inflated to the required pressure, it theoretically uses no more air. The combination reducing regulating valve merely maintains the required pressure by compensating for any air leaks through the pipe connections, packings or fittings.

If an air leak develops in the cushion unit, it is generally assumed that the packings are worn out and must be replaced. However, if the cushion has not been used for a period of two or three weeks it is advisable to inject two or three shots of grease into each grease fitting to soften the packing. Also, under severe vibration conditions the metal tubing may fracture near the connections and cause an air leak which may be mistaken for a leaking cup packing. Before disassembling "C" and "D" cushions it is advisable to check these fittings as explained on page No. 40.



Note: Pneumatic Die Cushions should always be loaded evenly. When die requires pins to be unbalanced, use **compensating pins** to balance load. Dayton Rogers manufactures cushions specifically designed to customers requirements for jobs where off-center loading is necessary.



CAUTION!! Failure to lubricate as instructed may result in permanent mechanical damage to internal working parts of die cushion or c'balance cylinder. This may result in seizure of unit and **possibility of injury** to operating personnel.

Types of Mountings

Dayton Rogers Pneumatic Die Cushions are designed and constructed primarily for deep drawing die operations, however, they can be used to an advantage for pressure pad control on forming dies as well as for stripper pad control on compound blanking and piercing dies. To meet these requirements several different die cushion models were developed which could be suspended from the **bolster plate** of the press or directly from the **press bed**.

BOLSTER PLATE MOUNTING

This type of mounting, as shown in Fig. No. 1, is recommended for single units in either the Model "C", "D", "MC", "MD" or Model "H" cushions; however, it is occasionally used for mounting multiple installations when the press bed is so designed that no other type of mounting can be used. The installation procedure is very simple, as it requires only the drilling and tapping of four holes in the bolster plate of the press. The mounting rods are provided with shoulders that automatically take care of the alignment of the cushion with reference to the bed of the press. When drilling and tapping bolster, extra care should be taken to insure that the holes are perpendicular to the bolster plate. As a general rule, these rods

should not be out of parallel with the center line of the cushion by more than **.001 for each two inches of rod length** in order to reduce side stresses in the rods.

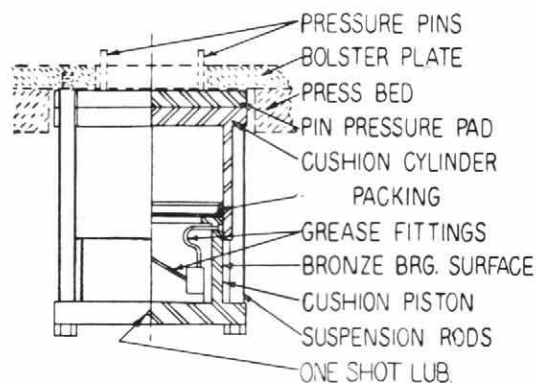


Fig. No. 1, Bolster Mounting

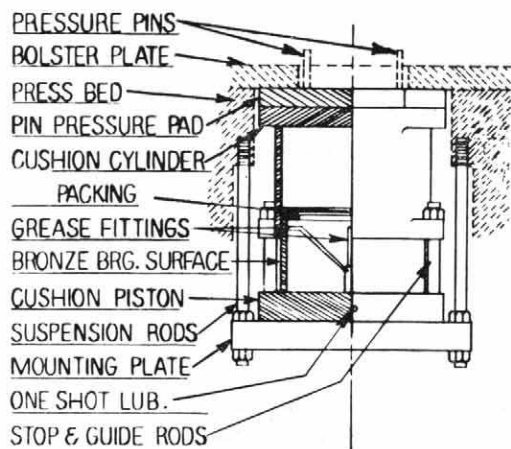


Fig. No. 2, Press Bed Mounting

PRESS BED MOUNTING

This type of mounting, as shown in Fig. No. 2, is used on single unit installations as well as on the larger, multiple installations. It is more desirable in most installations, because the bolster plate of the press can be removed at any time without disturbing the cushion unit. This feature is very desirable on presses where a variety of different types of tools are being used. The installation of a press bed mounting, however, requires greater care, because the mounting plate, as well as the pin pressure pad, must be aligned with the top of the press bed to avoid a tilting action on the cushion unit when in operation. **When the bed is tapped the same precautions as to out-of-parallel conditions should be applied as for bolster mounting.**



Application and Design of Raised Pin Pressure Pads

When a pneumatic die cushion is to be used for stripping purposes on a compound blanking and piercing die, it is sometimes necessary to use a raised pin pressure pad to permit the slugs or parts to fall through the die. Fig. 4 and 5 show two of the more common designs used. However, many other types and designs are possible to fit practically any punch press requirement. In Fig. 4, the mounting rods are merely made longer so that the pin pressure pad will come to rest below the press bed and permit the slugs to be removed from the top of the cushion. By using a design as shown in Fig. 5 a counter-bored, removable plug can be provided so that the slugs will fall through the hole in the raised pin pressure pad when the plug is removed. If the cushion is to be used for drawing operations, the plug can be easily replaced and the entire area of the pressure pad can be used for the pressure pins.

Many times the cushion required for a particular press is too large to fit into the press bed opening. In cases of this kind a raised pin pressure pad similar to the one shown in Fig. 6 can be used very satisfactorily. The cushion itself is suspended just below the bed of the press and the raised pin pressure pad is used as a filler block between the top of the cushion unit and the top of the press bed.

When installing a cushion with a raised pin pressure pad, the same procedure is used as on all other standard installations, except that the raised pin pad must be considered as a top of the cushion.

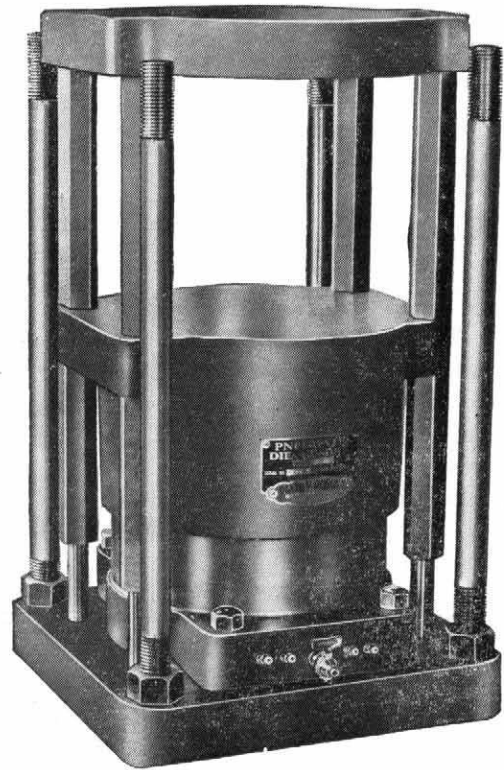


Fig. No. 3

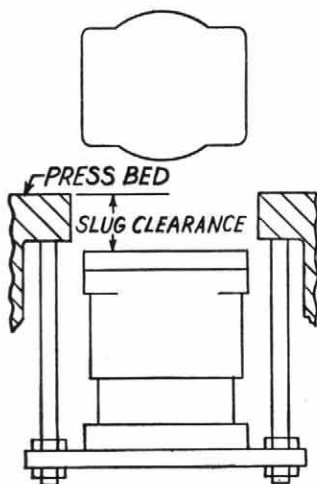


Fig. No. 4

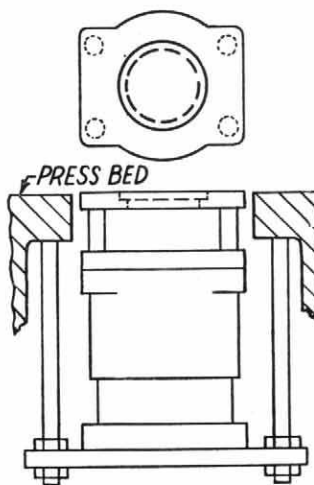


Fig. No. 5

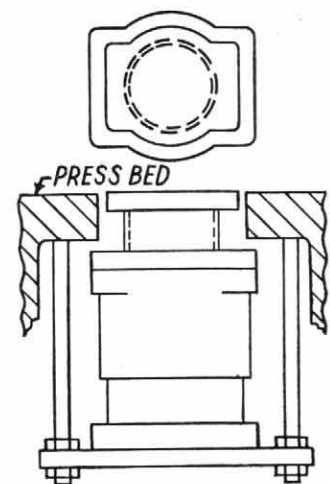


Fig. No. 6

Installation Instructions

MODEL "D" BOLSTER PLATE MOUNTING




IMPORTANT! Do not disassemble the cushion cylinder and piston when installing, because the packing will flare out and cause an air leak unless reassembled properly.

**NOTE: All cushion installations are tested and inspected for air leaks before shipment.
100 PSI MAX. PRESSURE**

The following is the recommended procedure for mounting a single unit Model "D" to the bolster plate of a press:

(1) The die cushion should be mounted to the bolster plate so that it is centrally located with reference to the opening in the press bed. (See Fig. No. 8.) To accomplish this it is advisable to scribe the press bed opening on the underside of the bolster plate before removing it from the press. This outline will locate the relative position for attaching the die cushion.

 (2) Remove the bolster plate and check both surfaces carefully to make sure they are flat and parallel. **THIS IS IMPORTANT!** If surfaces are bowed or not parallel, have them machined and then replace the bolster plate on the press and again scribe the opening on the underside of it.

(3) Layout hole centers on the underside of the bolster plate according to dimensions "A" and "B" shown on Page No. 5. The tolerances on these holes must be held to a maximum of plus or minus 1/64", otherwise the mounting rods will not line up with the holes in the bottom flange of the die cushion unit. Drill and tap holes according to dimensions "I" and "J", making sure that the holes are square with the surface of the bolster plate. (See p. 2.) If blind holes are used, be sure a minimum length of full thread is tapped in the bolster plate.

(4) Bolt the bolster plate onto the press bed in its normal position.

(5) Screw the ends of the four mounting rods with the short length of thread into the bolster plate. Make sure that the shoulders of these rods are securely screwed up to the plate.



Fig. No. 7
MODEL "D"

(6) Place cushion under the press in its correct relative position, making sure the side with the name plate is toward the front of the press. Raise the die cushion into position so that the mounting rods pass through the holes in the bottom flange of the cushion and arrange some temporary blocking device to hold the cushion unit in place. Run on the four nuts and lock washers, making sure they are pulled up tight so that the shoulders of the rods are secure against the bottom flange of cushion.

(7) Install combination reducing and regulating valve and pressure gauge, as well as the high pressure hoses, according to detailed instructions on Page No. 36.

(8) If surge tank is to be used with the cushion installation, turn to Page No. 38 for detailed instructions on installation of surge tanks. If no surge tank is to be used, plug up the hole in the bottom flange of the cushion with the **pop safety valve** provided for this purpose.



(9) Each cushion unit is completely lubricated before shipping; however, it is advis-

able to lubricate each fitting until grease emerges from between the piston and cylinder walls before cushion is put into operation. The same procedure should be followed after **every 8 hours** of operation. As a result of careful tests and experimental research the DAYTON ROGERS MFG. CO. has developed a specially compounded lubricant for die cushions. (See pages 73 and 74.)



IMPORTANT!

READ CAREFULLY PRECAUTIONS FOR INSTALLATION AND OPERATION OF PNEUMATIC DIE CUSHIONS DESCRIBED ON PAGE NO. 1.

Catalog Number	Standard Draw (Without Surge Tank)	Maximum Draw (Surge Tank Required)	Draw Ring Pressure (At 100 lb. P.S.I.)
D-5	1 1/4"	2 11/16	.9 Tons
D-6	1 3/4"	3 1/4"	1.4 "
D-8	2"	3 3/4"	2.5 "
D-10	2"	3 3/4"	3.9 "
D-12	2"	3 3/4"	5.7 "
D-14	2 1/2"	4 3/4"	7.7 "
D-16	2 1/2"	5 3/4"	10.0 "

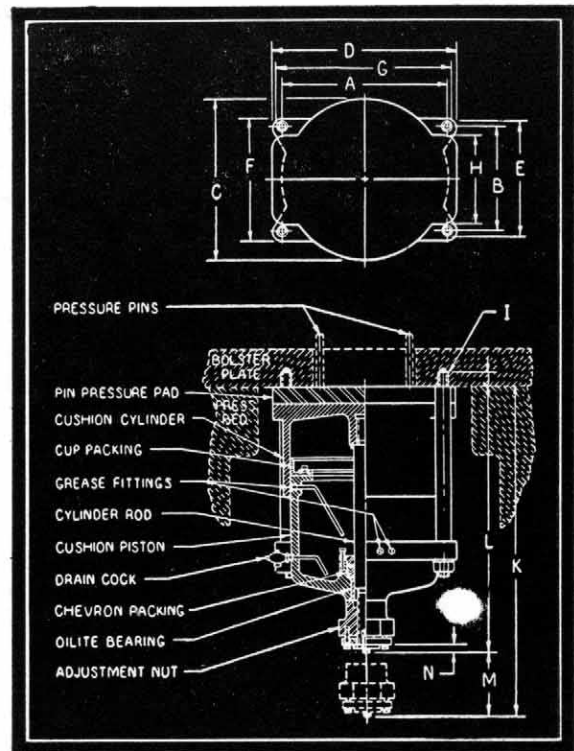


Fig. No. 8

INSTRUCTIONS FOR OPERATING ADJUSTMENT NUT



1. Loosen lock bolts* on bottom of nut.
2. Rotate nut up or down by hand or with wrench if cushion is pressurized.
3. Tighten lock bolts.

*Never Loosen Center Bolt unless nut is to be removed.

Model Cushion	A	B	C	D	E*	F	G*	H	I	J	K	L	M*	N**
D-5	5 3/4	3 7/8	5 3/4	6 5/8	4 1/2	4 3/4	6 3/8	3	3/8-16	3/4	15 7/16	12 15/16	2 11/16	5/8
D-6	7 1/4	4	7	8 1/2	4 3/4	5 1/4	8	3 1/8	1/2-13	3/4	19 15/16	17 1/16	3 1/4	5/8
D-8	8 19/32	5 19/32	9	10	6 15/32	7	9 15/32	4 1/2	5/8-11	1	21 13/16	18 7/16	3 3/4	5/8
D-10	10 7/8	6 3/8	11	12 3/8	7 3/8	7 7/8	11 7/8	5 1/8	3/4-10	1	22 3/8	19	3 3/4	5/8
D-12	12	8 7/16	13 1/8	13 3/4	9 9/16	10 3/16	13 1/8	7 1/16	7/8-9	1 1/4	24 7/16	21 1/16	3 3/4	1/2
D-14	14 1/4	10 3/4	15 1/4	16 1/4	11 1/2	12 1/4	15 1/2	8 3/4	1-8	1 3/8	28 5/16	23 15/16	4 3/4	1/2
D-16	16 1/2	11	17 1/4	19	12 3/8	13 1/2	17 7/8	9	1 1/4-7	1 7/16	28 13/16	23 7/16	5 3/4	1

NOTE: Dimension "M" equals the maximum draw **only** when adjustment nut is **fully extended**. (See Fig. No. 10, P. 7.)

*Min. Open Area for MTG. Rod clearance.

*M—Draw
**N—Adjustment

DAYTON DIE CUSHIONS

Installation Instructions




MODEL "D" PRESS BED MOUNTING (With Supporting Structure)

IMPORTANT: Do not disassemble the cushion cylinder and piston when installing, because the packing will flare out and cause an air leak unless reassembled properly.

NOTE: All cushion installations are tested and inspected for air leaks before shipment.

100 PSI MAX. PRESSURE

The following is the recommended procedure for mounting a die cushion to the press bed of a press:

 (1) Remove the bolster plate and check both surfaces carefully to make sure they are flat and parallel. **THIS IS IMPORTANT!** If surfaces are bowed and not parallel, have them machined so that the pin pressure pad of the cushion will have an accurate surface to stop against.

(2) Screw the ends of the suspension rods, "D", (See Fig. No. 10) with the short length of thread into the drilled and tapped holes in the press bed, which have been provided for mounting the die cushion. (See P. 2.) Make sure these rods are pulled up as far as they will go into the tapped holes. If the cushion is to be suspended from mounting bosses that are not tapped, the mounting rods are provided with nuts on both top and bottom of the bosses.

(3) With the use of skids or timbers, slide the cushion unit into the approximate location relative to the press bed opening. (NOTE: If the distance between the mounting rods at the front of the press bed is not enough to allow the cushion to pass between them, it is advisable to leave them out until after the cushion has been placed under the press bed opening.

(4) Run on the upper adjusting nuts, "F", as far as they will go. Raise the cushion unit so that the rods pass through the holes in the mounting plate or mounting channels and run on the lower adjusting nuts, "F".

(5) Prepare a measuring rod, "C" from 3/16" round steel for adjusting the height and alignment of the cushion unit. The over-all length of this rod should be equal to the over-all height of the cushion, "J", when expanded, plus the thickness of the pin

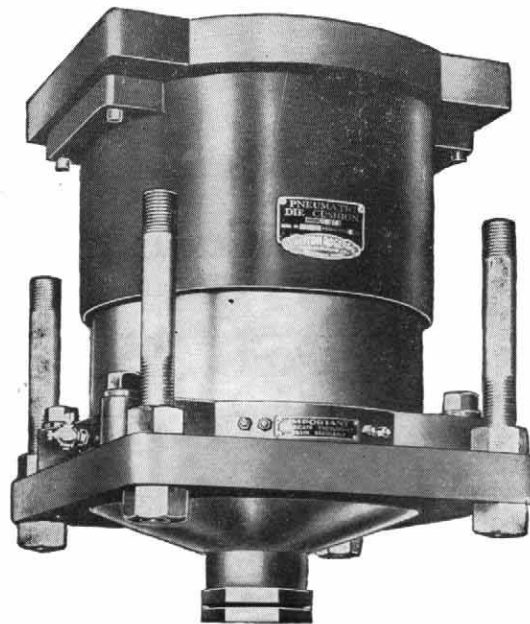


Fig. No. 9

Model "D"

pad minus 1/8". The 1/8" is allowed to make sure that the pin pressure pad comes to rest against the bottom of the bolster plate.

(6) With a large parallel, "A", laid on top of the press bed, (See Fig. No. 10) line up the supporting structure at the four points marked, "X", by using the measuring rod, "C". The adjustment and alignment of the mounting plate at these four points must be held to a maximum tolerance of 1/64" to avoid a tilting action. After this adjustment is obtained, lock the upper adjusting nuts on the mounting plate, which will secure the cushion unit in correct parallel alignment and relative height in connection with the top of the press bed.



PRECAUTION: It should be remembered that the adjustment of the nuts on the suspension rods should allow the pin pressure pad to extend $\frac{1}{8}$ " above the press bed when the cushion cylinder is fully expanded and the bolster plate removed. The Model "D" cushion is fully expanded when the adjusting nut is run to the bottom of its adjustment.

(7) Install combination reducing and regulating valve and pressure gauge, as well as high pressure hoses, according to detailed instructions on Page No. 36.

(8) If surge tank is to be used with the cushion installation, turn to Page No. 38 for detailed instructions on the installation of surge tanks. If no surge tank is to be used, plug up the hole in the bottom flange of the cushion with the **pop safety valve** provided for this purpose.



(9) Each cushion unit is completely lubricated before shipping; however, it is advisable to lubricate each fitting until grease emerges from between the piston and cylinder walls before cushion is put into operation. The same procedure should be followed after **every 8 hours** of operation. As a result of careful tests and experimental research the DAYTON ROGERS MFG. CO. has developed a specially compounded lubricant for die cushions. (See pages 73 and 74.)



IMPORTANT!

READ CAREFULLY PRECAUTIONS FOR INSTALLATION OF PNEUMATIC DIE CUSHIONS DESCRIBED ON PAGE NO. 1.

DIMENSIONS FOR DETERMINING LENGTH OF MEASURING ROD, "C"

EXAMPLE: On a Model D-6 the "H" dimension is $11\frac{1}{16}$ ", and assuming the thickness of the pin pad is 1", it would make a total height of $12\frac{1}{16}$ ". By subtracting $\frac{1}{8}$ " from this figure as described in Paragraph No. 5, the length of measuring rod, "C" would be $11\frac{1}{8}$ ".

Catalog Number	H	K	M	Draw Ring Pressure (At 100 lbs. P.S.I.)
D-5	$9\frac{1}{8}$	$12\frac{3}{16}$	$21\frac{1}{16}$	.9 Tons
D-6	$11\frac{1}{16}$	$15\frac{15}{16}$	$3\frac{3}{4}$	1.4 "
D-8	$12\frac{5}{16}$	$17\frac{9}{16}$	$3\frac{3}{4}$	2.5 "
D-10	$12\frac{3}{16}$	18	$3\frac{3}{4}$	3.9 "
D-12	$12\frac{7}{8}$	$19\frac{1}{2}$	$3\frac{3}{4}$	5.7 "
D-14	$15\frac{3}{4}$	$22\frac{3}{8}$	$4\frac{3}{4}$	7.7 "
D-16	$18\frac{5}{8}$	$21\frac{15}{16}$	$5\frac{3}{4}$	10.0 "

NOTE: Dimension "M" equals the maximum draw **only** when adjustment nut is **fully extended**. (See Fig. No. 10)

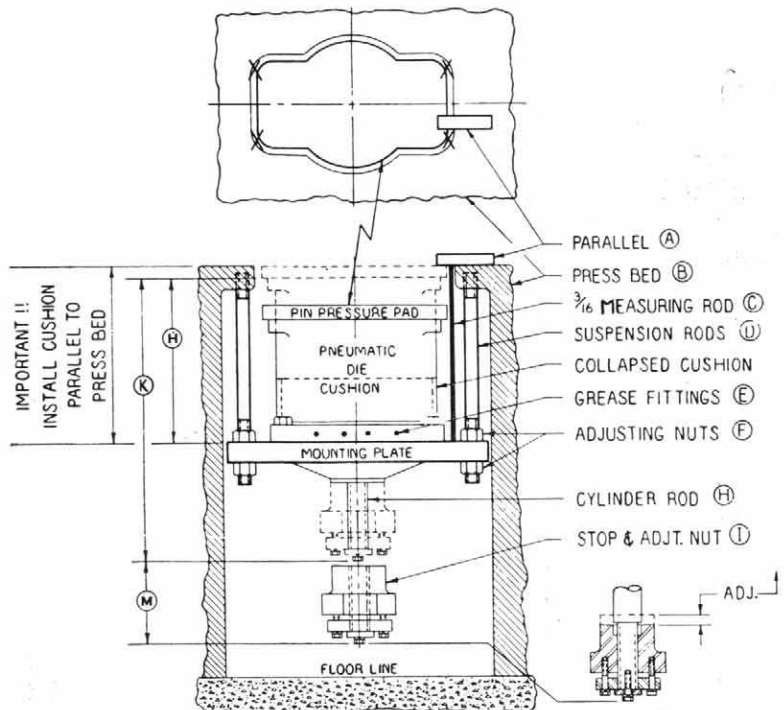


Fig. No. 10



INSTRUCTIONS FOR OPERATING ADJUSTMENT NUT

1. Loosen lock bolts* on bottom of nut.
2. Rotate nut up or down by hand or with wrench if cushion is pressurized.
3. Tighten lock bolts.

*Never Loosen Center Bolt unless nut is to be removed.

Installation Instructions



MODEL "R" FOR BOLSTER PLATE OR DIE SHOE MOUNTING

IMPORTANT! Do not disassemble the cushion cylinder and piston when installing, because the packing will flare out and cause an air leak unless reassembled properly.


NOTE: All cushion installations are tested and inspected for air leaks before shipment.

200 PSI MAX. PRESSURE

The following is the recommended procedure for mounting the Model "R" die cushion:

I—Bolster Mounting (See Fig. No. 13).

(1) The die cushion should be mounted to the bolster plate so that it is centrally located with reference to the opening in the press bed. (See Fig. No. 13.) To accomplish this it is advisable to scribe the press bed opening on the underside of the bolster plate before removing it from the press. This outline will locate the relative position for attaching the die cushion.

 (2) Remove the bolster plate and check both surfaces carefully to make sure they are flat and parallel. **THIS IS IMPORTANT!** If surfaces are bowed or not parallel, have them machined and then replace the bolster plate on the press and again scribe the opening on the underside of it.

(3) Lay out hole in center of scribed bed opening, then drill and tap according to dim. "A" on Page No. 9. If blind hole is used be sure adequate length of full thread is tapped into bolster plate. **Be sure tapped hole is perpendicular to bolster plate surface.**

(4) Bolt bolster plate to the press and mount cushion. Tighten securely by placing a wrench over the outermost hex nut on the bottom of the cushion. (Caution: When removing cushion from press place wrench on upper nut.)

(5) Install combination reducing and regulating valve and pressure gauge, as well as the high pressure hoses, according to detailed instructions on Page No. 36.



Fig. No. 11

Model "R"



(6) Each cushion unit is completely lubricated before shipping; however, it is advisable to lubricate each fitting until grease emerges from between the piston and cylinder walls before cushion is put into operation. The same procedure should be followed after **every 8 hours** of operation. As a result of careful tests and experimental research the DAYTON ROGERS MFG. CO. has developed a specially compounded lubricant for die cushions. (See page 73 and 74).

II—Die Shoe Mounting (See Fig. No. 12).

(1) The die cushion should be mounted to the die shoe so that pressure pins are symmetrically spaced about the piston rod.

(2) Lay out hole on underside of die shoe, then drill and tap according to dim. "A" below.

(3) Mount die shoe to bolster plate and attach cushion to die shoe. Tighten cushion piston rod by following procedure outlined in step (4), page No. 8.

(4) Follow steps (5) and (6) on Page No. 8.

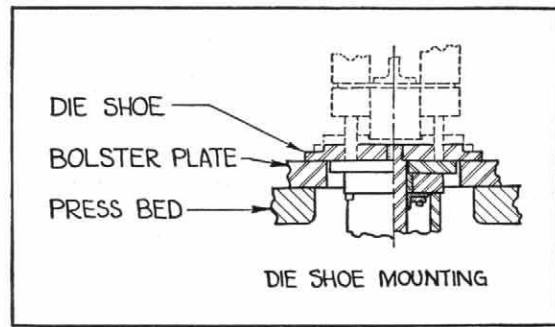
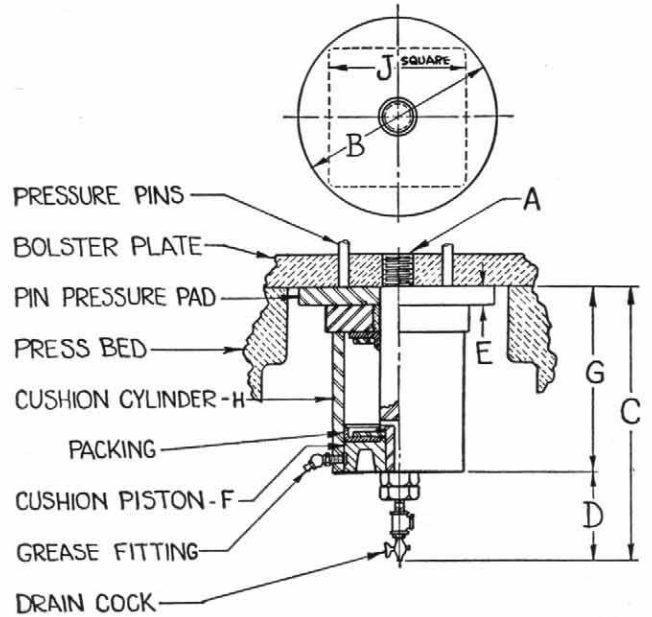


Fig. No. 12



BOLSTER PLATE MOUNTING

Fig. No. 13



IMPORTANT! Read carefully precautions for installation and operation of pneumatic die cushions described on Page No. 1.

Catalog Number	DIMENSIONS								
	A	B*	C	D	E	F	G	H	J
R-3-3	3/4-10x1 1/8	5 1/4	14	6 1/4	1/2	3" Dia.	7 3/4	3 5/8	3 5/8
R-4-4	1-8x1 1/4	7	17 1/2	6 3/4	3/4	4" Dia.	10 3/4	4 7/8	5
R-5-4	1 1/4- 7x1 1/2	8 1/2	18 1/2	7 3/4	3/4	5" Dia.	10 3/4	5 3/4	6
R-6-4	1 1/2- 6x2 1/4	**	19 1/2	7 3/4	7/8	6" Dia.	11 3/4	6 3/4	**

*Pin Pads cannot be made larger than shown.

**7" Dia. with 5 1/4 wide side lugs. Over-all length, 8 1/2. (See C-6, P. 11.)

Catalog and Model Number	R-3-3	R-4-4	R-5-4	R-6-4
Die Cushion Piston Size	3" Dia.	4" Dia.	5" Dia.	6" Dia.
Standard Draw (Without Surge Tank)	3"	4"	4"	4"
Draw-ring Holding Pressure (100 lbs. per sq. in.) in Tons	.3	.6	.9	1.3
Draw-ring Holding Pressure (200 lbs. per sq. in.) in Tons	.6	1.2	1.8	2.6
Shipping Weight, Approximate Pounds	30	50	75	95

Catalog numbers are according to cylinder size and depth of maximum draw. For example, the R-3-3 cushion is a Model R, 3-inch diameter, with maximum draw of 3 inches. No surge tank is needed.

Installation Instructions



MODEL "C" BOLSTER PLATE MOUNTING

IMPORTANT! Do not disassemble the cushion cylinder and piston when installing, because the packing will flare out and cause an air leak unless reassembled properly.

NOTE: All cushion installations are tested and inspected for air leaks before shipment.

100 PSI MAX. PRESSURE

The following is the recommended procedure for mounting a single unit Model "C" to the bolster plate of a press:

(1) The die cushion should be mounted to the bolster plate so that it is centrally located with reference to the opening in the press bed. (See Fig. No. 15.) To accomplish this it is advisable to scribe the press bed opening on the under side of the bolster plate before removing it from the press. This outline will locate the relative position for attaching the die cushion.



(2) Remove the bolster plate and check both surfaces carefully to make sure they are flat and parallel. **THIS IS IMPORTANT!** If surfaces are bowed or not parallel, have them machined and then replace the bolster plate on the press and again scribe the opening on the underside of it.

(3) Lay out hole centers on the under side of the bolster plate according to dimensions "A" and "B" shown on Page No. 11. The tolerances on these holes must be held to a maximum of plus or minus 1/64", otherwise the mounting rods will not line up with the holes in the bottom flange of the die cushion unit. Drill and tap holes according to dimensions "I" and "J", making sure that the holes are square with the surface of the bolster plate. **(See P. 2.)** If blind holes are used, be sure a minimum length of full thread is tapped in the bolster plate.

(4) Bolt the bolster plate on to the press bed in its normal position.

(5) Screw the ends of the four mounting rods with the short length of thread into the bolster plate. Make sure that the shoulders of these rods are securely screwed up to the plate.



Fig. No. 14

MODEL "C"

(6) Place cushion under the press in its correct relative position, making sure the side with the name plate is toward the front of the press. Raise the die cushion into position so that the mounting rods pass through the holes in the bottom flange of the cushion and arrange some temporary blocking device to hold the cushion unit in place. Run on the four nuts and lock washers, making sure they are pulled up tight so that the shoulders of the rods are secured against the bottom flange of cushion.

(7) Install combination reducing and regulating valve and pressure gauge, as well as the high pressure hoses, according to detailed instructions on Page No. 36.

(8) If surge tank is to be used with the cushion installation, refer to Page No. 38 for detailed instructions on installation of surge tanks. If no surge tank is to be used, plug up the hole in the bottom flange of the cushion with the **pop safety valve** provided for this purpose.



(9) Each cushion unit is completely lubricated before shipping; however, it is advisable to lubricate each fitting until grease

emerges from between the piston and cylinder walls before cushion is put into operation. The same procedure should be followed after **every 8 hours** of operation. As a result of careful tests and experimental research the DAYTON ROGERS MFG. CO. has developed a specially compounded lubricant for die cushions. (See pages 73 and 74.)



IMPORTANT!

READ CAREFULLY PRECAUTIONS FOR INSTALLATION AND OPERATION OF PNEUMATIC DIE CUSHIONS DESCRIBED ON PAGE NO. 1

Catalog Number	DIMENSIONS						
	A	B	C	D	E	I	J
C-6	7 1/4	4	7	8 1/2	5 1/4	1/2-13	3/4
C-8	8 19/32	5 19/32	9	10	7	5/8-11	1
C-10	10 7/8	6 3/8	11	12 3/8	7 7/8	3/4-10	1
C-12	12	8 7/16	13 1/8	13 1/2	10	3/4-10	1
C-14	14 1/4	10 1/4	15 1/4	16 1/4	12 1/4	1 - 8	1 3/8
C-16	16 1/2	11	17 1/4	19	13 1/2	1 1/4-7	1 1/2
C-18	17 3/4	12 3/4	19 1/4	20 1/4	15 1/4	1 1/4-7	1 1/2
C-20	20 1/2	14 1/4	21 1/4	23 3/8	17 1/8	1 1/4-7	1 3/4
C-22	22 1/4	15 1/2	23 3/8	25 1/4	18 1/2	1 3/8-6	2
C-24	24	16 3/4	25 5/8	27 1/4	20	1 5/8-6	2

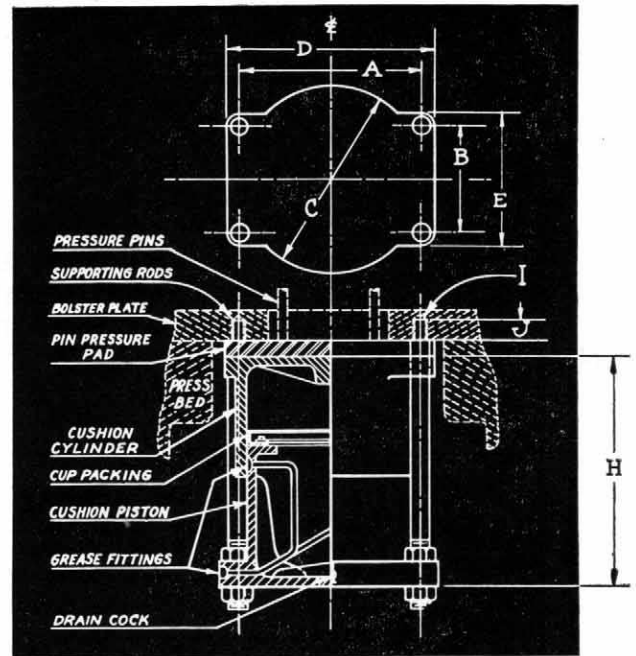


Fig. No. 15

Catalog Number	*Over-all Height (H) of Cushions having a Maximum Draw of —						Ring Holding Pressure @ 100 lbs. psi
	2"	3"	4"	5"	6"	8"	
C-6	10 1/4	11 1/4					1.4 Tons
C-8	11 1/4	12 1/4	13 1/4				2.5 Tons
C-10		15 1/4	16 1/4	17 1/4	18 1/4		3.9 Tons
C-12		15 1/4	16 1/4	17 1/4	18 1/4		5.7 Tons
C-14		15 1/4	16 1/4	17 1/4	18 1/4		7.7 Tons
C-16		16 5/8	17 5/8	18 5/8	19 5/8		10.0 Tons
C-18**		18-13/16	19-13/16	20-13/16	21-13/16		12.7 Tons
C-20**			19-13/16	20-13/16	21-13/16		15.7 Tons
C-22**			22-7/16	23-7/16	24-7/16		19.0 Tons
C-24**			24-7/16	25-7/16	26-7/16	28-7/16	22.6 Tons

*These dimensions do not include pin pad, or lower nuts on mounting rods.
 **These dimensions include piston reinforcing plate.

Installation Instructions



MODEL "C" PRESS BED MOUNTING (with Supporting Structure)

IMPORTANT! Do not disassemble the cushion cylinder and piston when installing, because the packing will flare out and cause an air leak unless reassembled properly.

NOTE: All cushion installations are tested and inspected for air leaks before shipment.

100 PSI MAX. PRESSURE

The following is the recommended procedure for mounting a die cushion to the press bed of a punch press:



(1) Remove the bolster plate and check both surfaces carefully to make sure they are flat and parallel. **THIS IS IMPORTANT!** If surfaces are bowed and not parallel, have them machined so that the pin pressure pad of the cushion will have an accurate surface to stop against.

(2) Screw the ends of the suspension rods, "E", (See Fig. No. 17) with the short length of thread into the drilled and tapped holes in the press bed, which have been provided for mounting the die cushion. Make sure these rods are pulled up as far as they will go into the tapped holes. If the cushion is to be suspended from mounting bosses that are not tapped, the mounting rods are provided with nuts on both top and bottom of the bosses.

(3) With the use of skids or timbers slide the cushion into the approximate location relative to the press bed opening. (NOTE: If the distance between the mounting rods at the front of the press bed is not enough to allow the cushion to pass between them, it is advisable to leave them out until after the cushion has been placed under the press bed opening.)

(4) Run on the upper adjusting nuts, "H", as far as they will go. Raise the cushion unit so that the rods pass through the holes in the mounting plate or mounting channels and run on the lower adjusting nuts, "H".

(5) Prepare a measuring rod, "C" from 3/16" round steel for adjusting the height and alignment of the cushion unit. The over-all length of this rod should be equal to the over-all height of the cushion when expanded, plus the thickness of the pin pad minus 1/8". **The 1/8" is allowed to make sure that the pin**



Fig. No. 16

pressure pad comes to rest against the bottom of the bolster plate.

(6) With a large parallel, "A", laid on top of the press bed (see Fig. No. 17), line up the supporting structure at the four points marked "X", by using the measuring rod, "C". The adjustment and alignment of the mounting plate at these four points must be held to a maximum tolerance of 1/64" to avoid a tilting action. After this adjustment is obtained, lock the upper adjusting nuts on the mounting plate, which will secure the cushion unit in correct parallel alignment and relative height in connection with the top of the press bed.



PRECAUTION: It should be remembered that the adjustment of the nuts on the suspension rods should allow the pin pressure pad to extend 1/8" above the press bed when the cushion cylinder is fully expanded and the bolster plate removed. The Model "C" cushion is fully expanded when the stop rods, "D", are up against the bottom of the mounting plate.

(7) Install combination reducing and regulating valve and pressure gauge, as well as high pressure hoses, according to detailed instructions on Page No. 36.

(8) If surge tank is to be used with the cushion installation, turn to Page No. 38, for detailed instructions on the installation of surge tanks. If no surge tank is to be used, plug up the hole in the bottom flange of the cushion with the **pop safety valve** provided for this purpose.



(9) Each cushion unit is completely lubricated before shipping; however, it is advisable to lubricate each fitting until grease emerges from between the piston and cylinder walls before cushion is put into operation. The same procedure should be followed after **every 8 hours** of operation. As a result of careful tests and experimental research the DAYTON ROGERS MFG. CO. has developed a specially compounded lubricant for die cushions. (See pages 73 and 74.)



IMPORTANT!

READ CAREFULLY PRECAUTIONS FOR INSTALLATION AND OPERATION OF PNEUMATIC DIE CUSHIONS DESCRIBED ON PAGE NO. 1

DIMENSIONS FOR DETERMINING LENGTH OF MEASURING ROD, "C"

EXAMPLE: On a Model C-6 with a 2" draw, the over-all height is 10 1/4", and assuming the thickness of the pin pad is 1", it would make a total of 11 1/4". Subtracting 1/8" from this figure, as described in Paragraph No. 5, will make the length of measuring rod, "C", 11 1/8".

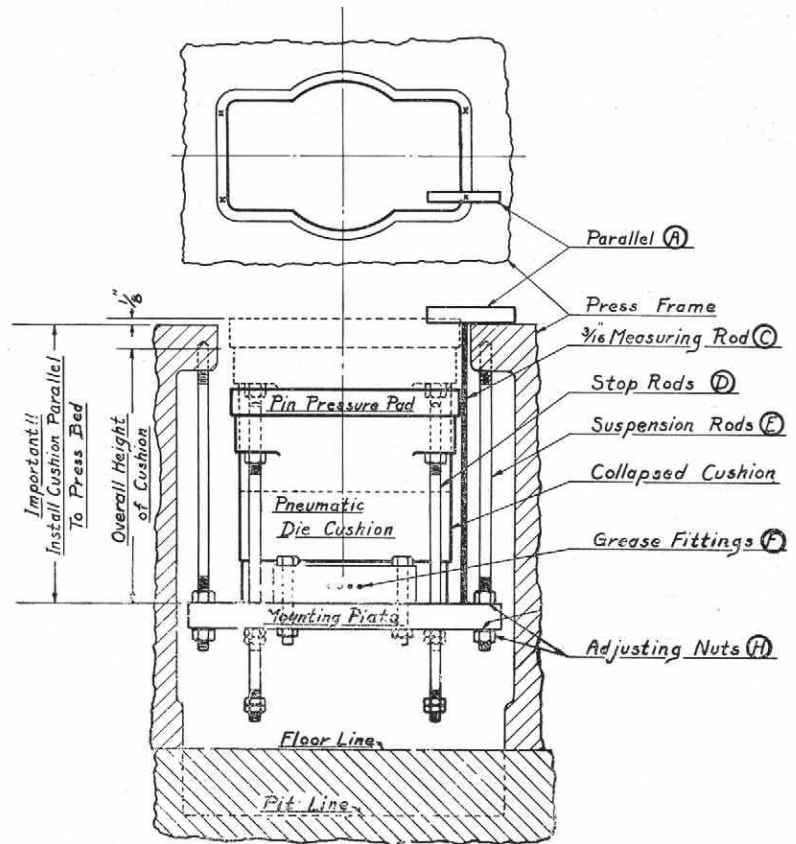


Fig. No. 17

	Over-all Height of Cushion Having a Maximum Draw of					
	2"	3"	4"	5"	6"	8"
C-6"	10 1/4	11 1/4				
C-8"	11 1/4	12 1/4	13 1/4			
C-10"		15 1/4	16 1/4	17 1/4	18 1/4	
C-12"		15 1/4	16 1/4	17 1/4	18 1/4	
C-14"		15 1/4	16 1/4	17 1/4	18 1/4	
C-16"		16 5/8	17 5/8	18 5/8	19 5/8	
C-18"		17 5/8	18 5/8	19 5/8	20 5/8	
C-20"		17 5/8	18 5/8	19 5/8	20 5/8	
C-22"		20	21	22	23	
C-24"		22	23	24	25	27

Installation Instructions

MODEL "MC" BOLSTER PLATE MOUNTING



IMPORTANT! Do not disassemble the cushion cylinder and piston when installing, because the packing will flare out and cause an air leak unless reassembled properly.

100 PSI MAX. PRESSURE

MOUNTING PROCEDURE:



(1) The die cushion should be mounted to the bolster plate so that it is centrally located with reference to the press bed opening. Scribe press bed opening on the underside of bolster plate, remove, and check both surfaces to make sure they are flat and parallel. **This is important!** If surfaces are bowed or not parallel, have them machined and again scribe bed opening on bolster plate.

(2) Lay out holes according to "F" and "G", Fig. No. 19. The tolerance on these holes must be held to $\pm 1/64$ " for proper alignment with mounting rods. Drill and tap holes according to dimensions "I" and "K", making sure holes are square to the under surface of the bolster plate. (See P. 2.)

(3) Bolt bolster plate to bed in its normal position, and screw the ends of the mounting rods having the short length of thread into position. Make sure that the shoulders of these rods are securely tightened against the bolster plate.

(4) Position die cushion under rods, and raise so that rods pass through holes in base flange of cushion. Use temporary blocking if necessary to hold cushion until lock washers and nuts can be run on and tightened. (On MC-12 through MC-16 cushions, nuts should be pinned after assembled by cross-drilling, tapping, and inserting set screw.)

(5) Install combination regulator and gauge, high pressure hoses, as well as surge tank per instructions on pages 36 and 38, respectively. **Note! Piping for surge and air line is the same as shown on page 37.**



(6) Lubricate unit until grease emerges from between piston and cylinder walls before initial operation. Note that the grease fitting located per chart below feeds the upper piston. Since this is buried within the cylinder no grease will ever be seen externally. Therefore, when lubricating insert the same volume in this fitting as is put in the total of all the others. (i.e. If an MC. 14 uses 2 shots in each of the 3 lower piston fittings, put 6 shots in the upper piston fitting.) The same procedure should be followed after EVERY 8 HOURS of operation. Use DAYTON ROGERS specially compounded lubricant. (See pages 73 and 74.)



Flat area for lub. fittings

No's 1 2 3 4 5
(Round Area)

Fig. No. 18

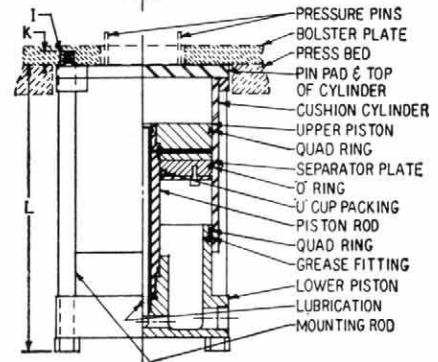
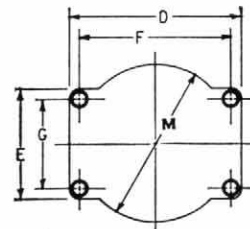


Fig. No. 19



IMPORTANT!
READ CAREFULLY PRECAUTIONS FOR INSTALLATION AND OPERATION OF PNEUMATIC DIE CUSHIONS DESCRIBED ON PAGE NO. 1.

Upper
Piston Fitting

*Recommended size—all mounting rods are made to customer requirements.

Catalog Number	Quar. Lub. Fitting	If on round area	If on flat area	DIMENSIONS							
				C	M	D	E	F	G	I*	J*
MC-8	2	# 2	# 2	9	9	10 1/4	7 1/4	8-19/32	5-19/32	7/8-9	1 1/4
MC-10	3	# 4	# 4	11	11	12 5/8	8 1/2	10 7/8	6 3/8	1 -8	1 1/2
MC-12	3	# 4	# 4	13 1/2	13	13 3/4	10-3/16	12	8-7/16	1 -8	1 1/2
MC-14	4	# 5	# 4	15 1/4	15	16 1/4	12 1/4	14 1/4	10 1/4	1 1/4-7	1 3/4
MC-16	4	# 5	# 4	17 1/4	17 1/4	19	13 1/2	16 1/2	11	1 3/8-6	2
MC-18	5	# 5	# 4	19 1/4	19 1/4	20 1/4	16 1/4	17 3/4	12 3/4	1 1/2-6	2 1/4
MC-20	5	# 3	# 3	21 1/4	21 1/4	24 3/4	18 3/4	21 1/4	15 1/4	1 3/4-5	2 3/4
MC-22	5	# 3	# 3	23 3/8	23 3/8	26 1/4	20 1/4	22 3/4	16 3/4	1 3/4-5	2 3/4
MC-24	5	# 3	# 3	25 3/8	25 3/8	28 3/8	22 1/8	24 3/8	18 1/8	2-4 1/2	3 1/4

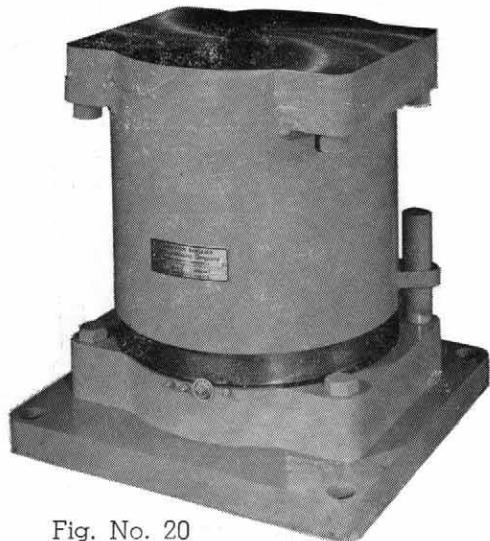


Fig. No. 20

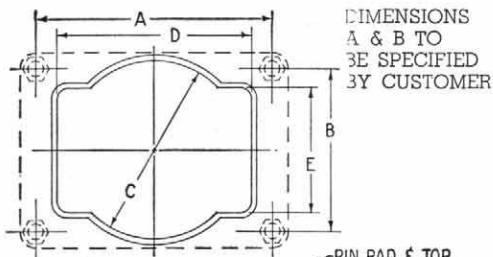


Fig. No. 21

Installation Instructions

MODEL "MC" PRESS BED MOUNTING

NOTE: All cushion installations are tested and inspected for air leaks before shipment.

100 PSI MAX. PRESSURE

MOUNTING PROCEDURE:



(1) Remove the bolster plate and check both surfaces carefully to make sure they are flat and parallel. **This is important!** If surfaces are bowed and not parallel, have them machined so that they are parallel.

(2) Screw ends of rods having shortest thread into drilled and tapped holes provided in press bed. (See P. 2.) If rods are to be mounted to bosses that are not tapped, be sure that nuts are provided on top and bottom of the bosses.

(3) Slide cushion into approximate location relative to press bed opening. (Note: If distance between rods is not great enough to allow cushion to slide between them, leave front rods out until cushion is positioned under press bed.)

(4) Run on upper mounting plate nuts as far as they will go; raise unit so mounting rods pass through holes provided in mounting plate, and run on lower mounting plate nuts.



(5) Model "MC" cushions can either be mounted so they stop against the bolster plate or against their own stop rod, according to customer's preference. If bolster stopping is desired, subtract 1/8" from dim "H" and adjust mounting plate this distance below press bed surface. **BE SURE MOUNTING PLATE IS ADJUSTED PARALLEL TO PRESS BED.** Run upper nuts down tight against plate and pin both upper and lower nuts by cross-drilling, tapping, and inserting set screw.



(6) Follow steps 5 and 6, opposite page, to hookup installation for operation.

NOTE! The stamped shroud located halfway up cylinder wall is covering vent holes. **Never plug these vents** as they are necessary for proper cushion operation. If air is leaking from these vents while cushion is not being compressed it is likely that the cushion packings need replacing.

†Special draw lengths can be supplied upon request. These lengths are typical and may vary according to installation requirements. Cushions will be designed to stop against bolster plate unless otherwise specified by customer.

K*	Draw† Dim.	2		3		4		5		6		8		Ring-holding Pressure (tons) @ 100 P.S.I.
		H	L	H	L	H	L	H	L	H	L	H	L	
1		18 1/8	19	19 1/8	20	26 1/8	27	27 1/8	28	28 1/8	29			5.0
1 1/4		18 1/2	19 1/2	19 1/2	20 1/2	26 1/2	27 1/2	27 1/2	28 1/2	28 1/2	29 1/2			7.8
1 1/2		19	20 1/8	20	21 1/8	27	28 1/8	28	29 1/8	29	30 1/8			11.4
1 5/8		21 3/4	23	22 3/4	24	23 3/4	25	28 3/4	30	29 3/4	31			15.4
1 3/4		21 1/8	22 3/4	22 3/8	23 3/4	27 3/8	28 3/4	28 3/8	29 3/4					20.0
1 7/8		24 5/8	26 3/4	25 5/8	27 3/4	30 5/8	32 3/4	31 5/8	33 3/4					25.4
2		30 3/4	33 5/8	31 3/4	34 5/8	32 3/4	35 5/8	35 3/4	38 5/8	36 3/4	39 5/8			31.4
2		30 3/4	33 5/8	31 3/4	34 5/8	32 3/4	35 5/8	35 3/4	38 5/8	36 3/4	39 5/8			38.0
2 1/4		33 3/4	37 1/8	34 3/4	38 1/8	35 3/4	39 1/8	36 3/4	40 1/8	41 3/4	45 1/8	42 3/4	46 1/8	45.2


Installation Instructions

MODEL "MD" BOLSTER PLATE MOUNTING

IMPORTANT! Do not disassemble the cushion cylinder and piston when installing, because the packing will flare out and cause an air leak unless reassembled properly.

100 PSI MAX. PRESSURE

MOUNTING PROCEDURE:


 (1) The die cushion should be mounted to the bolster plate so that it is centrally located with reference to the press opening. Scribe press bed opening on under side of bolster plate, remove, and check both surfaces to make sure they are flat and parallel. **This is important!** If surfaces are bowed or not parallel, have them machined and again scribe bed opening on bolster plate.

(2) Lay out holes according to "F" and "G", Fig. No. 23. The tolerance on these holes must be held to $\pm 1/64$ " for proper alignment with mounting rods. Drill and tap holes according to dimensions "I" and "K", making sure holes are square to the under surface of the bolster plate. (See P. 2.)

(3) Bolt bolster plate to bed in its normal position, and screw the ends of the mounting rods having the short length of thread into position. Make sure that the shoulders of these rods are securely tightened against the bolster plate.

(4) Position die cushion under rods, and raise so that rods pass through holes in base flange of cushion. Use temporary blocking if necessary to hold cushion until lock washers and nuts can be run on and tightened. (On MD-12 through MD-16 cushions, nuts should be pinned after assembled by cross-drilling, tapping, and inserting set screw.)

(5) Install combination regulator and gauge, high pressure hoses, as well as surge tank per instructions on pages 36 and 38, respectively. **Note! Piping for surge and air line is the same as shown on page 37.**

 (6) Lubricate unit until grease emerges from between piston and cylinder walls before initial operation. Note that the grease fitting located per chart below feeds the upper piston. Since this is buried within the cylinder no grease will ever be seen externally. Therefore, when lubricating insert the same volume in this fitting as is put in the total of all the others. (i.e. If an MD 14 uses 2 shots in each of the 3 lower piston fittings, put 6 shots in the upper piston fitting.) The same procedure should be followed after EVERY 8 HOURS of operation. Use DAYTON ROGERS specially compounded lubricant. (See pages 73 and 74.)

(See Fig. 24)

Upper
Piston Fitting

*Recommended size—all mounting rods are made to customer requirements.

Catalog Number	Quan. Lub. Fittings	If on round area	If on flat area	DIMENSIONS								
				C	M	D	E	F	G	I*	J*	
MD 8	2	# 2	# 2	9	9	10 $\frac{1}{4}$	7 $\frac{1}{4}$	8 $\frac{19}{32}$	5 $\frac{19}{32}$	$\frac{7}{8}$ -9	1 $\frac{1}{4}$	
MD 10	3	# 4	# 4	11	11	12 $\frac{5}{8}$	8 $\frac{1}{8}$	10 $\frac{7}{8}$	6 $\frac{3}{8}$	1 -8	1 $\frac{1}{2}$	
MD 12	3	# 4	# 4	13 $\frac{1}{8}$	13	13 $\frac{3}{4}$	10 $\frac{3}{8}$	12	8 $\frac{1}{16}$	1 -8	1 $\frac{1}{2}$	
MD 14	4	# 5	# 4	15 $\frac{1}{4}$	15	16 $\frac{1}{4}$	12 $\frac{1}{4}$	14 $\frac{1}{4}$	10 $\frac{1}{4}$	1 $\frac{1}{4}$ -7	1 $\frac{3}{4}$	
MD 16	4	# 5	# 4	17 $\frac{1}{4}$	17 $\frac{1}{4}$	19	13 $\frac{1}{2}$	16 $\frac{1}{2}$	11	1 $\frac{3}{8}$ -6	2	



Fig No. 22

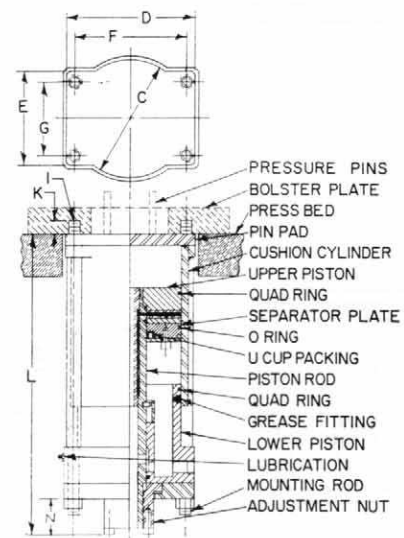


Fig. 23



IMPORTANT!
READ CAREFULLY PRECAUTIONS FOR
INSTALLATION AND OPERATION OF
PNEUMATIC DIE CUSHIONS DESCRIBED
ON PAGE NO. 1.

Installation Instructions

MODEL "MD" PRESS BED MOUNTING

NOTE: All cushion installations are tested and inspected for air leaks before shipment.

Flat area
for lub. fittings

100 PSI MAX. PRESSURE

MOUNTING PROCEDURE:



(1) Remove the bolster plate and check both surfaces carefully to make sure they are flat and parallel. **This is important!** If surfaces are bowed and not parallel, have them machined so that they are parallel.

(2) Screw ends of rods having shortest thread into drilled and tapped holes provided in press bed. (**See P. 2.**) If rods are to be mounted to bosses that are not tapped, be sure that nuts are provided on top and bottom of the bosses.

(3) Slide cushion into approximate location relative to press bed opening. Be sure to **protect the adjustment nut** while cushion is being installed.

(Note: If distance between rods is not great enough to allow cushion to slide between them, leave front rods out until cushion is positioned under press bed.)

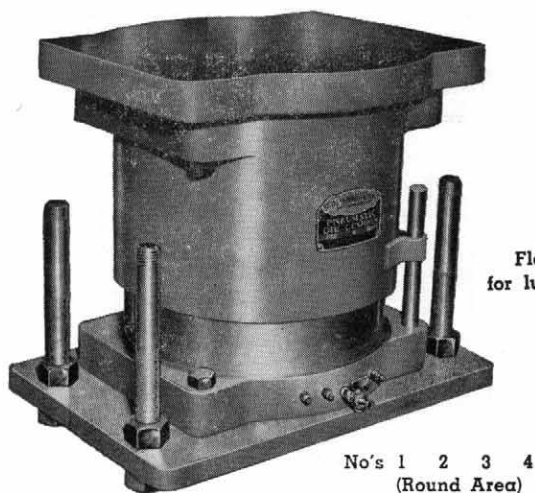
(4) Run on upper mounting plate nuts as far as they will go; raise unit so mounting rods pass through holes provided in mounting plate, and run on lower mounting plate nuts.



(5) Model "MD" cushions can either be mounted so they stop against the bolster plate or against their own stop rod, according to customer's preference. If bolster stopping is desired, subtract $\frac{1}{8}$ " from dim "H" and adjust mounting plate this distance below press bed surface. **BE SURE MOUNTING PLATE IS ADJUSTED PARALLEL TO PRESS BED.** Run upper nuts down tight against plate and pin both upper and lower nuts by cross-drilling, tapping, and inserting set screw.



(6) Follow steps 5 and 6, opposite page, to hook-up installation for operation.



No's 1 2 3 4
(Round Area)

Fig. No. 24

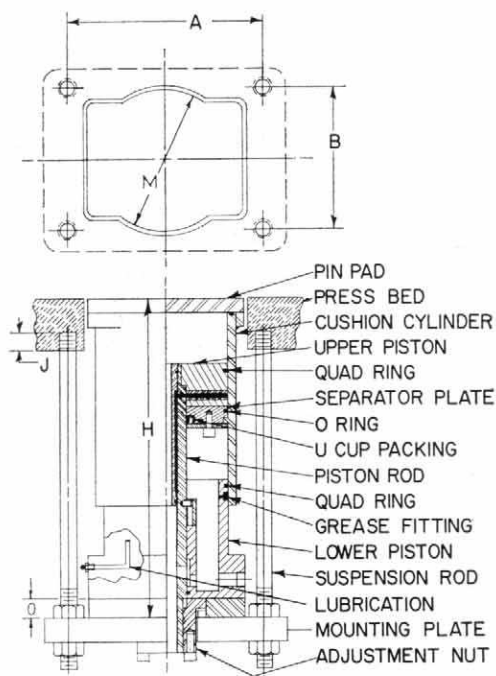


Fig. No. 25



NOTE! The stamped shroud located halfway up cylinder wall is covering vent holes. **Never plug these vents** as they are necessary for proper cushion operation. If air is leaking from these vents while cushion is not being compressed it is likely that the cushion packings need replacing.

†Special draw lengths can be supplied upon request. These lengths are typical and may vary according to installation requirements. Cushions will be designed to stop against bolster plate unless otherwise specified by customer.

K*	Max. Adj.	N	O	3		4		5		6		Ring-holding Pressure (tons) @ 100 P.S.I.
				L	H	L	H	L	H	L	H	
1	$\frac{5}{8}$	$3\frac{7}{8}$	$1\frac{3}{16}$	$20\frac{5}{16}$	$24\frac{3}{16}$	$27\frac{5}{16}$	$31\frac{3}{16}$	$28\frac{5}{16}$	$32\frac{3}{16}$	$29\frac{5}{16}$	$33\frac{3}{16}$	5
$1\frac{1}{4}$	$\frac{5}{8}$	$3\frac{7}{8}$	$1\frac{3}{16}$	$20\frac{5}{16}$	$24\frac{3}{16}$	$27\frac{11}{16}$	$31\frac{3}{16}$	$28\frac{11}{16}$	$32\frac{3}{16}$	$29\frac{11}{16}$	$33\frac{3}{16}$	7.8
$1\frac{1}{2}$	$\frac{5}{8}$	$3\frac{7}{8}$	$1\frac{11}{16}$	$21\frac{11}{16}$	$25\frac{9}{16}$	$28\frac{11}{16}$	$32\frac{3}{16}$	$29\frac{11}{16}$	$33\frac{3}{16}$	$30\frac{11}{16}$	$34\frac{3}{16}$	11.4
$1\frac{5}{8}$	$\frac{5}{8}$	$3\frac{11}{16}$	$1\frac{11}{16}$	$24\frac{11}{16}$	$28\frac{3}{8}$	$25\frac{11}{16}$	$29\frac{3}{8}$	$30\frac{11}{16}$	$34\frac{3}{8}$	$31\frac{11}{16}$	$35\frac{3}{8}$	15.4
$1\frac{3}{4}$	$\frac{5}{8}$	$3\frac{11}{16}$	$2\frac{3}{16}$	$24\frac{9}{16}$	$28\frac{1}{4}$	$29\frac{9}{16}$	$33\frac{1}{4}$	$30\frac{9}{16}$	$34\frac{1}{4}$			20

Installation Instructions

MODEL "HC" BOLSTER PLATE MOUNTING

IMPORTANT! Do not disassemble the cushion cylinder and piston when installing, because the packing will flare out and cause an air leak unless reassembled properly. **200 PSI MAX. PRESSURE**

MOUNTING PROCEDURE:

(1) The die cushion should be mounted to the bolster plate so that it is centrally located with reference to the press bed opening. Scribe press bed opening on under side of bolster plate, remove, and check both surfaces to make sure they are flat and parallel. **This is important!** If surfaces are bowed or not parallel, have them machined and again scribe bed opening on bolster plate.

(2) Lay out holes according to "F" and "G", Fig. No. 27. The tolerance on these holes must be held to $\pm 1/64"$ for proper alignment with mounting rods. Drill and tap holes according to dimensions "I" and "K", making sure holes are square to the under surface of the bolster plate. (See P. 2.)

(3) Bolt bolster plate to bed in its normal position, and screw the ends of the mounting rods having the short length of thread into position. Make sure that the shoulders of these rods are securely tightened against the bolster plate.

(4) Position die cushion under rods, and raise so that rods pass through holes in base flange of cushion. Use temporary blocking if necessary to hold cushion until lock washers and nuts can be run on and tightened. (On HC-12 through HC-24 cushions, nuts should be pinned after assembled by cross-drilling, tapping, and inserting set screw.)

(5) Install booster pump and surge tank per instructions on pages 20 and 37, respectively. Combination regulator and gauge (page 36) can be substituted for booster pump if shop air pressure is adequate.

(6) Lubricate unit until grease emerges from between piston and cylinder walls before initial operation. The same procedure should be followed after EVERY 8 HOURS of operation. Use DAYTON ROGERS specially compounded lubricant. (See pages 73 and 74.)

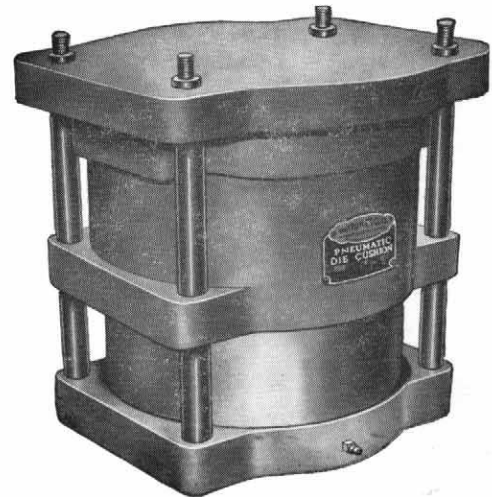


Fig. No. 26

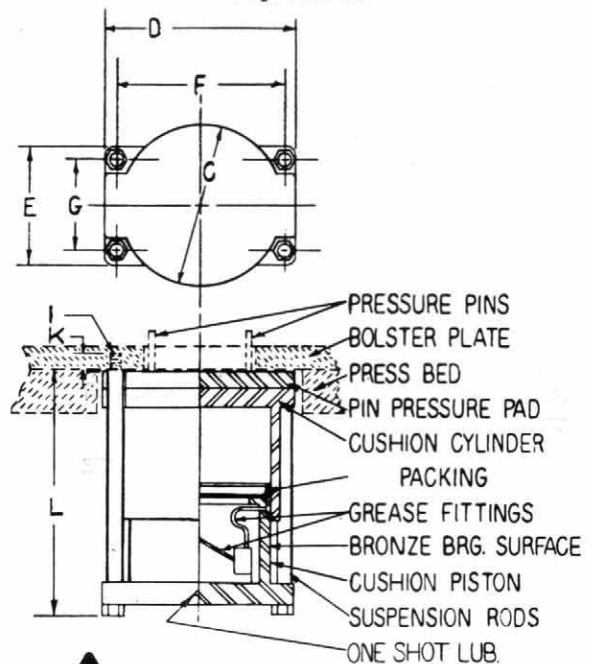


Fig. No. 27

IMPORTANT!
**READ CAREFULLY PRECAUTIONS FOR
 INSTALLATION AND OPERATION OF
 PNEUMATIC DIE CUSHIONS DESCRIBED
 ON PAGE NO. 1.**

Catalog Number	Press Bed Rod Spacing		DIMENSIONS						I*	J*
	F to B	L to R	C	D	E	F	G			
HC 8	To be Specified by Customer	To be Specified by Customer	9 $\frac{3}{4}$	11 $\frac{5}{8}$	8 $\frac{1}{2}$	9 $\frac{7}{8}$	6 $\frac{3}{4}$	7 $\frac{7}{8}$ -9	1 $\frac{1}{4}$	
HC 10			11 $\frac{3}{4}$	13 $\frac{1}{16}$	10 $\frac{1}{4}$	11 $\frac{1}{16}$	8 $\frac{1}{4}$	1-8	1 $\frac{1}{2}$	
HC 12			13 $\frac{1}{2}$	15 $\frac{5}{8}$	11 $\frac{3}{4}$	13 $\frac{3}{8}$	9 $\frac{1}{2}$	1 $\frac{1}{4}$ -7	1 $\frac{1}{2}$	
HC 14			16	17 $\frac{5}{8}$	13 $\frac{3}{8}$	15 $\frac{1}{8}$	10 $\frac{7}{8}$	1 $\frac{1}{4}$ -7	1 $\frac{3}{4}$	
HC 16			18	19 $\frac{3}{4}$	15	17	12 $\frac{1}{4}$	1 $\frac{3}{8}$ -6	2	
HC 18			20	22	16 $\frac{3}{4}$	19	13 $\frac{3}{4}$	1 $\frac{1}{2}$ -6	2	
HC 20			22 $\frac{1}{4}$	24 $\frac{3}{4}$	18 $\frac{3}{4}$	21 $\frac{1}{4}$	15 $\frac{1}{4}$	1 $\frac{3}{4}$ -5	2 $\frac{3}{4}$	
HC 22			24 $\frac{1}{4}$	26 $\frac{1}{4}$	20 $\frac{1}{4}$	22 $\frac{3}{4}$	16 $\frac{3}{4}$	1 $\frac{3}{4}$ -5	2 $\frac{3}{4}$	
HC 24			26 $\frac{1}{4}$	28 $\frac{5}{8}$	22 $\frac{1}{8}$	24 $\frac{7}{8}$	18 $\frac{1}{8}$	2-4 $\frac{1}{2}$	3 $\frac{1}{4}$	

*Recommended size—all mounting rods are made to customer requirements.

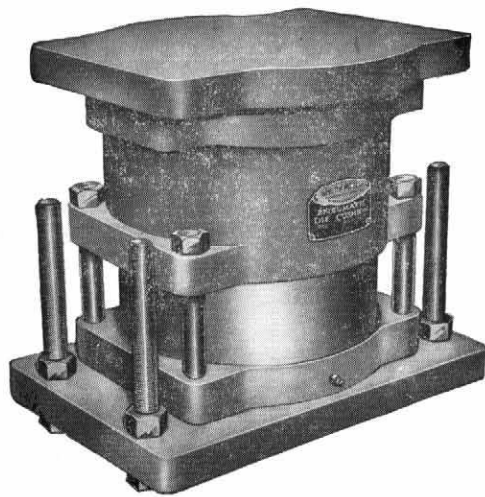


Fig. No. 28

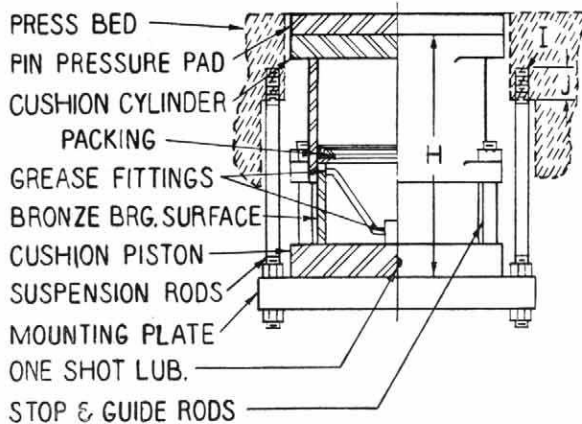
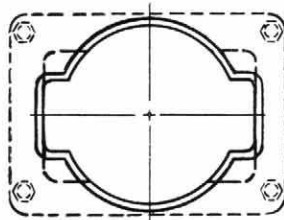


Fig. No. 29

Installation Instructions

MODEL "HC" PRESS BED MOUNTING

NOTE: All cushion installations are tested and inspected for air leaks before shipment.

200 PSI MAX. PRESSURE

MOUNTING PROCEDURE:

! (1) Remove the bolster plate and check both surfaces carefully to make sure they are flat and parallel. **This is important!** If surfaces are bowed and not parallel, have them machined so that they are parallel.

(2) Screw ends of rods having shortest thread into drilled and tapped holes provided in press bed. **(See P. 2.)** If rods are to be mounted to bosses that are not tapped, be sure that nuts are provided on top and bottom of the bosses.

(3) Slide cushion into approximate location relative to press bed opening. (Note: If distance between rods is not great enough to allow cushion to slide between them, leave front rods out until cushion is positioned under press bed.)

(4) Run on upper mounting plate nuts as far as they will go; raise unit so mounting rods pass through holes provided in mounting plate, and run on lower mounting plate nuts.

! (5) Model "H" cushions can either be mounted so they stop against the bolster plate or against their own stop rods, according to customer's preference. If bolster stopping is desired, measure pin pad thickness, add to dim "H", subtract 1/8" and adjust mounting plate this distance below press bed surface. **BE SURE MOUNTING PLATE IS ADJUSTED PARALLEL TO PRESS BED.** Run upper nuts down tight against plate and pin both upper and lower nuts by crossdrilling, tapping, and inserting set screw.

! (6) Follow steps 5 and 6, opposite page, to hook-up installation for operation.

K*	Draw† Dim.	2		4		6		8		10		12		Ring-holding Pressure (tons) @ 200 P.S.I.
		H	L	H	L	H	L	H	L	H	L	H	L	
1		15½	17¼	17½	19¼	19½	21¼							5.0
1¼		17⅝	19½	19⅝	21½	21⅝	23½							7.8
1½				19⅝	22	21⅝	24							11.4
1⅝				21⅝	23¾	23⅝	25¾	27⅝	29¾	31⅝	33¾			15.4
1¾				21⅝	24⅝	23⅝	26⅝	27⅝	30⅝	31⅝	34⅝			20.0
1⅞				22⅝	26	24⅝	28	28⅝	32	32⅝	36	36⅝	40	25.4
2				22⅝	26¼	24⅝	28¼	28⅝	32¼	32⅝	36¼	36⅝	40¼	31.4
2				24⅝	28	26⅝	30	30⅝	34	34⅝	38	38⅝	42	38.0
2¼				27⅝	31½	29⅝	33½	31⅝	35½	35⅝	39½	39⅝	43½	45.2

†Special draw lengths can be supplied upon request. These lengths are typical and may vary according to installation requirements. Cushions will be designed to stop against bolster plate unless otherwise specified by customer.

General Information

MODEL "H-4" "H-4B" OR H-6 PNEUMATIC BOOSTER PUMP

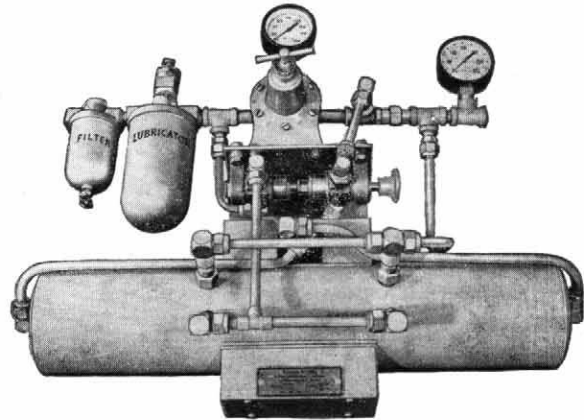


CAUTION: BE SURE THAT EQUIPMENT USED WITH PUMP IS RATED AT PRESSURE USED

300 PSI MAX. OUTPUT PRESSURE

Note: Except for size and external appearance these pumps are identical in theory and performance.

The DAYTON ROGERS "H-4", "H-4B", or "H-6" Booster Pump is a self-contained automatic air pumping unit. Its primary function is to increase shop line pressure and to act as a pressure regulator by controlling its output pressure at any setting up to **two times input** pressure for the model "H-4", **two and one half times input** for the model "H-6", and **three times input** for the model "H-4B".



Model H-4

Fig. No. 30

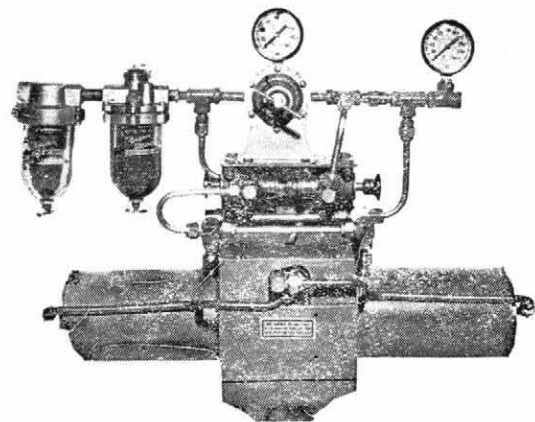
(1) MODEL "H-4"

This pump is designed to combine **shop line pressure** and **regulator pressure**. (ie—assume shop line at 100 psi and regulator set at 90 psi, the output pressure would be 190 psi \pm 5%.) Using 100 psi input pressure and the system pre-charged to 100 psi, the pump takes 1 minute to pump 24 gallons up to 190 psi. This is equivalent to **3.2 cfm compressed air** at 190 psi, or **40 cfm free air**. The time required to pump any volume to this pressure may be obtained by dividing the volume in gallons by 24 when 100 psi input and 100 psi pre-charge is used. (See table for pumping rates.) The pump is an opposed cylinder type unit having a **4-inch bore** and a **4-inch stroke**, which is controlled by a self-contained, cam-operated lever arm.

(2) MODEL "H-4B"

This pump is designed to combine **shop line pressure** plus **two times the pressure** set on the **regulator**. (ie—assume shop line at 80 psi and regulator set at 60 psi, the output pressure would be 200 psi \pm 5%.) **CAUTION!**

The "H-4B" has a boost ratio up to **three times shop line pressure**, thus it is possible to exceed the 300 psi maximum rating for pressure vessels, pipe fittings, or die cushions. Using 100 psi input pressure and the system pre-charged to 100 psi, the pump takes 1 minute to pump 12 gallons up to 190 psi. This is equivalent to **1.6 cfm compressed air** at 190 psi or **20 cfm free air**.



Model H-4B

Fig. No. 31


Installation Instructions

MODEL "AF" BOLSTER PLATE MOUNTING

(See Page 20-B for PRESS BED MOUNTING)

100 PSI MAX. PRESSURE

MOUNTING PROCEDURE:

 (1) The die cushion should be mounted to the bolster plate so that it is centrally located with reference to the press bed opening. Scribe press bed opening on under side of bolster plate, remove, and check both surfaces to make sure they are flat and parallel. **This is important!** If surfaces are bowed or not parallel, have them machined and again scribe bed opening on bolster plate.

(2) Lay out holes according to "F" and "G", Fig. No. B. The tolerance on these holes must be held to $\pm 1/64"$ for proper alignment with mounting rods. Drill and tap holes according to dimensions "I" and "K", making sure holes are square to the under surface of the bolster plate. (See P. 2)

(3) Bolt bolster plate to bed in its normal position, and screw the ends of the mounting rods having the short length of thread into position. Make sure that the shoulders of these rods are securely tightened against the bolster plate.

(4) Position die cushion under rods, and raise so that rods pass through holes in base flange of cushion. Use temporary blocking if necessary to hold cushion until lock washers and nuts can be run on and tightened. (On AF-10 through AF-30 cushions, nuts should be pinned after assembled by cross-drilling, tapping, and inserting set screw.)

(5) Install combination regulator and gauge, high pressure hoses, as well as surge tank per instructions on pages 36 and 38, respectively. **Note! Piping for surge and air line is the same as shown on page 37.**

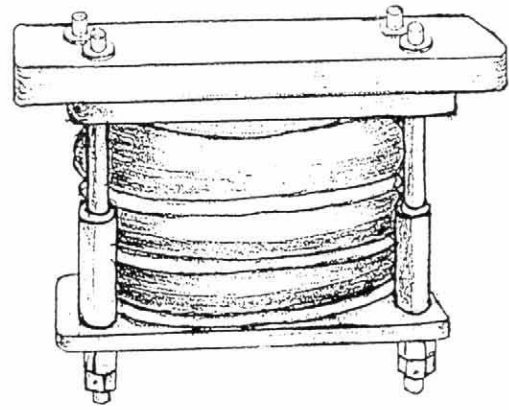


Fig. No. A

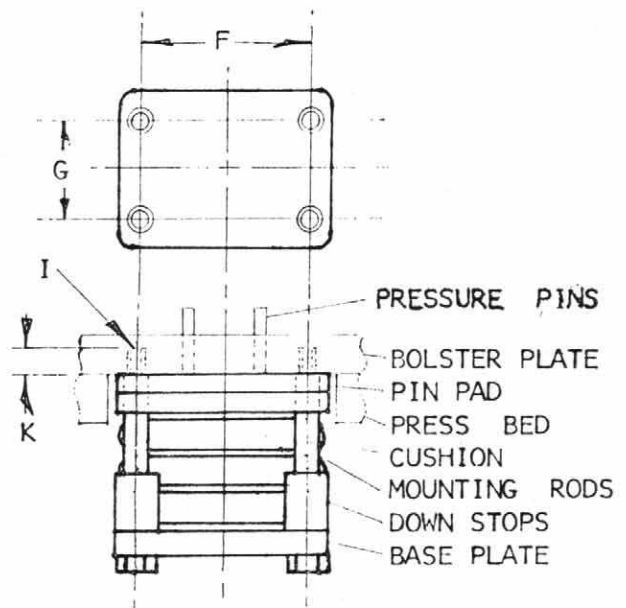


Fig. No. B

Catalog Number	F	G	I*	K
AF 10			$\frac{3}{4}$ -10	1
AF 12	Specified		$\frac{3}{4}$ -10	1
AF 14	to Job. See		1-8	$1\frac{3}{8}$
AF 16	Installation		$1\frac{1}{4}$ -7	$1\frac{1}{2}$
AF 18	Drawing		$1\frac{1}{4}$ -7	$1\frac{1}{2}$
AF 20	pertaining		$1\frac{1}{4}$ -7	$1\frac{3}{4}$
AF 22	to particular		$1\frac{3}{8}$ -6	2
AF 24	unit.		$1\frac{3}{8}$ -6	2
AF 30			2-4 $\frac{1}{2}$	3

*Recommended size—all mounting rods are made to customer requirements.



IMPORTANT!

READ CAREFULLY PRECAUTIONS FOR INSTALLATION AND OPERATION OF PNEUMATIC DIE CUSHIONS DESCRIBED ON PAGE NO. 1.

Installation Instructions

MODEL "AF" PRESS BED MOUNTING

NOTE: All cushion installations are tested and inspected for air leaks before shipment.

100 PSI MAX. PRESSURE

MOUNTING PROCEDURE:

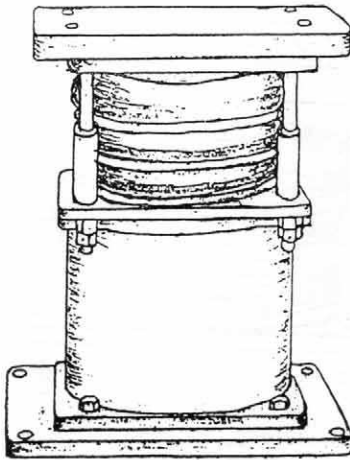


Fig. No. C

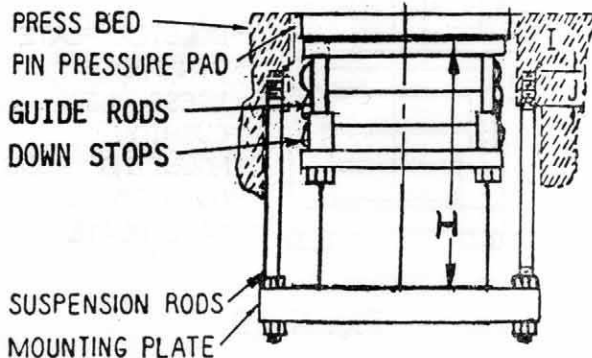
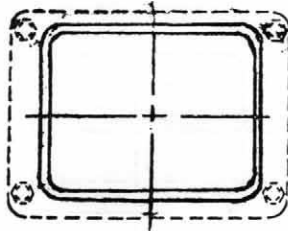


Fig. No. D



(1) Remove the bolster plate and check both surfaces carefully to make sure they are flat and parallel. **This is important!** If surfaces are bowed and not parallel, have them machined so that they are parallel.

(2) Screw ends of rods having shortest thread into drilled and tapped holes provided in press bed. (See P. 2) If rods are to be mounted to bosses that are not tapped, be sure that nuts are provided on top and bottom of the bosses.

(3) Slide cushion into approximate location relative to press bed opening. (Note: If distance between rods is not great enough to allow cushion to slide between them, leave front rods out until cushion is positioned under press bed.)

(4) Run on upper mounting plate nuts as far as they will go; raise unit so mounting rods pass through holes provided in mounting plate, and run on lower mounting plate nuts.



(5) Model "AF" cushions can either be mounted so they stop against the bolster plate or against their own stop rods, according to customer's preference. If bolster stopping is desired, measure pin pad thickness, add to dim "H", subtract 1/8" and adjust mounting plate this distance below press bed surface. **BE SURE MOUNTING PLATE IS ADJUSTED PARALLEL TO PRESS BED.** Run upper nuts down tight against plate and pin both upper and lower nuts by crossdrilling, tapping, and inserting set screw.

(6) Install combination regulator and gauge, high pressure hoses, as well as surge tank per instructions on pages 36 and 38, respectively. Note! Piping for surge and air line is the same as shown on page 37.



IMPORTANT!

READ CAREFULLY PRECAUTIONS FOR INSTALLATION AND OPERATION OF PNEUMATIC DIE CUSHIONS DESCRIBED ON PAGE NO. 1.

(See Page 20-A for BOLSTER MOUNTING)

Model	Equivalent Diameter	Maximum Stroke	Tonnage (R.H.F.) @ 100 P.S.I.					Min. Space Required				
			Predetermined Designed Stroke									
								3"	6"	8"	10"	12"
LOW PRESSURE												
AF 10	10	10	4.4	3.7	3.2	2.7	—	14" x 14"				
AF 12	12	10	6.0	5.4	4.7	3.8	—	17" x 17"				
AF 14	14	10	8.9	7.8	7.0	6.0	—	20" x 20"				
AF 16	16	7	12.0	9.8	—	—	—	21" x 21"				
AF 18	18	10	12.2	11.1	10.0	8.6	—	22" x 22"				
AF 20	20	10	16.7	15.3	14.3	13.0	—	24" x 24"				
AF 24	24	12	25.8	23.8	23.0	21.3	19.5	29" x 29"				
AF 30	30	12	48.0	45.0	43.0	40.5	38.0	39" x 39"				
HIGH PRESSURE												
HAF 12	12	10	12.0	10.8	7.0	5.7	—	17" x 17"				
HAF 14	14	10	17.8	15.6	10.5	9.0	—	20" x 20"				
HAF 16	16	4	24.0	—	—	—	—	21" x 21"				
HAF 18	18	10	24.4	22.2	15.0	12.9	—	22" x 22"				
HAF 20	20	10	33.4	30.6	21.5	19.5	—	24" x 24"				
HAF 24	24	12	51.6	47.6	34.5	32.0	29.3	29" x 29"				
HAF 30	30	12	96.0	90.0	64.5	60.8	57.0	39" x 39"				

The time required to pump any volume to this pressure may be obtained by dividing the volume in gallons by 12 when 100 psi input pressure and 100 psi pre-charge is used. (See table for pumping rates.)

The pump has a **4-inch bore** and a **4-inch stroke** which is controlled by a self-contained, cam-operated lever arm.

The primary purpose of the "**H-4B**" pump is to boost shop line pressures of less than 100 psi to an output pressure requirement of 200 psi or greater.

(3) MODEL "H-6"

The pump is designed to combine shop line pressure and one and one half times the regulator pressure (ie, Assume shop line at 100 psi and regulator at 60 psi., the output pressure would be 190 psi \pm 5%.) Using 100 psi input, pump takes 1 minute to pump 40 gallons precharge to 100 psi, up to 190 psi. This is equivalent to **5.4 cfm compressed air** or **70 cfm free air**. The time required to pump any volume to this pressure may be obtained by dividing the volume in gallons by 40 when 100 psi input and 100 psi precharge is used (See table for pumping rates.)

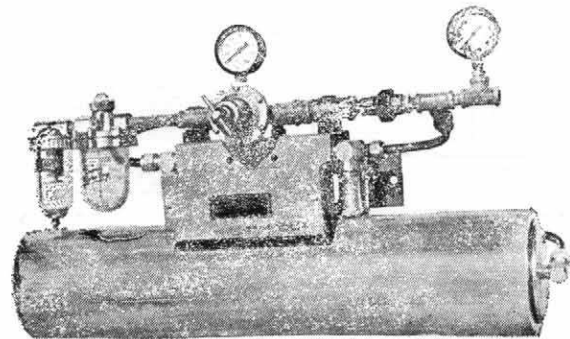
The pump has a **6-inch bore** and a **6-inch stroke** which is controlled by a self-contained cam operated lever arm.

The primary purpose of the **H-6 pump** is to boost line pressures of less than 100 psi to a output pressure greater than 200 psi. It also has greater capacity for pumping large pressure vessels.

OPERATIONAL SPECIFICATIONS

(1) **Power Connections**—Shop Air Line. No other source of power necessary.

	H-4	H-4B	H-6
(2) Max. Input Pressure —	150 psi.	100 psi.	125 psi.
(3) Min. Output Pressure —	0 psi.	0 psi.	0 psi.
(4) Max. Output Pressure —	300 psi.	300 psi.	300 psi.
(5) Output Pressure Control Variation —	\pm 5%.		



Model H-6
Fig. No. 32

OUTPUT CAPACITY (MIN)

MODEL	PUMP CAPACITY IN GALLONS				
	12	18	33	51	125
H-4	0'-30"	0'-45"	1'-20"	2'-10"	5'- 0"
H-4B	1'- 0"	1'-30"	2'-45"	4'-15"	10'-30"
H-6	0'-18"	0'-28"	0'-50"	1'-16"	3'-10"

Installation Instructions

H-4, H-4B AND H-6

PNEUMATIC BOOSTER PUMP

Note: See separate book (F-44-E) for further information on operating and servicing pump.

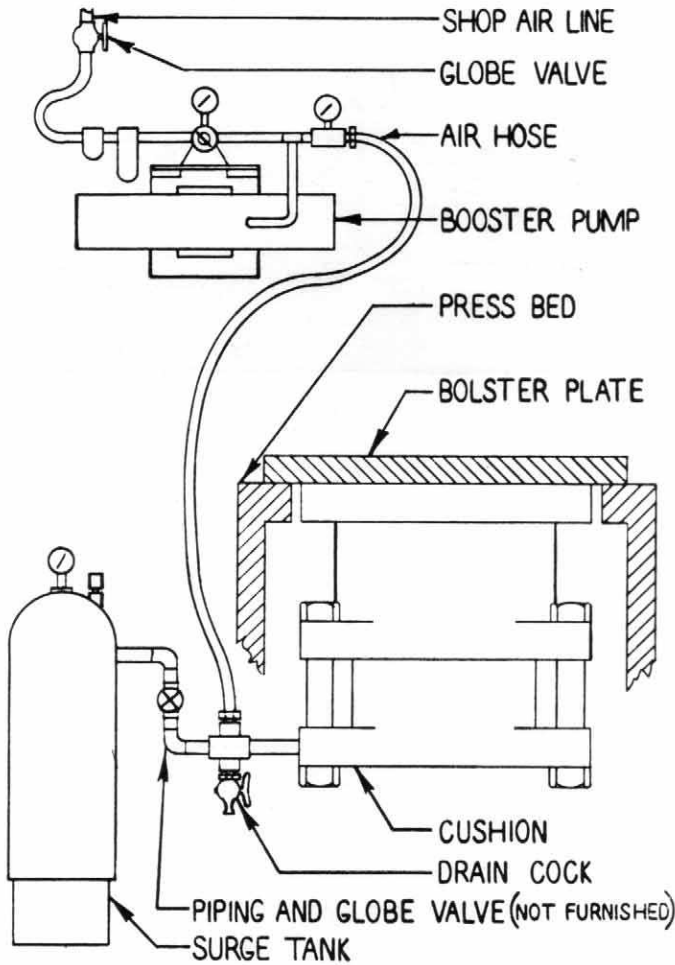


Fig. No. 33

(1) MOUNTING

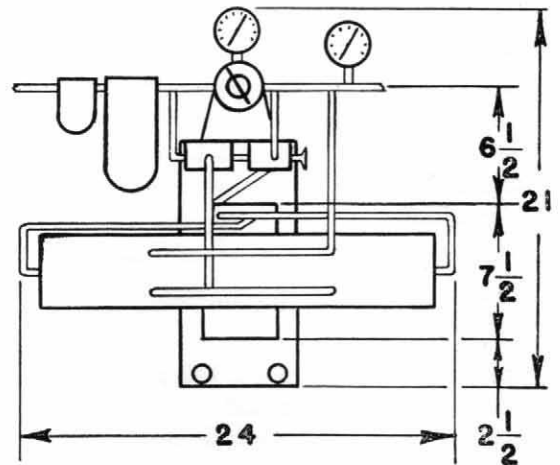
The pump should be mounted horizontally to the press frame or any other convenient place by bolting through three holes provided in the mounting plate. Select space large enough to accommodate pump as dimensioned in Fig. No. 34. If pump is mounted on an uneven or curved surface, care should be taken not to bend pump mounting plate.

(2) PIPING TO WORK

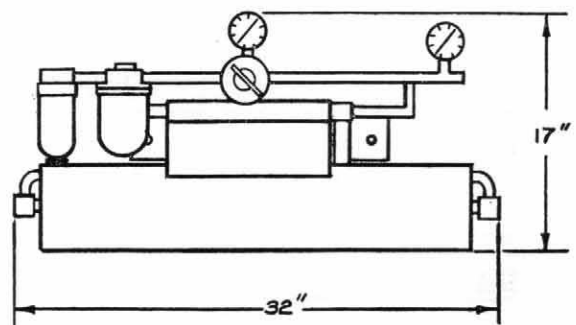
Input can be piped to shop air line with standard pipe fittings. The H-4 and H-4B should have a minimum pipe diameter of $\frac{3}{8}$ ". The H-6 should have a minimum pipe diameter of $\frac{1}{2}$ ". Any pipe smaller than the diameters specified will cause the pump to



"starve" for air and pumping time will increase. Pump output should be connected to work unit either with 300 psi pipe fittings, or with flexible hose rated at 300 psi minimum.



Model H-4 and H-4B



Model H-6

Fig. No. 34

(3) Recommended method for piping pump into a pneumatic Model "H" die cushion is shown in Fig. No. 33. If excessive moisture is present in air line, a water trap should be provided between the shop air line connection and filter. (See Fig. No. 36.)



(4) Before running pump, **fill lubricator with Texaco Regal A-R & O (viscosity SAE 10) or equivalent. Adjust lubricator** so that when pump is operating approximately **one drop of oil** enters air stream **every 3 or 4 strokes** of pump. The drops are observed through sight tube on lubricator. **Check and fill lubricator periodically.**

BOOSTER PUMP WITH RESERVOIR

An optional 3 gallon tank is available for all pumps. This tank serves as a reservoir to insure an even output pressure. This reservoir is recommended for:

1. When even output pressures are required.
2. When two or more pumps are installed in series.

A line sketch of this installation is shown in figure 35.

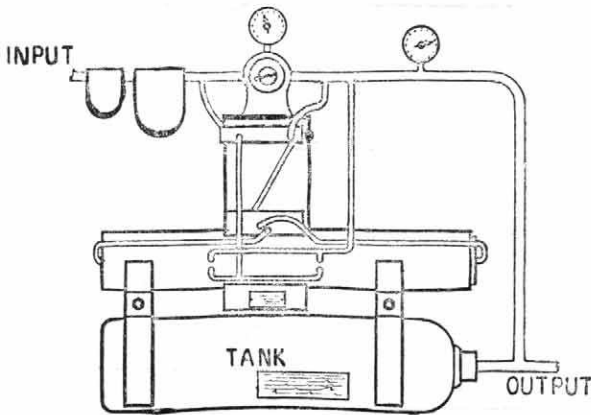
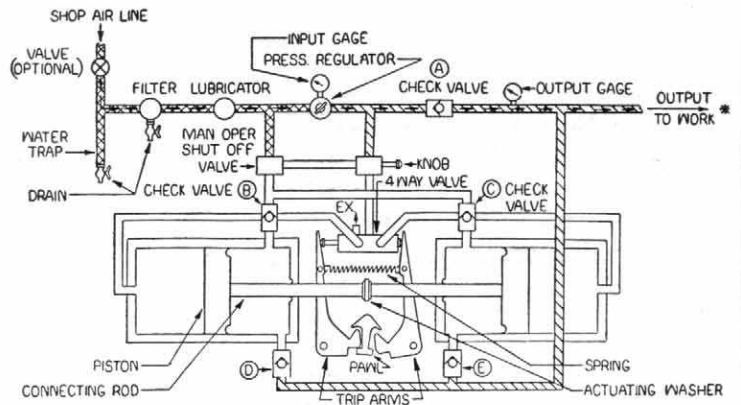


Fig. No. 35



* IMPORTANT—BE SURE THAT EQUIPMENT USED WITH PUMP IS RATED AT MAXIMUM PRESSURE.

SCHEMATIC PIPING CIRCUIT
BOOSTER PUMP

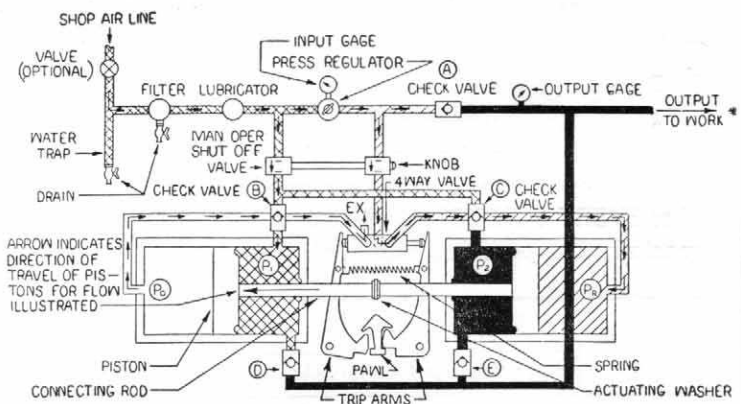
	REGULATED PRESS.
	SHOP LINE PRESS.
	OUTPUT PRESS.

(MANUALLY OPERATED VALVE CLOSED—PUMP CUT OUT OF CIRCUIT)

Fig. No. 36

OPERATING INSTRUCTIONS

- (1) **Manually-operated Shut-off Valve**
Output-zero to shop line pressure.
Push left knob. (See Fig. No. 36 for air flow.)
Regulator controls output direct.
Output-shop line to 3 times shop line pressure.
Push right knob. (See Fig. No. 37 for air flow through pump.)
- (2) **Initial Charging of Work**
Push left knob and charge to approximate shop line pressure. Push right knob, leaving regulator at high setting until pressure approaches desired value. Reset regulator. Pump will automatically stop at pre-set pressure and hold this pressure thereafter.



* IMPORTANT—BE SURE THAT EQUIPMENT USED WITH PUMP IS RATED AT MAXIMUM PRESSURE.

SCHEMATIC DIAGRAM
BOOSTER PUMP

	REGULATED PRESS.
	SHOP LINE PRESS.
	OUTPUT PRESS.

(MANUALLY OPERATED VALVE OPEN—PUMP OPERATING)

Fig. No. 37

Installation Instructions

MODEL "HD" BOLSTER PLATE MOUNTING



IMPORTANT! Do not disassemble the cushion cylinder and piston when installing, because the packing will flare out and cause an air leak unless reassembled properly. **200 PSI MAX. PRESSURE**

MOUNTING PROCEDURE:



(1) The die cushion should be mounted to the bolster plate so that it is centrally located with reference to the press bed opening. Scribe press bed opening on the under side of bolster plate, remove, and check both surfaces to make sure they are flat and parallel. **This is important!** If surfaces are bowed or not parallel, have them machined and again scribe bed opening on bolster plate.

(2) Lay out holes according to "F" and "G", Fig. No. 39. The tolerance on these holes must be held to $\pm 1/64$ " for proper alignment with mounting rods. Drill and tap holes according to dimensions "I" and "K", making sure holes are square to the under surface of the bolster plate. (See P. 2).

(3) Bolt bolster plate to bed in its normal position, and screw the ends of the mounting rods having the short length of thread into position. Make sure that the shoulders of these rods are securely tightened against the bolster plate.

(4) Position die cushion under rods, and raise so that rods pass through holes in base flange of cushion. Use temporary blocking if necessary to hold cushion until lock washers and nuts can be run on and tightened. (On HD-12 through HD-16 cushions, nuts should be pinned after assembly by cross-drilling, tapping, and inserting set screw.)

(5) Install booster pump and surge tank per instructions on page 20 and 37, respectively. Combination regulator and gauge (page 36) can be substituted for booster pump shop air pressure is adequate.



(6) Lubricate unit until grease emerges from between piston and cylinder walls before initial operation. The same procedure should be followed after EVERY 8 HOURS of operation. Use DAYTON ROGERS specially compounded lubricant. (See pages 73 and 74.)



Fig. No. 38

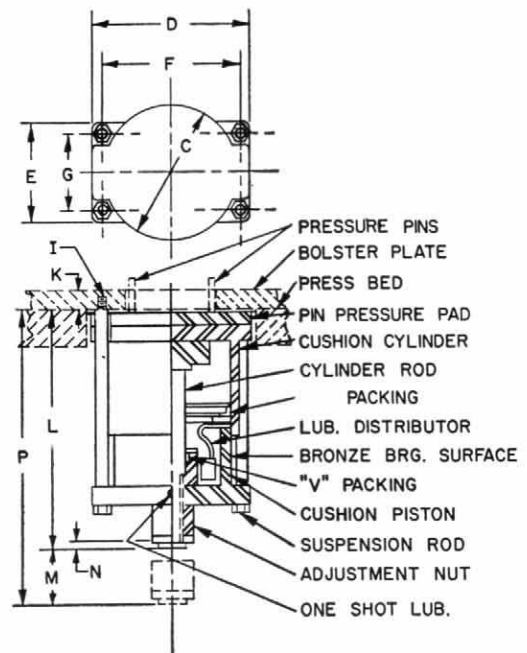


Fig. No. 39

NOTE: Dimension "M" equals the maximum draw **only** when adjustment nut is **fully extended**.

MODEL CUSHION	A & B	C	D	E	F	G	H††	I†	J†	K†	L††	M*	N**	P††	RING HOLD PRESS TONS @ 200 PSI.	DRAW WITHOUT SURGE TANK
HD-8	SPEC. BY CUST	9 $\frac{3}{4}$	11 $\frac{5}{8}$	8 $\frac{1}{2}$	9 $\frac{7}{8}$	6 $\frac{3}{4}$	19 $\frac{1}{2}$	7 $\frac{7}{8}$ -9	1 $\frac{1}{4}$	1	23 $\frac{5}{16}$	6	2	29 $\frac{5}{16}$	5.0	2
HD-10	..	11 $\frac{3}{4}$	3 $\frac{3}{4}$	10 $\frac{1}{4}$	11 $\frac{11}{16}$	8 $\frac{1}{4}$	21 $\frac{5}{8}$	1 -8	1 $\frac{1}{2}$	1 $\frac{1}{4}$	25 $\frac{7}{16}$	6	2	31 $\frac{7}{16}$	7.8	2
HD-12	..	13 $\frac{1}{2}$	15 $\frac{5}{8}$	11 $\frac{3}{4}$	13 $\frac{3}{8}$	9 $\frac{1}{2}$	21 $\frac{5}{8}$	1 $\frac{1}{4}$ -7	1 $\frac{1}{2}$	1 $\frac{1}{2}$	26 $\frac{1}{8}$	6	2	32 $\frac{1}{8}$	11.4	2
HD-14	..	16	17 $\frac{5}{8}$	13 $\frac{3}{8}$	15 $\frac{1}{8}$	10 $\frac{7}{8}$	23 $\frac{1}{8}$	1 $\frac{1}{4}$ -7	1 $\frac{3}{4}$	1 $\frac{5}{8}$	27 $\frac{5}{8}$	6	2	33 $\frac{5}{8}$	15.4	2
HD-16	..	18	19 $\frac{3}{4}$	15	17	12 $\frac{1}{4}$	23 $\frac{5}{8}$	1 $\frac{3}{8}$ -6	2	1 $\frac{3}{4}$	28 $\frac{1}{8}$	6	2	34 $\frac{1}{8}$	20.0	2

†Recommended size—all mounting rods are made to customer requirements.

*M—Max. draw—may be less—customer to specify

**N—Adjustment

††—Dim. for 6" draw—may be less by reduction of draw.

Installation Instructions


MODEL "HD" PRESS BED MOUNTING

NOTE: All cushion installations are tested and inspected for air leaks before shipment.

200 PSI MAX. PRESSURE

The Model "HD" pneumatic die cushion is designed to operate at **200 psi.** maximum initial air pressure, which is obtained by connecting the Model H-4 booster pump between the cushion and shop air line.

MOUNTING PROCEDURE:


 (1) Remove the bolster plate and check both surfaces carefully to make sure they are flat and parallel. **This is important!** If surfaces are bowed and not parallel, have them machined so that they are parallel.

(2) Screw ends of rods having shortest thread into drilled and tapped holes provided in press bed. (**See P. 2.**) If rods are to be mounted to bosses that are not tapped, be sure that nuts are provided on top and bottom of the bosses.


(3) Slide cushion into approximate location relative to press bed opening. Be sure to **protect the adjustment nut** while cushion is being installed.

(Note: If distance between rods is not great enough to allow cushion to slide between them, leave front rods out until cushion is positioned under press bed.)

(4) Run on upper mounting plate nuts as far as they will go; raise unit so mounting rods pass through holes provided in mounting plate, and run on lower mounting plate nuts.

 (5) Model "HD" cushions can either be mounted so they stop against the bolster plate or against their own stop nut, according to customer's preference. If bolster stopping is desired, measure pin pad thickness, add to dim "H", subtract $\frac{1}{8}$ " and adjust mounting plate this distance below press bed surface. **BE SURE MOUNTING PLATE IS ADJUSTED PARALLEL TO PRESS BED.** Run upper nuts down tight against plate and pin both upper and lower nuts by crossdrilling, tapping, and inserting set screw.

(6) Install booster pump and surge tank per instructions on pages 20 and 37, respectively. Combination regulator and gauge (page 36) can be substituted for booster pump if shop air pressure is adequate.

 (7) Lubricate until grease emerges from between piston and cylinder walls before initial operation. The same procedure should be followed after **EVE-RY 8 HOURS** of operation. Use **DAYTON ROGERS** specially compounded lubricant. (See pages 73 and 74.)

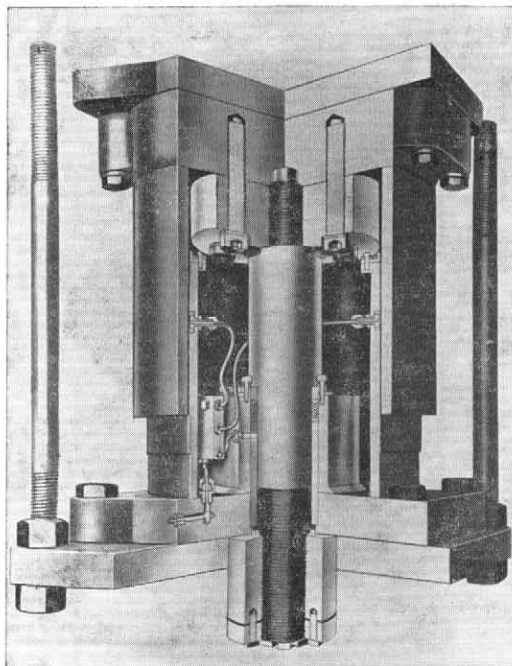


Fig. No. 40

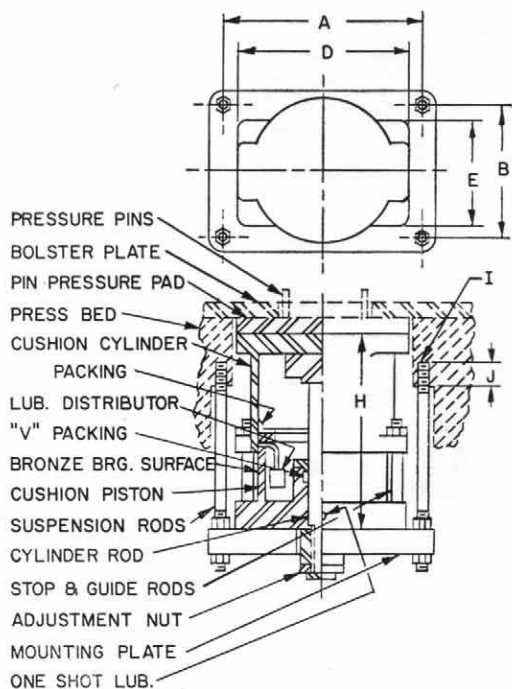


Fig. No. 41

Note: See opposite page for dimensions.



IMPORTANT!

READ CAREFULLY PRECAUTIONS FOR INSTALLATION AND OPERATION OF PNEUMATIC DIE CUSHIONS DESCRIBED ON PAGE NO. 1.

Installation Instructions



MODEL "HMC" PRESS BED MOUNTING

IMPORTANT! Do not disassemble the cushion cylinder and piston when installing, because the packing will flare out and cause an air leak unless reassembled properly.

200 PSI MAX. PRESSURE

MOUNTING PROCEDURE:



(1) Remove the bolster plate and check both surfaces carefully to make sure they are flat and parallel.

This is important! If surfaces are bowed and not parallel, have them machined so that they are parallel.

(2) Screw ends of rods having shortest thread into drilled and tapped holes provided in press bed. (See P. 2.) If rods are to be mounted to bosses that are not tapped, be sure that nuts are provided on top and bottom of the bosses.

(3) Slide cushion into approximate location relative to press bed opening. (Note: If distance between rods is not great enough to allow cushion to slide between them, leave front rods out until cushion is positioned under press bed.)

(4) Run on upper mounting plate nuts as far as they will go; raise unit so mounting rods pass through holes provided in mounting plate, and run on lower mounting plate nuts.



(5) Model "HMC" cushions can either be mounted so they stop against the bolster plate or against their own stop rod, according to the customer's preference. If bolster stopping is desired, subtract $\frac{1}{8}$ " from dim "H" and adjust mounting plate this distance below press bed surface. **BE SURE MOUNTING PLATE IS ADJUSTED PARALLEL TO PRESS BED.** Run upper nuts down tight against plate and pin both upper and lower nuts by cross-drilling, tapping, and insert set screw.

(6) Install booster pump and surge tank per instructions on pages 20 and 37, respectively. Combination regulator and gauge (page 36) can be substituted for booster pump if shop air pressure is adequate.



(7) Lubricate unit until grease emerges from between piston and cylinder walls before initial operation. The fitting for the upper piston is located on the extreme right of either the centralized grease block or on the cushion flange. This fitting requires an equal volume of grease as used to lubricate the bottom piston (i.e., If an HMC 14 uses 2 shots in each of the 3 fittings, put 6 shots in the upper piston). The same procedure be followed EVERY 8 HOURS of operation. Use DAYTON ROGERS specially compounded lubricant. (See pages 73 and 74.)

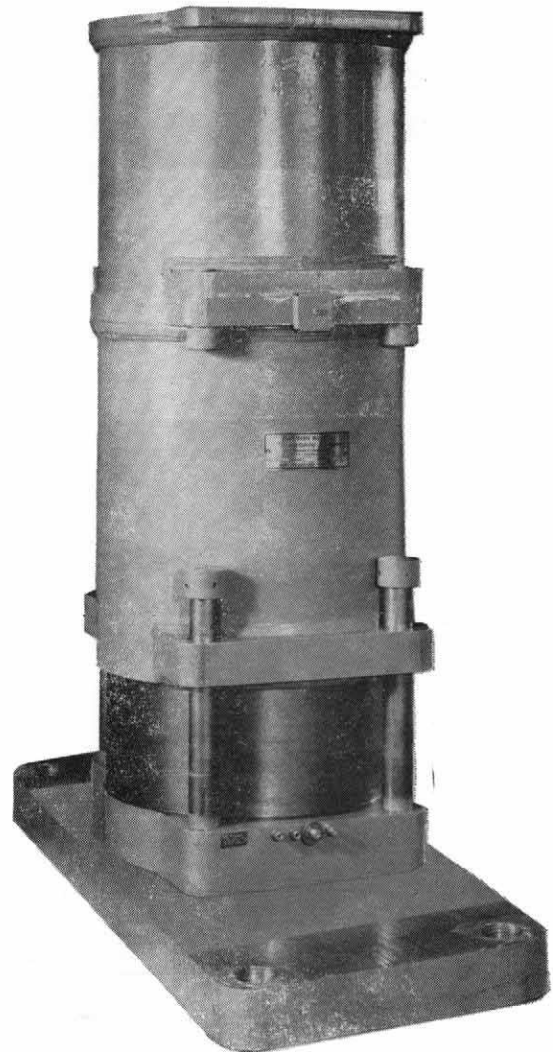


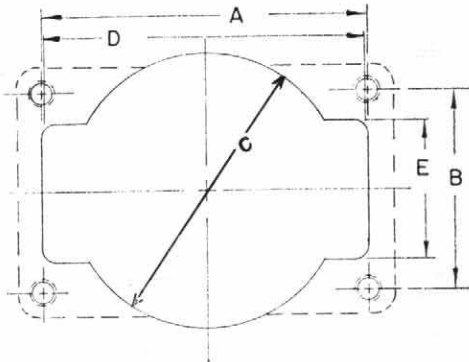
Fig. No. 42



IMPORTANT

READ CAREFULLY PRECAUTIONS FOR INSTALLATION AND OPERATION OF PNEUMATIC DIE CUSHIONS DESCRIBED ON PAGE NO. 1.

DIMENSIONS
A & B TO
BE SPECIFIED
BY CUSTOMER



SPECIAL INSTRUCTIONS FOR BOLSTER PLATE MOUNTING

Model HMC cushions can be mounted to the bolster plate if no provisions are available for mounting to the press bed. The mounting procedure 1-7 should be followed. The customer must drill and tap the bottom side of the bolster in accordance with Dimensions A, B, J and I.

Note Dimensions A and B are minimum dimension and should be specified by the customer.

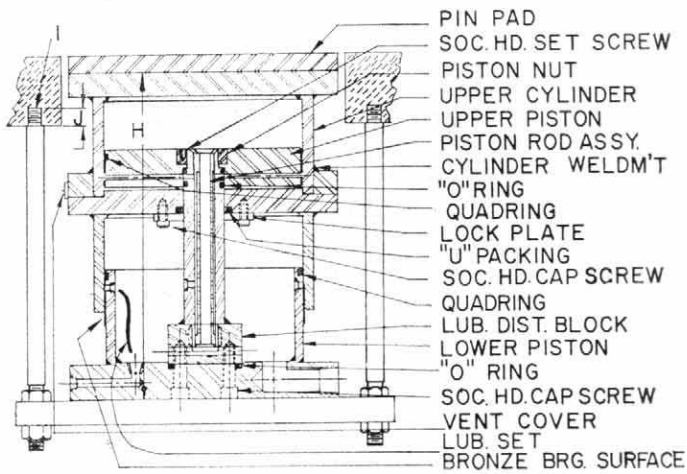


Fig. No. 43



NOTE! The stamped shroud located halfway up cylinder wall is covering vent holes. Never plug these vents as they are necessary for proper cushion operation. If air is leaking from these vents while cushion is not being compressed it is likely that the cushion packings need replacing.

Catalog Number	Min. Dim. A	Min. Dim. B	C	D	E	I	J	Overall Height "H" For Max. Draw of				Ring Holding Force @ 200 PSI
								3	4	5	6	
HMC-8	9 $\frac{7}{8}$	6 $\frac{3}{4}$	9 $\frac{3}{4}$	12	4 $\frac{5}{8}$	1 -8	1 $\frac{1}{2}$	20 $\frac{1}{2}$	27 $\frac{1}{2}$	28 $\frac{1}{2}$	29 $\frac{1}{2}$	10 Ton
HMC-10	11 $\frac{1}{8}$	8 $\frac{1}{4}$	11 $\frac{3}{4}$	14 $\frac{1}{2}$	6	1 $\frac{1}{4}$ -7	1 $\frac{1}{2}$	20 $\frac{1}{2}$	27 $\frac{1}{2}$	28 $\frac{1}{2}$	29 $\frac{1}{2}$	15.6 Ton
HMC-12	13 $\frac{3}{8}$	9 $\frac{1}{2}$	13 $\frac{1}{2}$	16 $\frac{1}{4}$	6 $\frac{1}{2}$	1 $\frac{1}{2}$ -6	1 $\frac{3}{4}$	20 $\frac{1}{2}$	27 $\frac{1}{2}$	28 $\frac{1}{2}$	29 $\frac{1}{2}$	22.8 Ton
HMC-14	15 $\frac{1}{8}$	10 $\frac{7}{8}$	16	17 $\frac{3}{8}$	8	1 $\frac{1}{2}$ -6	2	27 $\frac{1}{4}$	28 $\frac{1}{4}$	33 $\frac{1}{4}$	34 $\frac{1}{4}$	30.8 Ton
HMC-16	17	12 $\frac{1}{4}$	18	20 $\frac{1}{4}$	9	1 $\frac{3}{4}$ -5	2	27 $\frac{1}{4}$	28 $\frac{1}{4}$	33 $\frac{1}{4}$	34 $\frac{1}{4}$	40 Ton
HMC-18	18	16	20	22 $\frac{1}{2}$	11 $\frac{1}{2}$	2 $\frac{1}{4}$ -4 $\frac{1}{2}$	2 $\frac{1}{2}$	31 $\frac{5}{8}$	32 $\frac{5}{8}$	33 $\frac{5}{8}$	36 $\frac{5}{8}$	50.8 Ton
HMC-20	20	17 $\frac{1}{2}$	22 $\frac{1}{4}$	24 $\frac{3}{4}$	12 $\frac{1}{4}$	2 $\frac{1}{2}$ -4	3	31 $\frac{5}{8}$	32 $\frac{5}{8}$	33 $\frac{5}{8}$	36 $\frac{5}{8}$	62.8 Ton
HMC-22	22	19	24 $\frac{1}{4}$	27	13	2 $\frac{1}{2}$ -4	3	32	33	38	39	76 Ton
HMC-24	24	20 $\frac{1}{2}$	26 $\frac{1}{4}$	28 $\frac{3}{8}$	13 $\frac{3}{4}$	2 $\frac{3}{4}$ -4	3	37 $\frac{1}{4}$	38 $\frac{1}{4}$	39 $\frac{1}{4}$	40 $\frac{1}{4}$	90.4 Ton

Installation Instructions

MODEL "CC" PRESS BED MOUNTING




(See special instruction for Bolster Plate Mounting)

IMPORTANT: Do not disassemble the cushion cylinder and piston when installing, because the packing will flare out and cause an air leak unless reassembled properly.

NOTE: All cushion installations are tested and inspected for air leaks before shipment.
100 PSI MAX. PRESSURE

The following is the recommended procedure for mounting a Model "CC" die cushion to the press bed of a press:

 (1) Remove bolster plate and check both surfaces carefully to make sure they are flat and parallel. **THIS IS IMPORTANT!** If surfaces are bowed or not parallel, have them machined to assure an accurate surface for the pin pressure pad of the cushion to stop against.

(2) Screw the ends of the mounting rods, "C", with the short length of thread into the drilled and tapped holes in the press bed which have been provided for mounting the die cushion. (See Fig. No. 45 & P. 2.) Make sure these rods are pulled up as far as they will go into the tapped holes. If the cushion is to be suspended from mounting bosses that are not tapped, the suspension rods are provided with nuts on both top and bottom of the bosses. Make sure the nuts are secure before proceeding with the installation.

(3) With the use of skids or timbers, slide the cushion unit into the approximate location relative to the press bed opening. (Note: If the distance between the mounting rods at the front of the press is not enough to allow the cushion to pass between them, it is advisable to leave them out until after the cushion has been placed under the press bed opening.

(4) Run on the upper adjusting nuts, "F," as far as they will go. Raise the cushion unit so that the rods pass through the holes in the mounting plate or mounting channels and run on the lower adjusting nuts, "F", to hold the cushion unit in place.

(5) Prepare a measuring rod, "B", from 3/16" round steel for adjusting the height and alignment of the cushion unit. The over-all length of this rod should be equal to the over-all height of the cushion. (See Fig. 45, plus the thickness of the pin pressure pad minus 1/8". **The 1/8" is allowed to make sure**

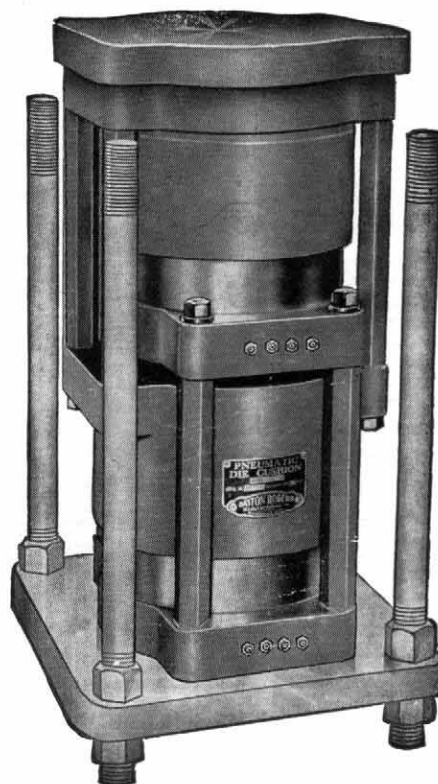


Fig. No. 44

the pin pressure pad comes to rest against the bottom of the bolster plate.

(6) With a large parallel, "A", laid on top of the press bed, line up the mounting plate at the four points marked, "X", by using measuring rod, "B". The adjustment and alignment of the mounting plate at these four points must be held to a maximum tolerance of 1/64" to avoid a tilting action on the pin pressure pad. After adjustment is obtained, lock the upper adjusting nuts on the mounting plate, which will secure the cushion unit in correct parallel alignment and relative height in relation to the top of the press bed.



PRECAUTION: It should be remembered that the adjustment of the nuts on the suspension rods should allow the pin pressure pad to extend $\frac{1}{8}$ " above the press bed when the cushion cylinder is fully expanded and the bolster plate removed.

(7) Install combination reducing and regulating valve and pressure gauge, as well as high pressure hoses, according to detailed instructions on Page No. 36.

(8) If surge tank is to be used with the cushion installation, refer to Page No. 38 for detailed instructions. If no surge tank is to be used, plug up the hole in the bottom flange of the cushions with the **pop safety valve** provided for this purpose.



(9) Each cushion unit is completely lubricated before shipping; however, it is advisable to lubricate each fitting until grease emerges from between the piston and cylinder wall before cushion is put into operation. The same procedure should be followed after **every 8 hours** of operation. As a result of careful tests and experimental research the DAYTON ROGERS MFG. CO. has developed a specially compounded lubricant for die cushions. (See pages 73 and 74.)

DIMENSIONS FOR DETERMINING LENGTH OF MEASURING ROD "B"

EXAMPLE: On a Model CC-6 with a 2" draw, the over-all height of the cushion is $20\frac{1}{2}$ " and assuming the pin pressure pad is $1\frac{1}{2}$ " thick, the total height is 22". By subtracting $\frac{1}{8}$ " from this figure, as described in paragraph No. 5, the length of measuring rod, "B", would be $21\frac{7}{8}$ ".



IMPORTANT

READ CAREFULLY PRECAUTIONS FOR THE INSTALLATION AND OPERATION OF PNEUMATIC DIE CUSHIONS DESCRIBED ON PAGE NO. 1.

SPECIAL INSTRUCTIONS FOR BOLSTER PLATE MOUNTING

Occasionally it is necessary to suspend a Model "CC" die cushion from the bolster plate of the press because there is no ledge or provision in the press bed for drilling and tapping holes for the suspension rods. This installation is accomplished by passing the suspension rods through the pin pressure pad into the bolster plate itself. The length of the measuring rod, "B", for checking alignment of the bolster plate mounting, is the same as explained in Paragraph No. 5, for the press bed mounting. The procedure is also identical except that the bolster plate must be in place on the press.

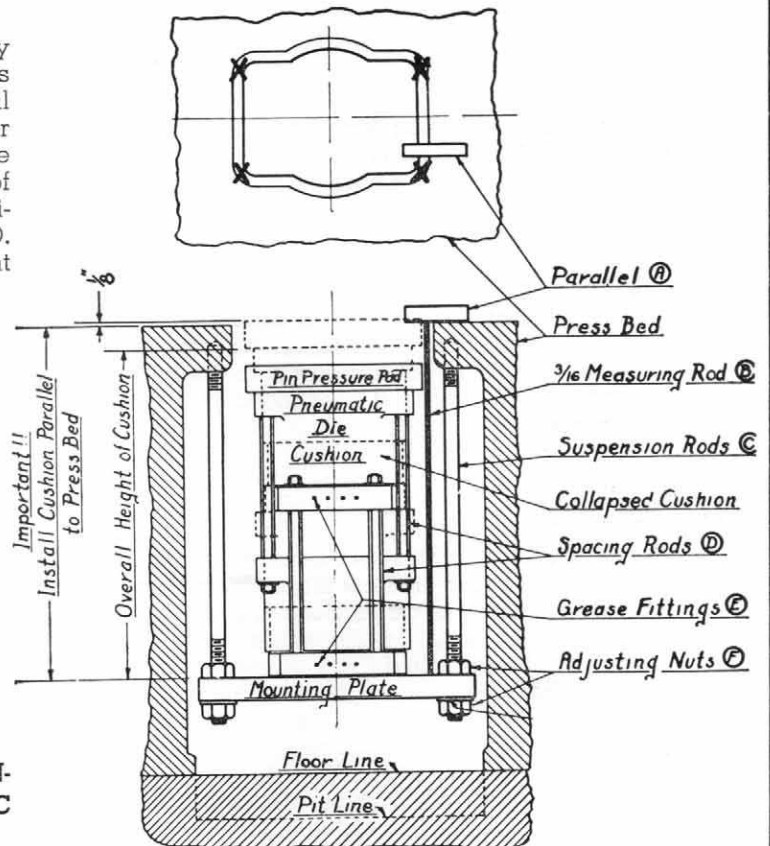


Fig. No. 45

Cushion Size	Over-all Height of Cushions Having a Maximum Draw of					
	2"	3"	4"	5"	6"	8"
CC—6"	$20\frac{1}{2}$	$22\frac{1}{2}$				
CC—8"	$20\frac{1}{2}$	$22\frac{1}{2}$	$26\frac{1}{2}$	$30\frac{1}{2}$		
CC—10"		$30\frac{1}{2}$	32	34	$36\frac{1}{2}$	
CC—12"		$30\frac{1}{2}$	$32\frac{1}{2}$	$34\frac{1}{2}$	$36\frac{1}{2}$	
CC—14"		$30\frac{1}{2}$	32	$34\frac{1}{2}$	$36\frac{1}{2}$	
CC—16"		$33\frac{1}{4}$	$35\frac{1}{4}$	$37\frac{1}{4}$	$39\frac{1}{4}$	
CC—18"		$37\frac{3}{8}$	$37\frac{3}{4}$	$39\frac{3}{4}$	$41\frac{3}{4}$	
CC—20"			$37\frac{3}{4}$		$41\frac{3}{4}$	
CC—22"			42		46	
CC—24"			46		50	54

Installation Instructions

MODEL "C" PNEUMATIC DIE CUSHION WITH AIR EXHAUST HOLD-DOWN



IMPORTANT: Do not disassemble the cushion cylinder and piston when installing, because the packing will flare out and cause an air leak unless reassembled properly.

NOTE: All cushion installations are tested and inspected for air leaks before shipment.

100 PSI MAX. PRESSURE

The Dayton Rogers Air Exhaust Hold-down Cushion is a standard pneumatic die cushion which is exhausted at or near the bottom of its stroke, held down for a predetermined length of time and then allowed to assume its normal extended position at any desired rate. The unit is completely versatile in that either or both of these cycle phases can quickly be adjusted or omitted.

PURPOSE

This type of installation is particularly useful in drawing operations where additional time is needed to remove the work, or on long draws where a rapid return might distort the part.

CONSTRUCTION

Figure No. 48 indicates the general construction of the cushion unit itself. Basically, the cushion is a conventional type of pneumatic cushion except that the piston is enclosed across its top in order to hold the volume of exhausted air to a minimum. Cushion features all wrought steel welded construction with bronze bearing surface on the piston.



Fig. No. 46

OPERATION

Figure No. 47 shows the basic control circuit. For the greater part of the stroke or draw the cushion operates in normal fashion by emitting air through the air control valve (A) and check valve (B) to the surge tank. A cam-operated air valve (C) is attached to the press so that it will be actuated by the press ram or other moving press component (i. e., crank) at the bottom of the down stroke. This valve is connected to the air control valve (A) and when actuated causes the cushion air to be exhausted. The absence of pressurized air in the cushion allows it to stay down.

When the cam-operated valve (C) is released it causes the air-actuated valve (A) to return to its former position. Air from the surge tank will then be forced into the cushion, thereby allowing it to return. This air, however, must pass through an adjustable flow-control valve (D) so that the rate of cushion return can be controlled. A lubricator (E) is placed in the auxiliary circuit to lubricate air valves. The high-capacity regulator (F) insures rapid replenishing of exhausted air.

EQUIPMENT FURNISHED

All equipment necessary to operate cushion is furnished as indicated in Fig. No. 49. Installation comes complete with mounting structure to fit particular press.

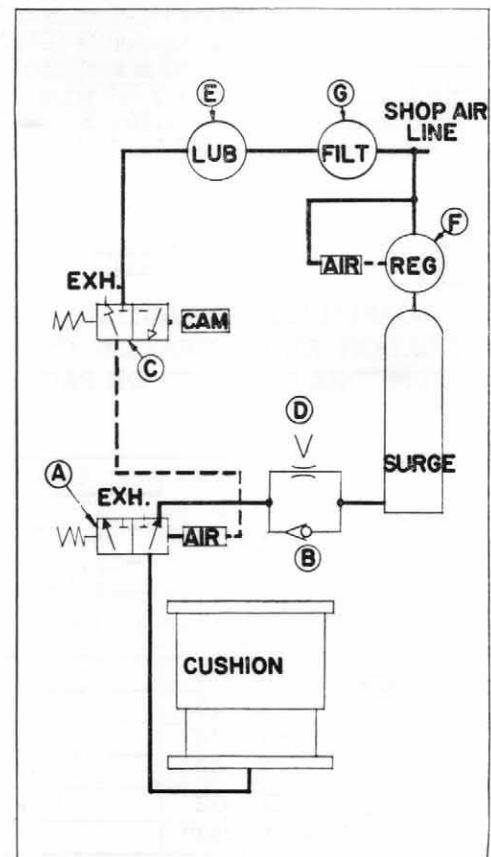


Fig. No. 47

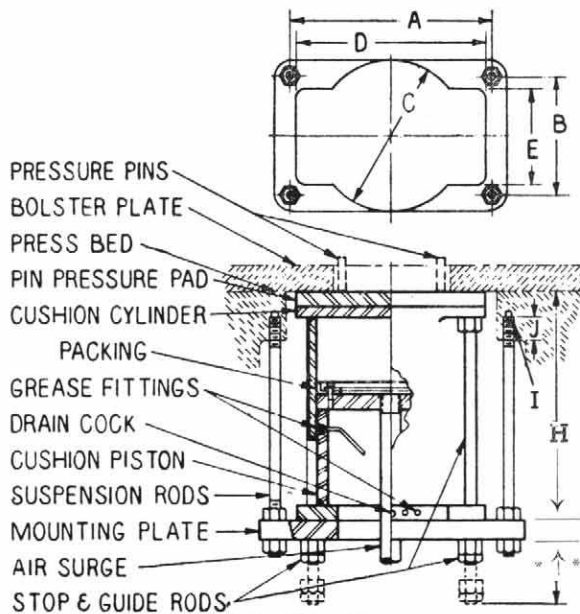


Fig. No. 48

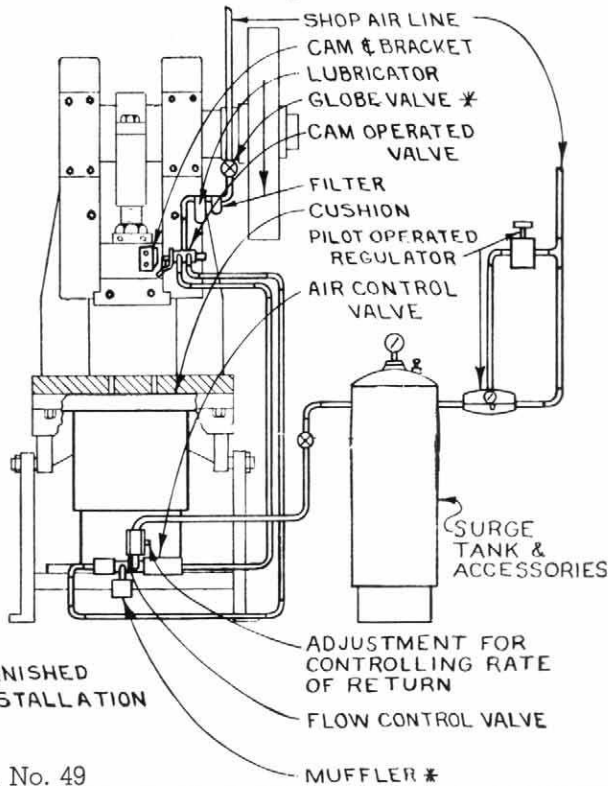


Fig. No. 49

MOUNTING PROCEDURE:

- (1) Install cushion into bed of press by following steps as outlined on pages 12 and 13.
- (2) Add necessary piping to connect air surge pipe of cushion through air control valve and flow control valve to surge tank as shown in Fig. Nos. 47 and 49.
- (3) Connect remote controlled regulator between surge tank and main air supply. **(Be sure shop air line is large enough to rapidly replenish air lost through exhausting.)**
- (4) Add pilot regulator to remote controlled regulator and shop air line. (See Fig. No. 49.)
- (5) Install cam-operated valve on press frame so that cam, which must be installed on ram or other moving press component, will engage roller lever of valve and actuate it when ram is at or near bottom of stroke. (See Fig. No. 49.)
- (6) Connect shop air line through filter and regulator to cam-operated valve inlet port.
- (7) Connect outlet port or ports of cam valve to small (1/4 NPT) cylinder port or ports of air-control valve.
- (8) After checking all connections and clearances, start press and actuate ram. Adjust cam valve and/or cam until cushion exhausts at or near bottom dead center.
- (9) Adjust flow-control valve until desired return rate is reached.

NOTE: Hold-down cycle can be omitted by adjusting cam so it does not engage cam valve.

Model Cushion	A&B	DIMENSIONS					*OVER-ALL HEIGHT (H) OF CUSHIONS HAVING A MAXIMUM DRAW OF						Ring Holding Pressure @ 100 psi	
		C	D	E	I	J	2"	3"	4"	5"	7"	9"		11"
C-6		7	8½	5¼	5/8-11	1"	11¼	12¾	14¼	16¼				1.4 Tons
C-8		9	10	7	¾-10	1"	11¼	12¾	14¼	16¼				2.5 "
C-10		11	12¾	7¾	7/8-9	1¼"		13¼	15¼	17¼				3.9 "
C-12		13¾	13½	10	7/8-9	1¼"		13¾	17¾	18¾				5.7 "
C-14		15¼	16¼	12¼	1-8	1½"		14¾	15¾	18¾	22¾	26¾		7.7 "
C-16		17¼	19	13½	1¼-7	1½"		15¾	19¾	20¾	24¾	28¾		10.0 "
C-18		19¼	20¼	15¼	1¼-7	1¾"		19¾	20¾	21¾	25¾	29¾	33¾	12.7 "

CUSHION MUST STOP ON BOLSTER — NOT ON GUIDE RODS

*These dimensions do not include Pin Pad, Mounting Plate or Lower Suspension Rod Nuts.

**On C-6 thru C-16 Guide Rods extend approximately the length of draw plus 1½" below Mounting Plate.



Installation Instructions

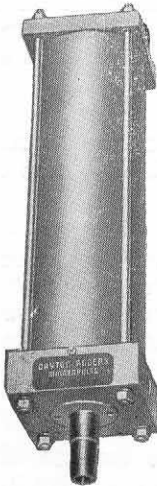
MODEL "L" COUNTER-BALANCE CYLINDERS

100 PSI MAX. PRESSURE

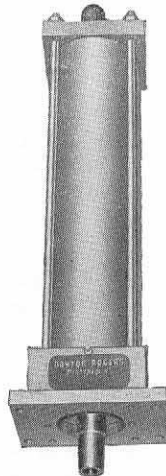


IMPORTANT: Do not disassemble the counter-balance cylinder and piston when installing, because the packing will flare out and cause an air leak unless reassembled properly.

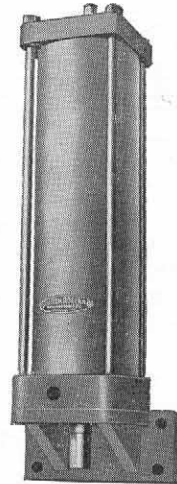
NOTE: All counter-balance cylinder installations are tested and inspected for air leaks at the factory prior to shipment.



Tie Rod Mounting



Flange Mounting



Side Base Mounting



Pivot Mounting

Fig. No. 50

INSTALLATION

When installing a counter-balance with any of the mountings pictured above, it is very important that the piston rod or rods be parallel with the ways of the press. Otherwise excessive wear and damage can occur to the packings and bearings. Although there are many ways this can be accomplished, possibly the most practical is described as follows:

Check the bed of the press to make sure it is level, both front to back and left to right. If the bed is level, it can be assumed that the ways of the press are at a true 90 degrees to the press bed and, therefore, a plumb-bob can be used for lining up the piston rod of the counter-balance cylinder.

The determining factor in parallel mounting of the cylinder, no matter which type is used, is that the mounting itself is installed square and parallel to the bed.

Some presses are equipped with special bosses for receiving the end of the connecting rod. (While DAYTON ROGERS counter-balances are stocked with female piston rods; they can be furnished with male piston rods upon request.) The cylinder has an accurate external pilot which can be used as an aid to proper alignment with mounting bosses.

When the press is not equipped with bosses to complete the installation, a bracket similar to the ones shown in Fig. No. 51 can be readily made up to fit any specific requirements.

If the counter-balance cylinder is being mounted so that the rod passes directly in front of the cam portion of the crankshaft, care should be taken to make sure there is enough clearance between the crankshaft and piston rod.



NOTE: Lubricate grease fittings at base of cylinder and refill oil cup on top of cylinder with good grade of lubricating oil after EACH 8 HOURS of operation.

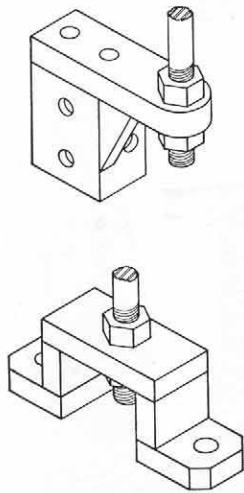


Fig. No. 51

As a general rule counter-balance installations consist of two cylinders. These cylinders should be mounted at opposite corners of the press ram, as shown in Fig. No. 53 to evenly distribute the weight of the ram. On most of the inclinable presses, however, one cylinder is sufficient and it is recommended that it be mounted at the back side of the crown of the press midway between the two sides of the press frame.

The regulator for controlling pressure of the cylinders can be installed in any convenient place on the press frame. See page 36 for complete instructions. Fig. No. 53 shows the recommended procedure for piping the installation. Page 39 gives detailed instructions for mounting surge tank.

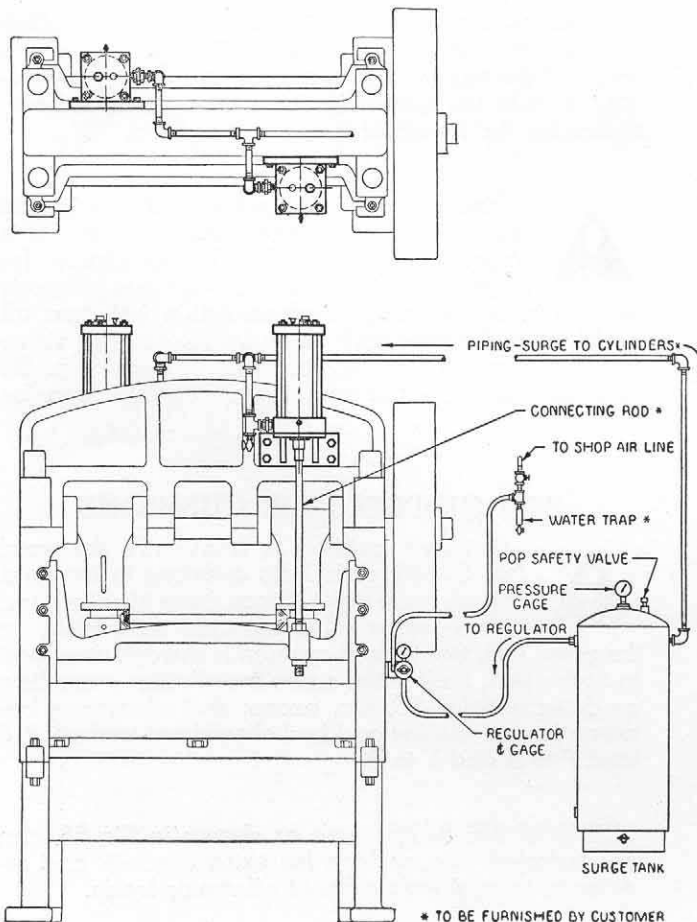


Fig. No. 53

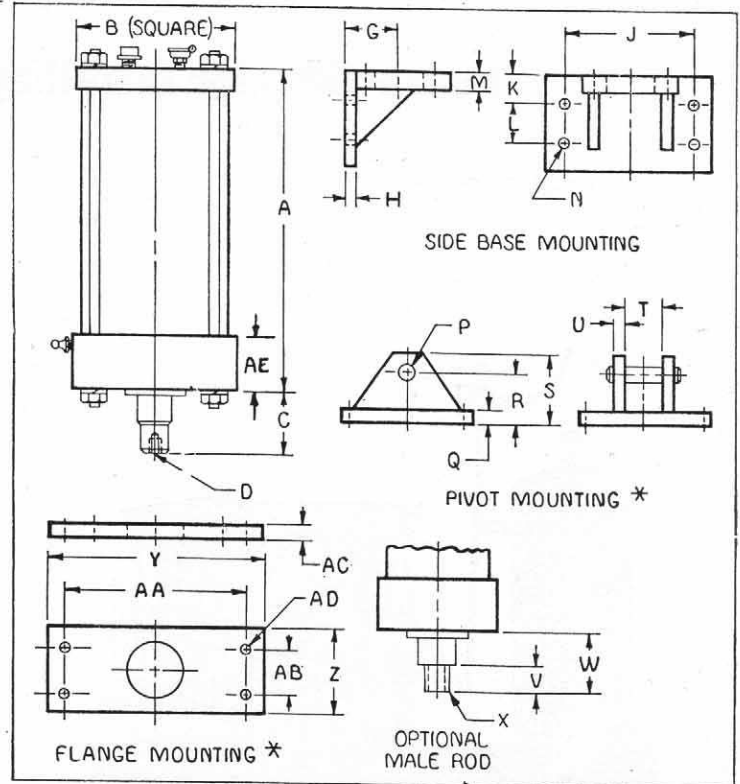
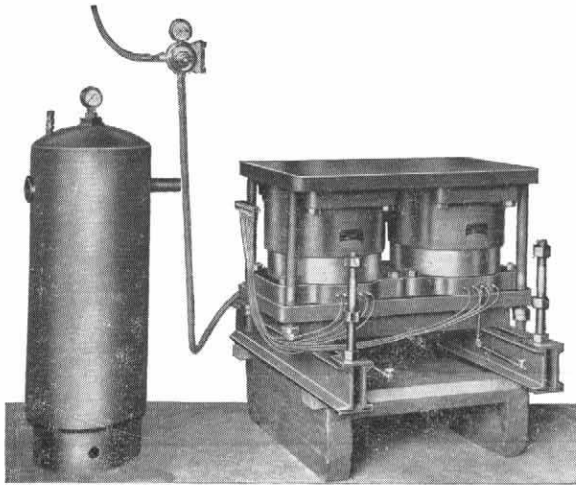


Fig. No. 52 *Part of Basic Cyl. on L-10 and 12

Catalog No.	DIMENSIONS				
	L-5	L-6	L-8	L-10	L-12
Diameter	5"	6"	8"	10"	12"
Capacity tons @ 100 P.S.I.	.9	1.3	2.4	3.8	5.5
A**	23 ⁵ / ₁₆	23 ⁵ / ₁₆	23 ⁹ / ₁₆	24 ⁵ / ₁₆	25 ¹³ / ₁₆
B	6	6 ³ / ₄	8 ¹ / ₂	11	13 ¹ / ₄
C	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	3 ⁵ / ₁₆	5 ³ / ₁₆	4 ¹⁵ / ₁₆
D	7 ⁸ / ₉ -9	7 ⁸ / ₉ -9	7 ⁸ / ₉ -9	11 ⁸ / ₈ -7	13 ⁸ / ₈ -6
G	3.750	4.250	5.250	6.437	7.562
H	1 ⁵ / ₁₆	1 ⁵ / ₁₆	1 ⁵ / ₁₆	1 ⁵ / ₁₆	1 ⁵ / ₁₆
J	7 ¹ / ₂	8 ¹ / ₂	10 ¹ / ₂	12 ¹ / ₂	14 ³ / ₄
K	1 ⁷ / ₁₆	1 ⁷ / ₁₆	1 ¹³ / ₁₆	1 ¹ / ₁₆	1 ⁷ / ₁₆
L	2 ⁵ / ₈	2 ⁵ / ₈	2 ⁵ / ₈	2 ⁵ / ₈	3 ⁵ / ₈
M	3 ⁴ / ₄	3 ⁴ / ₄	3 ⁴ / ₄	1 ⁵ / ₁₆	1 ⁵ / ₁₆
N	1 ¹ / ₁₆	1 ¹ / ₁₆	1 ¹ / ₁₆	1 ¹ / ₁₆	1 ³ / ₁₆
P	1.001 1.003	same	same	1.501 1.503	same
Q	1 ¹ / ₁₆	1 ¹ / ₁₆	1 ⁵ / ₁₆	1 ¹ / ₂	1 ¹ / ₂
R	2 ³ / ₁₆	2 ³ / ₁₆	2 ⁷ / ₁₆	4	4
S	3 ³ / ₁₆	3 ³ / ₁₆	3 ⁷ / ₁₆	5 ¹ / ₂	5 ¹ / ₂
T	1 ¹ / ₂	1 ¹ / ₂	1 ¹ / ₂	2 ¹ / ₂	2 ¹ / ₂
U	3 ⁴ / ₄	3 ⁴ / ₄	3 ⁴ / ₄	1 ¹ / ₄	1 ¹ / ₄
V	1 ⁵ / ₈	1 ⁵ / ₈	1 ⁵ / ₈	2	2 ¹ / ₄
W	3 ¹ / ₁₆	3 ¹ / ₁₆	3 ⁷ / ₁₆	4	4 ¹³ / ₁₆
X	1-14	1-14	1-14	1 ¹ / ₄ -12	1 ¹ / ₂ -12
Y	8	9	11	11	13 ¹ / ₄
Z	6	6	8	11	13 ¹ / ₄
AA	7	7 ⁷ / ₈	9 ³ / ₄	9 ³ / ₄	11 ¹ / ₄
AB	4 ¹ / ₄	4 ⁷ / ₈	6 ³ / ₄	9 ³ / ₄	11 ¹ / ₂
AC	3 ⁴ / ₄	3 ⁴ / ₄	1		
AD	9 ¹ / ₁₆ 2 ³ / ₈	9 ¹ / ₁₆ 2 ³ / ₈	1 ¹ / ₁₆ 2 ³ / ₈	1 ¹ / ₁₆ 2 ³ / ₈	1 ³ / ₁₆ 2 ⁷ / ₈

Instructions for Installing Multiple Installations

(Models 2C, 3C, 2HC, 2MC, etc.)



Model 2C
Fig. No. 54

As a general rule, each multiple cushion installation requires special consideration in the design of the mounting structure. Consequently, it is usually necessary to draw up a blueprint showing all the details as applied to each installation. Two of these prints are sent to the customer to be used when installing the cushion installation.



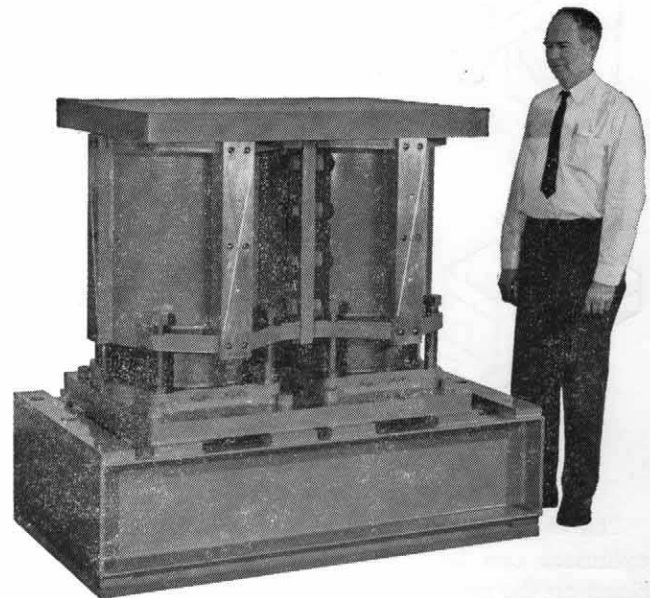
When installing a multiple cushion, it is very important that the bolster plate or any other surface against which the pin pressure pad is to stop be flat and parallel. If the bolster or other surfaces are not flat and parallel, they should be machined so that the pin pad will have an accurate surface for a positive stop.



It is also important that the mounting plate or structure be aligned so that it is parallel with the top of the press bed and adjusted to the correct height. Since practically all multiple installations are mounted on a supporting structure, the instructions for press bed mounting on Page Nos. 12, 15 and 19, must be followed. The method for determining the height from the top of the press bed to the mounting plate or structure must be altered on some designs as follows:

MODELS 2C, 3C, 2HC, 2MC, ETC.

When installing a 2C, 3C, etc., installation as shown in Fig. 59, the height from the top of the press bed to the mounting channels is determined by taking the over-all height of the cushion plus the thickness of the pin pressure pad, minus $\frac{1}{8}$ ", as ex-



Model 2C Bed Guided Type with Cushion Tie Bars
Fig. No. 55

plained on Page No. 12. However, since spacers have been added between the bottom of the cushion unit and the top of the mounting channels, it is necessary to add the height of these spacers in order to determine the length of the measuring rod, "C".



Refer to page 38 for detailed instructions for installation of surge tank or tanks. It is important to note that surge piping for multiple installations with common pin pads **must provide common interconnection between all cushions and surge tank or tanks.** Regulating valve can be connected to any cushion in system (p. 36) and air inlets in the remaining cushions can be plugged.

BED GUIDED TYPE CUSHIONS



External guiding is frequently designed into C, MC, or HC die cushions in the form of bed guide strips. Since these steel backed bronze strips must coincide with those in the press bed, this type of cushion is always designed to fit the bed. Follow the same installation procedure as described for 2C, etc. except that clearance between bronze guides and bed **should not exceed .015 total F to B and L to R.**

CUSHION TIE BARS, such as shown in Fig 55, can be designed into cushion for extra strength and resistance to cocking action of off-center loads.

PARTS LIST and ACCESSORIES

for

- **PNEUMATIC DIE CUSHIONS**
- **PNEUMATIC BOOSTER PUMP**
- **COUNTER-BALANCE CYLINDERS**

Should it be necessary to order repair parts, always give the Cushion Model, Serial Number and Key Number of the part. The serial number is stamped at the front of the lower left-hand flange of each cushion unit. The cushion model and maximum drawing depth is stamped on the same plate of each cushion unit. This information is very important, as it enables us to give prompt service, which we cannot do unless we know the exact cushion on which the new parts are to be used. It is seldom advisable to make your own repair parts, since the manufacturer has an accurate record of all parts for your pneumatic die cushion equipment and can furnish them directly from stock at a nominal charge.

In conclusion, remember there is no finer or better cushion built than the Dayton Rogers models. Remember, too, that no machine equipment, regardless of how well it is designed and built, will stand up for a long period under abuse, neglect or indifferent treatment. A careful study of the instructions in this book will insure you years of uninterrupted service.

INSTALLATION INSTRUCTIONS AND PARTS LIST

Combination Reducing Regulating Valve and Pressure Gauge

When installing a Dayton Rogers Combination Regulator and Pressure Gauge on a pneumatic die cushion installation, high pressure hoses should be used from the regulator to the cushion unit. A brass or steel pipe may be used; however, a high pressure hose is long-lived, and does absorb the shock of the press on the working equipment of the regulator as well as the pressure gauge.

The Combination Regulator and Gauge, which is furnished with a bracket, should be installed on the left-hand side of the press bed frame. (See Fig. No. 57. It should be mounted approximately five or six feet from the floor within easy reach and view of the operator.

It is very important that the vibration dampener (See Fig. No. 57) be used when mounting the regulator in order to remove as much of the press shock from the regulator and gauge as possible. After the shop air line has been piped to within 2 or 2½ feet of the pressure regulator, it is advisable to provide a globe valve on the end of the pipe so that the air pressure can be turned off when the cushion is not in use.



PRECAUTION:

After the globe valve has been attached to the shop air line, be sure to blow out the shop air line to remove any foreign matter or dirt before connecting the short length of hose from the globe valve to the inlet side of the pressure regulator. If this precaution is not taken, there is a possibility a small piece of dirt will get under the seat of the regulator valve and it will not function properly. Also, note that the regulator openings are marked with an arrow to indicate direction of flow so that the air hoses can be connected to correct side for proper operation.

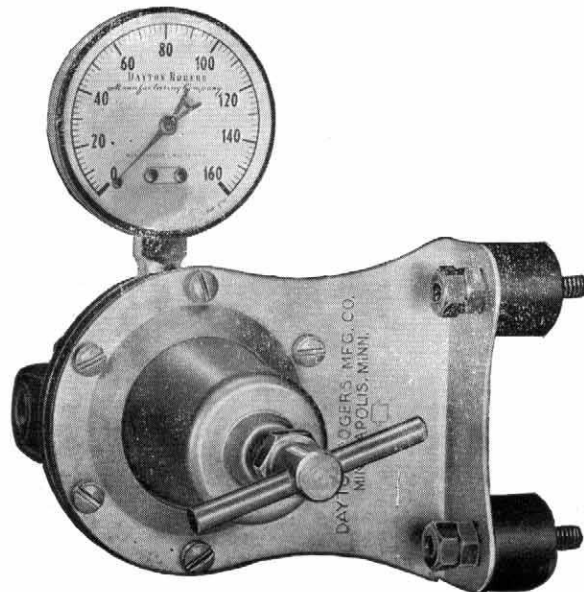
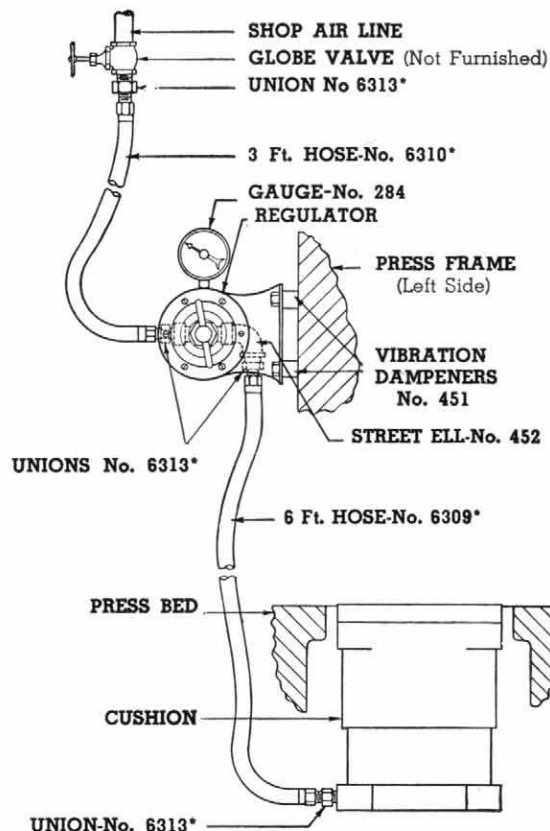


Fig. No. 56



*Included in No. 3248 HOSE GROUP
Fig. No. 57 ("C" and "D" Cushions)

The 6-foot high pressure hose is connected directly from the outlet side of the regulator to the cushion unit, as shown, by Fig. No. 57. A $\frac{3}{8}$ " tapped hole with a union is provided in the lower flange of "C" and "D" types to receive the other end of the 6-foot hose. A tee should be used to hook up the hose as well as surge tank for "H", "MD" and "MC" cushions, as shown by Fig. No. 58. On multiple installation, such as "CC", "2CC", "2C", etc., the 6-foot hose can be connected to any one of the cushion units and the others must be plugged up with $\frac{3}{8}$ " pipe plugs which are furnished with the installation. It is advisable to check these plugs to make sure they are tight before the cushion is put into operation.

(Note: Hoses as shown in Fig. No. 57 are available in $\frac{1}{4}$ " I.D. only.)

By recording the pressure required for a given job when it is first set up, it is an easy matter to reset the same die equipment at a later date by merely setting the pressure on the pressure gauge according to this reading.

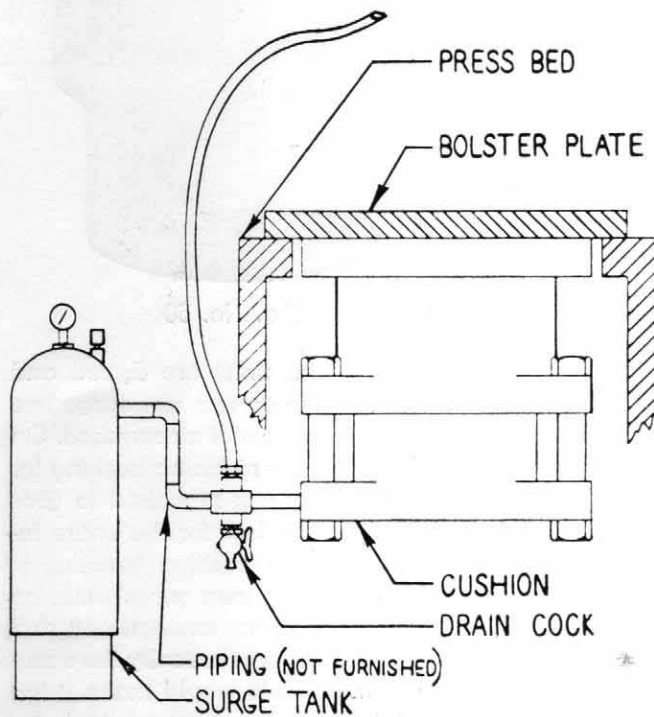


Fig. No. 58 ("H" and "MC" Cushions)

The $\frac{1}{4}$ " size regulator and gauge, No. 1502, is furnished as standard equipment with all "C", "D", and "R" cushion installations as well as with "L" counter-balance installations.

Dayton Rogers also offers the following sizes of regulators for use when special conditions warrant their use:

Description	Regulator Assembly with Gauge			
	1502	1131	1596	1605
Size	$\frac{1}{4}$ "	$\frac{3}{8}$ "	$\frac{1}{2}$ "	$\frac{3}{4}$ "

Regulator Assembly Nos. 1502, 1131, and 1596 include bracket and vibration dampeners as shown in Fig. No. 56, while No. 1605 does not.

PRESSURE GAUGES

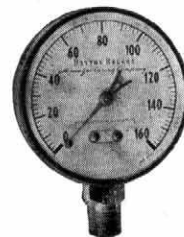


Fig. No. 59

These gauges have safety backs and $\frac{1}{4}$ -inch pipe thread on inlet. Shipping weight: 12 oz. each.

Part	Dial Reading	Graduation Intervals	Diameter
No. 6114	300 lbs.	5 lbs.	2½ ins.
No. 284	160 lbs.	2 lbs.	2½ ins.

Installation Instructions and Parts List

SURGE TANKS

On deep-drawing operations where the pin pressure pad is deflected to the maximum drawing capacity of the pneumatic die cushion, a surge tank reservoir is used so that the air compressed in the cushion cylinder will not build up to prohibitive pressure at the bottom of the work cycle of the press. The larger the surge tank used, the more constant the ring holding or pad pressure will be throughout the work cycle. Too small a surge tank or one connected with too small a pipe, will cause a noticeable increased pressure during the work cycle of the pneumatic die cushion unit.

The size of the surge tank required depends on the combined piston area and the depth of the draw. **The volume of the tank plus the volume of the cushion when inflated should be six times the displacement of the cushion at maximum draw.** The pipe connection from the cushion to the surge tank should be sufficiently large to permit a free flow of air from the cushion to the surge tank. The pipe sizes given in the table below are the recommended sizes for cushion installations consisting of one to six cushion units.



PIPE SIZE REQUIRED FROM CUSHION UNIT TO SURGE TANK

Cushion Diameter (Model C, D & H)	No. of Cushion Units					
	1	2	3	4	5	6
6"	1/2	3/4	1 1/4	1 1/4	1 1/4	1 1/2
8"	1/2	3/4	1 1/4	1 1/4	1 1/4	1 1/2
10"	3/4	1 1/4	1 1/2	2	2	2
12"	3/4	1 1/4	1 1/2	2	2	2
14"	1	1 1/2	2	2 1/2	2 1/2	3
16"	1 1/4	2	2 1/2	3	3	
18"	1 1/4	2	2 1/2	3	3	
20"	1 1/4	2	2 1/2	3	3	
22"	1 1/2	2 1/2	3			
24"	1 1/2	2 1/2	3			

Cylinder Diameter (Model "L")	No. of Cylinder Units			
	1	2	3	4
5"	3/4	1 1/4	1 1/2	2
6"	3/4	1 1/4	1 1/2	2
8"	3/4	1 1/4	1 1/2	2
10"	1	1 1/2	2	2 1/2
12"	1	1 1/2	2	2 1/2

Cushion Diameter (Model MC & MD)	No. of Cushions Units	
	1	2
8"	3/4	1 1/4
10"	1 1/4	2
12"	1 1/4	2
14"	1 1/2	2 1/2
16"	2	2 1/2
18"	2	3
20"	2	3
22"	2 1/2	4
24"	2 1/2	4

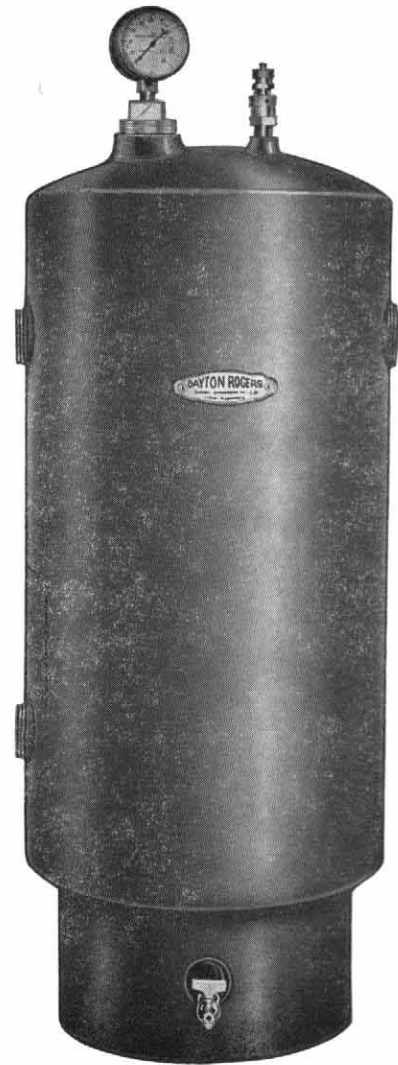


Fig. No. 60

All cushion units are drilled and tapped for the correct size surge line to handle the flow of air required. On multiple units a reducing bushing for the correct size is furnished to give the proper air flow for the entire installation. Each cushion installation should have its own surge tank, as the pressure in the cushion unit and the surge tank is practically the same at all times. This would make it impossible to use one surge tank for two cushion installations, particularly if they were being run under different air pressures.

It is advisable to install the surge tank as close to the cushion unit as possible to minimize the flow of air through surge lines. The surge tank itself may be installed in either a horizontal or vertical position. On inclinable presses it is advisable to mount the surge tank on the back of the press frame, as indicated by the dotted lines in Fig. No. 61, so that when the press is inclined, the surge tank installation will not be disturbed. If this cannot be done, we recommend that a high pressure hose of the correct size be used from the cushion unit to the surge tank.

Each surge tank is provided with the required number of outlets for making either of the above installations.

All surge tanks furnished with pneumatic die cushions and counter-balance cylinders include pop safety valve, pressure gauge and drain cock. Tanks furnished with "C", "D", "MC", "MD" and "L" installations have a maximum working pressure of 125 psi, with pop safety valve set at 125 psi. Tanks furnished with "H" installations have a maximum working pressure of 250 psi, with pop safety valve set to relieve at this pressure. All tanks are built to ASME and National Board of Registration Standards and are furnished with certified code tag.

REPAIR PARTS FOR SURGE TANK AND ACCESSORIES: If it becomes necessary to order replacement parts for a surge tank and its accessories, order by part number according to Fig. No. 61. Full particulars on all sizes of surge tanks used in connection with pneumatic die cushion units are also listed below.

SURGE TANKS—PART NUMBER AND SIZE

125 PSI		250 PSI		Size	Gal.	Out-let Size	Shpg. Wt.	
Assem- bly	Tank	Assem- bly	Tank				125 PSI	250 PSI
		6990	12982	8x18	3	3/4		15
6998	6991	6979	6301	12x33	12	2	56	76
6999	6992	6980	6302	12x45	18	2	67	100
7000	6993	6981	6303	16x47	33	2 1/2	100	157
7001	6994	6982	6304	18x55	51	3	140	250
7002	6995			20x65	75	3	220	
7003	6996	7209	6306	24x75	125	3	285	
7004	6997			26x77	170	3	335	

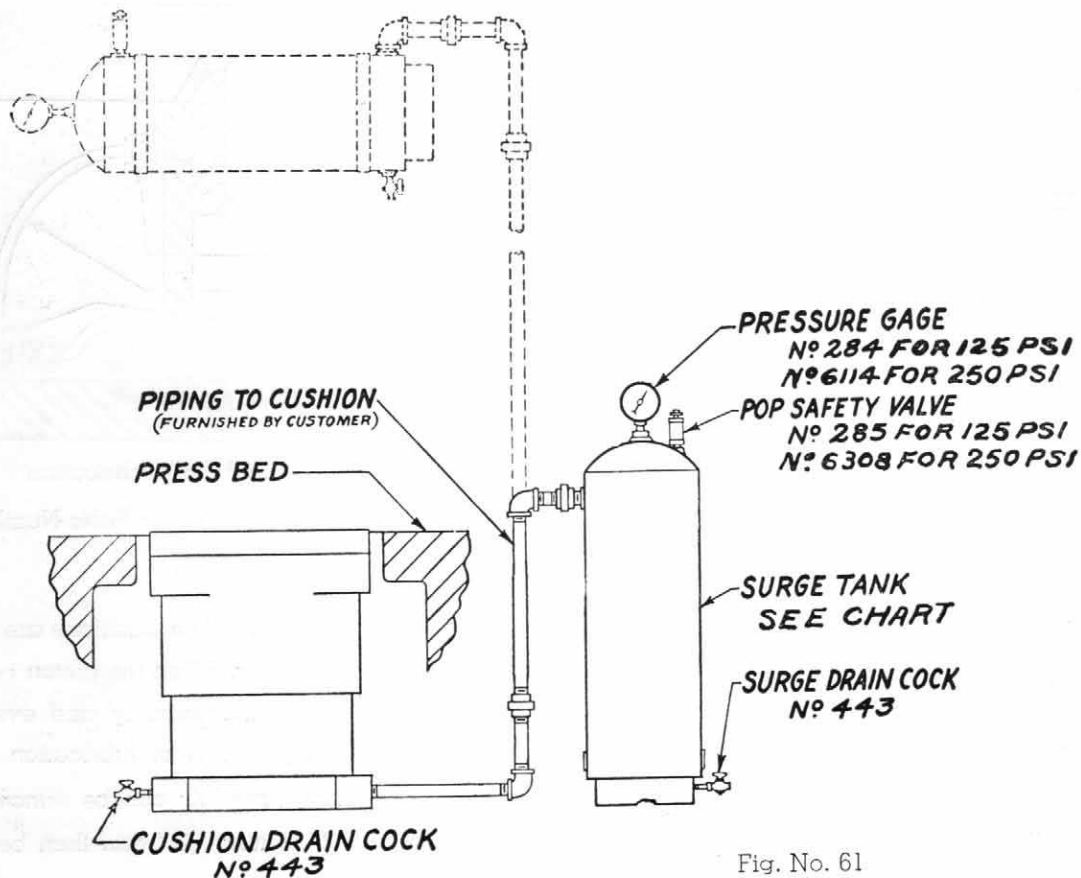


Fig. No. 61

Lubrication

INSTRUCTIONS AND PARTS LISTS



All Dayton Rogers Pneumatic Die Cushions and C' Balance Cylinders are thoroughly lubricated at the factory prior to shipment. It is advisable, however, to lubricate each fitting until grease emerges from between the piston and cylinder walls before cushion is put into operation. The same procedure should be followed after **every 8 hours** of operation. If the cushion is permitted to stand idle for a period of two or three weeks, the grease may dry out and as a result the packing will become hard and will possibly cause an air leak until it has softened up sufficiently. It may be necessary in some cases to inject grease into the lubrication system to soften up these packings so that they will retain their resiliency. A standard automotive pressure grease gun can be used on all lubricating fittings on Dayton Rogers pneumatic die cushions and C' Balance Cylinders.

DO NOT USE AN ORDINARY CUP GREASE, AS IT WILL NOT DISTRIBUTE ITSELF PROPERLY OVER THE INTERIOR SURFACES OF THE CYLINDER AND PISTON WALLS. LUBRICANT ESPECIALLY COMPOUNDED FOR DIE CUSHIONS IS AVAILABLE FROM DAYTON ROGERS MFG. CO. IN 4-LB. CANS AND 35-LB. PAILS. See PAGES 73 and 74.

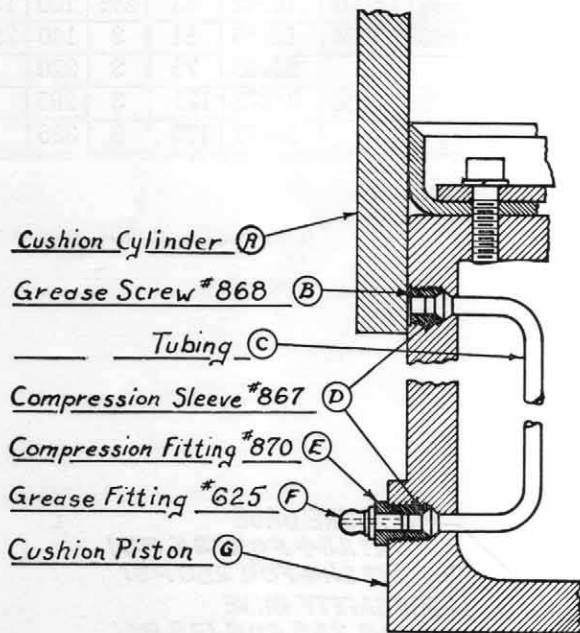


Fig. No. 62 "C", "D" "MD" and "MC" Lubrication

Pressure fittings are located at the front of each individual "C" "D" "MD" and "MC" die cushion piston.

Under severe vibrating conditions the 3/16" metal tubing, "C", may have a tendency to fracture just behind compression sleeve "D". In the event an air leak develops this can be very readily checked by removing compression fitting "E", and inspecting the compression sleeve to make sure the seat is tight against the cushion piston and that no fractures are visible in the tubing.



CAUTION!! Failure to lubricate as instructed may result in permanent mechanical damage to interval working parts of die cushion or c' balance cylinder. This may result in seizure of unit and the **possibility of injury** to operating personnel.

HOSE FITTING 10129
CUSHION CYLINDER
HOSE NUT
INCL. W/10129
FLEXIBLE HOSE 10140
LUB. DISTRIBUTOR
CUSHION PISTON
LUB. FITTING 210

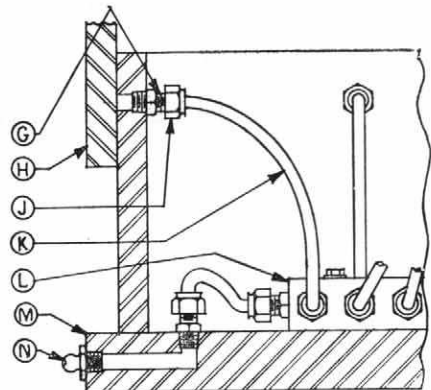


Fig. No. 63 "H" Lubrication

(See Pages 55 and 63 for Parts Numbers)

Model "H" Pneumatic Die Cushions are lubricated through one fitting located on the piston base. Lubricant is distributed automatically and evenly to all points of wear by means of lubrication distributor "L". If necessary, hose "K" can be removed by unscrewing nut "J". Fitting "G" can then be removed.

CENTRALIZED LUBRICATION:

On some installations, particularly in the larger sizes, the press bed is so constructed that the grease fittings are not accessible. (See Fig. No. 66.) The lubrication of the cushion unit on installations of this type can be easily provided for by centralized lubrication, as shown in Figs. No. 64 and No. 65.) The centralized lubrication system consists of a header block (See Fig. No. 65) with 3/16" metal tubing running from this header block directly to the die cushion unit. The header block is provided with as many grease fittings as there are in the complete cushion installation. These header blocks can be placed in any convenient location on the press and will permit easy and positive lubrication of all the necessary points on the cushion units. In addition to the metal tubing, all other fittings required for making the complete installation are furnished. This principle can be applied equally as well to "H" type lubrication.



After centralized lubrication system has been installed, fill the lines with grease until it emerges from between the piston and cylinder walls. **Check again after 8 hours** operation to see how many shots are necessary to again cause grease to emerge. Thereafter **lubricate** this amount **every 8 hours** of operation.

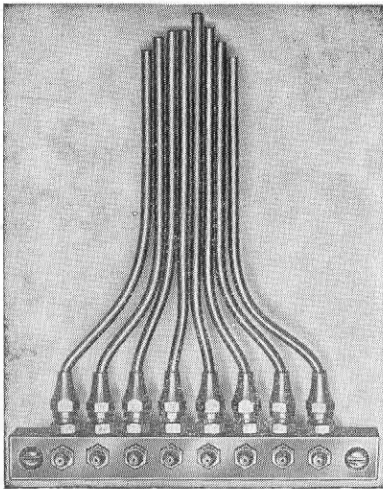


Fig. No. 65

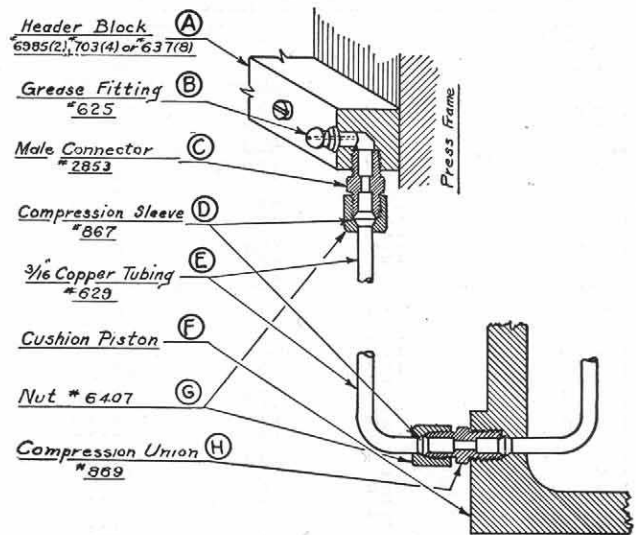


Fig. No. 64

REPAIR PARTS:

If it becomes necessary to order repair parts for the lubrication system on a pneumatic die cushion, please specify the quantity of items required, and the part number as shown in Fig. No. 62 for "C", "MC" "MD" and "D" cushions. See Fig. No. 63 for "H" lubrication parts.

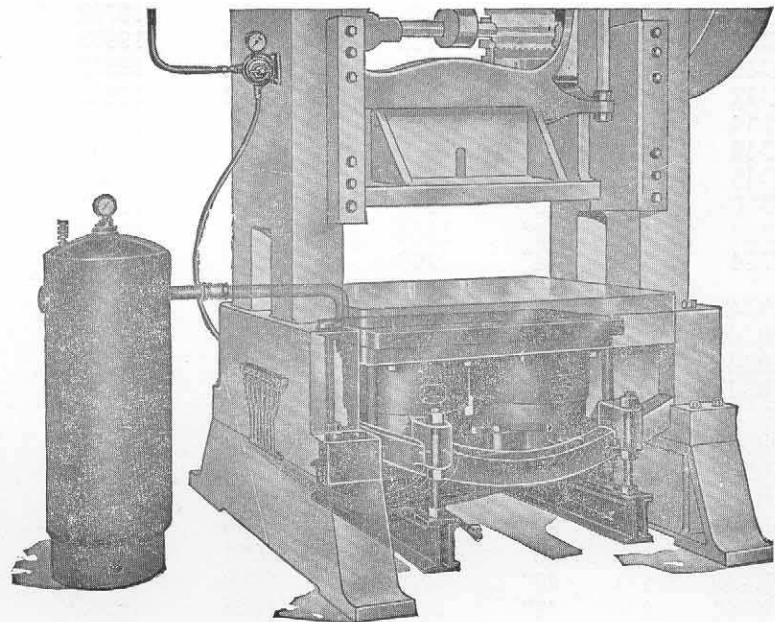


Fig. No. 66

Pneumatic Packings

Dayton Rogers Packings are of first quality material, thus assuring long wear and dependability under strenuous operating conditions.

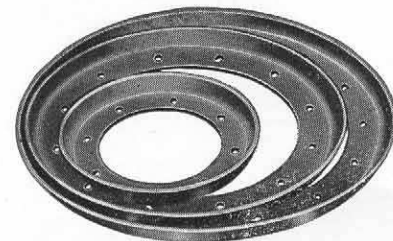
When ordering packings, give Model, Size, and Serial No. of Cushion or Counter-balancing Cylinder as well as Part No. of the packing.

EQUIPMENT

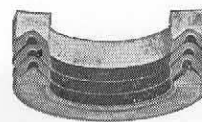
PISTON PACKINGS

ROD PACKINGS

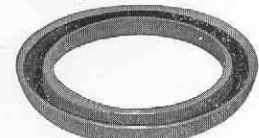
	PISTON DIA.	CUP PACKING	QUAD PACKING	CUSHION S/N*	ROD DIA.	CHEVRON TYPE	QUAD PACKING
D-5	5"	646	10013	19035	1 1/4 Quad 1 1/2 Chev.	702	7954
D-6	6"	495	8312	18985	1 1/4	811	7954
D-8	8"	169	8335	19105	1 1/2	702	9324
D-10	10"	490	8700	19185	1 1/2	702	9324
D-12	12"	492	10109	19532	2	684	8311
D-14	14"	179	9878	20264	2	684	8311
D-16	16"	168	10110	19232	2	684	8311
HD-8	8"	169	8335	22375	2	684	8311
HD-10	10"	490	8700	20000	2	684	8311
HD-12	12"	492	10109		3	6510	9893
HD-14	14"	179	9878	18873	3	6510	9893
HD-16	16"	168	10110	19799	3 Quad 3 1/2 Chev.	7130	9893
L-5	5"	646	.....	19680	1 1/2	6187	9324
L-6	6"	495	.....	19506	1 1/2	6187	9324
L-8	8"	169	.....	19400	1 1/2	6187	9324
L-10	10"	490	8700	19476	1 1/2	6187	9324
L-12	12"	492	10109	21615	2	6746	8311
R-3	3"	5987	9653	18586	1	U-PACKING 6121	9141
R-4	4"	5975	7955	18877	1 1/4	6122	7954
R-5	5"	5985	10013	18747	1 1/2	6123	9324
R-6	6"	495	8312	18798	2	6759	8311
MC, MD, HMC-8	8"	....	8335	All Quad	2 1/2	7882	....
MC, MD, HMC-10	10"	....	8700	All Quad	2 1/2	7882	....
MC, MD, HMC-12	12"	....	10109	All Quad	2 1/2	7882	....
MC, MD, HMC-14	14"	....	9878	All Quad	3 3/4	8973	....
MC, MD, HMC-16	16"	....	10110	All Quad	3 3/4	8973	....
MC, MD, HMC-18	18"	....	10687	All Quad	3 3/4	8973	....
MC, MD, HMC-20	20"	....	10688	All Quad	4 7/8	11737	....
MC, MD, HMC-22	22"	....	10689	All Quad	4 7/8	11737	....
MC, MD, HMC-24	24"	....	10690	All Quad	4 7/8	11737	....
				All Quad	5 7/8	13068	....
C-6	6"	495	8312	19762			
C-8	8"	169	8335	19603			
C-10	10"	490	8700	19570			
C-12	12"	492	10109	19238			
C-14	14"	179	9878	19187			
C-16	16"	168	10110	19230			
C-18	18"	650	10687	19646			
C-20	20"	970	10688	19609			
C-22	22"	1104	10689	19642			
C-24	24"	798	10690	19384			
HC-8	8"	169	8335	24997			
HC-10	10"	490	8700	19626			
HC-12	12"	492	10109	20115			
HC-14	14"	179	9878	19343			
HC-16	16"	168	10110	19253			
HC-18	18"	650	10687	20056			
HC-20	20"	970	10688	20009			
HC-22	22"	1104	10689	19639			
HC-24	24"	798	10690	19743			
HC-30	30"	8650	10761	19974			
HC-40	40"	....	10699	19600			
HC-48	48"	....	10698	19560			



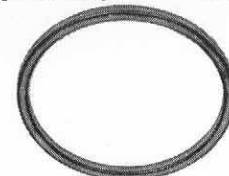
Cup Packing



Chevron Type Packing



U Packing



Quad-Ring Packing

Fig. No. 67

*Quad Ring Packings used after this S/N.

INSTALLATION INSTRUCTIONS

CUP PACKINGS

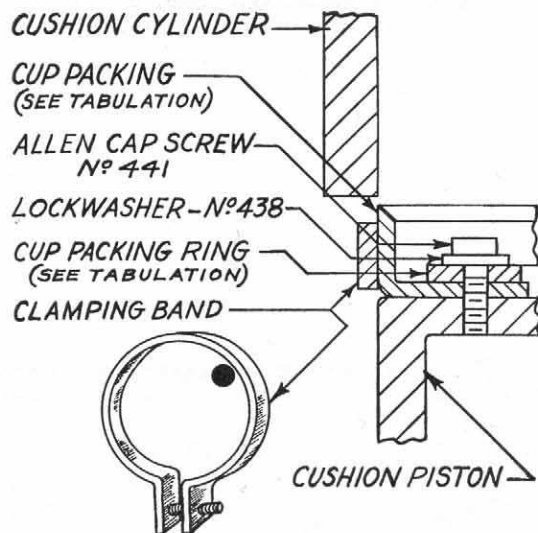


Fig. No. 68

PRECAUTION: When installing a cup packing, be careful not to damage or turn back the lip. This can be avoided by making a clamping band as shown in Fig. No. 69 from 16-gauge band iron, 1/2" to 5/8" wide. The ends of this band iron with two holes pierced to receive an ordinary stove bolt should be bent so that the circumference is a little less from bend to bend than the circumference of the piston of the pneumatic die cushion unit on which it is to be used.

QUAD PACKINGS

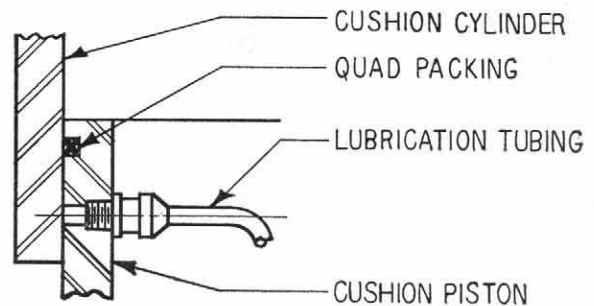


Fig. No. 69

When installing quad packings it is advisable to grease the packing and groove thoroughly before cylinder is installed. Cylinder should be eased over packing to prevent shearing or gouging during installation.

CAUTION: It is advisable to check the 3/16" metal greasing tubes while the cushion unit is disassembled, because severe vibration may cause them to fracture at times. The lubrication instructions given on Page No. 40 will explain the procedure to follow in checking the lubrication system.

MODEL "L" COUNTER-BALANCE PISTON RODS

CHEVRON TYPE PACKING

Rod packings can be replaced by removing screws "Z". Spring "P" should then push packing set out. Extend rod if packings stick within the base. Packings come in sets of three.

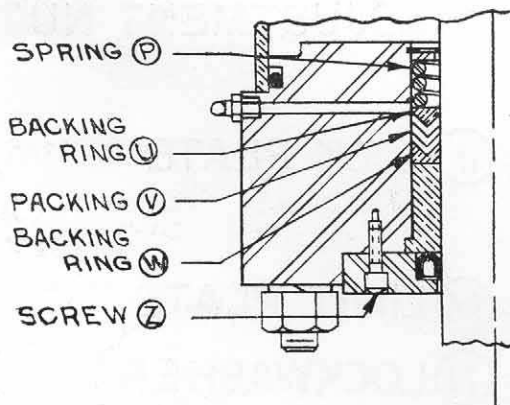


Fig. No. 70

QUAD PACKING

To replace Quad packing remove base "S" from cylinder. Packing "Q" can then be removed. Grease groove and packing before reinstalling base.

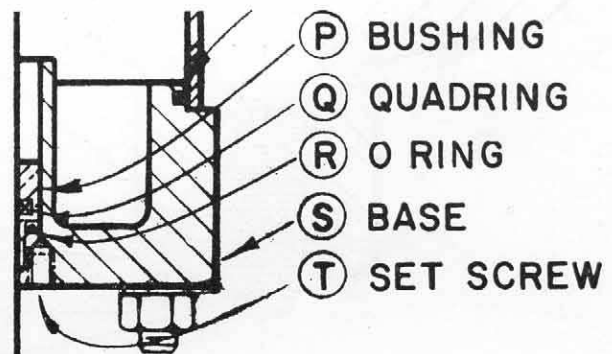


Fig. No. 71

NOTE: The designs shown in Fig. 70 and 71 are not current production. See Fig. 82, page 68 for current design. Parts for above models can be serviced, however, by ordering by Counter Balance Model and Serial No. Also state part name and figure No. as shown above.

Model "D" Parts List

IMPORTANT: When ordering repair parts, be sure to indicate cushion model and size, serial number and part number on purchase order to avoid errors.

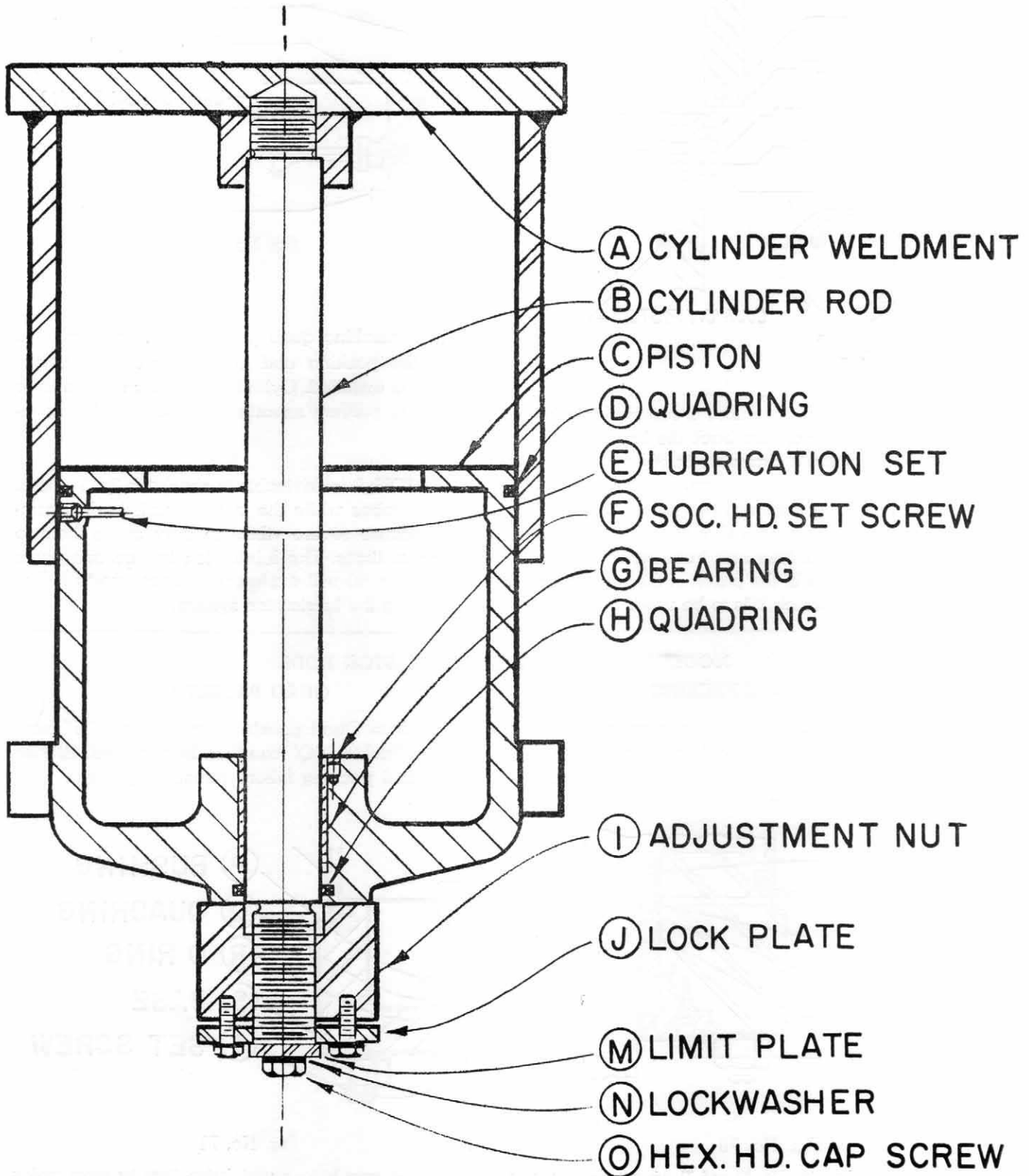


Fig. No. 72

MODEL "D" PARTS LIST

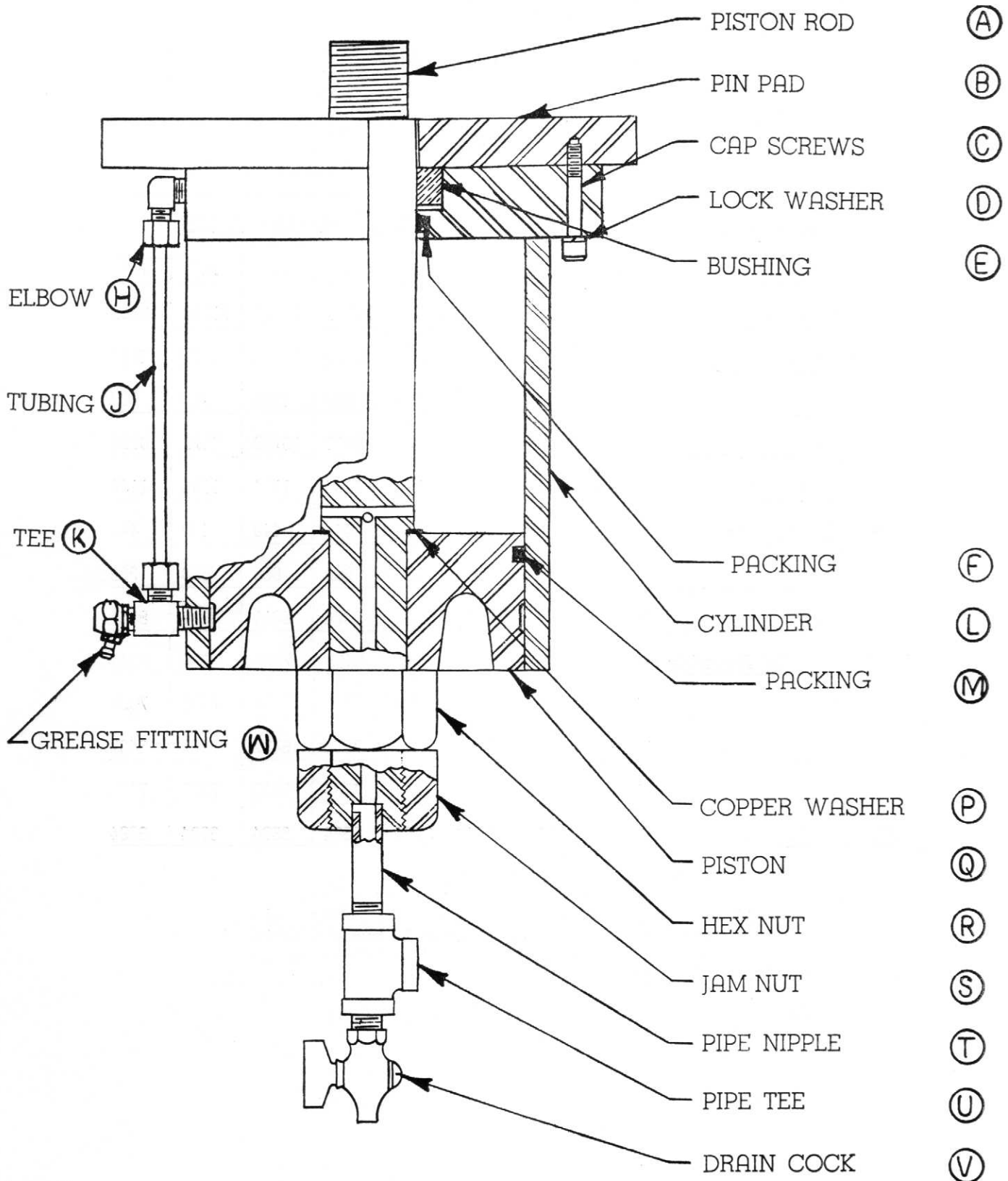
DESCRIPTION		CUSHION DIAMETER AND PART NUMBER						
		5"	6"	8"	10"	12"	14"	16"
Cylinder Weldment **	A	10114	10148	10150	10136	10152	10166	10169
Cylinder Rod **	B	10113	12153	10151	10137	10153	10167	10170
Piston	C	10112	12146	694	707	5288	756	892
Quad Ring	D	10013	8312	8335	8700	10109	9878	10110
Lubrication Set *	E	1134	1134	1134	1134	1134	1134	1134
Soc. Hd. Set Screw	F	440	440	440	440	440	440	440
Bearing	G	813	813	698	698	668	668	668
Quad Ring	H	7954	7954	9324	9324	8311	8311	8311
Adjustment Nut Assembly	I	6404	6404	6405	6405	7006	7006	7006
Lock Plate	J	7217	7217	7218	7218	7008	7008	7008
Limit Plate	M	6400	6400	7534	7534	6402	6402	6402
Lock Washer	N	7234	7234	7234	7234	7235	7235	7235
Hex. Hd. Cap Screw	O	3584	3584	3584	3584	6394	6394	6394

* See detailed sketch on Page 40.

** When ordering cylinders and cushion pistons, order according to cushion model and serial number. (Serial number is located at the front, lower flange of the cushion unit.)

Model "R" Parts List

IMPORTANT: When ordering repair parts, be sure to indicate cushion model and size, serial number and part number on purchase order to avoid errors.



MODEL "R" PARTS LIST

DESCRIPTION		PART NUMBER			
		R-3-3	R-4-4	R-5-4	R-6-4
Cushion Model No.					
Piston Rod	A	7184	7238	7239	7384
Pin Pad	B	5955	5971	5982	7394
Cap Screws	C	7340	1453	1290	639
Lock Washer	D	1930	457	457	474
Bushing	E	10427	10428	11245	10330
Quad-Ring Packing	F	9141	7954	9324	8311
Elbow	H	7974	7974	7974	7974
Tubing	J	629	629	629	629
Tee	K	7975	7975	7975	7975
Cylinder	L	7457	7462	7463	7892
Quad-Ring Packing	M	9653	7955	10013	8312
Copper Washer	P	247	144	5983	7185*
Piston	Q	9650	7952	9651	8310
Hex Nut	R	424	324	485	818
Jam Nut	S	487	484	485	818
Pipe Nipple	T	2666	3053	1591	575
Pipe Tee	U	1590	10168	589	589
Drain Cock	V	443	443	443	443
Grease Fitting	W	444	444	444	444

*O-Ring.

Model "C" Parts List

(To be used for multiple installations also)

IMPORTANT: When ordering repair parts, be sure to indicate cushion model and size, serial number and part number on purchase order to avoid errors.

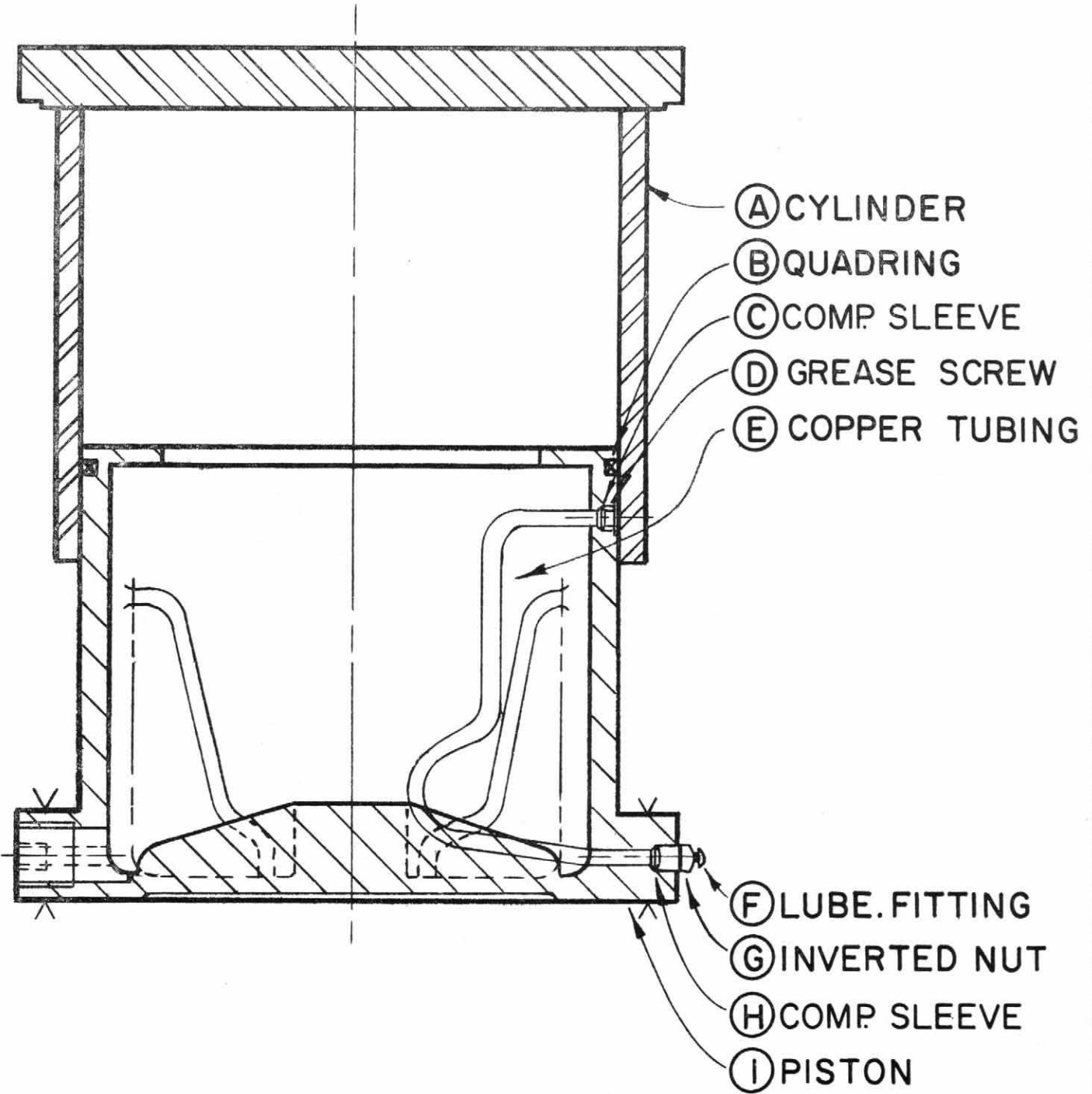


Fig. No. 74

MODEL "C" PARTS LIST

DESCRIPTION		CUSHION DIAMETER AND PART NUMBER									
		6"	8"	10"	12"	14"	16"	18"	20"	22"	24"
Cylinder *	A	7429	4231	4170	4141	4142	4143	5681	5682	4146	5683
Quadrang	B	8312	8335	8700	10109	9878	10110	10687	10688	10689	10690
Comp. Sleeve	C	867	867	867	867	867	867	867	867	867	867
Grease Screw	D	868	868	868	868	868	868	868	868	868	868
Copper Tubing	E	629	629	629	629	629	629	629	629	629	629
Lub. Fitting	F	625	625	625	625	625	625	625	625	625	625
Inverted Nut	G	870	870	870	870	870	870	870	870	870	870
Comp. Sleeve	H	867	867	867	867	867	867	867	867	867	867
Piston *	I	222	318	306	311	309	556	649	969	1103	797

* When ordering cylinders and cushion pistons, order according to cushion model and serial number. (Serial number is located at the front, lower flange of the cushion unit.)

Model "MC" Parts List

IMPORTANT: When ordering repair parts, be sure to indicate cushion model and size, serial number and part number on purchase order to avoid errors.

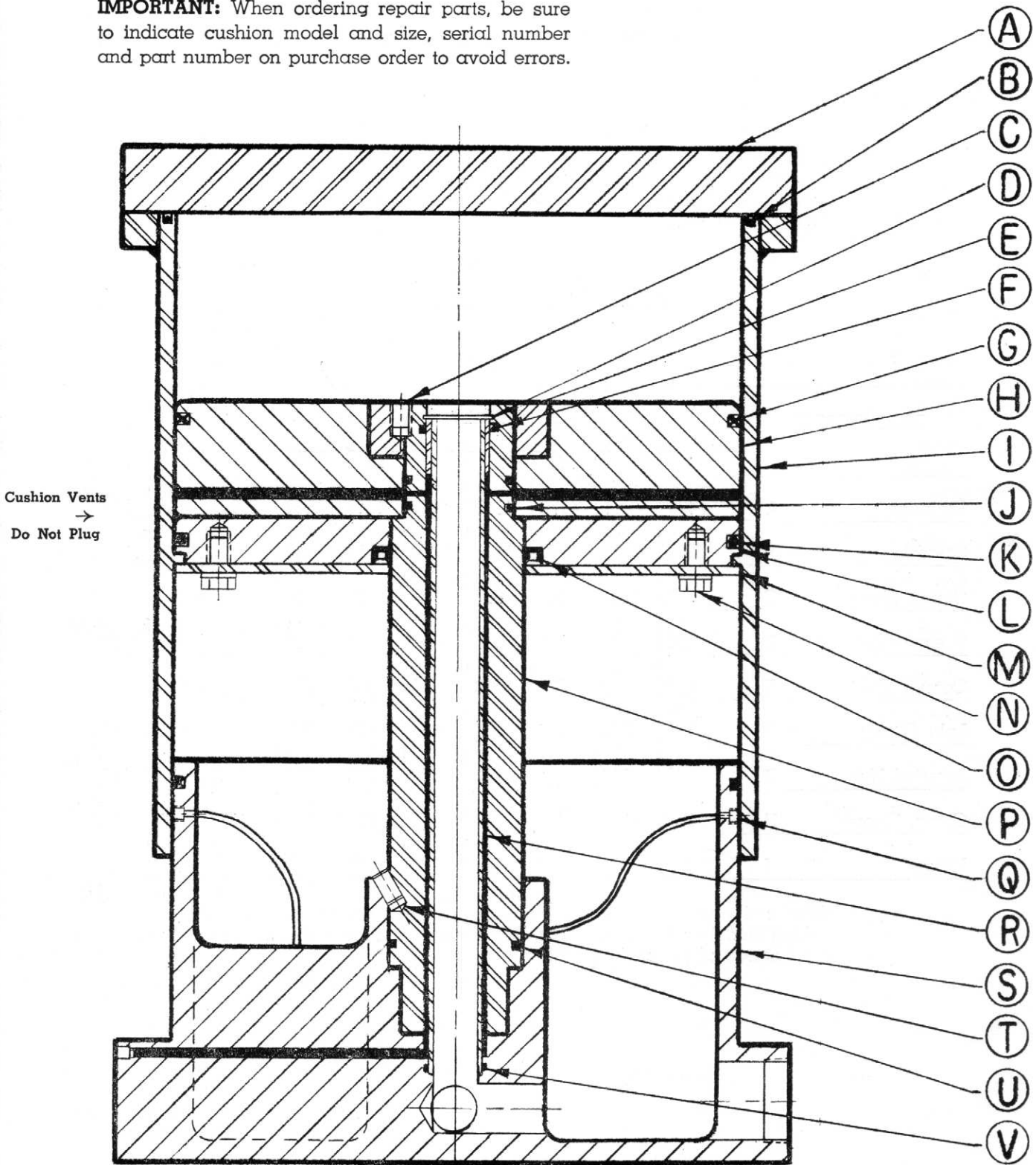


Fig. No. 75

MODEL "MC" PARTS LIST

DESCRIPTION		DIAMETER OF CYLINDER AND PART NUMBER								
		8"	10"	12"	14"	16"	18"	20"	22"	24"
Pin Pad A	P.B.M. B.P.M.	418 8982	418 7550	418 8788	418 8797	418 8969	....	....	....	....
"O" Ring	B	8987	10737	7884	8972	10110	....	....	....	....
Soc. Hd. Set Screw	C	6223	6223	6223	3018	3018	3018	3018	3018	3018
Retaining Ring	D	6074	6074	6074	10873	10873	10873	....	....	....
Piston Nut	E	....	....	....	10785	10785	10785	11734	11734	11734
"O" Ring	F	10412	10412	10412	6490	6490	6490	....	....	....
Quadrang	G	8335	8700	10109	9878	10110	10687	10688	10689	10690
Upper Piston *	H	8983	7685	8789	8793	8970	11617	11739	11723	11754
Cylinder Weldment *	I	8981	7549	7687	8798	8968	....	....	....	....
"O" Ring	J	6161	6161	6161	6162	6162	6162	6068	6068	6068
"O" Ring	K	6156	6157	6158	10086	6159	....	....	....	....
Cylinder Separator Plate	L	8984	7748	8790	8795	8971	....	....	....	....
Lock Plate	M	8985	7686	8791	8796	8974	11618	11735	11735	11735
Soc. Hd. Cap Screw	N	7879	11455	11455	11456	11456	11455	11455	6394	6394
"U" Packing	O	7882	7882	7882	8973	8973	8973	11737	11737	11737
Piston Rod	P	7511	7511	7511	8794	8978	11620	11728	11728	11728
Lubrication Set	Q	1134	1134	1134	1134	1134	1134	1134	1134	1134
Lubrication Tube	R	7677	7677	7677	8799	8979	11619	....	....	....
Lower Piston *	S	8986	7304	7693	8792	8977	11611	11738	11729	11750
Soc. Hd. Set Screw	T	2002	2002	2002	6223	6223	7498	....	....	....
"O" Ring	U	6161	6161	6161	7419	7419	7419	3639	3639	3639
"O" Ring	V	8892	8892	8892	9345	9345	9345	....	....	....

P.B.M.—Press Bed Mounting.
B.P.M.—Bolster Plate Mounting.

*When ordering cushion cylinders and cushion pistons, order according to cushion model and serial number. (Serial number is located at the front, lower flange of the cushion unit.)

Model "MD" Parts List

IMPORTANT: When ordering repair parts, be sure to indicate cushion model and size, serial number and part number on purchase order to avoid errors.

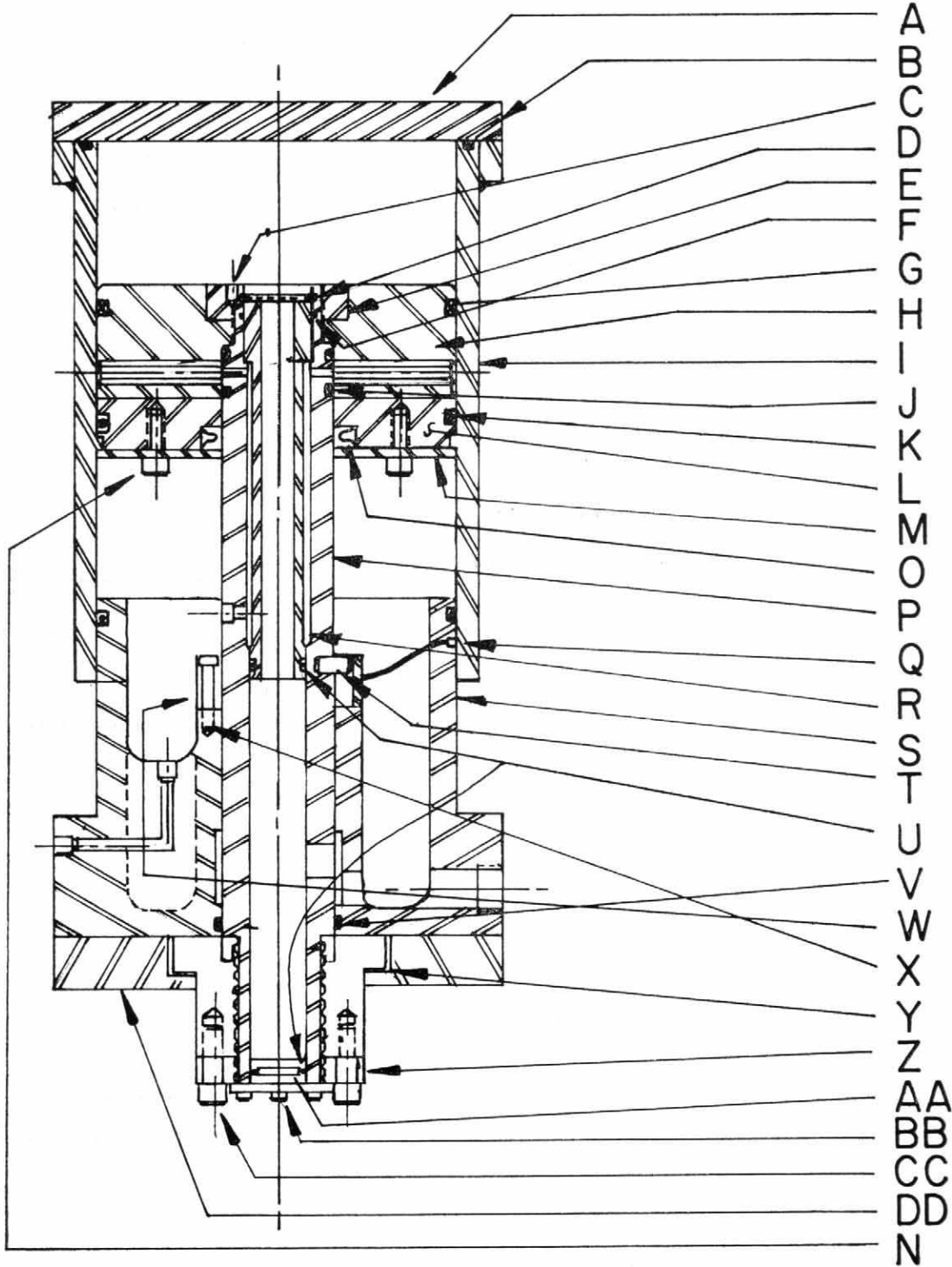


Fig. No. 76

MODEL "MD" PARTS LIST

DESCRIPTION		DIAMETER OF CYLINDER AND PART NUMBER				
		8"	10"	12"	14"	16"
Pin Pad A	P.B.M.	418	418	418	418	418
	B.P.M.	8982	7550	8788	8797	8969
"O" Ring	B	8987	10737	7884	8972	10110
Soc. Hd. Set Screw	C	3889	2889	2889	3018	3018
Retaining Ring	D	3473	3473	3473	10873	10873
Piston Nut	E	....	....	....	10785	10785
"O" Ring	F	10412	10412	10412	7418	7418
Quadring	G	8335	8700	10109	9878	10110
Upper Piston *	H	8983	7685	8789	8793	8970
Cylinder Weldment *	I	8981	7549	7687	8798	8968
"O" Ring	J	6161	6161	6161	6162	6162
"O" Ring	K	6156	6157	6158	10086	6159
Cylinder Separator Plate	L	8984	7748	8790	8795	8971
Lock Plate	M	8985	7686	8791	8796	8974
Soc. Hd. Cap Screw	N	7879	11455	11455	11456	11456
"U" Packing	O	7882	7882	7882	8973	8973
Piston Rod	P	12427	12357	12357	12415	12446
Lubrication Set	Q	1134	1134	1134	1134	1134
Lubrication Tube	R	12366	12366	12366	12416	12445
Lower Piston *	S	12405	12384	12361	12414	12448
Dowel, Ant. Rotation	T	12576	12576	12576	12576	12576
"O" Ring	U	2723	2723	2723	6146	6146
Quad Ring	V	8698	8698	8698	12027	12027
Anti-Rotation Collar	W	12912	12362	12362	12417	12417
Soc. Hd. Cap Screw	X	3058	3058	3058	3058	3058
Adjustment Nut	Y	12365	12365	12365	12418	12418
Lock Plate, Adj. Nut	Z	12365	12364	12364	12419	12419
Plug	AA	12911	12911	12911	12911	12911
Soc. Hd. Cap Screw	BB	3391	3391	3391	3391	3391
Soc Hd. Cap Screw	CC	1291	1291	1291	1291	1291
Support Plate	DD	12473	12386	12367	12420	12447

Model "HC" Parts List

IMPORTANT: When ordering repair parts, be sure to indicate cushion model and size, serial number and part number on purchase order to avoid errors.

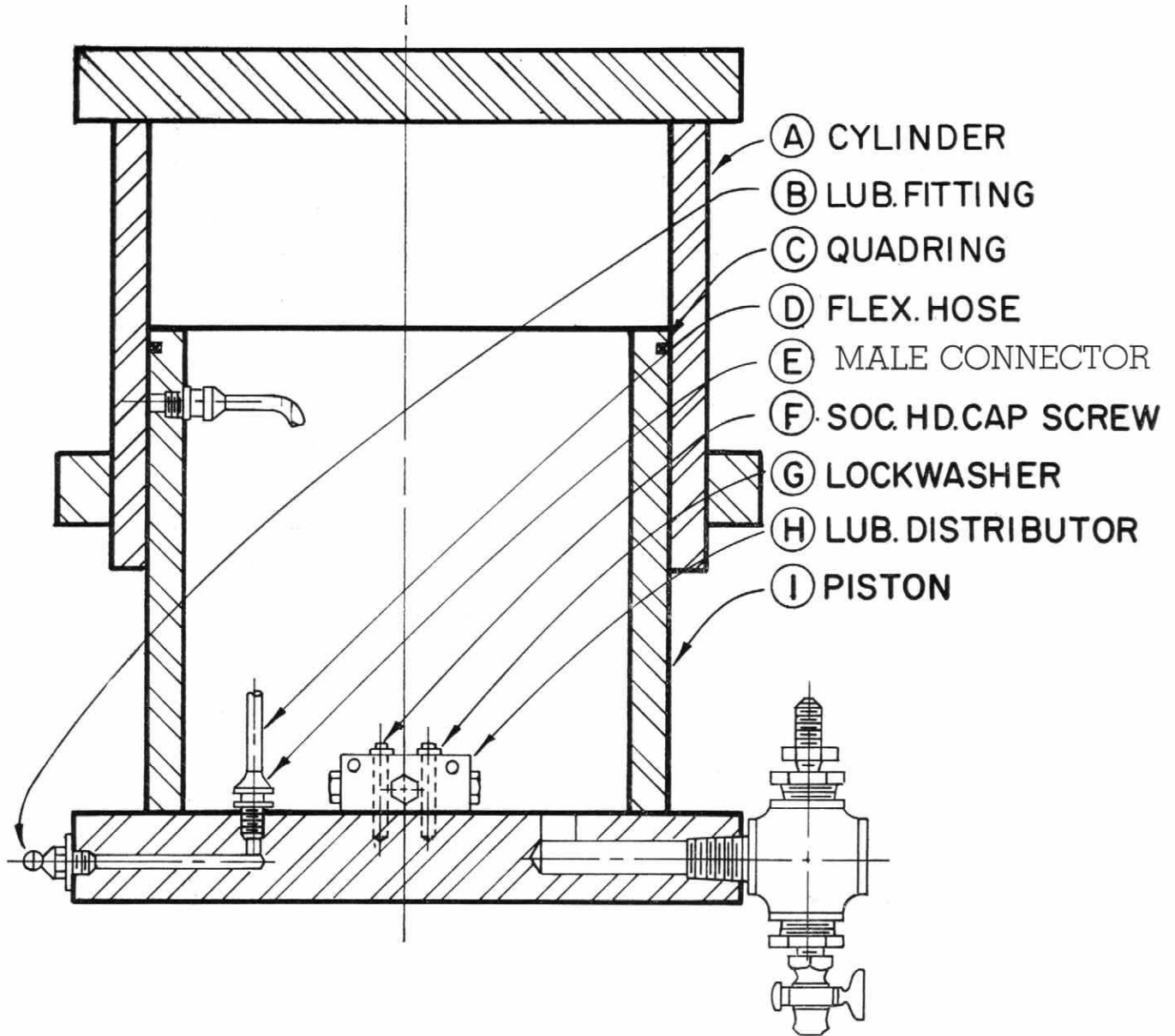


Fig. No. 77

MODEL "HC" PARTS LIST

DESCRIPTION		CUSHION DIAMETER AND PART NUMBER								
		8"	10"	12"	14"	16"	18"	20"	22"	24"
Cylinder**	A	6629	6671	6622	6595	6323	6281	6509	6506	6289
Lub. Fitting*	B	210	210	210	210	210	210	210	210	210
Quadring	C	8335	8700	10109	9878	10110	10687	10688	10689	10690
Flex. Hose	D	10140	10140	10140	10140	10140	10140	10140	10140	10140
Male Connector	E	10129	10129	10129	10129	10129	10129	10129	10129	10129
Soc. Hd. Cap Screw	F				7369	7369	7369	7369	7369	7369
Lock Washer	G				438	438	438	438	438	438
Lub. Distributor	H	10965 3578	10965 3578	10965 3578	6620	6620	6620	6620	6620	6620
Piston**	I	6630	6672	6623	6596	6324	6282	6581	6507	6290

* See detailed sketch on Page 40.

** When ordering cushion cylinders and cushion pistons, order according to cushion model and serial number. (Serial number is located at the front, lower flange of the cushion unit.)

Model "H-4" Booster Pump

IMPORTANT: When ordering repair parts, be sure to indicate pump model and size, serial number and part number on purchase order to avoid errors.

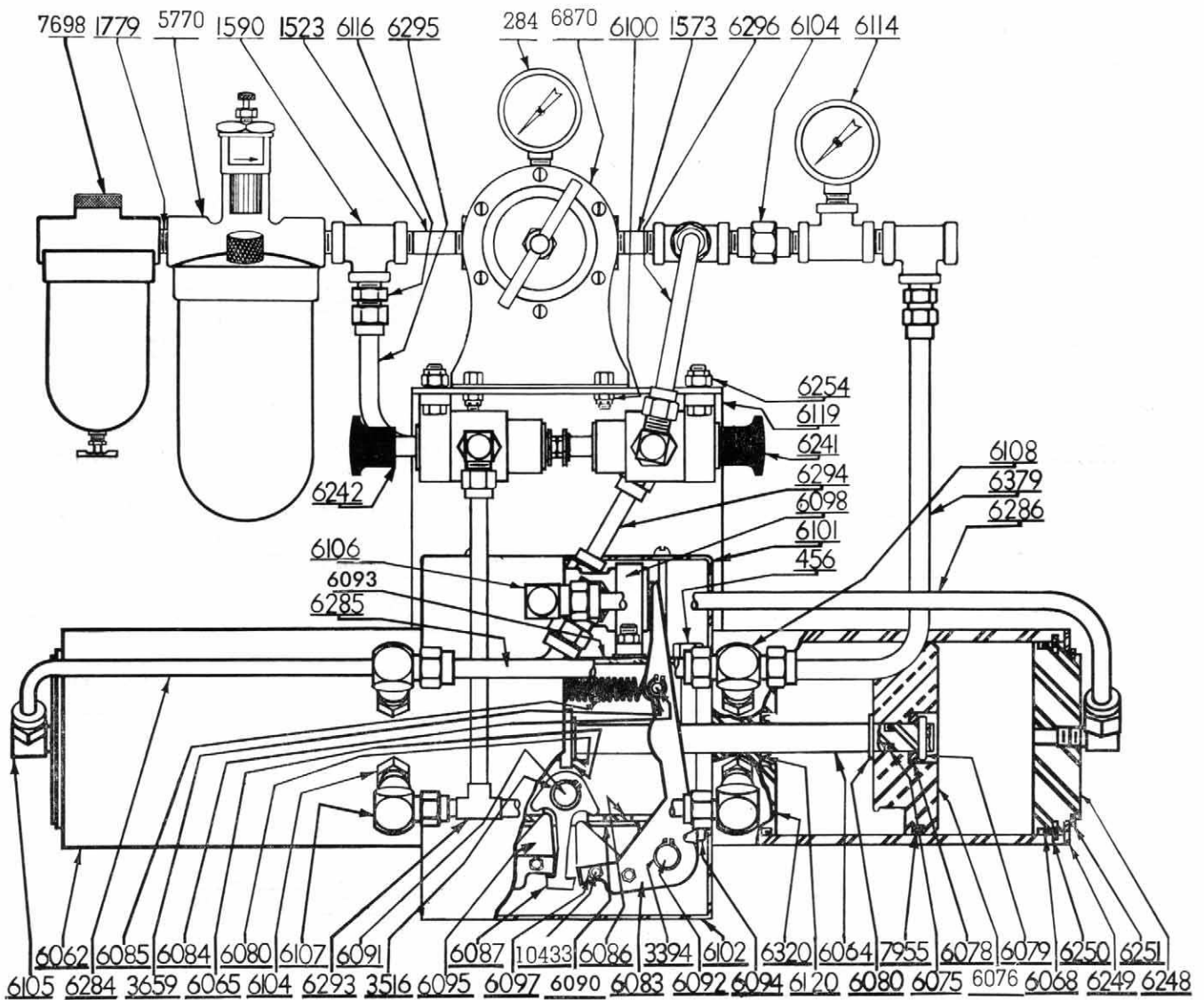


Fig. No. 78

MODEL "H-4" BOOSTER PUMP PARTS LIST

DESCRIPTION	Part No.	DESCRIPTION	Part No.
Gauge (160)	284	Trip Lever Cover	6102
Hex. Head Cap Screw	456	Check Valve	6104
Pipe Nipple	1523	Male Elbow	6105
Pipe Nipple	1573	Extra Long Male Elbow	6106
Pipe Tee	1590	Female Elbow	6107
Pipe Nipple	1779	Female Branch Tee	6108
Truarc Retainer	3394	Air Filter	7698
Truarc Retainer	3516	Gauge (300)	6114
Truarc Retainer	3659	Male Connector	6116
Main Cylinder Tube	6062	Base Mounting Plate	6119
Connecting Rod	6064	"U" Packing	6120
Actuator	6065	Valve, 2-way, Knob Operated.....	6241
"O" Ring	6068	Valve, 2-way	6242
"O" Ring	6075	Head	6248
Moveable Piston	6076	Head Retainer	6249
Piston Washer	6078	Truarc Retainer	6250
Piston Pin	6079	Truarc Retainer	6251
Truarc "E" Retainer	6080	Nut.....	6254
Trip Arm	6083	Air Line	6284
Spring Pin	6084	Tubing	6285
Spring	6085	Tubing	6286
Bottom Mounting Plate	6086	Regulator and Bracket Assembly.....	6870
Pawl Assembly	6087	Tubing	6293
Pawl Pin	6091	Tubing	6294
Trip Arm Pin	6092	Tubing	6295
Nut.....	6094	Tubing	6296
Trip Arm Insert	6095	Bowl Lubricator	5770
Round Head Machine Screw.....	10433	Stationary Piston	6320
Hex Nut	6097	Tubing	6379
Valve, 4-way	6098	Pivot Plate	6090
Nut.....	6100	Top Mounting Plate	6093
Valve Cover	6101	Quad-Ring Packing	7955

Model "H-4B" Booster Pump

IMPORTANT: When ordering repair parts, be sure to indicate cushion model and size, serial number and part number on purchase order to avoid errors.

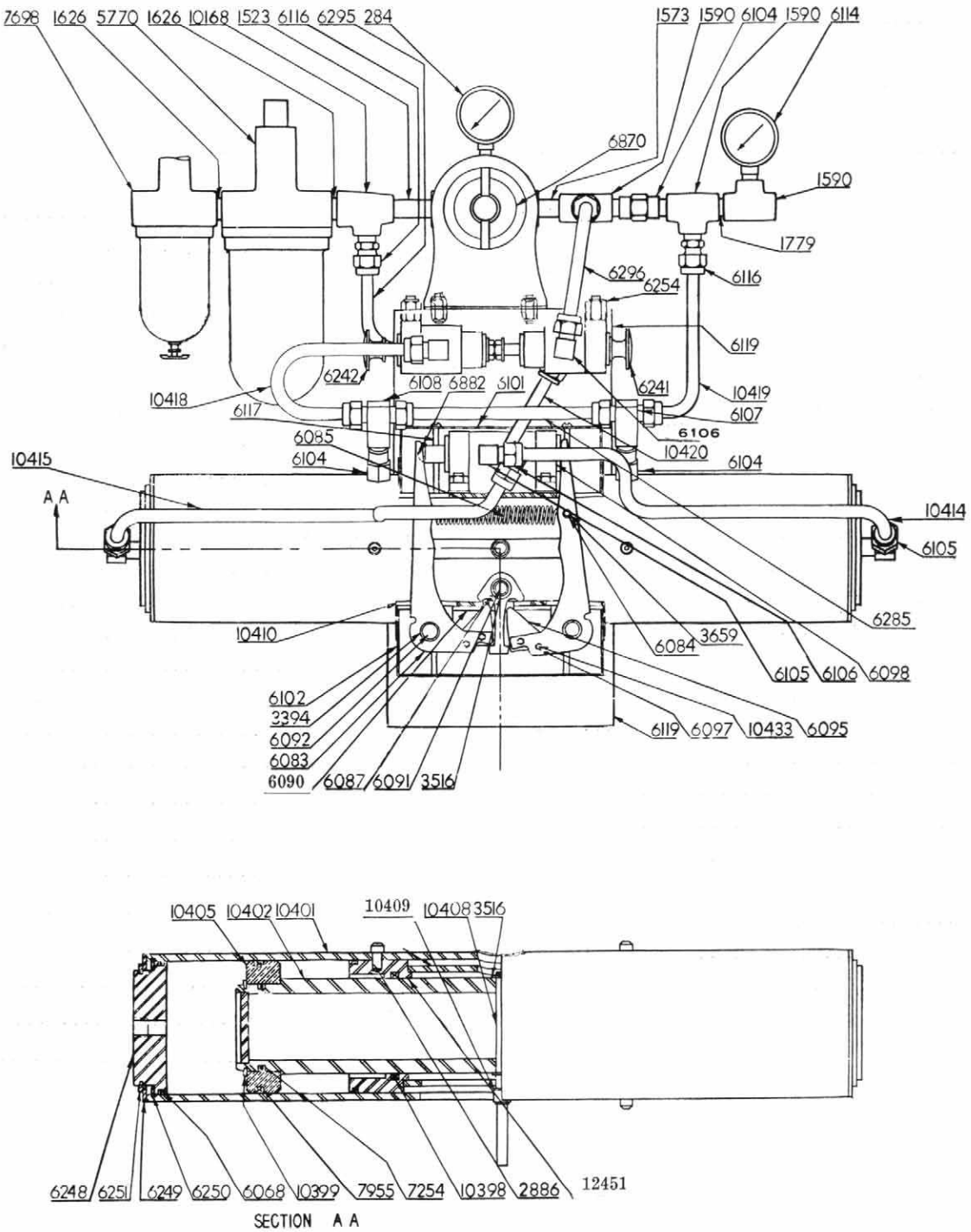


Fig. No. 79

MODEL "H-4B" BOOSTER PUMP PARTS LIST

DESCRIPTION	Part No.	DESCRIPTION	Part No.
Gauge	284	Valve, 2-Way Knob Operated R.H.	6242
Pipe Nipple	1523	Head	6248
Pipe Nipple	1573	Head Retainer	6249
Pipe Tee	1590	Truarc Retainer	6250
Pipe Nipple	1626	Truarc Retainer	6251
Pipe Nipple	1779	Hex-Nut	6254
Soc Head Cap Screw	2886	Tubing	6285
Truarc Retainer	3394	Tubing	6295
Truarc Retainer	3516	Tubing	6296
Truarc Retainer	3659	Regulator	6870
Bowl Lubricator	5770	Screw, Button Head	6882
O-Ring	6068	O-Ring	7254
Trip Arm	6083	Air Filter	7698
Spring Pin	6084	Quad Ring	7955
Spring	6085	Pipe Tee	10168
Pawl Assembly	6087	Quad Ring	10398
Pivot Plate	6090	Truarc Retainer	10399
Pawl Pin	6091	Main Cylinder Tube	10401
Trip Arm Pin	6092	Piston Rod Assembly	10402
Trip Arm Insert	6095	Connecting Pod	10402
Hex-Nut	6097	Movable Piston	10405
Valve, 4-Way	6098	Stationary Piston	12451
Valve Cover	6101	Trip Pin	10408
Trip Arm Cover	6102	Bearing	10409
Check Valve	6104	Mounting Bracket-Valve	10410
Male Elbow	6105	Tubing	10414
Extra Large Male Elbow	6106	Tubing	10415
Female Elbow	6107	Tubing	10418
Female Branch Tee	6108	Tubing	10419
Guage (300 PSI)	6114	Tubing	10420
Male Connector	6116	RD HD Machine Screw	10433
Mach Screw	6117		
Base Mounting Plate	6119		
Valve, 2-Way Knob Operated L.H.	6241		

Model "H-6" Booster Pump

IMPORTANT: When ordering repair parts, be sure to indicate cushion model and size, serial number and part number on purchase order to avoid errors.

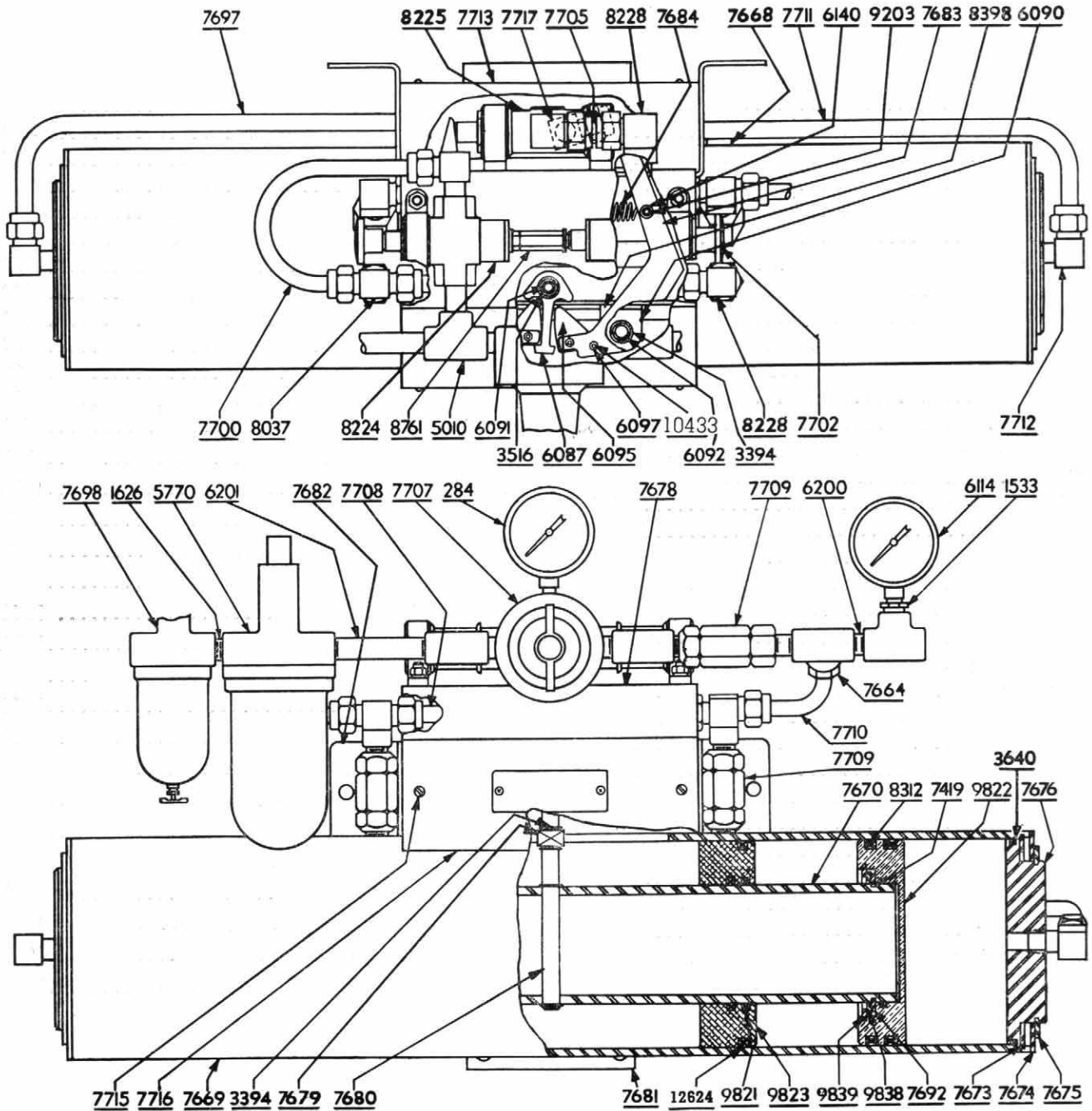


Fig. No. 80

MODEL "H-6" BOOSTER PUMP PARTS LIST

DESCRIPTION	Part No.	DESCRIPTION	Part No.
Gauge (160)	284	Top Mounting Bracket	7682
Reducing Bushing	1533	Trip Arm	7683
Pipe Nipple	1626	Spring	7684
Retaining Ring	3394	Retaining Ring	7692
Retaining Ring	3516	Tubing	7697
"O" Ring	3640	Filter	7698
Pipe Tee	5010	Tubing	7700
Lubricator	5770	2-Way Valve	7702
Pawl Assembly	6087	Tubing	7705
Pivot Point Plate	6090	Pressure Regulator	7707
Pawl Pivot Pin	6091	Tubing	7708
Trip Lever Pivot Pin	6092	Check Valve	7709
Trip Arm Insert	6095	Tubing	7710
Machine Screw	10433	Tubing	7711
Locknut	6097	Male Elbow	7712
Pressure Gauge, 300 psi	6114	Valve Cover	7713
Retaining Ring	6140	Machine Screw	7715
Pipe Nipple	6200	Linkage Cover	7716
Pipe Nipple	6201	Male Elbow	7717
"O" Ring	7419	Female Outlet Tee	8037
Male Connector	7664	2-Way Valve	8224
Soc. HD Shoulder Screw	7668	4-Way Valve	8225
Cylinder	7669	Female Elbow	8228
Connecting Cylinder	7670	Quad-Ring Packing	8312
Movable Piston	9822	Pivot Point Plate	8398
Retaining Ring	7673	Valve Stem Extension	8761
Cylinder Cap Retainer	7674	Spring Pin	9203
Retaining Ring	7675	Quad-Ring Packing	9821
Cylinder Cap	7676	Stationary Piston	9823
Valve Mounting Bracket	7678	Piston Retainer	9838
Bearing	7679	Retaining Ring	9839
Trip Pin	7680	Quad-Ring Packing	12624
Bottom Mounting Bracket	7681		

Model "HD" Parts List

IMPORTANT: When ordering repair parts, be sure to indicate cushion model and size, serial number and part number on purchase order to avoid errors.

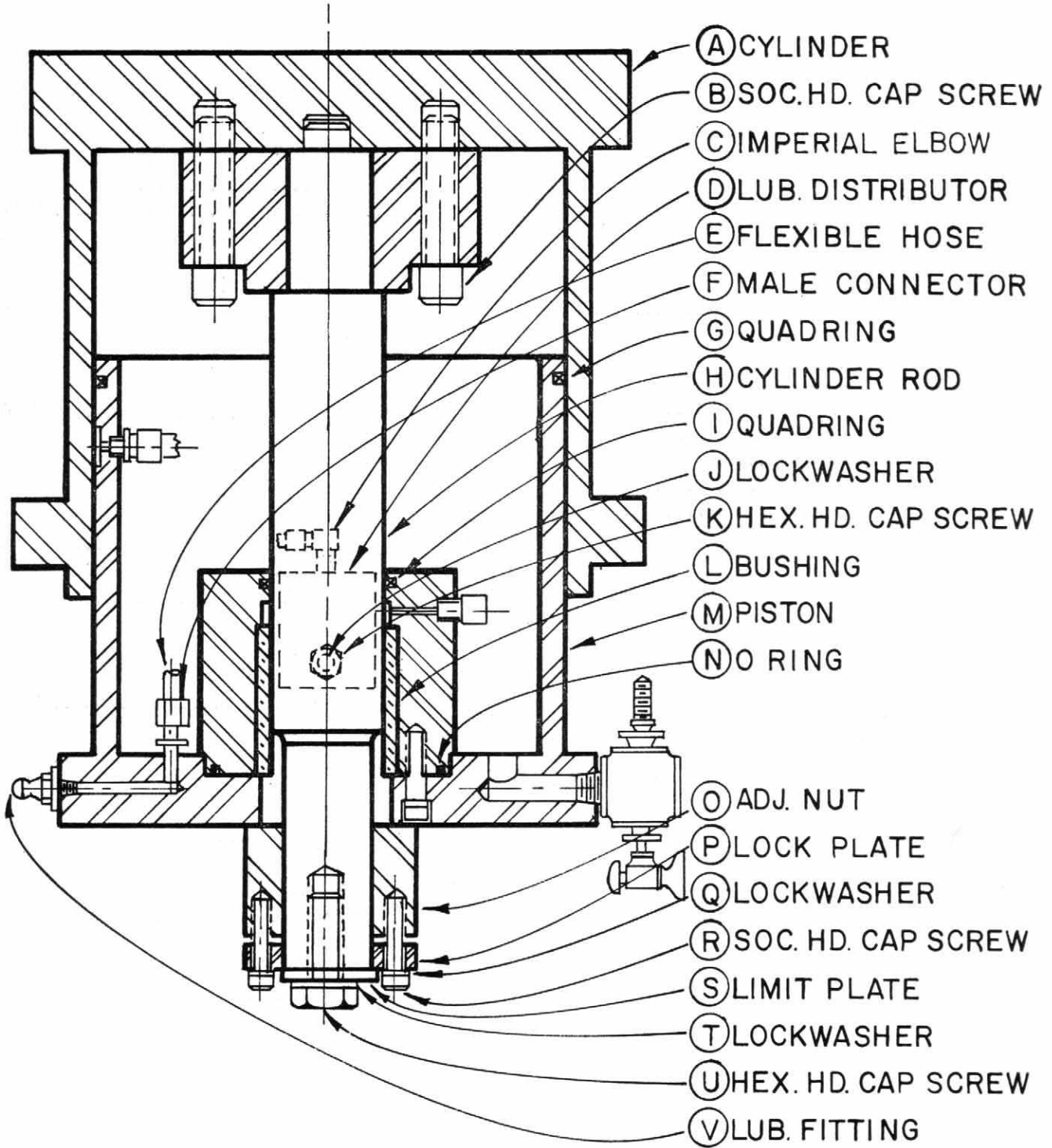


Fig. No. 81

MODEL "HD" PARTS LIST

DESCRIPTION		CUSHION DIAMETER AND PART NO.				
		8"	10"	12"	14"	16"
Cylinder *	A	8542	8598	8619	8442	8625
Soc. Hd. Cap Screw	B	7932	2615	3324	1489	1489
Imperial Elbow	C	10187	10187	10187	10187	10187
Lub. Distributor	D	8547	8547	6346	6347	6347
Flexible Hose	E	10140	10140	10140	10140	10140
Male Connector	F	10129	10129	10129	10129	10129
Quadring	G	8335	8700	10109	9878	10110
Cylinder Rod	H	7146	7206	6895	6895	7164
Quadring	I	8311	8311	9893	9893	9893
Lock Washer	J	8470	8470	438	438	438
Hex. Hd. Cap Screw	K	7337	7337	7319	7319	7319
Bushing	L	946	946	6955	6955	6955
Piston*	M	8545	8601	8622	8445	8628
"O" Ring	N	6068	6068	3640	3640	3640
Adj. Nut	O	7007	7007	6897	6897	6897
Lock Plate	P	7008	7008	6898	6898	6898
Lock Washer	Q	7235	7235	7235	7235	7235
Soc. Hd. Cap Screw	R	774	774	7349	7349	7349
Limit Plate	S	6402	6402	6953	6953	6953
Lock Washer	T	7235	7235	7235	7235	7235
Hex. Hd. Cap Screw	U	6394	6394	6394	6394	6394
Lub. Fitting	V	210	210	210	210	210

*When ordering cushion cylinders and cushion pistons, order according to cushion model and serial number. (Serial number is located at the front, lower flange of the cushion unit.)

Model "HMC" Parts List

IMPORTANT: When ordering repair parts, be sure to indicate cushion model and size, serial number and part number on purchase order to avoid errors.

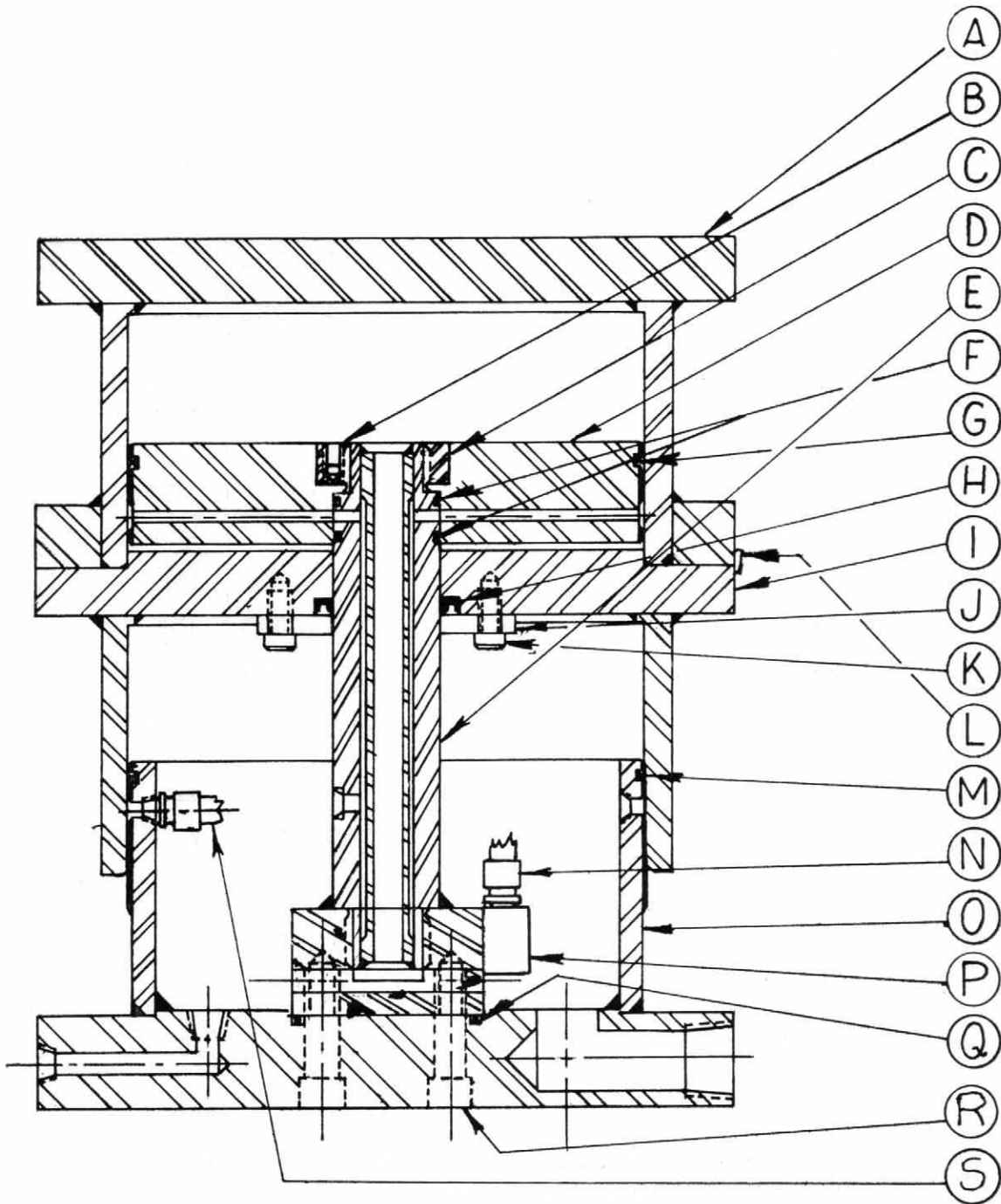


Fig. No. 82

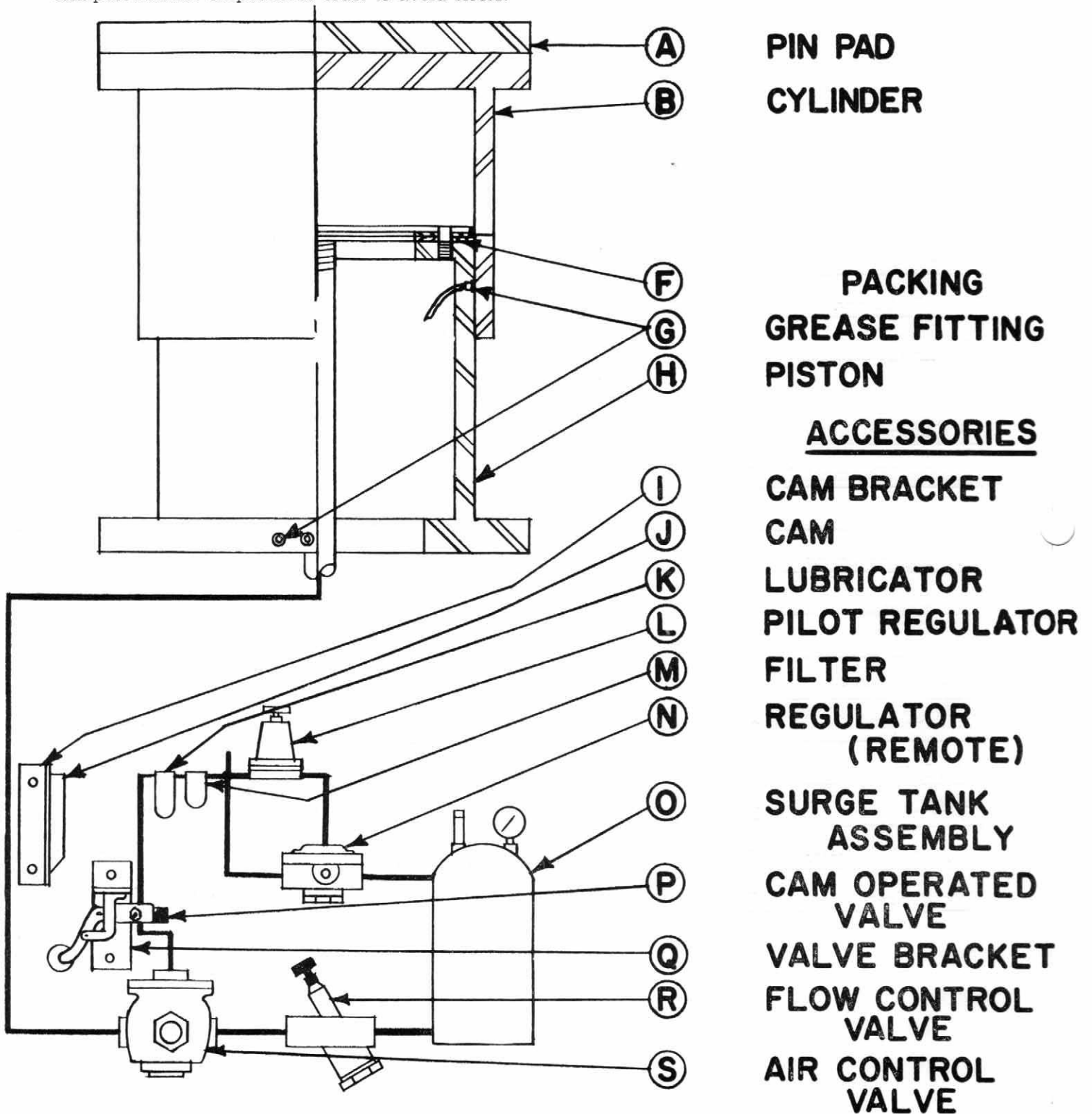
MODEL "HMC" PARTS LIST

		DIAMETER OF CYLINDER AND PART NUMBER								
		8"	10"	12"	14"	16"	18"	20"	22"	24"
Upper Cylinder	A	12802	12428	12487	12516	12399	12886	12890	12894	12898
Soc. Hd. Set Screw	B	1307	1307	1307	1463	1463	1463	1463	1463	1463
Piston Nut	C				12388	12388	13066	13066	13070	13070
Upper Piston	D	12801	12429	12489	12521	13060	11737	12890	13069	13075
Piston Rod Assy.	E	12805	12805	12805	12387	12387	13064	13064	13073	13073
"O" Ring	F	6161	6161	6161	6162	6162	6068	6068	11256	11256
Quadring	G	8335	8700	10109	9878	10110	10687	10688	10689	10690
"U" Packing	H	7882	7882	7882	8973	8973	11737	11737	13068	13068
Cylinder Weldment *	I	12803	12430	12488	12518	12397	12887	12891	12895	12899
Lock Plate	J	13052	13052	13052	12401	12401	11735	11735	13071	13071
Soc. Hd. Cap Screw	K	7879	7879	7879	10951	10951	7886	7886	7886	7886
Vent Cover	L	10834	10834	10834	10834	10834	10834	10834	10834	10834
Quadring	M	8335	8700	10109	9878	10110	10687	10688	10689	10690
Male Connector	N	10129	10129	10129	10129	10129	10129	10129	10129	10129
Lower Piston *	O	12804	12433	12485	12514	12389	12888	12892	12896	12990
Lubr. Distr. Block	P				6620	6620	6620	6620	6620	6620
"O" Ring	Q	6068	6068	6068	12016	12016	11676	11676	13546	13546
Soc. Hd. Cap Screw	R	6656	6656	6656	8607	8607	1276	1276	8204	8204
Grease Hose	S	10140	10140	10140	10140	10140	10140	10140	10140	10140

Model "C" with Air Exhaust Hold-down Parts List

(To be used for multiple installations also)

IMPORTANT: When ordering repair parts, be sure to indicate cushion model and size, serial number and part number on purchase order to avoid errors.



A PIN PAD
B CYLINDER

F PACKING
G GREASE FITTING
H PISTON

ACCESSORIES

I CAM BRACKET
J CAM
K LUBRICATOR
L PILOT REGULATOR
M FILTER
N REGULATOR (REMOTE)
O SURGE TANK ASSEMBLY
P CAM OPERATED VALVE
Q VALVE BRACKET
R FLOW CONTROL VALVE
S AIR CONTROL VALVE

Fig. No. 83

MODEL "C" WITH AIR EXHAUST HOLD-DOWN

PARTS LIST

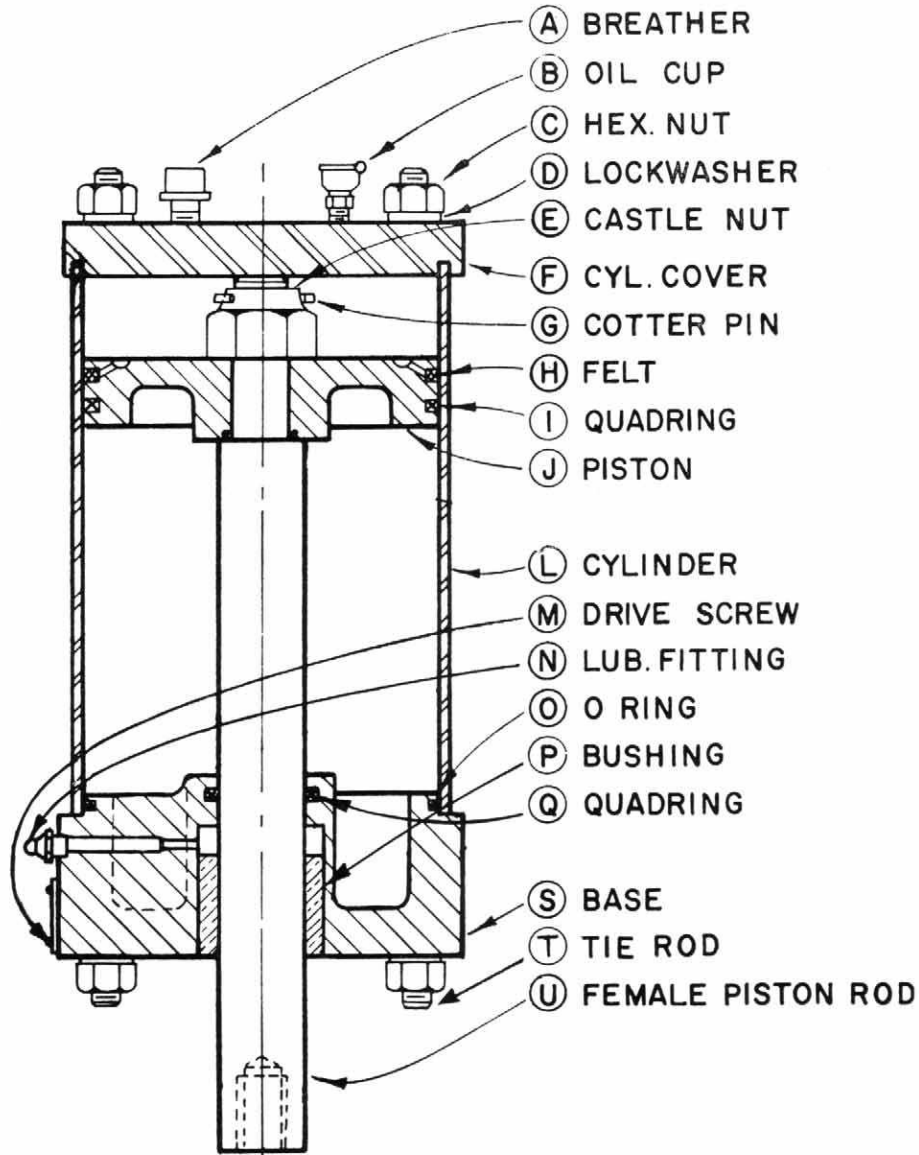
DESCRIPTION		CUSHION DIAMETER AND PART NO.						
		6"	8"	10"	12"	14"	16"	18"
Quadrang	F	8312	8335	8700	10109	9878	10110	10687
Grease Fitting	G	See detailed sketch on Page 40.						
Cushion Cylinder	B	When ordering cushion cylinders and cushion pistons, order according to cushion model and serial number. (Serial number is located at the front, lower flange of the cushion unit.)						
Cushion Piston	H							

ACCESSORIES

DESCRIPTION		CUSHION DIAMETER AND PART NO.						
		6"	8"	10"	12"	14"	16"	18"
Cam Bracket	I	6317	6317	6317	6317	6317	6317	6317
Cam	J	6319	6319	6319	6319	6319	6319	6319
Lubricator	K	6316	6316	6316	6316	6316	6316	6316
Pilot Regulator	L	6870	6870	6870	6870	6870	6870	6870
Filter	M	6111	6111	6111	6111	6111	6111	6111
Regulator (Remote)	N	6950	6950	6950	6950	6950	6950	6950
Surge Tank Assembly	O	See Page No. 37 for information.						
Cam-operated Valve	P	6949	6949	6949	6949	6949	6949	6949
Valve Bracket	Q	6318	6318	6318	6318	6318	6318	6318
Flow Control Valve	R	7826	7826	7826	7826	7827	7827	7827
Air Control Valve	S	7828	7828	7828	7828	7829	7829	7829

Counter-balance Cylinder Parts List

IMPORTANT: When ordering repair parts, be sure to indicate counter-balance cylinder model and size, serial number and part number on purchase order to avoid errors.



NOTE: For Prior Rod Bushing and packing construction see page 43. This construction used after

Model	S/N
L-5	21121
L-6	22324
L-8	22610
L-10	23210
L-12	22354

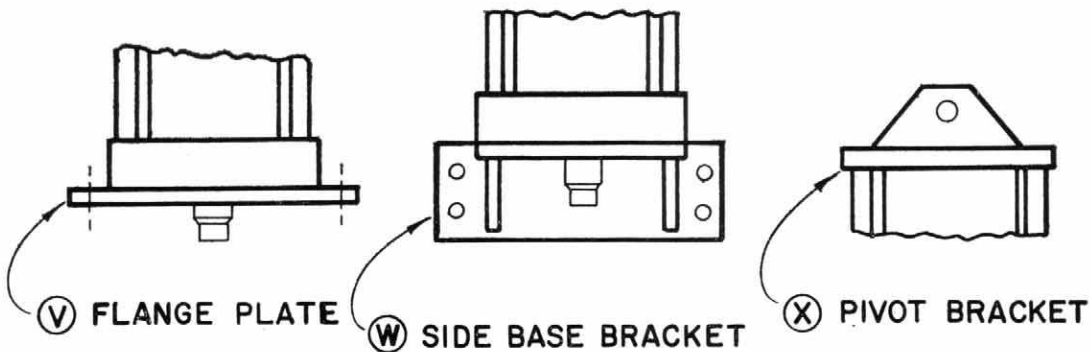


Fig. No. 84

Model "L" Parts List

DESCRIPTION		CYLINDER SIZE AND PART NO.				
		5"	6"	8"	10"	12"
Breather	A	6258	6258	6977	6977	6977
Oil Cup	B	3645	3645	3645	3645	3645
Hex Nut	C	598	598	664	424	424
Lock Washer	D	474	474	477	481	481
Castle Nut	E	6173	6173	6173	6173	6699
Cylinder Cover	F	6230	6616	6694	6698	6713
Cotter Pin	G	6252	6252	6252	6252	6842
Felt	H	459	459	459	459	459
Quadring	I	....	....	....	8700	10109
Piston	J	3617	3628	3635	6701	6715
Cylinder	L	3614	3625	3632	6705	6718
Drive Screw	M	3729	3729	3729	3729	3729
Lub Fitting	N	210	210	210	210	210
"O" Ring	O	3639	3640	3641	6708	11510
Bushing	P	698	698	698	698	668
Quadring	Q	9324	9324	9324	9324	8311
Base	S	6231	6617	6693	6709	6744
Tie Rod	T	3621	3621	6956	6706	6779
Female Piston Rod	U	3622	3622	6580	6736	6702
Flange Plate	V	6940	6946	6952	....	....
Side Base Bracket	W	6179	6628	6731	6711	6757
Pivot Bracket	X	6180	6615	6695	6710	6756
Felt Clamp	AA	3616	3627	3634	....	....
Cup Packing	BB	646	495	169	....	....
"O" Ring	CC	3642	3643	3644	....	....
Packing Clamp	DD	3615	3626	3633	....	....

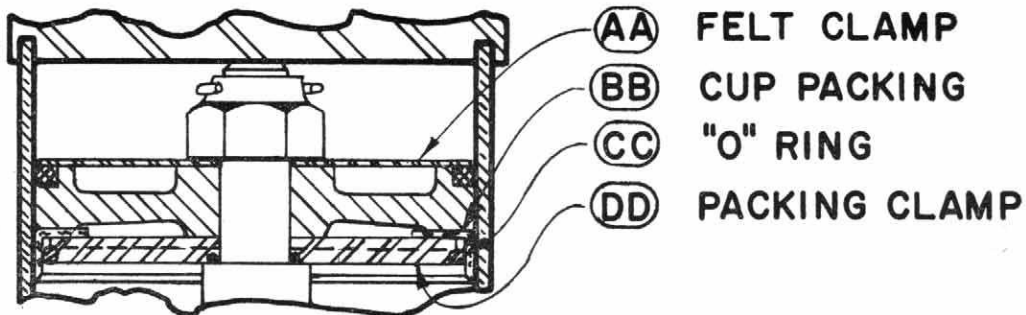


Fig. No. 85

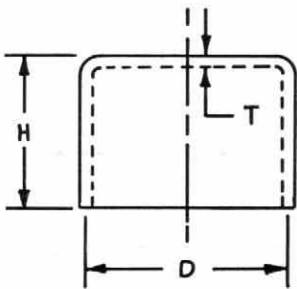
Use Loctite grade CV (blue) at assembly, where packing clamp shoulders on piston rod.)

TONNAGE AND RING HOLDING FORCE NECESSARY FOR DRAWING SHELLS*

A) TONNAGE FOR DRAWING SHELLS

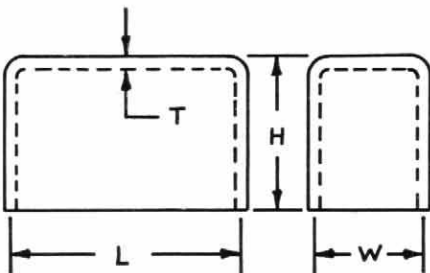
In general, the tonnage necessary to draw a shell of round or rectangular shape is a function of the area of metal in the wall (ie = mean perimeter and metal thickness). This is true because at any given time, the force necessary to deform the metal equals the area of metal being deformed x the yield strength of the material. (**In calculating these forces tensile strength is used**, since this will either draw the part, push out the bottom or tear the walls). This is generally true for parts having odd shapes, although there are other factors involved which complicate the operation.

1. ROUND SHELLS



$$\text{TONNAGE} = \frac{\pi D \times T \times \text{tensile str.}}{2000}$$

2. RECTANGULAR SHELLS



$$\text{TONNAGE} = \frac{2(L + W) \times T \times \text{tensile str.}}{2000}$$

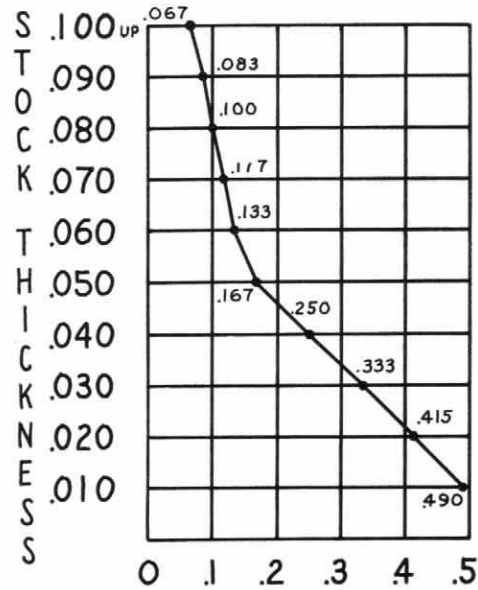
Mechanical punch presses are designed to deliver their maximum tonnage near the bottom of the stroke. Since drawing work actually starts before bottom, the full tonnage will not be available. **The above results, therefore, should be multiplied by "G" factor** (Chart I-P 71) when this type press is used.

*This information is general and should be treated as such. Specific forces must be determined for each job.

TONNAGE AND RING HOLDING FORCE NECESSARY FOR DRAWING SHELLS — (Continued)

H	"G"	H	"G"
1/2	1	10	3
1	1	12	3.25
1 1/2	1.5	14	3.5
2	1.5	16	3.75
3	1.75	18	4.
4	2	20	4.25
6	2.5	22	4.5
8	2.75	24	4.75

FACTOR "G" — CHART I



FACTOR "J" — CHART II

B) RING HOLDING PRESSURE OR FORCE

The primary function of the draw ring is to hold the blank while it is being formed to prevent wrinkles. Since the resistance to wrinkling becomes greater as the metal thickness increases, the necessary RHP decreases. Experience indicates that a close approximation to the RHP can be obtained by multiplying the tonnage required to draw the shell by "J" factor—Chart II. **(Note: Disregard "G" factor for this calculation).**

C) PRESS TONNAGE

Size of press necessary to draw shell in question is as follows:

$$\text{MINIMUM PRESS TONNAGE} = \text{SHELL TONNAGE PLUS CUSHION TONNAGE (RHP)}$$

D) EXAMPLE:

Figure the size of mechanical press required to draw the shell pictured.

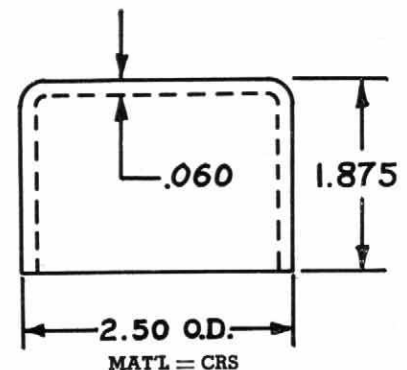
$$\text{DRAW TONNAGE} = \frac{\pi(2.50 - .06) \times .06 \times 55,000}{2000} = 12.7T \times 1.5(\text{"G"}) = 19.0T$$

$$\text{CUSHION TONNAGE} = 12.7 \times .133 = 1.7T$$

$$\text{MINIMUM MECHANICAL PRESS TONNAGE} = 20.7T$$

NOTE: If a hydraulic press were to be used then

$$\text{MINIMUM PRESS TONNAGE} = 12.7 + 1.7 = 14.4T$$



Tonnage Capacities on Presses

Capacity of Crankshafts at the Bottom of the Stroke					
Crank Shaft Dia. Inches	TONS		Crank Shaft Dia. Inches	TONS	
	Single Crank Press	Double Crank Press		Single Crank Press	Double Crank Press
1 ³ / ₈	6	.....	6 ¹ / ₂	150	150
1 ¹ / ₂	7.5	.....	7	180	180
1 ⁵ / ₈	9	.....	7 ¹ / ₂	215	215
1 ³ / ₄	10.5	.....	8	255	255
1 ⁷ / ₈	12	.....	9	345	345
2	14	.....	10	440	450
2 ¹ / ₈	16	.....	11	545	650
2 ¹ / ₄	18	.....	12	665	900
2 ¹ / ₂	22	22	13	790	1150
2 ³ / ₄	26.5	26.5	14	920	1400
3	31.5	31.5	15	1060	1700
3 ¹ / ₄	37	37	16	.....	2000
3 ¹ / ₂	43	43	16 ¹ / ₂	1300	.....
4	56	56	17	.....	2300
4 ¹ / ₂	71	71	18	1560	2700
5	88	88	20	1950	.....
5 ¹ / ₂	106	106	22	2380	.....
6	126	126	24	2860	.....

The tonnage figures do not apply to end wheel type of presses with overhanging crank-pin.

It is customary to equip the average punch press with a pneumatic die cushion that will develop a drawing holding pressure equal to one-sixth the total press tonnage. However, present practice indicates a trend toward cushion ratios approaching one fifth of the press tonnage. On the average inclinable press, it is usually desirable to use an "H" or "MC" type installation because the press bed opening is not large enough to permit installation of a "C" or "D" cushion that will develop enough ring holding pressure. While the "CC" type installation will develop enough tonnage, it requires a pit in many cases and frequently uses available standing room in front of the press.

To figure the draw-ring holding pressure produced by a pneumatic die cushion, multiply the area of the piston or pistons in square inches by the air pressure applied. For example, if an 8" diameter cushion is used which has a piston area of 50 square inches and the working pressure supplied from the shop air line is 50 pounds per square inch, the draw-ring holding pressure developed would be 50 times 50 or 2,500 pounds pressure. In other words, the maximum draw-ring holding pressure developed by an 8" diameter cushion on a 50-pound maximum shop air line would be 1¹/₄ tons.

Die Cushion Lubricant for All Pneumatic Die Cushions



As a result of careful tests and experimental research work, this die cushion lubricant is especially compounded for all pneumatic die cushions. It assures maximum packing life and also provides proper lubricant between the cylinder and piston surfaces of the die cushion units and all other working parts.

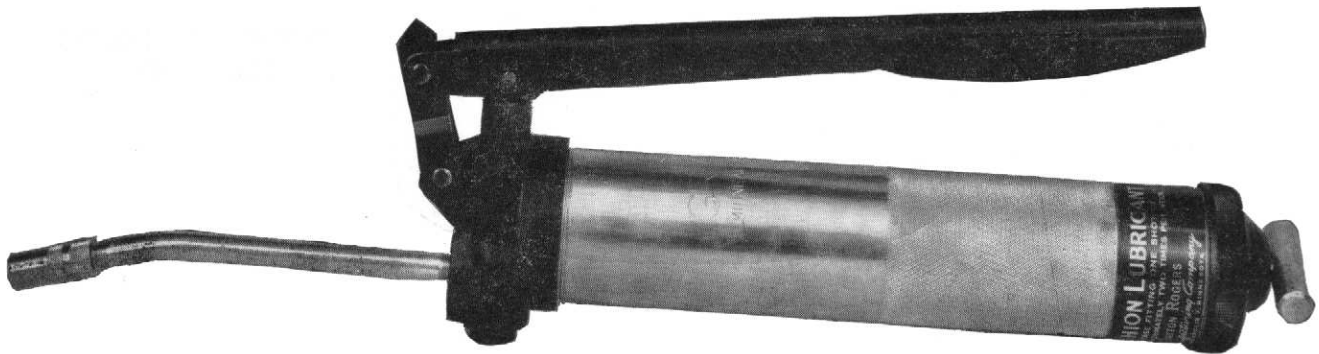
It is available from stock in 35-pound pails from your local jobber or direct from the Dayton Rogers Mfg. Co.

*All prices F.O.B. Minneapolis, Minn., and subject to change without notice.

Special Die Cushion Grease Gun

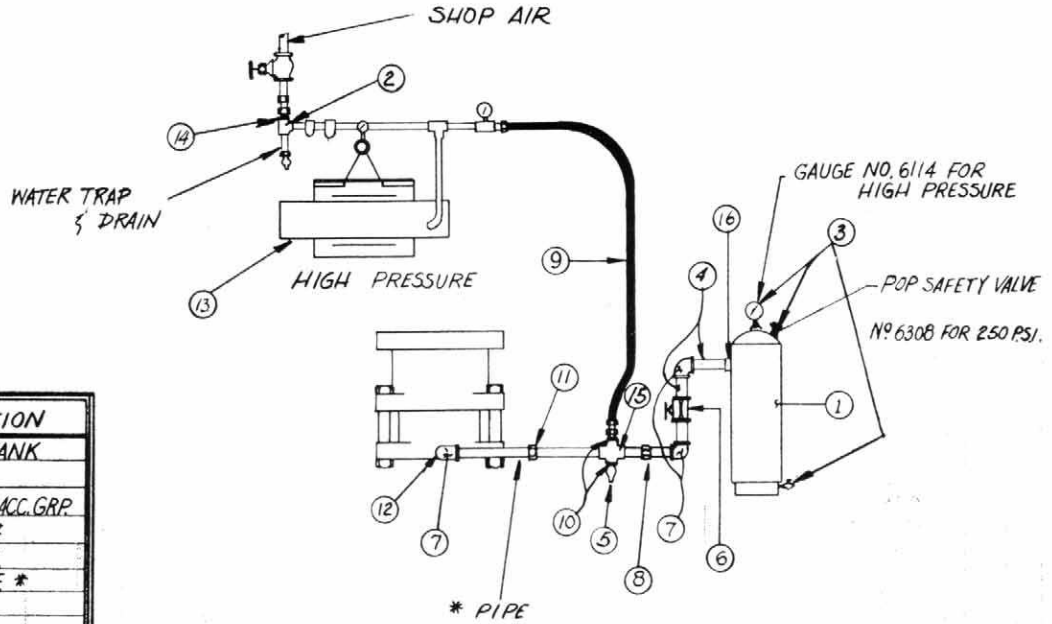
This grease gun is permanently tagged for die cushion lubricant, and should be reserved for die cushion lubricant exclusively.

This grease gun will develop a working pressure of 8,000 pounds per square inch, thus assuring the correct distribution of lubrication to all working parts of the die cushion equipment. Since it is specifically tagged, it can be retained by the maintenance department, tool-crib or stockroom for exclusive die cushion purposes only.



It is most important that the correct die cushion lubricant be used
at all times on your die cushion equipment.

200 PSI PIPING LAYOUTS



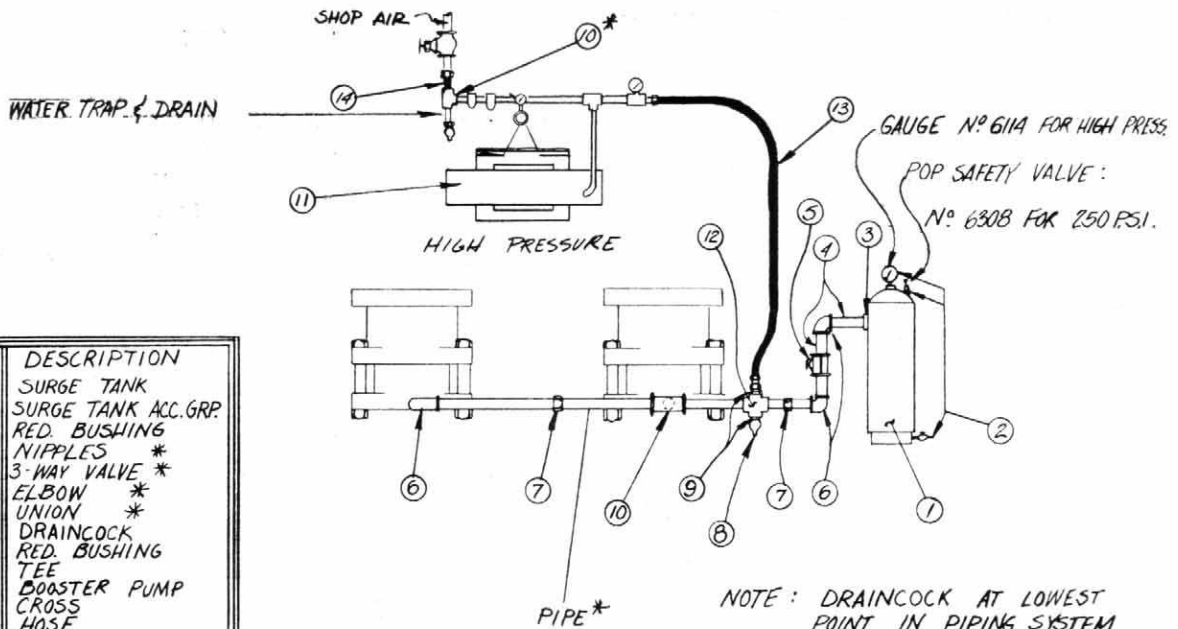
Nº	DESCRIPTION
1	SURGE TANK
2	TEE *
3	SURGE TANK ACC.GRP.
4	NIPPLES *
5	DRAINCOCK
6	3-WAY VALVE *
7	ELBOW *
8	UNION *
9	HOSE
10	RED. BUSHING
11	UNION
12	RED. BUSH.
13	BOOSTER PUMP
14	HOSE
15	CROSS
16	RED. BUSHING

NOTE : DRAIN COCK AT
LOWEST POINT IN SYSTEM

* : FURNISHED BY CUSTOMER

SINGLE CUSHION

Fig. No. 88



Nº	DESCRIPTION
1	SURGE TANK
2	SURGE TANK ACC.GRP.
3	RED. BUSHING
4	NIPPLES *
5	3-WAY VALVE *
6	ELBOW *
7	UNION *
8	DRAINCOCK
9	RED. BUSHING
10	TEE
11	BOOSTER PUMP
12	CROSS
13	HOSE
14	HOSE

NOTE : DRAINCOCK AT LOWEST
POINT IN PIPING SYSTEM

* FURNISHED BY CUSTOMER

MULTIPLE CUSHION

Fig. No. 89