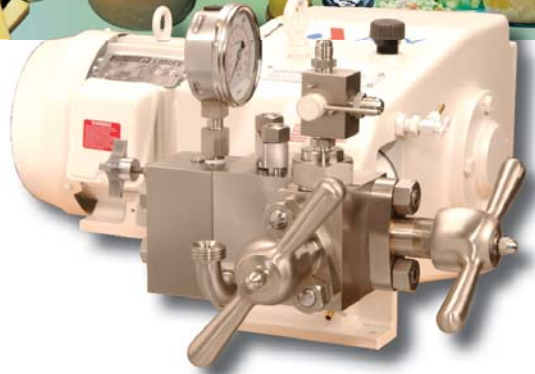




Instruction Manual

Gaulin Laboratory Homogenizers

Models 15MR & 31MR



Read and understand this manual prior to operating or servicing this product.



TABLE OF CONTENTS

SECTION I	GENERAL INFORMATION	
	Introduction	1-1
	Damage in Transit	1-1
	Machine Dimensions, Weights and Specifications	1-1
	Utility Requirements	1-1
	If Start-Up is Delayed	1-2
	How to Order Parts	1-2
	How to Return Materials	1-2
SECTION II	INSTALLATION	
	Uncrating Instructions	2-1
	Location	2-1
	Removal from Skids	2-1
	Machine Leveling	2-1
	Water Supply	2-1
	Lubricating Oil	2-1
	Electrical	2-2
	Product Piping	2-2
SECTION III	DISSASSEMBLY, CLEANING, REASSEMBLY	
	Introduction	3-1
	Disassembly	3-5
	Cleaning	3-14
	Reassembly	3-14
	Dampener Gauge Assembly	3-15
	Use of Pump Valve Seat Removal Tool	3-15
SECTION IV	HOMOGENIZING VALVE ASSEMBLIES	
	Introduction	4-1
	Single-Stage Homogenizing Valve Assembly	4-2
	Two-Stage Homogenizing Valve Assembly	4-4
SECTION V	PRODUCT CHARACTERISTICS AND CONDITIONS	
	Introduction	5-1
	Hot or Cold	5-1
	Flammability	5-1
	Viscosity	5-1
	Solids or Precipitates	5-1
	Compatibility	5-2
	Abrasiveness	5-2
	Cell Disruption	5-2
SECTION VI	OPERATION	
	Start-Up and Operation	6-1
SECTION VII	RECOMMENDED REGULAR MAINTENANCE SCHEDULE	7-1

Table of Contents (continued)

SECTION VIII	GENERAL MAINTENANCE	
	Plunger Packing	8-1
	Pump Valve Seats	8-2
	Pump Valves	8-2
	Product Pressure Gauge	8-2
	Homogenizer Valve Assembly Parts	8-2
	Water Spray Assembly Adjustment	8-3
	Dampener Gauge Assembly	8-4
	Motor Lubrication	8-5
	Motor Warranty	8-5
SECTION IX	TROUBLE-SHOOTING GUIDE	9-1
SECTION X	OPTIONAL EQUIPMENT	
	Pressure Feeder	10-1
	Sterile Processing	10-2
	Cored Cylinder	10-2
Addendum	APV Gaulin Warranty	

LIST OF ILLUSTRATIONS

3-A	Two-Stage Homogenizer Photograph	3-1
3-B	Outline Drawing — Side View, Internal	3-3
3-C	Outline Drawing — Side View, External	3-3
3-D	Outline Drawing — Front View	3-3
3-E	Tools	3-4
3-1 to 3-18	Disassembly/Reassembly Instructions	3-5-3-14
3-F & 3-G	Use of Pump Valve Seat Removal Tool	3-15
4-A	Single-Stage Homogenizing Valve Assembly	4-1
4-B	Two-Stage Homogenizing Valve Assembly	4-1
4-C	Exploded View, Single-Stage	4-3
4-D	Exploded View, Two-Stage	4-5
8-A	Plunger/Packing Measurements	8-1
8-B	Dampener Gauge Assembly	8-5
8-C	Wear Pattern Sheet	8-6
10-A	Pressure Feeder Assembly	10-1

SECTION I GENERAL INFORMATION

Introduction

In developing this manual we have tried to keep it basic. The drive end, cylinder assemblies, valve assemblies and accessories described in the following pages are standard on the 15MR and 31MR.

If any further information is needed regarding the installation or maintenance of your machine, please contact your local APV Gaulin distributor, regional manager or the APV Gaulin Service Department.

Complete familiarity with your APV Gaulin equipment and its working parts will give you an increased awareness of its superior construction and wide range of capabilities. Study this manual carefully. It will help you to install the machine correctly, operate it safely and efficiently and maintain it properly.

Damage in Transit

Occasionally, a machine suffers damage during transit or unloading procedures. Inspect the exterior of the crate and, if found damaged, open the crate and inspect the machine carefully. If any damage is evident, it is your responsibility to file a claim with the carrier immediately and notify APV Gaulin, Inc.

Machine Weights, Dimensions and Specifications

Height: 24" (610 cm.)
Width: 36" (914 cm.)
Depth: 38" (965 cm.)
Weight: 350 lbs. (158 kg.)

	15MR	31MR
Capacity	15 gph (57 lph)	31 gph (117 lph)
Minimum Sample	One pint (500 ml.)	One quart (1000 ml.)
Operating Pressure		
Continuous	8,000 psi (550 bar)	3,000 psi (200 bar)
Intermittent (20 min. maximum)	10,000 psi (690 bar)	3,500 psi (240 bar)

Utility Requirements

1. Electrical — It is suggested that a licensed electrician be employed to properly wire in accordance with local codes and the diagram on the electrical conduit box on the motor.
2. See text in "Installation" section of this manual for details. The plunger spray system will require water connections..

If Start-Up is Delayed More Than One Month

Often, APV Gaulin homogenizers and high pressure pumps are not installed and placed in operation immediately after their arrival at the job-site. As soon as possible after its arrival at the plant, the unit should be uncrated, per instructions. After the spare parts and tools have been checked against the packing list, we suggest that they be stored in a suitable place to prevent loss or damage.

There are many removable parts in the cylinder assembly, as shown on the applicable drawings. If the start-up is to be delayed for more than one month, it is suggested that all cylinder metal parts and gaskets be removed and stored with above. All parts should be wrapped separately to prevent damage.

Parts in the power-end have been cleaned and lightly coated with a lubricant, prior to shipping, as a temporary protection against rust. On delayed start-up it is essential that these parts be thoroughly coated with a corrosion-proof grease or sprayed with a vapor-phase inhibitor.

The complete machine should then be covered with a plastic sheet or other suitable cover to protect it against weather, dirt, dampness, etc.

When the machine is installed on location, the APV Gaulin distributor in your area should be contacted and advised of the approximate date of initial start-up, so that assistance and correct assembling instructions can be offered.

How to Order Parts

Contact your APV Gaulin distributor. To help them to help you, have the following information available:

1. your machine MODEL and SERIAL NUMBER;
2. the part number, as indicated on your "Recommended Spare Parts" list or from illustrations in this manual by the CORRECT NAME and use item numbers.

Your specific machine identification data is located at the front of the manual supplied with the machine. Model and serial number will be found on the packing list and at the front of the manual. The serial number will also be found on a nameplate tag attached to the top of the base casting, forward of the oil fill and breather cap.

How to Return Materials

Materials or equipment cannot be returned without first obtaining APV Gaulin's written permission. Materials and/or equipment accepted for credit are subject to a service charge, plus all transportation charges. Materials or equipment built to order are not subject to return for credit under any circumstances. Any materials or equipment authorized for return must be securely packed to reach APV Gaulin, Inc., without damage.

SECTION II INSTALLATION

Uncrating Instructions

Instructions for uncrating your machine are attached to the shipping crate. The top and sides of the crate can be removed, prior to moving the machine to the installation area on the skids provided. Uncrating at the installation area is preferable. Reasonable care must be exercised to avoid damage to the unit during the removal of the crate. An Operation and Service Manual with your packing list and identification sheet will be found with the spare parts.

Location

The 15MR and 31MR do not have to be bolted to a supporting area. The unit can be installed on the floor, a stationary or portable bench, utilizing casters, or a table. The 15MR and 31MR weigh 350 lbs. (158 kg.), and consideration should be given to this when mounting on a dolly, bench or table. If the unit is installed with the handwheel height from the floor between 30" (76 cm.) and 36" (91 cm.), this will simplify operation.

Removal from Skids

The machine must be lifted off the bolts which pass through the shipping skids.

Machine Leveling

The unit should be approximately level for best operation. Use the machined surfaces of the cylinder block for leveling side-to-side and front-to-back.

Water Supply

This machine requires water for cooling the plunger packing. The plunger cooling inlet valve is supplied with a compression-type fitting to accommodate a 1/4" o.d. plastic tubing (customer supplied). The plunger well drain line is equipped with a barbed fitting to accommodate a 5/16" i.d. plastic hose.

Lubricating Oil

A combination oil-splash-and-mist lubrication system is used on the gears, sleeve bearings, connecting rods and crossheads.

Add the oil to the crankcase, until the oil level is in the center of the oil level gauge. Oil capacity is 9 quarts (8.5 liters). **DO NOT USE OIL OTHER THAN THAT SPECIFIED FOR YOUR PARTICULAR MACHINE.** Correct crankcase oil may be purchased from APV Gaulin, and the initial quantity is furnished with the machine, when purchased. The oil required is a premium-grade, paraffinic-base, A.G.M.A. No. 5, industrial oil with a defoaming agent and oxidation and corrosion inhibitors. It has a viscosity of 1000/1165 SUS at 100°F. and 90 to 105 SUS at 210°F. with a viscosity index of 95, pour point +10°F. and flash point of 450°F. min. This oil is available in five-gallon cans (part no. 811100).

Electrical

MOTOR WARRANTY: The motors provided with the machine have been selected to meet load requirements and are covered by a warranty issued by the motor manufacturer. The motors should be lubricated in accordance with the manufacturer's recommendations. Although unlikely, should difficulty arise, contact the local representative of the motor manufacturer, our representative or the Factory. If any modification or repair not authorized by the manufacturer is undertaken, the warranty is automatically voided.

The Laboratory Homogenizer is a single-plunger, positive-displacement unit; therefore, the motor is under load only 50% of the time. This results in an abnormal amperage 50% of the time. Most starting boxes will require heaters having a rating 50% higher than ampere rating on the motor. This condition will not cause motor failure or provide an unsafe condition.

The main drive motor has been sized to meet the requirements of your machine's capacity, operating pressure and your electrical specifications. It must be wired to meet local codes.

Normal rotation of the main motor should be in accordance with the directional arrow mounted near the motor flange. Also, rotation can be viewed at the fan end of the motor.

Product Piping

If used, it is essential that adequate product piping to the machine be provided. The suction (inlet) piping size must never be smaller than the suction (inlet) connection and should be as short as possible.

The inlet system for your machine must provide a constant flow of liquid to the cylinder at a pressure sufficiently above the product's vapor pressure to prevent flashing as the liquid enters the pumping chambers. If air bubbles are entrained in the liquid or if flashing occurs in the cylinder, volumetric efficiency will drop and homogenizing efficiency will suffer.

WARNING: Your machine is a positive-displacement pump. A three-way valve, designated for a continuous, open position, is supplied for altering the flow direction of processed material at the discharge directly from the unit to recirculation or sample taking. **NEVER USE A FLOW CONTROL VALVE.** The flow of processed material must never be stopped while the machine is in operation.

SECTION III DISASSEMBLY, CLEANING, REASSEMBLY

Introduction

APV Gaulin laboratory homogenizers employ a single-plunger, positive-displacement pump equipped with a versatile homogenizing valve assembly, specifically designed for laboratory or pilot-plant use.

The following photographs will provide the operator with step-by-step instructions for dismantling and reassembling the laboratory homogenizer for cleaning and normal maintenance. Since the photographs are based on a single-stage unit, the photograph in Figure 3-A of a two-stage unit is provided for reference.

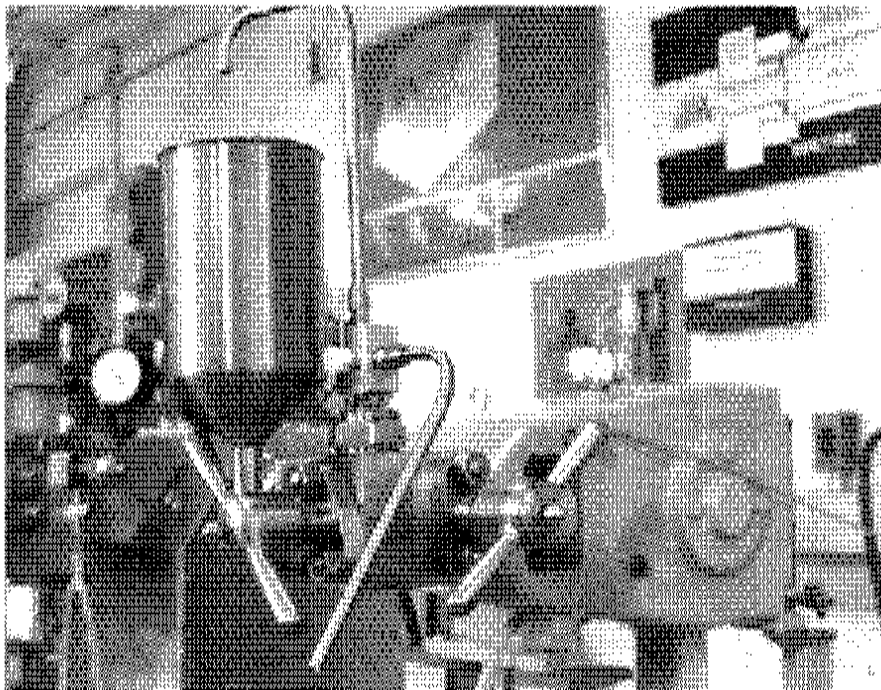


Figure 3-A: Two-stage Homogenizer

PARTS LIST

ITEM	QTY.	DESCRIPTION	ITEM	QTY.	DESCRIPTION
1	1	Cylinder Block	44	1	Three-Way Valve Handle
2	2	Upper Cap Stud Nut	45	1	Three-Way Valve Nut
3	1	Upper Cap	46	1	Inlet Connection Nipple
4	1	Upper Cap Plug	47	1	Inlet Connection Nut
5	1	Upper Cap Plug Gasket	48	1	Tank Elbow
6	2	Upper Cap Stud	49	1	Tank Nut
7	1	Pump Valve Seat	50	1	Tank
8	1	Pump Ball Valve	51	1	Discharge Tube
9	1	Pump Ball Valve Spring	52	1	Discharge Tube Nut
10	1	Plunger	53	1	Bypass Tube
11	1	Plunger Ring	54	1	Bypass Tube Nut
12	4	Plunger Packing	55	1	Valve Body (First-Stage)
13	2	Packing Adjusting Ring	56	1	Valve Rod Washer (First-Stage)
14	1	Packing Adjusting Screw	57	1	Homogenizing Valve Spring (First-Stage)
15	1	Crosshead Cover Spring	58	1	Valve Rod (First-Stage)
16	4	Crosshead Cover Packing Spring	59	1	Valve Body Stud Nut (First-Stage)
17	1	Crosshead Cover Packing	60	1	Valve Rod Packing (First-Stage)
18	1	Crosshead Cover	61	1	Homogenizing Valve (First-Stage)
19	2	Crosshead Cover O-Ring	62	1	Impact Ring (First-Stage)
20	1	Cylinder Set Screw	63	1	Homogenizing Valve Seat (First-Stage)
21	1	Well Drain	64	1	Homogenizing Valve Seat Gasket (First-Stage)
22	1	Oil Filler/Breather Cap	65	1	Handwheel (Second-Stage)
23	1	Draincock	66	1	Valve Rod Washer (Second-Stage)
24	1	Oil Sight Glass	67	1	Homogenizing Valve Spring (Second-Stage)
25	1	Water Drip Tube Assembly	68	1	Valve Rod (Second-Stage)
26	1	Handwheel (First-Stage)	69	2	Valve Body Stud Nuts (Second-Stage)
27	1	Handwheel Support (First-Stage)	70	1	Valve Rod Packing (Second-Stage)
28	2	Valve Body Stud (First-Stage)	71	1	Homogenizing Valve (Second-Stage)
29	2	Valve Body Stud Nut (First-Stage)	72	1	Valve Seat (Second-Stage)
30	1	Dampener Body	73	1	Valve Seat Gasket (Second-Stage)
31	4	Dampener Body Stud Nuts	74	1	Valve Body Stud (Second-Stage)
32	1	Dampener Knob	75	1	Valve Body (Second-Stage)
33	1	Dampener Gauge	76	1	Handwheel Support (Second-Stage)
34	1	Dampener Check Valve Ball	77	1	Motor
35	1	Dampener Check Valve Spring			
36	1	Dampener Needle Valve			
37	1	Dampener O-Ring			
38	1	Dampener Back-Up Ring			
39	1	Dampener Support Ring			
40	3	Dampener Pipe Plug			
41	1	Dampener Plunger			
42	1	Gasket — Dampener to Cylinder			
43	1	Three-Way Valve Bypass			

Figure 3-C

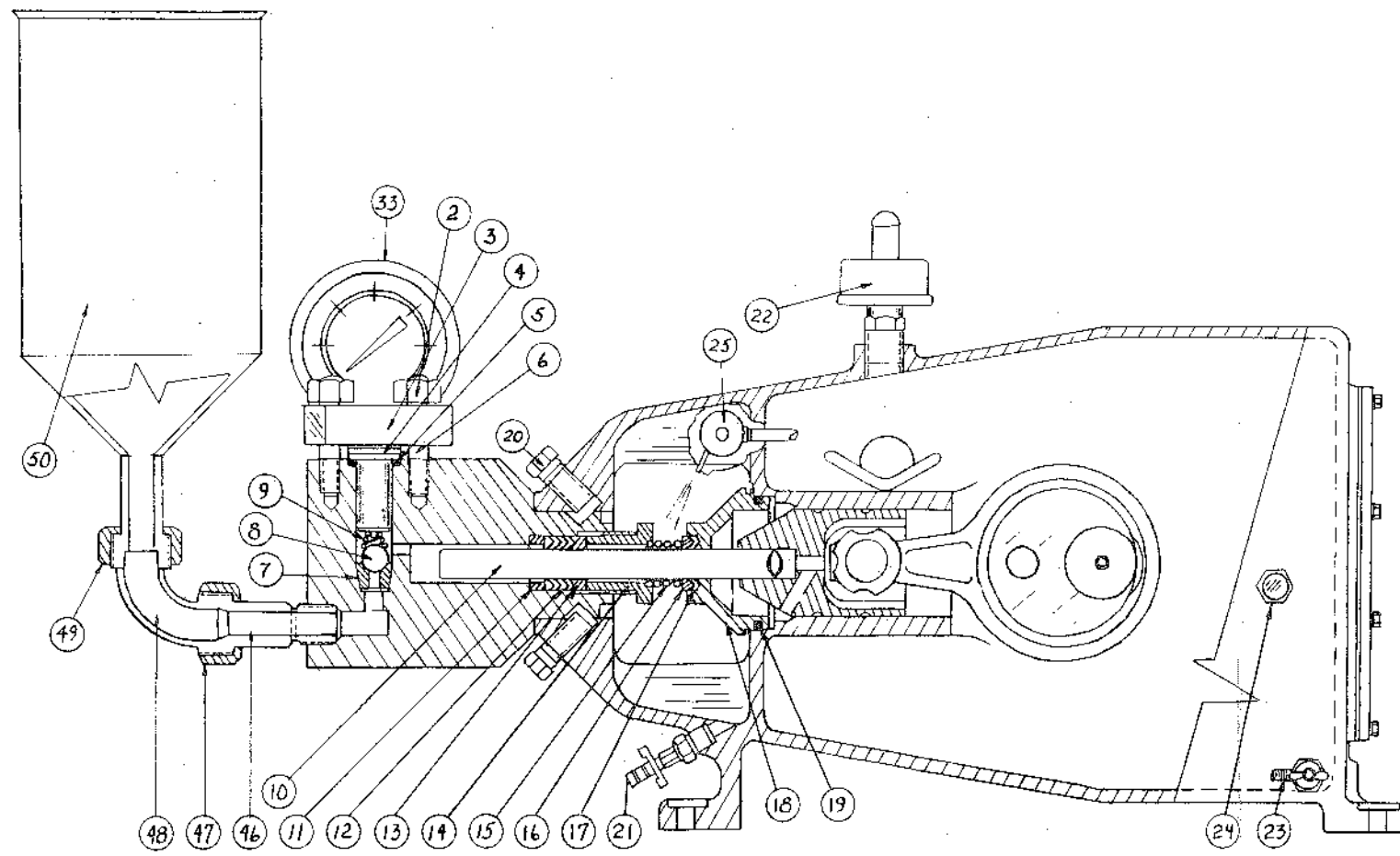
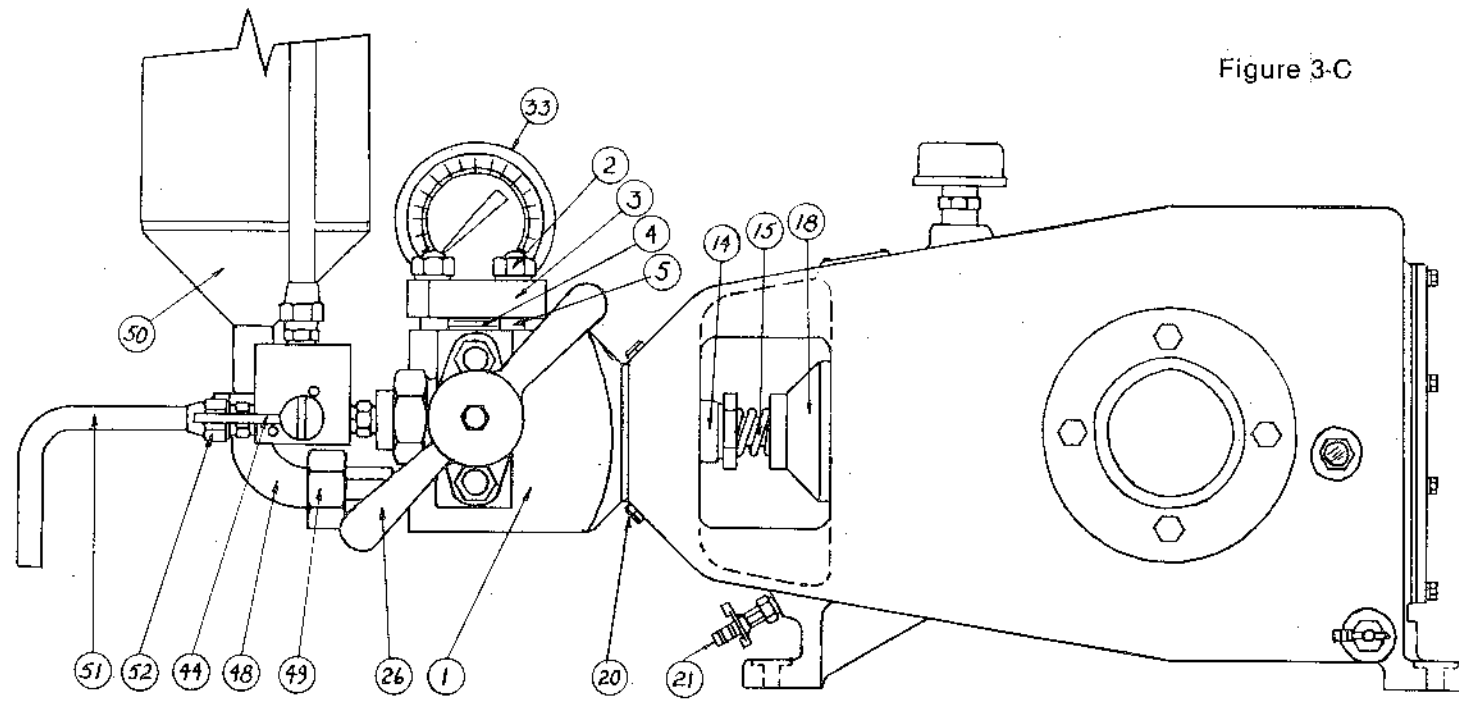


Figure 3-B

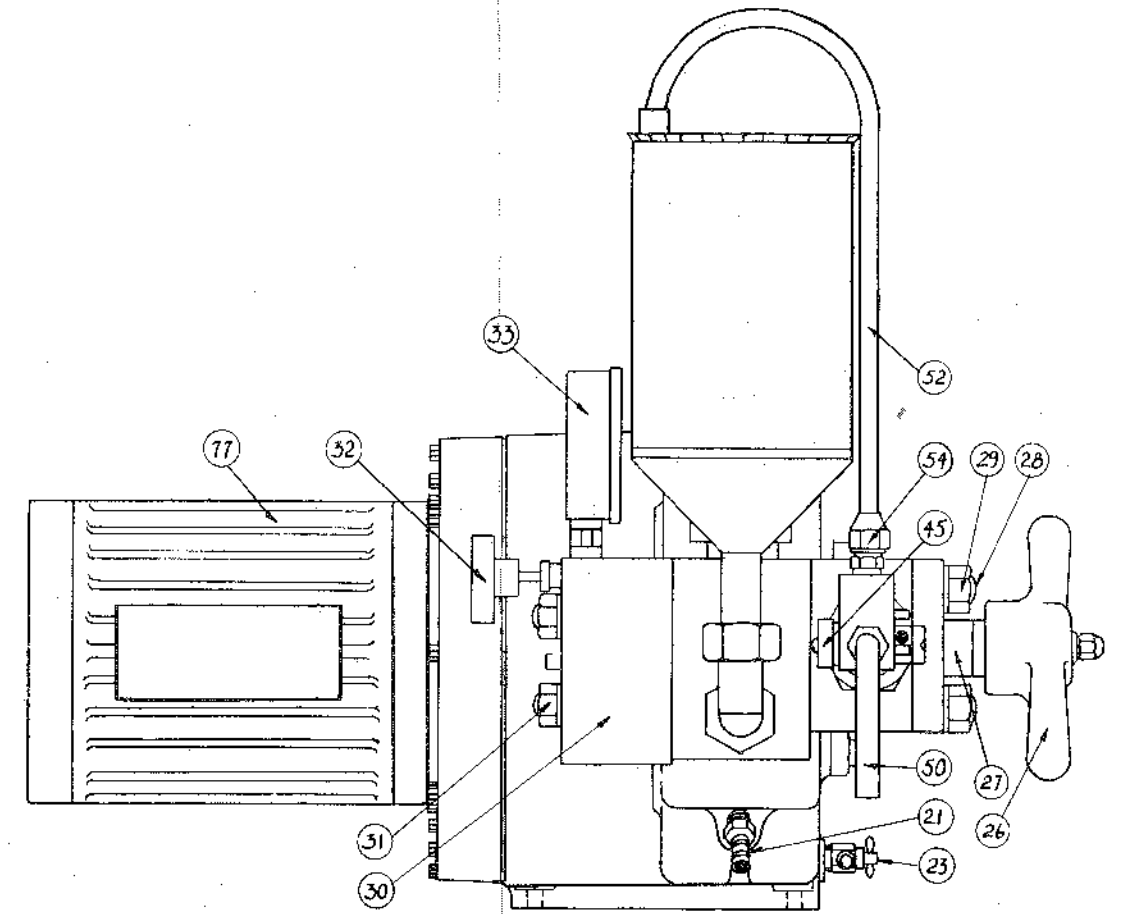
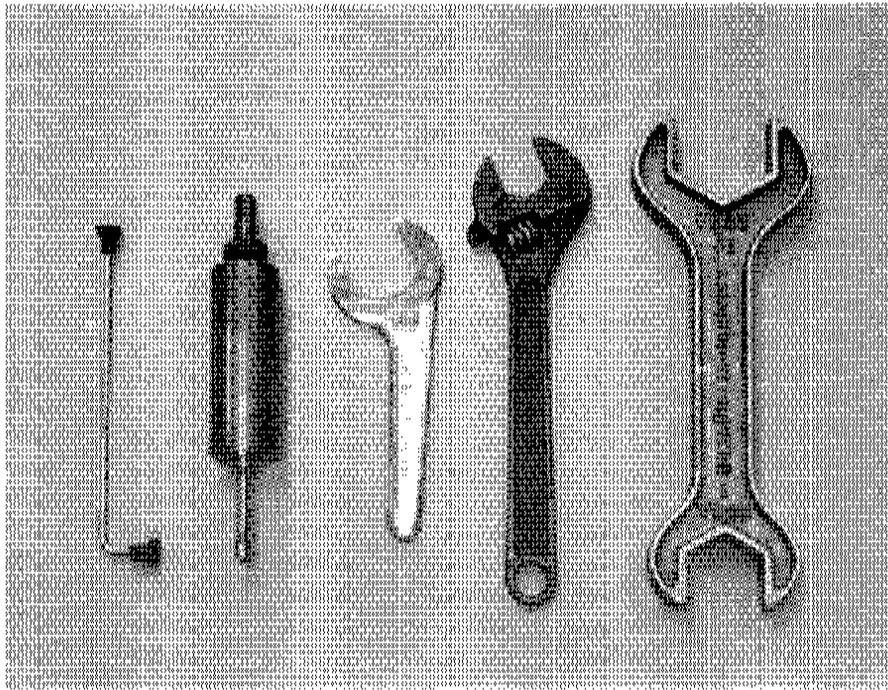


Figure 3-D

TOOL LIST

A	Ball Valve Removal Tool	Pt. No. 373407
B	Tapered Pump Valve Seat Removal Tool (See instructions for use on page 4-1)	373310
C	Packing Adjusting Screw Wrench	812905
D	General Wrench	812936
E	Sanitary Pipe Wrench (1 x 1½")	812403
F	Allen Wrench (3/16") (not shown — used for plugs on dampener assembly)	812341



(Left to Right: A, B, C, D, E)

Figure 3-E

DISASSEMBLY

Figure 3-1:

Remove discharge tube (51)
and bypass tube (53).

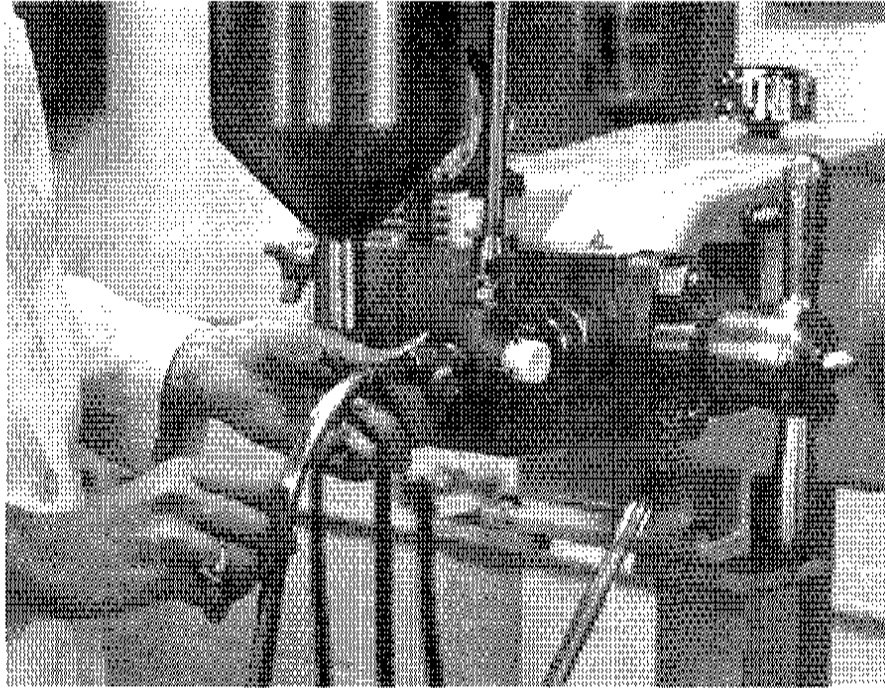


Figure 3-2

Remove feeder tank (50),
using wrench (E) to
loosen nut.

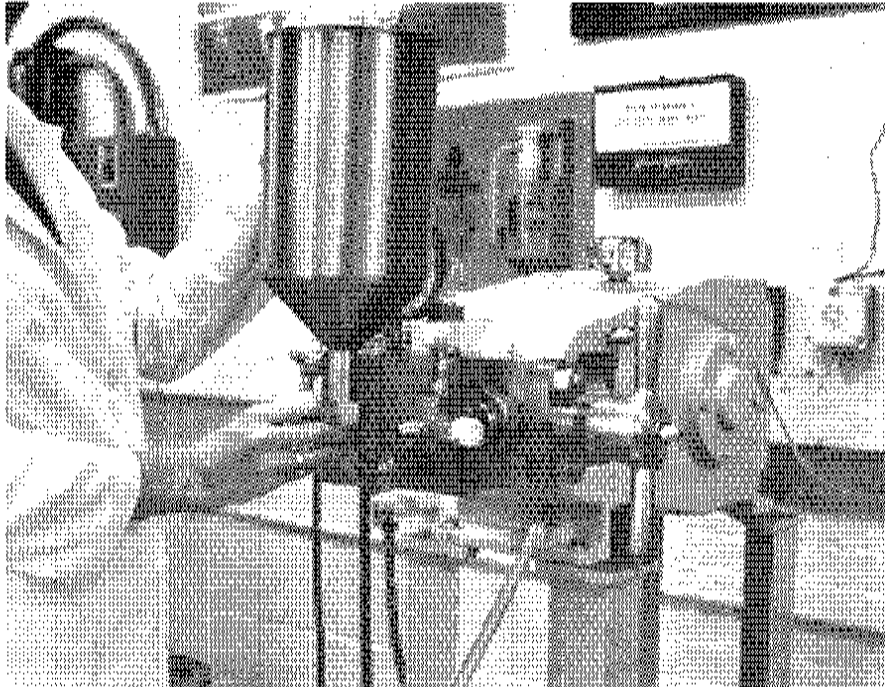


Figure 3-3:

Remove three-way valve bypass assembly (43, 44, 45).

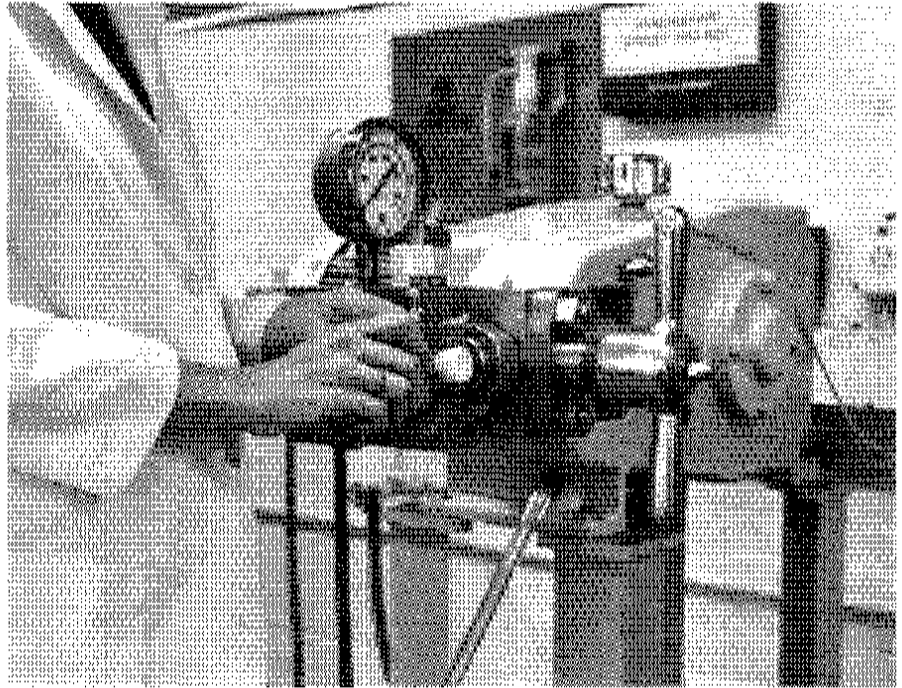


Figure 3-4:

Remove tank nut (49) and tank elbow (48). Use wrench (E) to loosen nut.

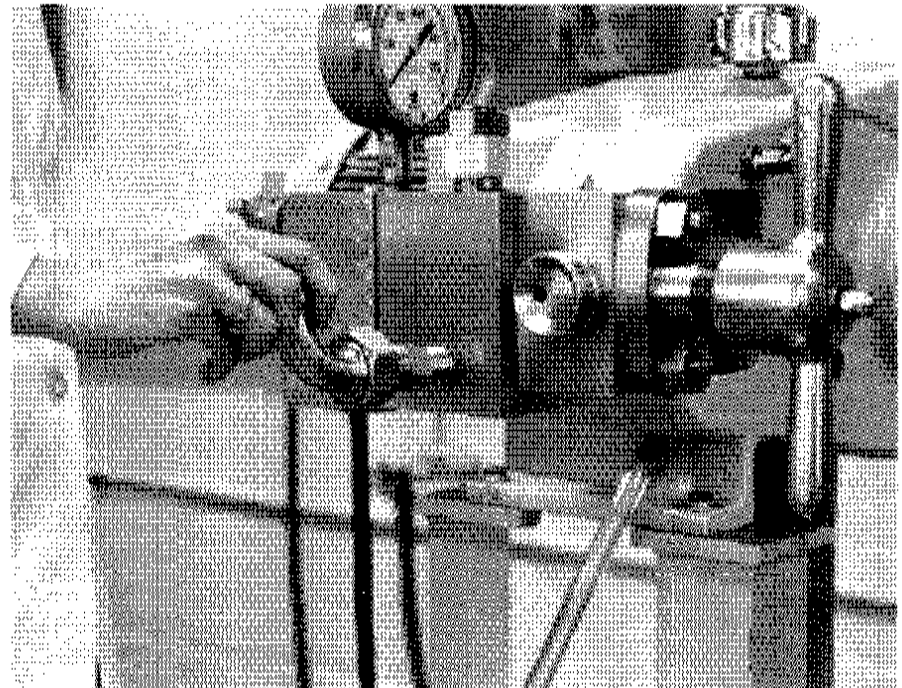


Figure 3-5:

Remove the two valve body stud nuts (29) with wrench (D). [On two-stage unit remove second-stage valve body stud nuts (69) first.]

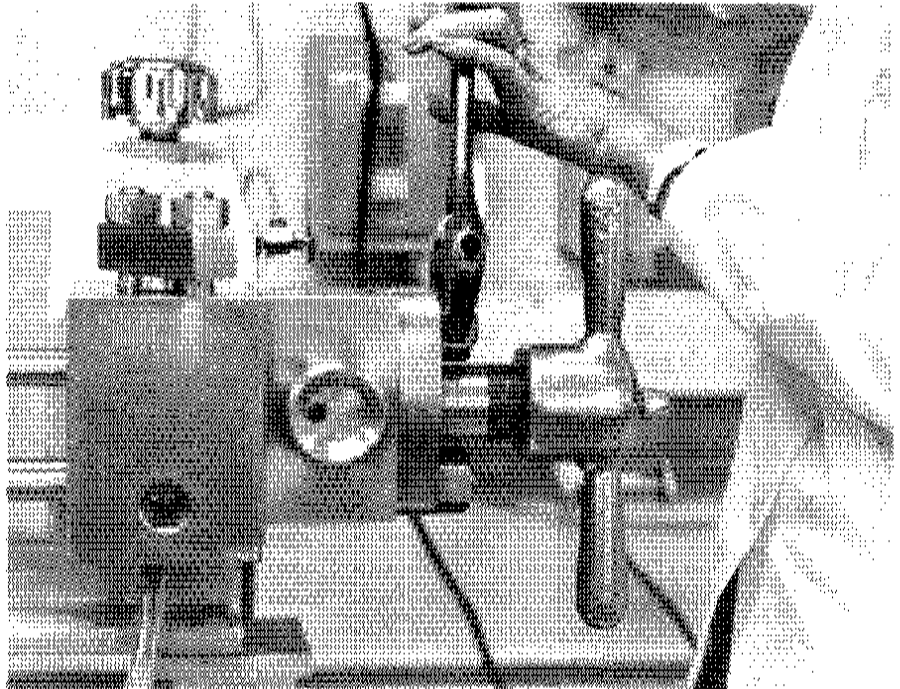


Figure 3-6:

Remove handwheel (26) and handwheel support (27). See Figure 3-8 for two-stage assembly.)

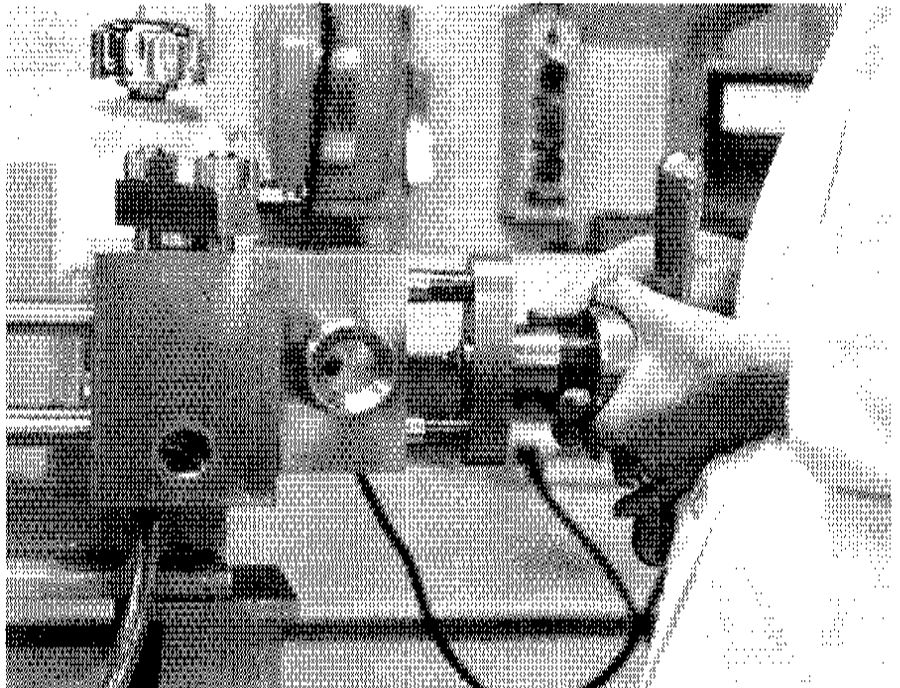


Figure 3-7

Remove valve body (55). (See Figure 3-8 for two-stage.)

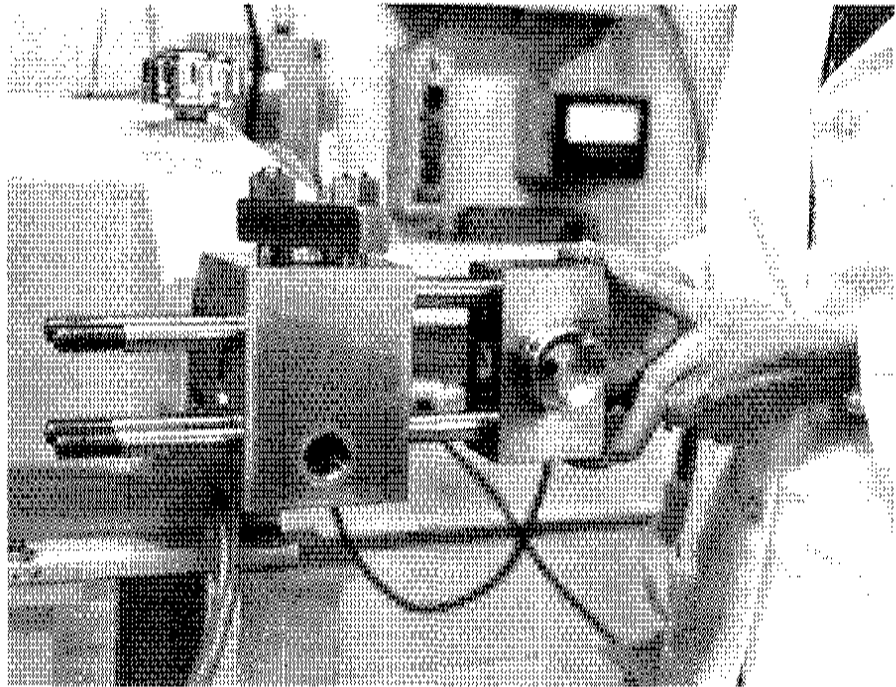


Figure 3-8

Removal of second-stage handwheel (65), handwheel support (76) and valve body (75).

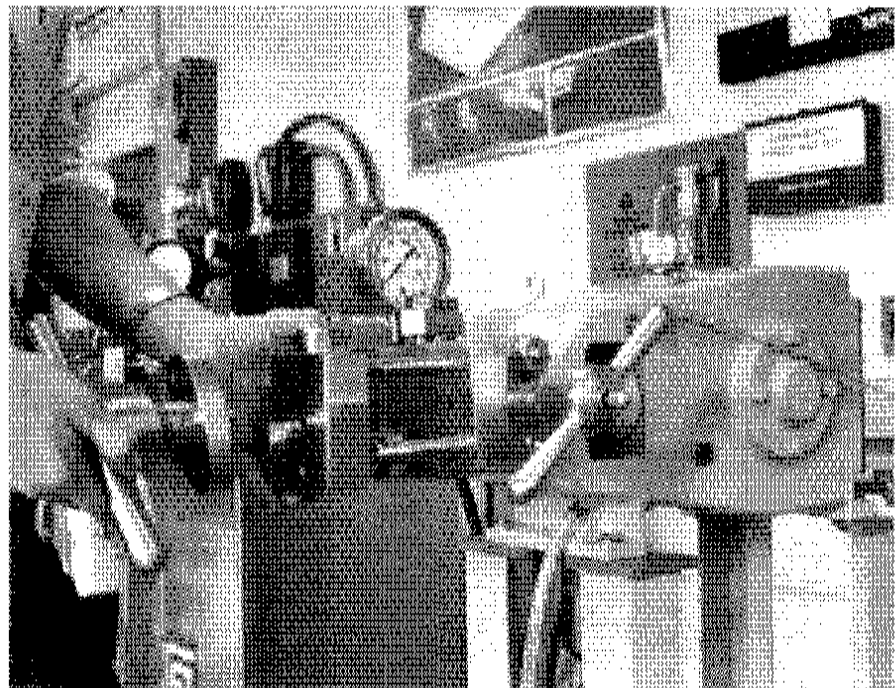


Figure 3-9:

Remove dampener body stud nuts (31) with wrench (D) or closed-end wrench, if available.

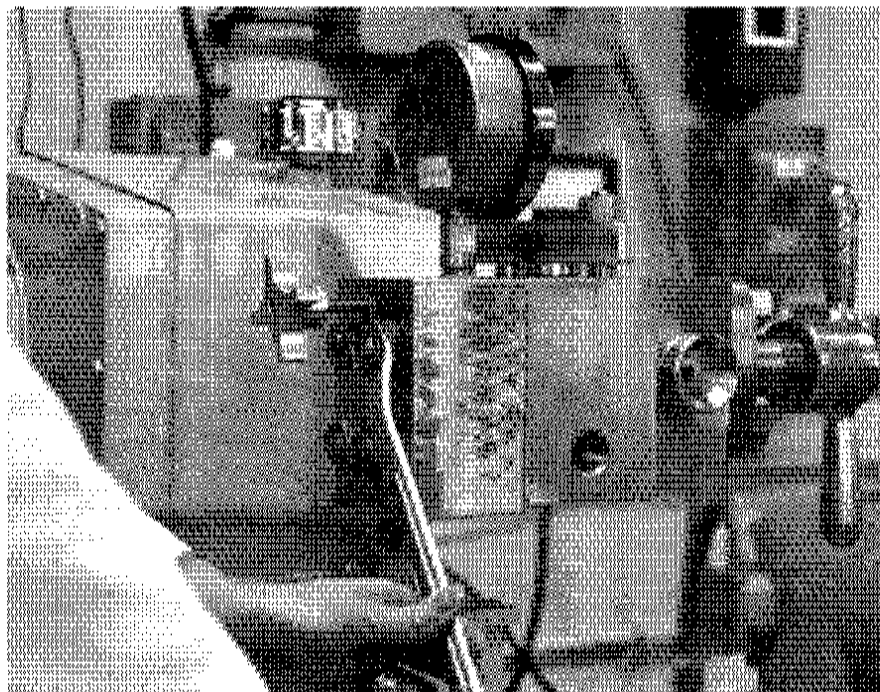


Figure 3-10:

Remove dampener body (30) as an assembly.

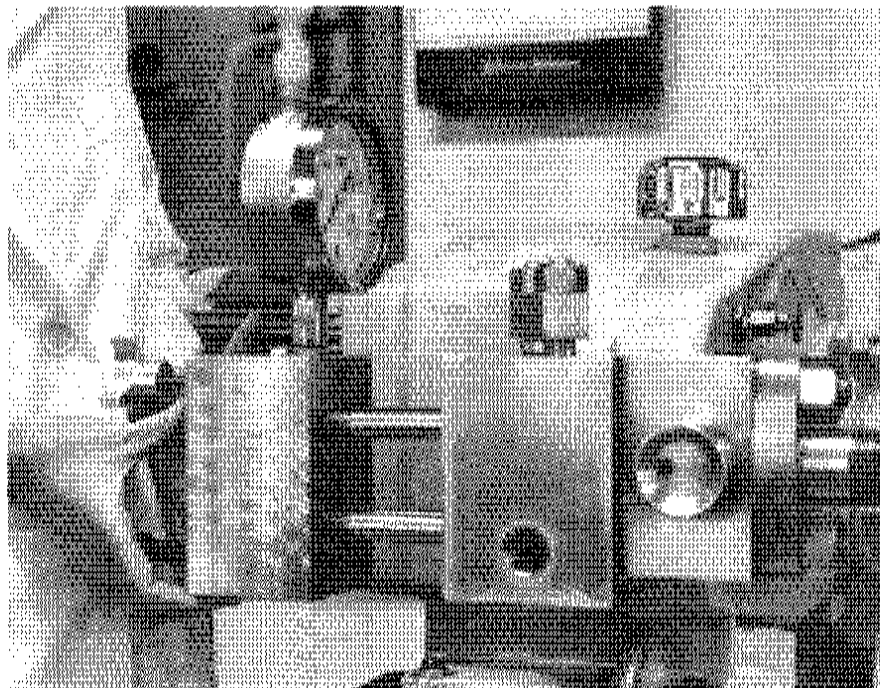


Figure 3-11:

Remove upper cap stud nuts (2) and upper cap (3) with wrench (D) or closed-end wrench, if available.

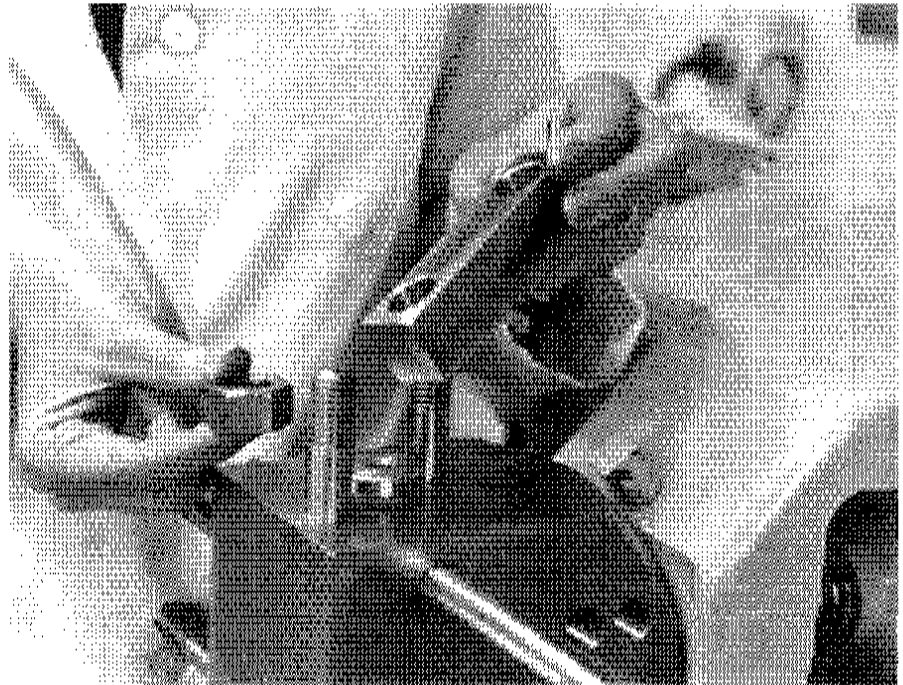


Figure 3-12:

Remove upper cap plug (4), spring (9) and gasket (5).

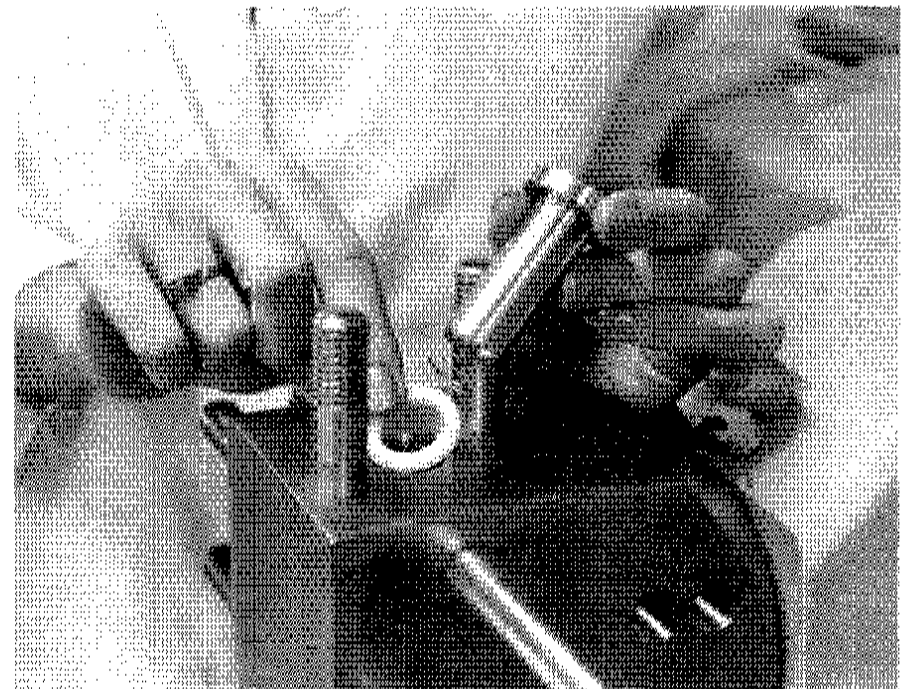


Figure 3-13:

Remove ball valve (8) with ball valve removal tool (A).

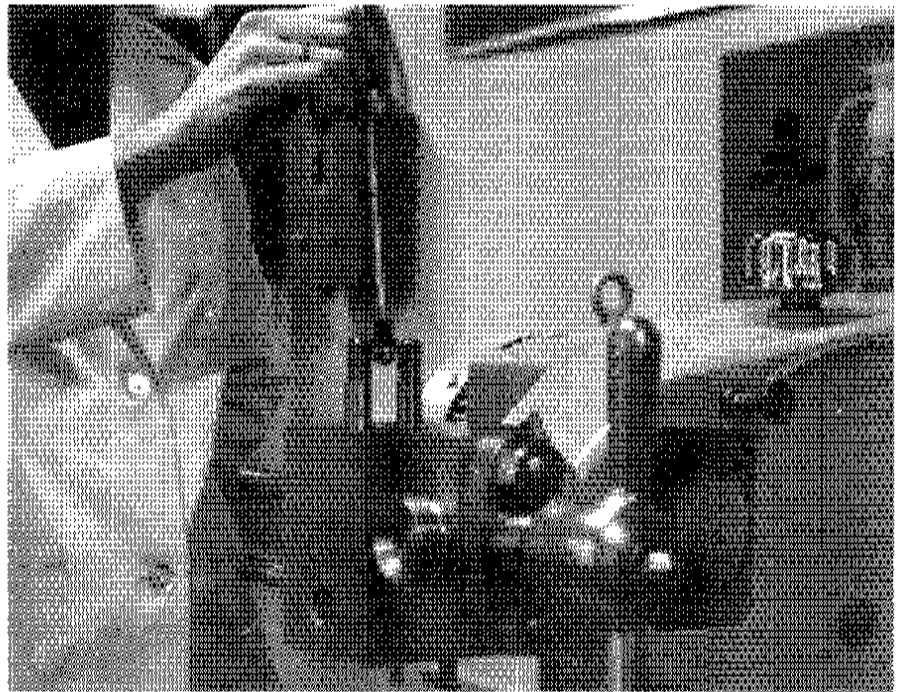


Figure 3-14:

Loosen packing adjusting screw (14) slightly and then top and bottom cylinder set screws (20) using wrench (D).

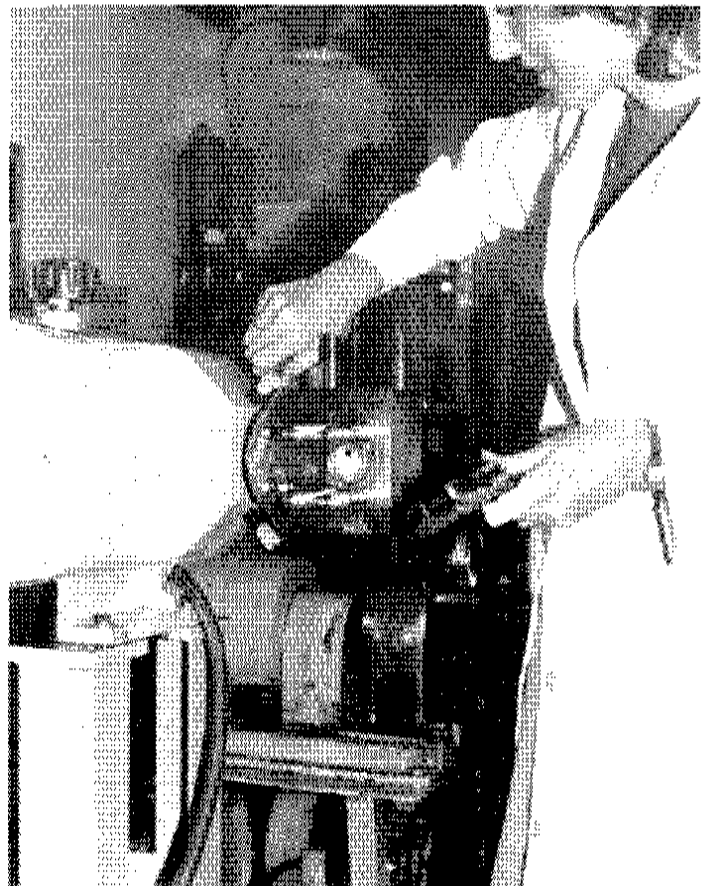
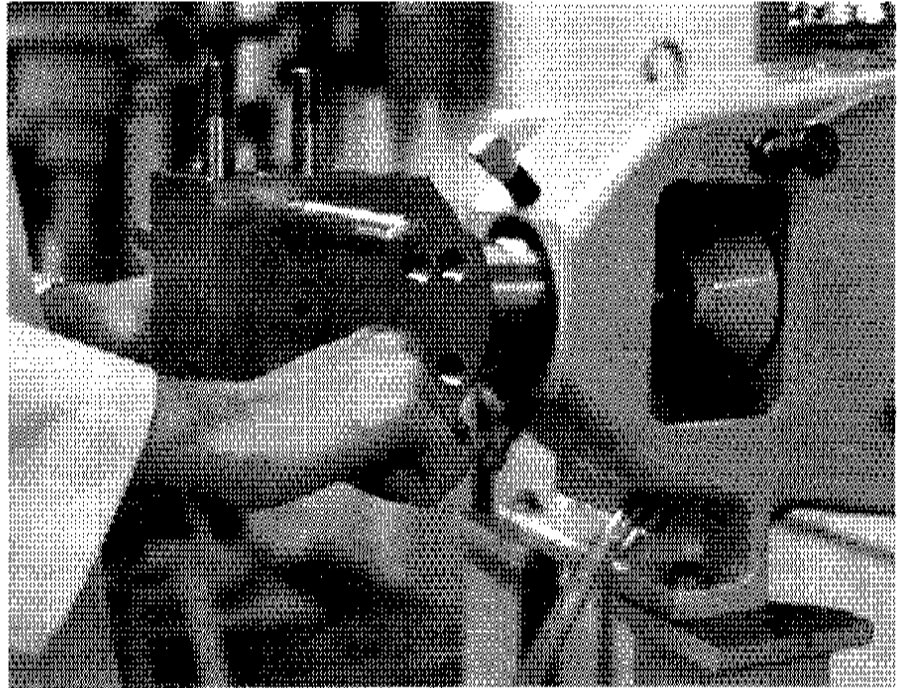


Figure 3-15

Side cylinder block off
cylinder studs by
LIFTING AND PULLING.



**CAUTION: CYLINDER BLOCK
WEIGHS APPROXIMATELY
30 LBS. DO NOT ALLOW
BLOCK TO REST ON
PLUNGER. IRREPARABLE
DAMAGE MAY RESULT TO
PLUNGER.**

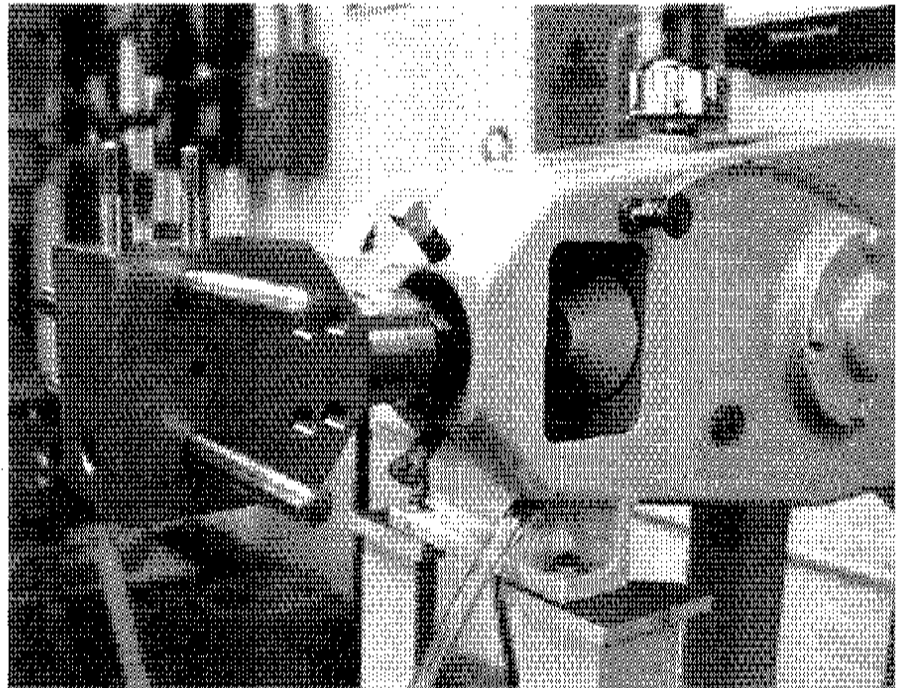


Figure 3-16:

Remove crosshead cover spring (15).

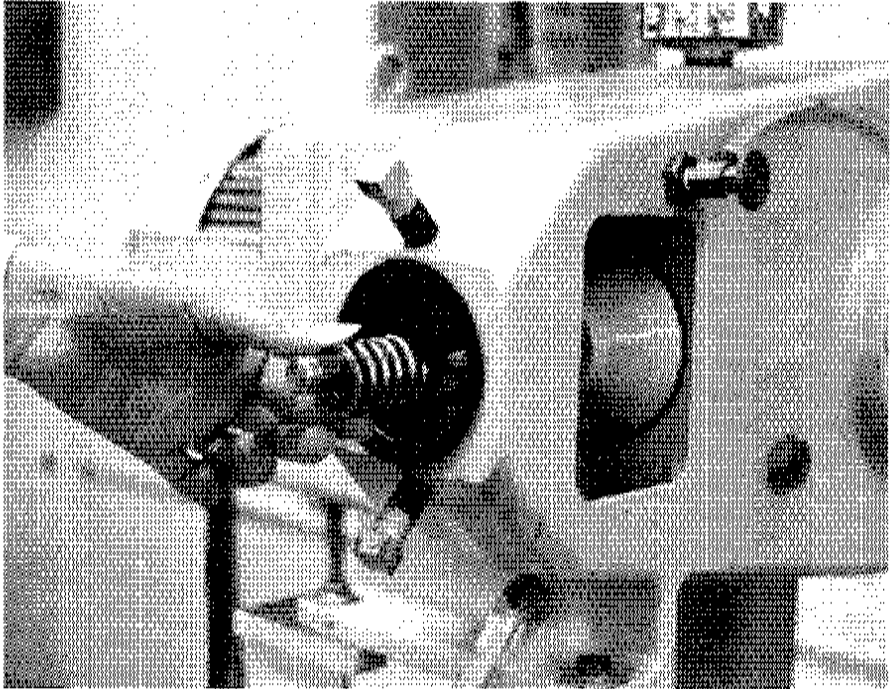
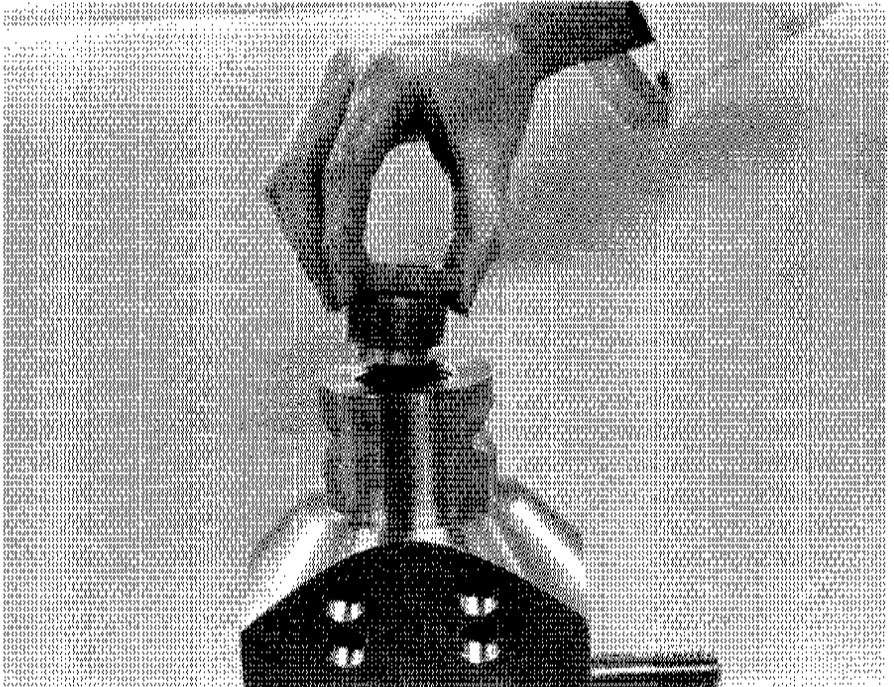


Figure 3-17:

Remove packing adjusting screw (14) from cylinder block with wrench (C)



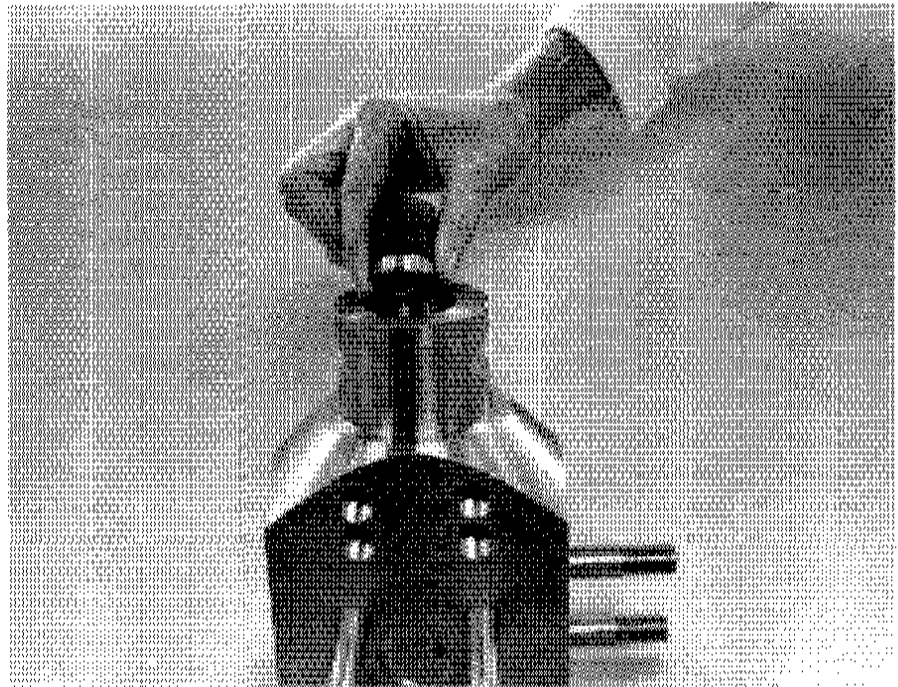


Figure 3-18:

By hand, remove packing adjusting ring (13), 4 pieces of packing (12) and plunger ring (11).

See instructions on following page for use of tool to remove pump valve seats.

Cleaning

Clean all parts thoroughly. Use brushes. Do not use metal brushes, sponges or other abrasive aids on parts.

Be careful to prevent metal parts from striking each other or other metal objects.

Lubricate all external threads with an acceptable lubricant before reassembling. Repeat this procedure on disassembly for at least one month to allow the threaded parts to become work-hardened.

Reassembly

Reassemble homogenizing valve assembly per instructions in Section IV. Then, using Figures 8-A, 3-18 and 3-17 for reference:

1. Insert plunger ring (11) into cylinder block (1), flat side facing inward.
2. Insert 4 pieces of packing (12) concave side facing inward.
3. Insert packing adjusting ring (13) CONCAVE side facing inward.
4. Install packing adjusting screw (14) hand-tight.

To reassemble remainder of unit, follow steps for disassembly in reverse. Make sure all nuts are tightened.

Dampener Gauge Assembly

For normal maintenance the dampener gauge assembly is not disassembled. If this becomes necessary, refer to Maintenance Section.

Use of Pump Valve Seat Removal Tool (B)

See Figures 3-F and 3-G.

1. Remove small, round nut from tip of removal tool. Insert in inlet bore under valve seat.
2. Insert valve seat removal tool stem into top bore and screw into the small round nut.
3. Attach tool sleeve. Insert nut on threaded end of stem.
4. Tighten all parts and apply pressure with wrench (D) to top nut to remove valve seat.
5. To reassemble use instructions in Maintenance, Section VII.

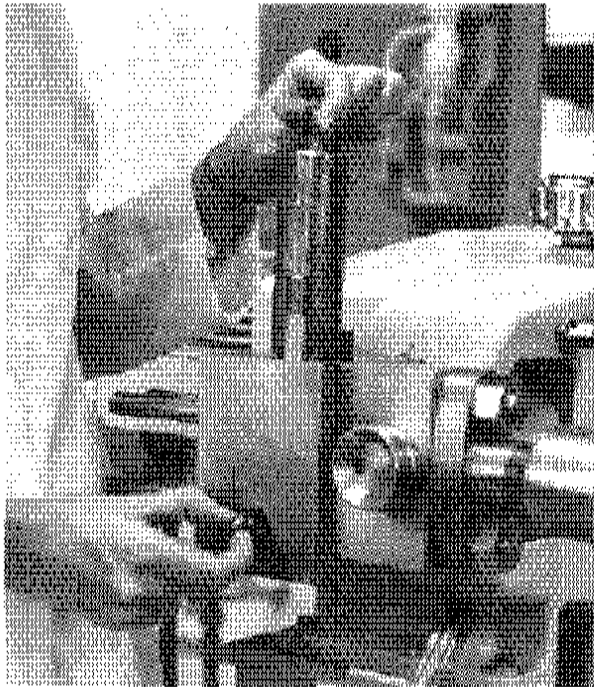


Figure 3-F



Figure 3-G

SECTION IV HOMOGENIZING VALVE ASSEMBLIES

Introduction

Laboratory homogenizers can be supplied with a single-stage homogenizing valve assembly, recommended for dispersions, or a two-stage valve assembly, recommended for emulsions. Rexalloy is standard for homogenizing valves, seats and impact rings and is suitable for emulsions and some dispersions. For abrasive applications tungsten carbide material is also available.

They can also be equipped with the "CD" valve (patent pending) for high efficiency cell disruption. These parts are constructed of ceramic for long wear life.

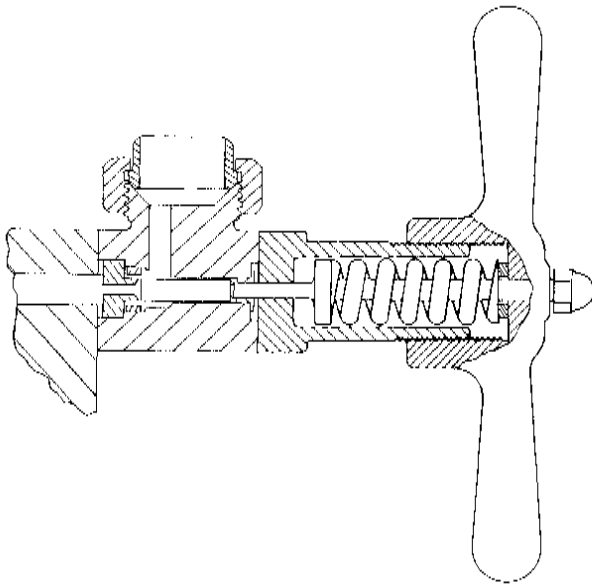
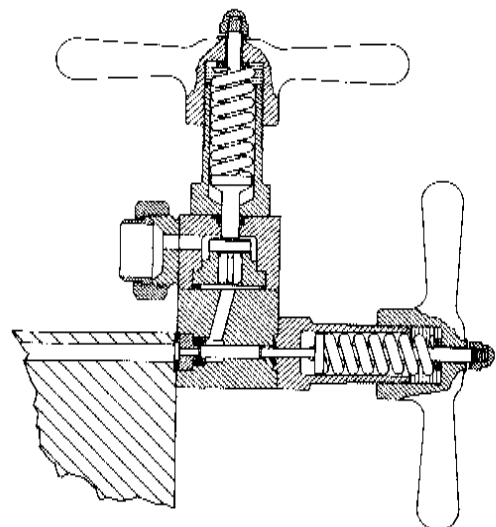


Figure 4-A
Single-Stage Homogenizing
Valve Assembly

Figure 4-B
Two-Stage Homogenizing
Valve Assembly



SECTION IV-A SINGLE-STAGE HOMOGENIZING VALVE ASSEMBLY

Refer to Figure 4-C.

Disassembly

1. Remove single-stage valve body stud nuts (29), single-stage handwheel (26) and handwheel support assembly (27).
2. Remove single-stage valve body (55) assembly, being careful not to drop valve components.
3. Remove valve seat gasket (64), valve seat (63), impact ring (62) and valve (61).

Cleaning

Clean all parts thoroughly. Use brushes. Do not use metal brushes, sponges or other abrasive aids on parts. Be careful to prevent metal parts from striking each other or other metal objects.

Lubricate all external threads with an acceptable lubricant before reassembling. Repeat this procedure on disassembly for at least one month to allow the threaded parts to become work-hardened.

Reassembly

1. Lubricate valve (61) with a food-grade lubricant and insert in valve body (55), making sure that the valve moves freely.
2. Install impact ring (62), valve seat (63) and valve seat gasket (64).
3. Slide valve body assembly over studs (28).
4. Reassemble handwheel (26) and handwheel support assembly (27) on studs.
5. Replace stud nuts (29) and tighten evenly and securely.

SINGLE-STAGE HOMOGENIZING VALVE ASSEMBLY

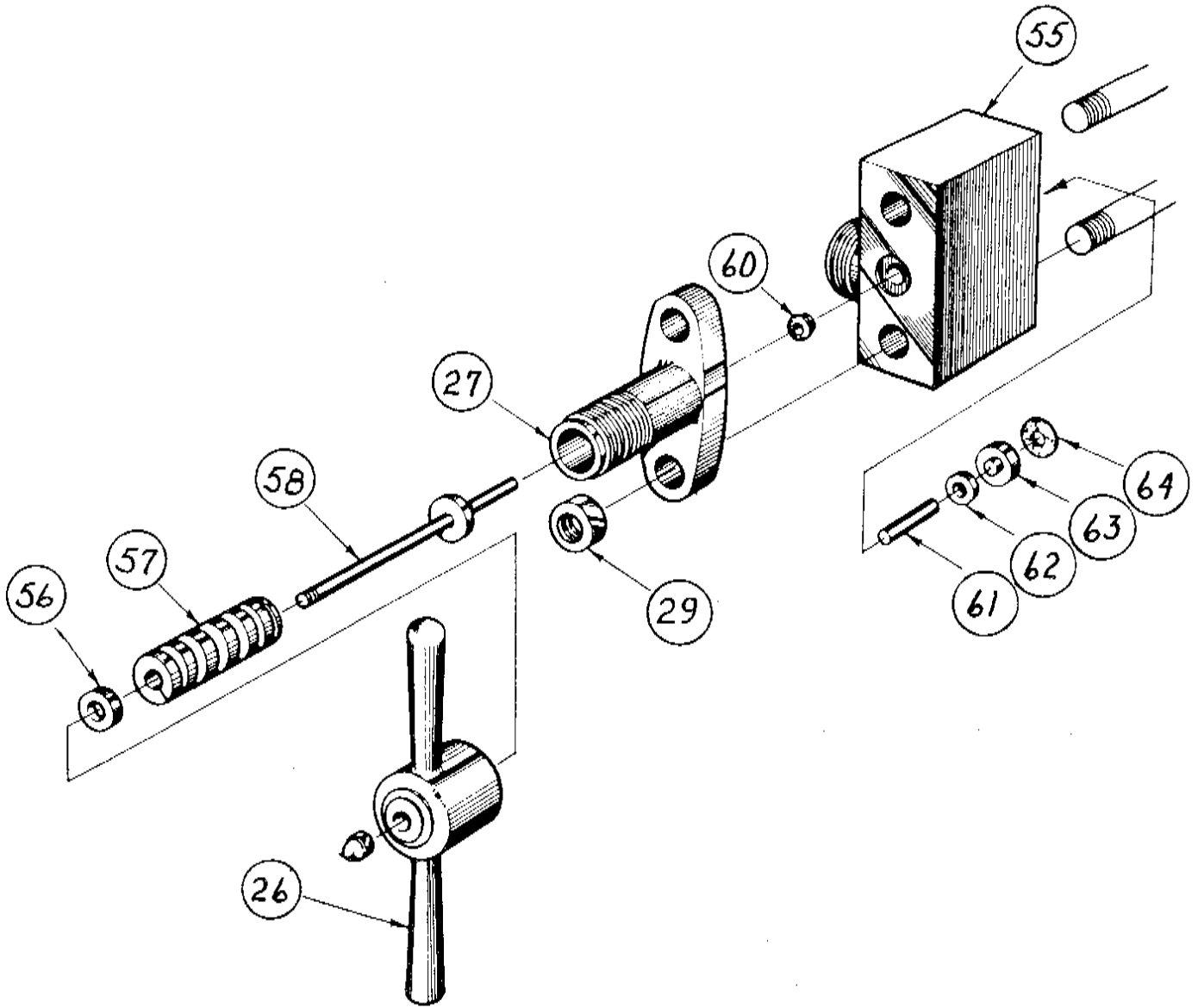


Figure 4-C

SECTION IV-B TWO-STAGE HOMOGENIZING VALVE

Refer to Figure 4-D.

Valve Disassembly

1. Remove second-stage valve body stud nuts (69), second-stage handwheel (65) and handwheel support assembly (76).
2. Remove second-stage valve body (75) being careful not to drop the valve and seat.
3. Remove valve (71), seat (72) and gasket (73) from second-stage body (75.)
4. Remove first-stage valve body stud nuts (29), first-stage handwheel (26) and handwheel support (27).
5. Remove first-stage valve body (55) assembly being careful not to drop valve components.
6. Remove valve seat gasket (64), valve seat (63), impact ring (62) and valve (61).

Cleaning

Clean all parts thoroughly. Use brushes. Do not use metal brushes, sponges or other abrasive aids on parts. Be careful to prevent metal parts from striking each other or other metal objects.

Lubricate all external threads with an acceptable lubricant before reassembling. Repeat this procedure on disassembly for at least one month to allow the threaded parts to become work-hardened.

Valve Reassembly

1. Lubricate valve (61) with an acceptable lubricant and insert in valve body (55), making sure that the valve moves freely.
2. Install impact ring (62), valve seat (63) and valve seat gasket (64).
3. Slide valve body assembly over studs (20).
4. Reassemble handwheel (26) and handwheel support (27) assembly on studs.
5. Replace stud nuts (29) and tighten evenly and securely.
6. Assemble second-stage valve (71) and valve seat (72) into valve body (75).

NOTE: To guard against possible valve stem breakage, be certain that valve (71) remains inserted into valve seat (72) after assembly has been placed into position in valve body.

7. Assemble valve seat gasket (73) into second-stage valve body (75).
8. Assemble second-stage valve body (75) to first-stage valve assembly on studs (74).
9. Assemble handwheel support (76) and handwheel (65) as a unit onto valve body studs (74).
10. Replace stud nuts (69) and tighten securely.

TWO-STAGE HOMOGENIZING VALVE ASSEMBLY

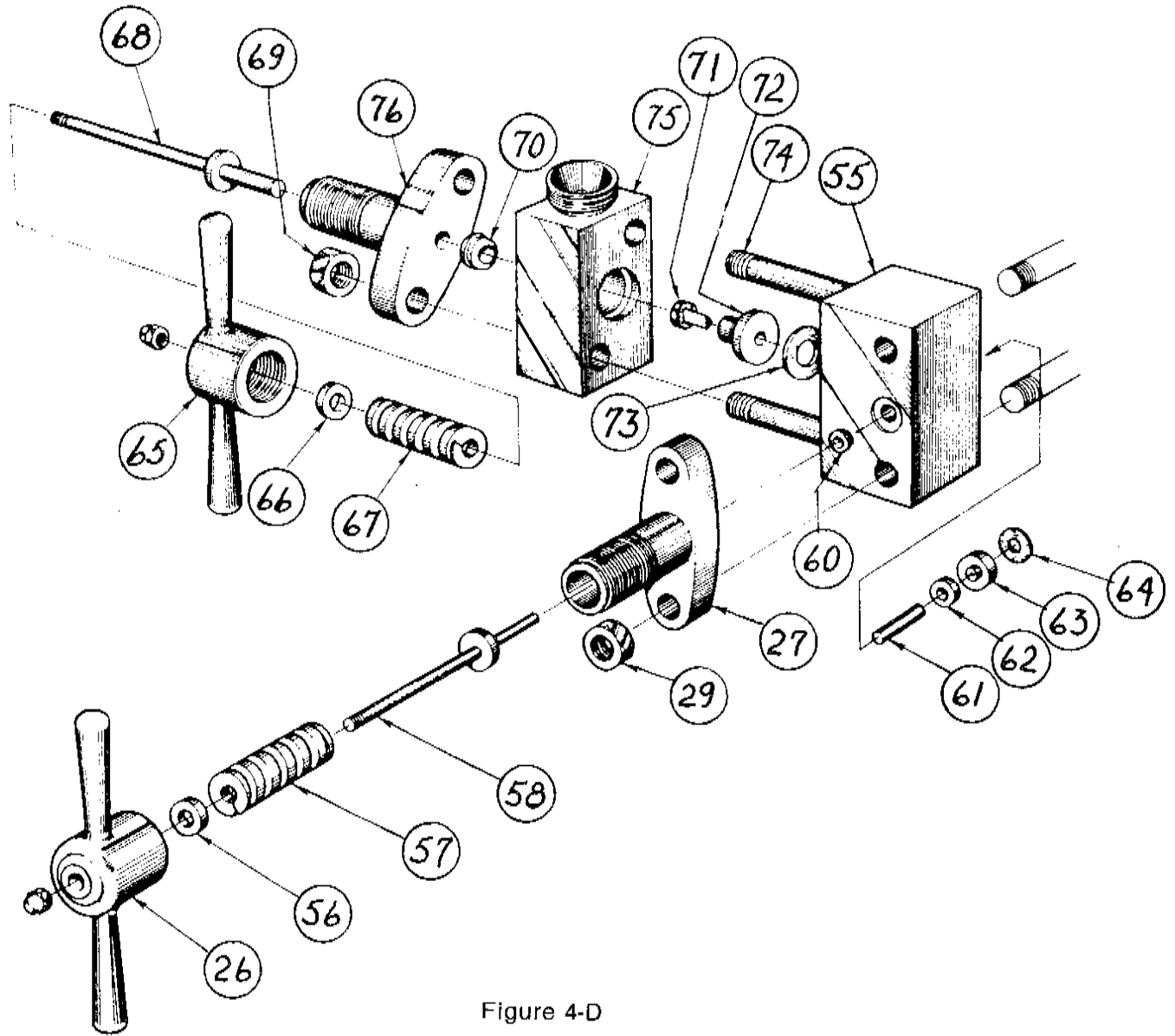


Figure 4-D

SECTION V

PRODUCT CHARACTERISTICS AND CONDITIONS

Introduction

The Laboratory Homogenizer can be used for processing many different types of products in the chemical, food, dairy, cosmetic and pharmaceutical industries. These products include water-in-oil emulsions, oil-in-water emulsions and dispersions of many types (solids dispersed in water or oils). Food products include such things as catsup, baby foods, fudge toppings, flavor emulsions, peanut butter, fruit nectars and soy beverages.

Before running a material through the Laboratory Homogenizer, it is helpful to consider the nature of the material and the processing conditions.

Hot or Cold

If the material to be processed is temperature-sensitive, it should be chilled before running and cooled after each pass through the Laboratory Homogenizer, because homogenization adds heat to the product. The higher the pressure, the greater the added energy. If the material requires heating, either to melt one or more phases or to reduce viscosity, then it might be necessary to preheat the cylinder. Preheating can be done by recycling a hot liquid compatible with the product or by using electric heaters in a specially-cored cylinder block. Preheating the metal in contact with the material to be processed prevents solidification of the product in the pumping chamber, and, thereby, loss of pumping action.

Flammability

If the material to be processed is highly flammable, then the unit should have an explosion-proof motor, and all switches and controls in the vicinity of the unit should be explosion-proof.

Viscosity

For gravity feeding to the Laboratory Homogenizer the product should be pourable. There is no absolute value for the maximum viscosity of a gravity-fed material; however, even though the unit will pump a gravity-fed, high viscosity product, the output of the pump will be reduced. This could affect homogenized product quality. Therefore, for high viscosity products a pressure feeder should be used to assure proper pumping efficiency.

Solids or Precipitates

Large, gritty particles may cause pumping problems in the unit by lodging between the ball pump valve and seat. In this condition the unit may pump without homogenizing pressure; however, when homogenizing pressure is applied, the fluid is forced back through the pump valve (between the ball and seat), which stops the pumping action. This pumping problem is also brought on by products which coat the pump ball valve, such as fibrous materials (cellulose) or latex dispersions. The unit may run for some time before build-up occurs and pumping becomes erratic. If this happens, the pump valve and homogenizing valve should be inspected and cleaned. If the particles are too large and this unit will not pump at all, then these particles need to be ground or milled to a smaller size. In some cases the pressure feeder may help with the pumping problem.

Compatibility

Make sure that the material to be processed is compatible with the gaskets and plunger packing.

Abrasiveness

If the processed material is abrasive, then wear-resistant carbide or ceramic parts should be used for the pump valve seat and homogenizing valve assembly.

Cell Disruption

If the unit is to be used for cell disruption, then the homogenizing valve should be of "CD" design.

SECTION VI OPERATION

Start-Up and Operation

1. Open homogenizing valve or valves by backing off handwheel or wheels (single-stage and/or two-stage). Turn in pressure dampener knob until snug; do not over-tighten.
2. Start homogenizer. When unit pumps steadily, set pressure.

- a. Two-Stage Homogenizing Valve Assembly:

The first-stage body is attached directly to the cylinder block. The second-stage body is attached to the first-stage body from which product is discharged to the bypass assembly. Always adjust the second-stage valve first. Read pressure on pressure gauge. Next, adjust the first-stage valve until required total homogenizing pressure is read on the pressure gauge. It may be necessary to tighten the pressure dampener knob to dampen the motion of the pressure gauge needle. Ideally, the second-stage pressure should be between 10 and 15% of the total pressure. Example, total pressure is 5000 psi. If the unit does not begin to pump steadily, release and reapply handwheel pressure a few times to prime the unit, before setting the second-stage pressure.

- b. Single-Stage Homogenizing Valve Assembly:

Set homogenizing pressure with the handwheel. It may be necessary to tighten the pressure dampener knob to dampen the motion of the pressure gauge needle. If the unit does not begin to pump steadily, release and reapply handwheel pressure a few times to prime the unit.

3. Once the pressure is set, collect the sample, after allowing several pump strokes to purge the discharge tube. Set the next desired pressure and allow the discharge tube to purge, then collect the sample.
4. In processing a small sample, it is sometimes found desirable to place a clear solvent or water in the supply tank and start the machine operating on this at the pressure desired. When pressure has been reached and the machine is operating smoothly, divert the discharge to some suitable container and watch the water level in the bottom of the supply tank. When the water has reached to the bottom of the tank, pour the material to be processed into the tank. If this is done at the proper time, the pressure will not vary to any appreciable extent. The first of the product coming through the #1 discharge pipe should be caught in a container and discharged, as it will be a mixture. As soon as the product is discharged through the pipe, it may be collected in sample containers.

SECTION VII

RECOMMENDED REGULAR MAINTENANCE SCHEDULE

Daily Inspection

1. Drain any condensate from the power frame oil through the petcock, before starting the machine.
2. Check the oil level (visible through the oil-level sight glass) and add oil if required.
3. Check the water lubrication system. Check water-spray nozzle to make sure it is flowing freely and aimed correctly.
4. Check for any leaks from cylinder or power frame.
5. With the machine running, listen for any abnormal sounds.

Monthly Inspection

1. Check tightness of all bolts, nuts and fittings.
2. Check for oil leaks.
3. Disassemble and inspect all homogenizer valves and cylinder parts for wear and damage.
4. Inspect baffle packing and crosshead extension for leaks. Readjust or replace, if necessary.

Six-Month Inspection

1. Drain oil, clean crankcase, gear case and oil-level sight glass. Fill with oil to proper level.
2. Repeat all monthly checks.
3. Lubricate motor bearings according to manufacturer's instructions.

SECTION VIII GENERAL MAINTENANCE

Plunger Packing

Leakage through the plunger packing is the result of worn packing, usually caused by the following: worn packing adjusting rings, worn or misaligned plungers, packing material unsatisfactory for high temperature or highly abrasive conditions, insufficient compression of the packing. Even new packing blows out from shock-loading.

The packing adjusting ring is made of bronze, which is a bearing metal. The plunger ring is always of stainless steel with a minimum clearance of .040" over the plunger. No metal contact between sliding members, when both are made of stainless steel, can be permitted without immediate damage.

Colmonoy-coated stainless-steel plungers are standard. They are also available in 18-8 s.s., hardened 17-4 PH s.s. and hard chrome-plated s.s.

Figure 8-A shows the packing assembly in relation to the plunger (10). Item 11 is the plunger ring. Item 12 is actually four separate pieces of plunger packing, and item 13 is the packing adjusting ring. Item 14 is the packing adjusting screw.

If the packing in your machine is leaking, try tightening the packing adjusting screw, while the machine is running (BUT NOT under pressure). The leaking should stop. If not, try replacing the four packings. (See instructions under cylinder reassembly in Section III.)

Should you find yourself replacing packing prematurely, the packing adjusting ring could be suspect. There is a simple way to measure wear on this bronze ring. When new, the packing adjusting ring will be a .002-.003 fit on the plunger. To check the wear simply measure the plunger o.d. and the adjusting ring i.d. Packing will fail prematurely, if there is a .007 or higher clearance between plunger and ring. Replace the adjusting ring, if you find this much wear. On older machines the plunger may have worn. The plunger should measure .624-.625. Anything measuring below that means the plunger is worn and may have to be replaced.

Worn ring i.d.	.632
Plunger o.d.	.625
	.007

At .007 or above, ring is worn.

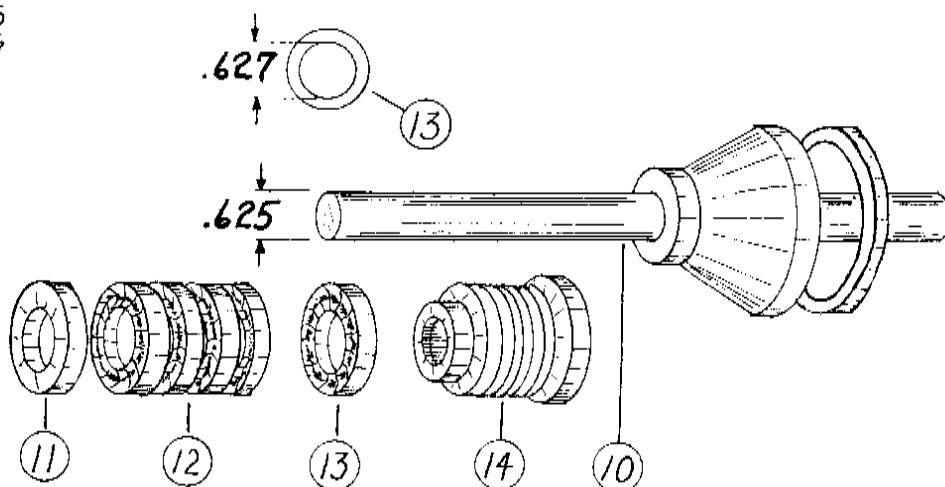


Figure 8-A

Pump Valve Seats

When replacing the seat, make certain that the taper on the seat and the cylinder bore are clean and dry. Pack the seat in dry ice or immerse in an alcohol/dry ice mixture for 20 to 30 minutes. Install in cylinder by tapping into place with a piece of wood or brass. Since any leakage between the seat and the cylinder bore will create serious damage, extreme care should be used in assembling the seat.

For valve seat refacing in the field, Rexalloy seats may be refaced on a lathe, using a carbide tool bit. Carbide, tapered seats are available for very abrasive products. Carbide seats must be returned to the Factory for refacing.

Pump Valves

The Rexalloy (Stellite) ball valve should be inspected regularly. Pits, dents or surface cracking will quickly lead to erosion of the pump valve seat and the ball valve; therefore, they should be replaced promptly. Abnormal noise, pressure gauge fluctuation and uneven pumping are associated with valves sticking.

Product Pressure Gauge

Gauge problems are due, primarily, to improper care in handling the gauge or severe shock-loading caused by operating either with air in the product or with inadequate infeed pressure or improper dampening.

Homogenizer Valve Assembly Parts

1. Valve Rod — When the valve rod is used with manually controlled valves, it must be kept straight and free from burrs, so it can move freely within the valve body. If it binds, pressure cannot be properly controlled.
2. Valve Rod Packing — This packing serves two purposes. The first is to seal against product leakage. The second is to dampen down the motion of the valve rod. When the packing becomes worn, it allows rapid oscillation of the valve rod, accelerating wear and affecting pressure control.
3. Valve Spring — Valve springs can take a set, break and, although they are plated, corrode and weaken. They should always be heavily lubricated with grease upon assembly, and the valve rod washer must be installed between the spring and the handwheel.
4. Handwheel and Handwheel Support — Other than an occasional check on the condition of the threads and lubrication prior to assembly, no maintenance is usually required.
5. Valve and Valve Seat — The valves will be of Rexalloy (Stellite), tungsten carbide or similar, very hard materials. The wear patterns shown in figure 8-C will apply to all materials and all configurations. Valves and valve seats must always have a continuous contact area round the full circumference on valve and seat. If this contact is broken at any point, as illustrated on the Wear Pattern Guide, Figure 8-C, item 5, the valve and seat require relapping or regrinding.
 - a. Rexalloy (Stellite) valves can be lapped in your plant using a standard, oil-mixed grinding compound, medium grit. Piloted valves (ones in which there is a three- or four-sided pilot which enters the hole in the valve seat to keep the valve face parallel with the seat) are ground to each other. Apply a small dab of compound at three places on the seating surface. Either hold the parts in your hands and rotate them together or secure them in a lathe chuck, turning at slow speed.

**LABORATORY HOMOGENIZER — MODELS 15MR AND 31MR
TROUBLE-SHOOTING GUIDE**

PROBLEM	CAUSE	REMEDY
Start switch is in ON position, motor turning, but homogenizer will not pump or will only pump intermittently.	Air lock in cylinder block (1)	Slowly turn handwheel (26) in and out until unit starts pumping. NOTE: Do not put any excessive pressure on handwheel, if unit does not begin to pump after handwheel is turned in to its stopping point. Excessive pressure on handwheel in the absence of product flow will result in damage to the homogenizing valve assembly. You may also be able to prime the homogenizer by covering the end of the discharge tube (51) until flow is established.
	Pump valve (8) stuck in OPEN position.	Disassemble and check pump valve (8) to ensure free vertical travel of ball valve.
	Pump valve seat (7) worn.	Inspect seat (7) for wear. Replace or recut, if necessary.
	Feed tank (50) blocked or empty.	Check for product and/or blockage from tank (50) homogenizer.
Growling sound from drive end.	Worn gears in gearbox or dirty and/or insufficient oil.	Check oil level and quality of oil. Replace, if needed.

CAUTION: Keep the compound away from the wings of the valve pilot to avoid increasing the diameter of the valve seat hole. Repeat process, adding compound as required, until seating surfaces are restored to the No. 2 pattern shown on the Wear Pattern Guide.

- b. For valves and seats of the unpiloted type apply the same type of automotive valve-grinding compound. Lap each piece separately by rotating them in a circular motion against a smooth, flat, hard surface such as a piece of heavy plate glass.
 - c. When seating surfaces are permitted to develop erosion channels, as shown on 5. of the Wear Pattern Guide, they cannot be corrected by lapping. Factory regrinding will be required.
 - d. Ceramic Valves — Using Wear Pattern Guide for reference, when ceramic valves are worn they must be returned to the Factory for evaluation and regrinding.
6. Impact Rings — These are available in Rexalloy (Stellite) and other materials and are designed to help prevent the high velocity stream, upon leaving the faces of the valve and seat, from cutting deep grooves in the stainless-steel valve bodies. When the groove or grooves on the inside of the ring are worn to a depth of approximately 1/3" to 1/16", the part should be replaced. Impact rings cannot be repaired.
7. Valve Seat Gasket — These, as well as all other gaskets in the fluid end of the machine, are available in several materials to handle the specific duty required. Replacement is only required when leakage develops.

Water Spray Assembly Adjustment

See Figure 3-B, part number 25.

WARNING: If the spray nozzle becomes clogged or misaligned, rapid deterioration of the plunger packing will result.

1. Turn on and adjust the flow of water to the water spray assembly to obtain a steady stream that will not splash when in contact with the plunger or spring.
2. Make sure that the spray nozzle is flowing evenly. A clogged nozzle can usually be freed by working a thin piece of wire into the end of the nozzle.
3. The nozzle is individually adjustable. Loosen the tubing nut around the nozzles. Aim the flow and tighten the nut.
4. The stream of water from the nozzle should be aimed to strike the top surface of the plunger or spring.

Dampener Gauge Assembly

Correct operation of the dampener assembly is important. Continued operation of the gauge with fluctuation of more than 200 lbs. (90 kg.) will result in gauge failure.

The dampener is charged with Dow Corning 200 food-grade oil. This oil is available from APV Gaulin in half-pints (part no. 811122). **The chamber must be completely filled and air-free.**

During normal operation of the homogenizer, a small amount of the dampening fluid *may* leak out of the dampener reservoir. If you find that you cannot build pressure on the gauge, referring to figure 8-B, remove the gauge block and inspect the position of the dampener piston (41). If the piston is retreated $11/16$ ", then fluid has escaped and refilling is necessary. At this time also try to note where the fluid has escaped from. It may have escaped from the needle valve O-ring or, perhaps, one of the pipe plugs has leaked.

To refill the dampener:

1. Remove pipe plug (40) opposite dampener piston (41).
2. With suitable tool, push piston back to position it $1/8$ " from the face of the block.
3. Add oil through hole until full and reinstall pipe plug, using thread sealant (Teflon tape) on threads.
4. Stand block upright and remove pipe plug (40) from top of block (next to gauge). Tip gauge back and forth to bring any air bubbles to top. Refill with oil and repeat until no more air escapes. Reinstall pipe plug (use thread sealant).
5. Using both thumbs, press on dampener piston. If spongyness is felt, the block still contains air pockets. Repeat step 4., until spongyness disappears from piston.
6. When operating homogenizer, check for any slight dampener fluid leaks and correct.

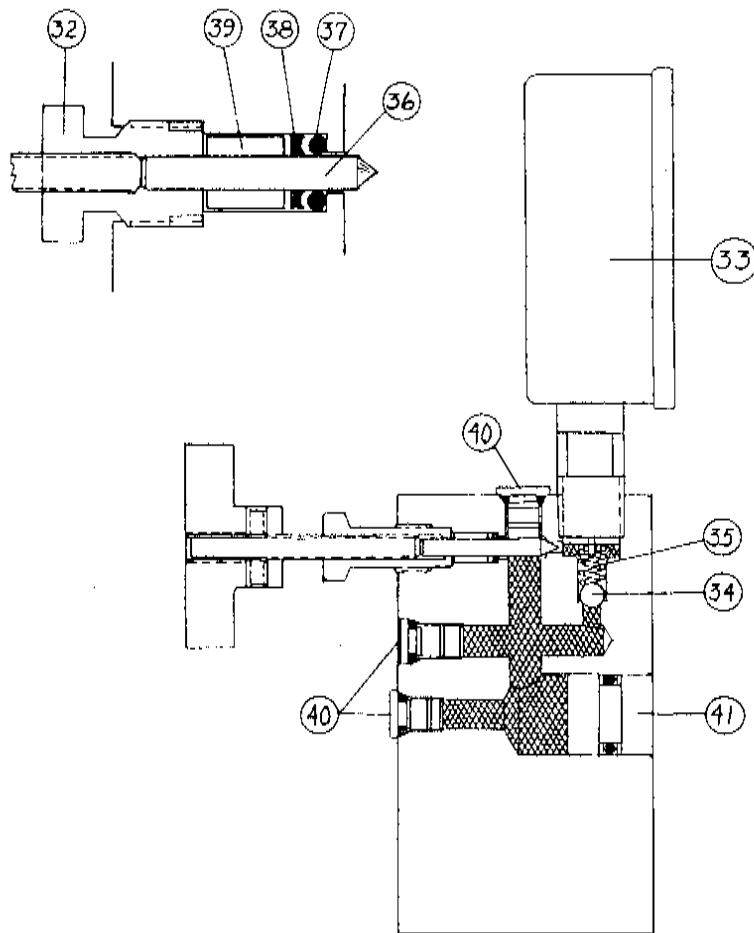


Figure 8-B

Motor Lubrication

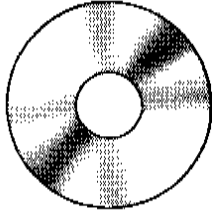
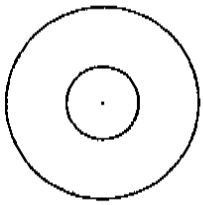
Motor bearing should be lubricated only as recommended by the motor manufacturer. Too much lubrication is more damaging than too little. Remove the plugs on the top and bottom of both bearings. With the manufacturer's recommended grease, pump grease into the bottom and allow old grease to flow out of the top. Install the bottom plugs but leave the top ones out, until the motor has run long enough to be at maximum operating temperature. Excess grease will have then expanded and run out of the top opening. Reinstall the top plugs.

Motor Warranty

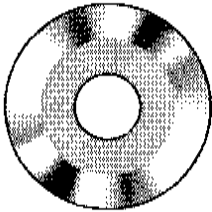
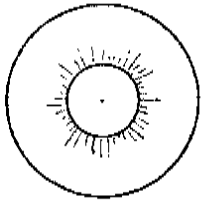
If provided with the machine, the motor has been selected to meet load requirements and is covered by a warranty issued by the motor manufacturer. Should difficulty arise, contact the local representative of the motor manufacturer, our representative or the Factory.

If any modification or repair not authorized by the motor manufacturer is undertaken, the warranty is automatically waived.

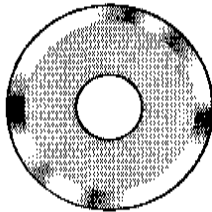
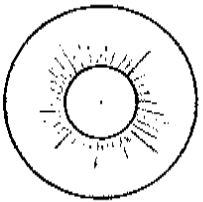
WEAR PATTERN HOMOGENIZING VALVE AND SEAT



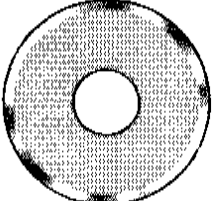
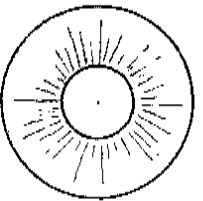
1. **NEW VALVE** — Complete bearing across whole face.
NEW VALVE SEAT — Complete bearing across whole face.



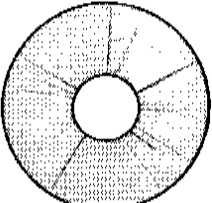
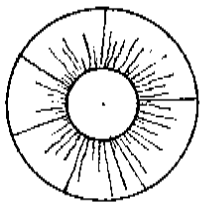
2. **USED VALVE** — No apparent wear.
USED VALVE SEAT — One-half of face still bearing. No channels. An excellent condition.



3. **USED VALVE** — Round erosion groove appears in center and radial grooves. Still good but monitor more often now.
USED VALVE SEAT — Three-quarters of face gone. No erosion. Still good but watch for channels.



4. **VALVE READY FOR REGRINDING** — Deep, circular erosion groove in center and, also, slight radial grooves appearing.
VALVE SEAT READY FOR REGRINDING — Approximately seven-eighths of face gone. Failure of homogenizing valve can occur at any moment.



5. **EROSION GROOVES** — Radial grooves due to erosion at any stage of wear. Valve must be reground for proper homogenization, regardless of other face conditions.

VALVE
(Item 61)

SEAT
(Item 63)

SECTION IX TROUBLE-SHOOTING GUIDE

The following is an easy-to-follow trouble-shooting guide for the Laboratory Homogenizer.

It will help you decide when a problem requires a simple adjustment, regular maintenance or Factory replacement or assistance.

If you have any questions not covered by this section, contact the APV Gaulin Customer Service Department.

Trouble-Shooting Guide

PROBLEM	CAUSE	REMEDY
Homogenizer is pumping product but is unable to obtain desired homogenizing pressure.	Worn homogenizing valve (61) and/or seat (63)	Disassemble homogenizing valve assembly inspect valve (61) and (63) for wear. See Wear Pattern Sheet.
	Packing failure. NOTE: Is packing (12) leaking?	Tighten packing adjusting screw (14) while machine is running (NOT under pressure). If still leaking, remove packing assembly (10, 11, 12, 13, 14) and inspect packing. If worn, replace all four pieces. Inspect packing adjusting ring (13). See Plunger Packing Assembly instructions under "Maintenance" section for proper method of measuring wear on adjusting ring.
	Valve rod (58) binding inside handwheel support (27)	Disassemble handwheel assembly. Thoroughly clean valve rod (58), handwheel (26) and handwheel support (27). Dirt and rust may be polished off with fine emery cloth. Small burrs may require a file or heavier emery cloth. Also check valve rod (58) to ensure that it is not bent at either end, preventing free travel of rod (58) through handwheel support (27) and valve body (55).
	Homogenizing valve (61) binding in valve body (55)	Remove valve (61) and inspect for any product build-up or a burr. Remove any burrs with emery cloth. Also check body (55) for burrs.
	Dampener body (30) has lost silicone.	Re-service dampener body (30) with proper silicone. See Dampener Gauge instructions under "Maintenance".

Trouble-Shooting Guide

PROBLEM	CAUSE	REMEDY
Capacity low or varies.	Pump valve (8) and/or seat (7) may be worn.	Check pump valve (8) and seat (7) for wear. Replace or regrind, if necessary.
	Motor (77) not up to speed.	Check motor (77) with tachometer and check amperage draw against nameplate on motor.
Machine leaking product under pressure.	Work packing (12) or worn gaskets (42, 64).	Tighten packing adjusting screw (14) or replace worn gaskets. Packing (12) may need to be replaced. Also, see Plunger Packing instructions under "Maintenance".
Machine labors or slows down under pressure.	Overload on machine, possibly because of defective gauge (33).	Check servicing of dampener body (30). See Dampener Gauge instructions under "Maintenance".

SECTION X OPTIONAL EQUIPMENT

Pressure Feeder

The stainless-steel assembly utilizes a simple plunger design, which is actuated by operator-controlled air pressure and should be used where viscosity of the product results in a decrease in capacity to less than 12 gph (45 lph) when processed by gravity feed. Erratic pumping when operating with gravity feed also indicates the need to use a pressure feeder. It is quickly installed and used, and it can be readily removed for disassembly and cleaning.

Instructions

Remove standard tank and replace with Pressure Feed Tank. Fill tank with product to be processed to approximately 2-1/2" from the top. Place piston assembly in tank. Install cap gasket, cap and cap nut. Tighten cap nut securely to tank. Connect air to the air inlet connection. The air pressure required will depend on viscosity of product and can range from 10 to 100 psi. (The maximum allowable air pressure is 100 psi.) Start homogenizer and build up air pressure, until machine operates smoothly. Adjust the homogenizer pressure to the desired point by turning handwheel. Take samples.

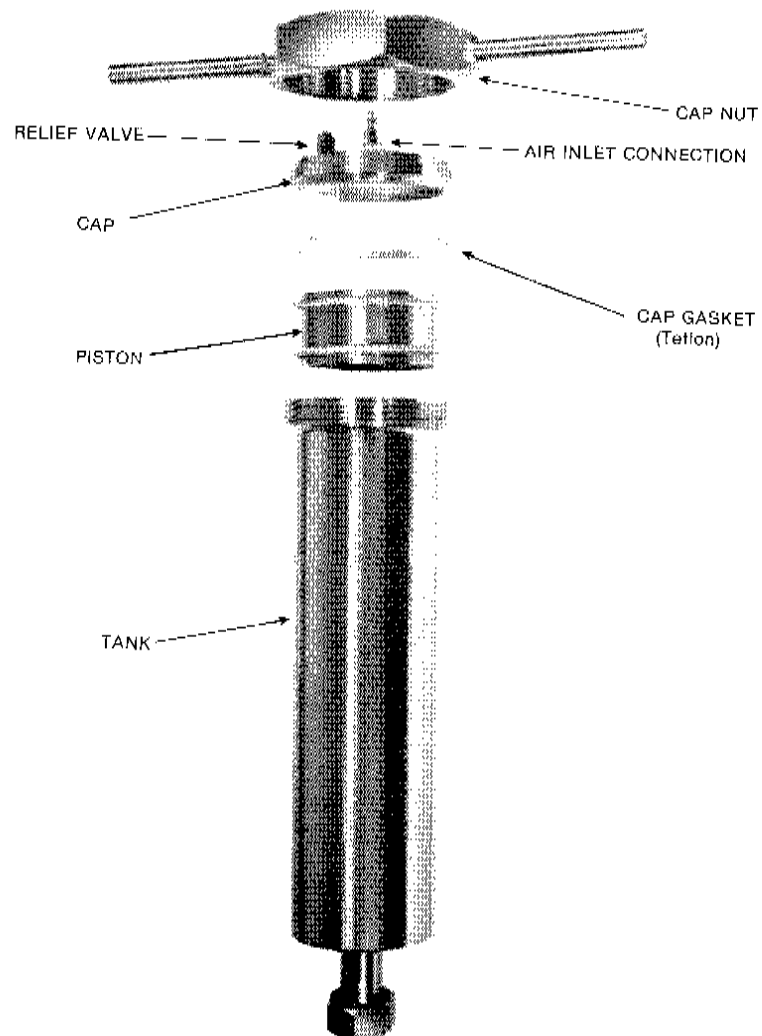


Figure 10-A

Sterile Processing

The lab-scale homogenizer can be purchased with a sterile modification or the modification can be installed in the field with ease. This modification provides a plunger packing arrangement to enable the use of steam or a sterile fluid to purge the exposed plunger zone.

Cored Cylinder Block

A cored cylinder block is available and, depending upon fittings supplied, can be operated with hot fluids or steam to preheat the cylinder prior to processing. The cored cylinder is also available with Calrod heater elements and a temperature controller. The cored cylinder will normally operate at temperatures as high as 350°F. (175°C.) With additional minor modifications it can be operated to 500°F. (200°C.).



Your local contact:



APV, An SPX Brand
Phone: (920) 648-8311
Email: answers.us@apv.com

For more information about our worldwide locations, approvals, certifications, and local representatives, please visit www.apv.com.

SPX Corporation reserves the right to incorporate our latest design and material changes without notice or obligation. Design features, materials of construction and dimensional data, as described in this bulletin, are provided for your information only and should not be relied upon unless confirmed in writing.

Issued: 03/2009 899886

Copyright © 1988, 2009 SPX Corporation