TRANE™

Maintenance OCOM-M-4

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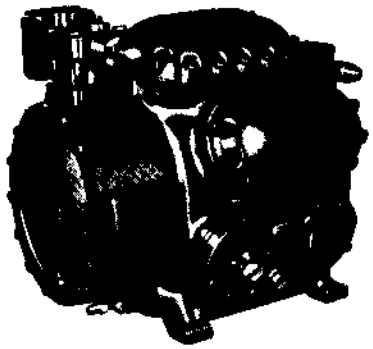
OPEN RECIPROCATING COMPRESSORS

MODEL A & B
4-6-8 CYLINDERS
COMPRESSOR MAINTENANCE



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La Crosse, Wisconsin 54601-7599
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The Trane Company urges that when servicing Trane Equipment, or any other manufacturer's equipment, every effort should be made to eliminate the emissions of CFC, HCFC and HFC refrigerants to the atmosphere resulting from installation, operation, routine maintenance or major repair of the equipment. Conservation of refrigerants is important even when working with acceptable alternative refrigerants.

Conservation and emission reduction can be accomplished by following recommended Trane operation, maintenance, and service procedures with specific attention to the following:

1. Refrigerant used in any type of air-conditioning or refrigerating equipment should be recovered for reuse, recovered and/or recycled for reuse, reprocessed (reclaimed), or properly destroyed, whenever it is removed from the equipment.

2. Always determine possible recycle or reclaim requirements of the recovered refrigerant before beginning recovery by any method. (Questions about recovered refrigerants and acceptable refrigerant quality standards are addressed in ARI Standard 7000

3. Use approved containment vessels and safety standards for the storage or transporting of new or used refrigerant. Comply with all applicable transportation standards when shipping refrigerant containers.

4. To minimize refrigerant emissions use recycling equipment when recovering refrigerant. Use methods which will pull the lowest possible system vacuum while recovering and condensing refrigerant into containment.

5. When leak checking with trace refrigerant and nitrogen, use HCFC-22 (R-22) rather than CFC-12 (R-12) or any other fully halogenated refrigerants. Remain aware of any new leak test methods which eliminate refrigerants as a trace gas.

6. When cleaning system components avoid using chemicals that have ozone depletion capability. Properly dispose of used materials in accordance with the manufacturers recommendations.

7. Take extra care to properly maintain all service equipment directly supporting refrigerant service work such as gages, hoses, vacuum pumps, and recycling equipment.

8. Remain aware of unit enhancements, conversion refrigerants, compatible parts and manufacturer's recommendations which will reduce refrigerant emissions and increase equipment operating efficiencies. Follow specific manufacturers guidelines for conversion of existing systems.

9. In order to assist in reducing power generation emissions, always attempt to improve equipment performance with improved maintenance and operations which will help conserve energy resources.

Servicing the Compressor

The design of the Trane Compressor is such that it can be repaired without removing the compressor from the base. However, major repairs may be facilitated by performing the work with the compressor set up on a workbench or table (see "TO REMOVE COMPRESSOR", OCOM-M-3).

There are two general groups into which compressor service repairs may fall. The first is the replacement of a single component such as a discharge valve cage assembly. The second is a complete disassembly of the entire compressor for major overhaul.

Many of the components of the compressor are combined as sub-assemblies. These sub-assemblies consist of a number of parts which can be removed and replaced as a unit. These units or sub-assemblies can be taken apart and in most cases, individual parts can be replaced. There are several major advantages to the sub-assembly type of design. A compressor which consists of a number of sub-assemblies can be taken apart, repaired, and reassembled in a minimum amount of time. When rebuilding a compressor where sub-assemblies are involved, it will, in most cases, be to the serviceman's advantage to replace complete sub-assemblies.

The design of the Trane Model A and B Compressors permits the replacement of many of these components or sub-assemblies without disassembly of the rest of the compressor. For instance, a cylinder liner may be removed and replaced without the removal of the piston or rod, without the removal of the oil from the crankcase or without the removal of the handhole cover.

There is no pre-selective fit with Trane compressor parts. This means that a connection rod within a compressor can be replaced by any standard stock replacement rod without tedious special fitting of connection rod inserts, shims, and so forth. Piston and rod assemblies can be interchanged without the necessity of measuring and adjusting piston clearances. No machining or special sizing is not required.

Wherever bolts or nut and bolt combinations are drawn up, a torque wrench should be used to insure evenness and proper fit. This is essential as some fits such as the connecting rod assembly on the crankshaft can be badly distorted and cause premature wear or complete failure. So that the serviceman will know the proper torque to be applied to the various bolts and nut and bolt combinations, torques are set forth throughout the manual.

Table 1A — Trane Model A Compressor Wear Rate Table

Part Name	Original Spec.	Recommended Limit	Maximum Recommended Oil Clearance
Main Bearings Crankshaft - Mains	2.5013 - 2.5030 2.4995 - 2.5000	2.505 2.4980	.006
Conrod - Crankpin (Vert.) Crankshaft - Crankpin	2.3772 - 2.3780 2.3744 - 2.3751	2.3810 2.3710	.008
Piston Pin Conrod - Pin Bore (Vert.)	.9998 - 1.0000 1.0005 - 1.0003	0.9994 1.0005	.0011
Cylinder Liner Piston (Perpendicular to Centerline of Pin Bore)	3.2500 - 3.2505 3.2485 - 3.2490	3.2520 3.247	0.0035
Piston Rings (Gap in 3.250" Ga.)	.010 - .020	.040 Compression Rings .060 Oil Rings	
Valves (All)	Valves are .033" - .035" thick - if not broken, valves should be replaced when seat groove wear depth exceeds .010" (.023"thinnest section).		
Valve Springs (All)	Whenever compressor is disassembled for servicing, valve springs should be replaced where they have operated in excess of 5000 hours on R-12 or 3000 hours on R-22.		
Shaft Seal	Replace when leaking or when compressor is overhauled.		

Notes:

1. Oil pressure 60# net.
2. The above recommended wear rates are for individual parts. For mating parts the maximum recommended oil clearance should predominate. In most cases this would mean that both of the mating parts should not each be at the recommended limit dimension.
3. These recommended limits are not to be interpreted that when these limits are anticipated that the compressor must be rebuilt. These recommended limits are good recommended practice for normal service rebuilding of compressors which will be reliable when put back into service.

Table 1B — Trane Model B Compressor - Wear Rate Table

Part Name	Original Spec.	Recommended Limit	Maximum Recommended Oil Clearance
Main Bearings Crank Shaft - Mains	1.8760 - 1.8778 1.8745 - 1.8750	1.8800 1.8730	0.0055
Conrod - Crankpin (Vert.) Crankshaft - Crankpin	1.7522 - 1.7530 1.7495 - 1.7500	1.7560 1.7470	0.0070
Piston Rod Conrod - Pin Bore (Vert.)	.7498 - .7500 .75005 - .7503	0.7494 0.7505	0.0011
Cylinder Liner Piston (Perpendicular to Centerline of Pin Bore)	2.5000 - 2.5005 2.4985 - 2.4990	2.5020 2.4970	0.0035
Piston Rings (Gap in 2.500" Ga.)	.007 - .017	.040 Compression Rings .060 Oil Rings	
Valves (All)	Valves are .028" - .030" thick - if not broken, valves should be replaced when seat groove wear depth exceeds .010" (.018" thinnest section).		
Valve Springs (All)	Whenever compressor is disassembled for servicing, valve springs should be replaced where they have operated in excess of 5000 hours on R-12 or 3000 hours on R-22.		
Shaft Seal	Replace when leaking or when compressor is overhauled.		

Notes:

1. Oil pressure 60# net.
2. The above recommended wear rates are for individual parts. For mating parts the maximum recommended oil clearance should predominate. In most cases this would mean that both of the mating parts should not each be at the recommended limit dimension.
3. These recommended limits are not to be interpreted that when these limits are anticipated that the compressor must be rebuilt. These recommended limits are good recommended practice for normal service rebuilding of compressors which will be reliable when put back into service.

Table 2 - Compressor General Information

Compressor Model	Speed (RPM)	Bore (In.)	Stroke (In.)	No. of Cylinders	Crankcase Oil Charge (Quarts)	Nominal Capacity R-12	Nominal Capacity R-22
A-514 2A-514	1750	3¼	2¾	4	10 10	25	40
A-516 2A-516 A-516R 2A-516R	1750	3¼	2¾	6	10 10 10 10	40	60
A-518 2A-518 A-518R 2A-518R	1750	3¼	2¾	8	10 10 10 10	50	75
B-514 2B-514	1750	2½	2	4	5 5	10	15
B-516 2B-516	1750	2½	2	6	5 5	15	25
B-518 2B-518	1750	2½	2	8	5 5	20	30

Note:

For recommended oil replacements see Service Bulletin HCOM-SB-4 "Recommended Oils and Oil Charges for Reciprocating and Scroll Compressors."

Before opening the compressor for service, operate the system to pumpdown the compressor and then close the service valves. If the compressor cannot be operated, close the service valves. After the compressor has been isolated with the service valves remove the refrigerant with a refrigerant recovery device. Do not relieve the refrigerant to the atmosphere. Follow the refrigerant recovery device manufacturer's operating instruction for proper operation.

If repairs require the removal of suction or handhole covers, the crankcase oil must be drained from the compressor. Because of the good cleaning properties of refrigerants used with the Trane Compressor, all parts being removed from the compressors must be handled carefully and protected against rusting immediately upon removal from the compressors.

It is recommended that as each part is removed it be oiled well with clean compressor oil. When reinstalling original parts or installing new parts, it is recommended that all parts be washed clean with a refrigeration compressor parts cleaner and oiled with clean new compressor oil before they are placed in the unit. CAUTION: Thoroughly lubricate all bearing surfaces within the unit when these parts are being installed. This lubrication will enable the compressor to run without seizure when it is started up for the first time and before the oil pump pressure builds up.

The number given in parenthesis following a part is a reference number of that part. An illustration of the part may be found in OCOM-UP-4, for Model B Compressors, and in OCOM-UP-5 for Model A Compressors.

The following disassembly procedure details the method of removing each assembly and its components individually. The sequence is also correct for complete compressor disassembly.

Cylinder Head

The cylinder heads are cast of close-grain, pressure tight, nickel alloy iron with high physical strength. The heads are interchangeable.

WARNING
To prevent injury or death due to compressor cylinder heads being propelled by the compressor internal pressure and striking persons working on or observing the work insure that the service valves are tightly closed and that the internal compressor pressure is measured at the service valve(s) back seat port is at atmospheric pressure.

WARNING
To prevent injury or death due to the compressor cylinder heads being propelled by the compressor safety head springs and striking persons working on or observing the work never remove all the head bolts and then jar the head with a hammer to loosen it. Always leave two bolts at opposite ends of the head and back them off two or three turns then use a mallet to loosen the head. Once the head is loose alternately loosen the remaining bolts to relieve the tension on the springs.

Table 1 — Cylinder Head Bolt Torques

1 - Model A Compressors - 76 Foot Lbs.
2 - Model B Compressors - 43 Foot Lbs.

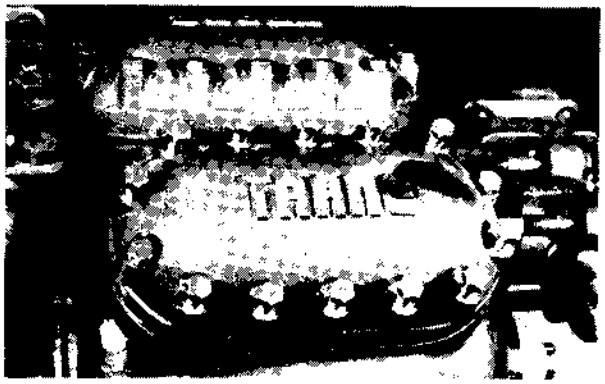

Figure 1

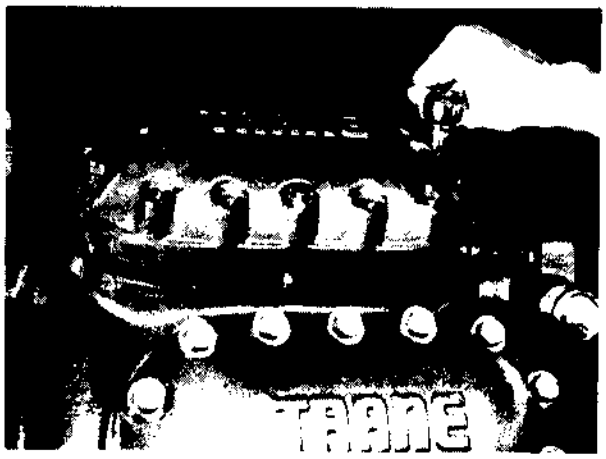

Figure 2

To Remove:
Loosen and remove all but two cylinder head bolts (Figure 1). Back off the remaining two bolts two or three full turns. Examine cylinder head to determine whether or not head is following the bolts. If it is not, jar the head with a lead hammer until gasket breaks loose. Slowly and alternately loosen the two remaining bolts to dissipate the energy of the safety head springs (Figure 2). As an aid in determining how far the bolts must be turned until they are freed of the tapped hole, a third bolt can be inserted through the head and turned into the tapped hole approximately two or three full turns. As the other two bolts are loosened and the head rises, the third bolt will serve as a measure of the amount of thread still engaged by the other two bolts. This third bolt will also hold the head in place on the cylinder and prevent it from falling when the other two bolts clear the tapped holes. Slowly and alternately loosen the two bolts, dissipate the energy of the safety head springs (Figure 2), remove bolts, withdraw head (Figure 3), and remove safety head springs (Figure 4).

To Install:
Make sure safety head springs are centered properly on the discharge valve cage assemblies (Figure 4). Put two bolts (on opposite sides) through the cylinder head. Oil the head gasket with compressor oil and center on cylinder head bolts. Position cylinder head, gasket and two cylinder head bolts on cylinder. Turn the two bolts in until their threads catch. The length of the bolts is such that the bolts will engage about two or three threads before compression of the safety head spring begins. Draw the head down evenly by alternate tightening of the bolts. Insert and tighten remaining head bolts. Tighten bolts to final torque. See Table 1.

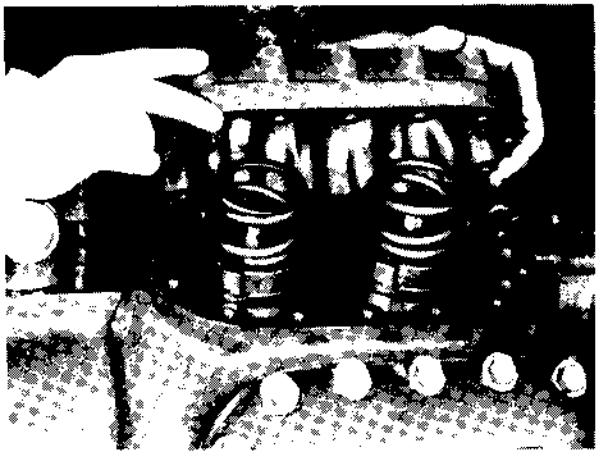

Figure 3

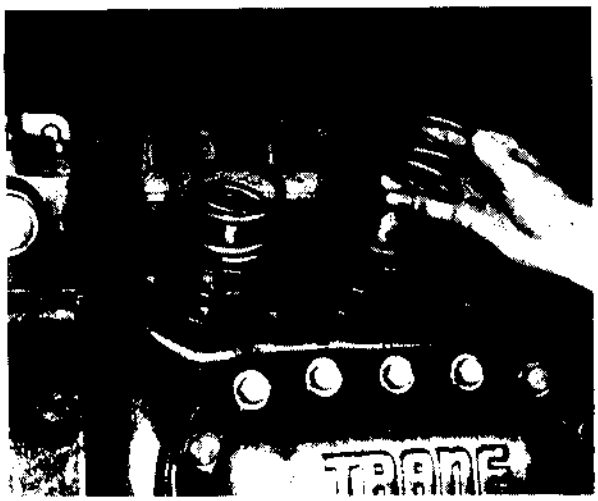

Figure 4

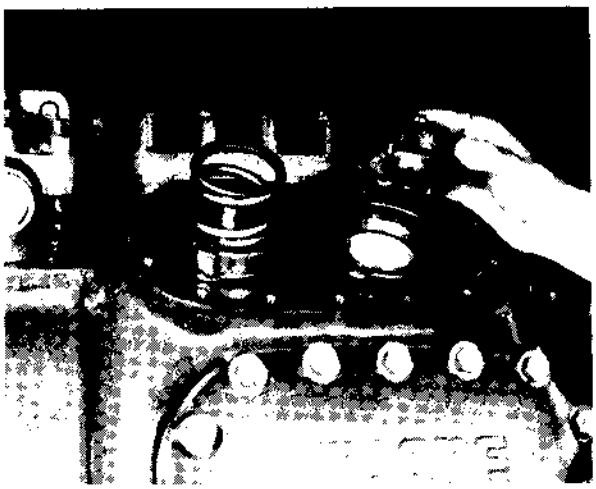

Figure 5

Discharge Valve

Trane Compressor discharge valves are ring type with large valve area. This large area requires only a minimum of valve movement. These nonflexing type valve rings are surface treated for extra long life. The entire discharge valve mechanism is a sub-assembly and can be replaced as a complete unit (Figure 5) or disassembled (Figure 6) and worn or broken pieces replaced.

To Remove:
Remove cylinder head (see "TO REMOVE CYLINDER HEAD"). Lift off safety head springs (Figure 4). Lift off the discharge valve cage (Figure 5).

To Install:
Center valve cage assembly over cylinder. Locate dowel pins in the suction valve plate. Press valve assembly into place being certain that valve assembly seats properly. If fit is proper, the dowel pins should slide easily into the holes in the valve plate. Do not force.

To Disassemble Discharge Valve:
Loosen locknut on discharge valve bolt. Remove discharge valve bolt and discharge valve seat. Remove valve ring, springs, valve cushion retainer and valve cushion.

Figure 6

To Assemble Discharge Valve:
Place valve cushion into the discharge valve cage making sure that the outer edge of the cushion is tucked into the undercut slot in the valve cage (Figure 7). The holes in the cushion must line up with the spring pockets in the valve cage. Press valve cushion retainer into place. This is a hand press fit (Figure 8). Place discharge valve springs into the spring pockets in discharge valve cage (Figure 8). Place discharge valve springs into the spring pockets in discharge valve cage (Figure 9). Lay the discharge valve in place over springs (Figure 10) and insert discharge valve seat and discharge valve cage bolt into the cage assembly (Figure 11). Before assembling and tightening locknut, make sure the discharge valve ring registers in the valve guide (Figure 12). Assemble locknut (Figure 13) and tighten in place. Recheck ring movement to make sure that its movement is not restricted by the valve guide (Figure 12). See Table 2.

Table 2 — Discharge Valve Bolt Torques

1 - Model A Compressors - 43 Foot Lbs.
2 - Model B Compressors - 23 Foot Lbs.

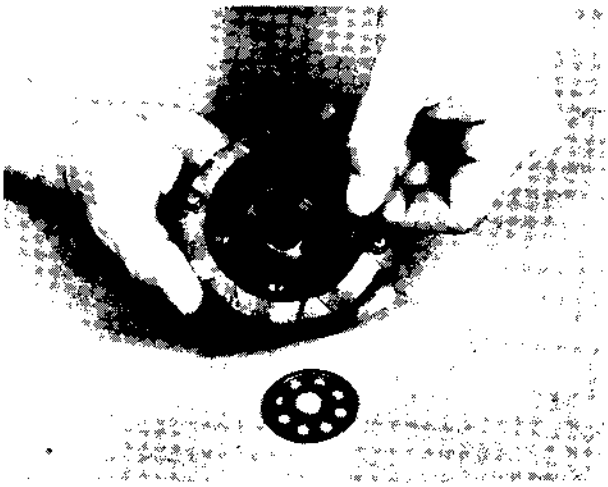

Figure 7

Figure 8

Figure 9

Figure 10

Figure 11

Figure 12

Figure 13

Cylinder Liners

Trane Compressors are equipped with cylinder liners. These liners, which form the wearing surface for the piston rings, can be readily removed and replaced in the field, without removal of the piston and connecting rod from the crankshaft. Three of the four cylinder liners, in the four cylinder model compressors, are equipped with unloader assemblies. Four of the six cylinder liners, in the six cylinder model compressors, are equipped with unloading assemblies. Six of the eight cylinder liners, in the eight cylinder model compressors, are equipped with unloading assemblies. The removal of the cylinder liners, with or without unloaders, is the same. The installation of the liners with or without unloaders is different, however, and will be discussed later.

To Remove:

WARNING
To prevent injury or death due to compressor cylinder heads being propelled by the compressor internal pressure and striking persons working on or observing the work insure that the service valves are tightly closed and that the internal compressor pressure is measured at the service valve(s) back seat port is at atmospheric pressure.

To prevent injury or death due to the compressor cylinder heads being propelled by the compressor safety head springs and striking persons working on or observing the work never remove all the head bolts and then jar the head with a hammer to loosen it. Always leave two bolts at opposite ends of the head and back them off two or three turns then use a mallet to loosen the head. Once the head is loose alternately loosen the remaining bolts to relieve the tension on the springs.

Remove cylinder head, safety head spring, and discharge valve cage assembly from above the cylinder liner to be removed (see "CYLINDER HEAD — TO REMOVE," Page 4). The suction valve plate which is mounted on the top of the cylinder liner is tapered in toward the top. A block of soft wood should be cut and shaped to fit into this taper (Figures 14 and 15). Rotate the crankshaft until piston head is down about two inches from the top surface of the valve plate. Place wood block in cylinder so that tapered ends fit inside of valve plate and hold in position. Rotate the crankshaft until piston head contacts puller block and

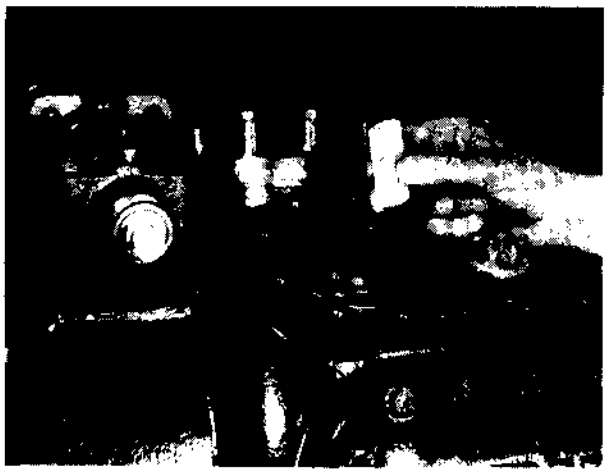

Figure 14

Figure 15

continue to rotate shaft so that piston forces cylinder liner out of housing. When rotating shaft, provide an even pressure. Do not bump. After cylinder assembly is forced out beyond the "O"-ring seal (Figure 15), it can be withdrawn by hand. On cylinder liners equipped with unloaders, the unloader mechanism will come out with the cylinder liner. While the liner is being withdrawn, support the piston through the liner so that the piston does not bump against the compressor housing when the liner comes off.

In some cases, while disassembling the compressor, it may be impossible to rotate the crankshaft or to run the pistons up and down within the cylinders. Thus, the cylinder liner cannot be removed by using the piston to drive the liner out of the cylinder. In such cases it will be necessary to remove the handhole covers from the compressor (see "TO REMOVE HANDHOLE COVERS," Page 12), and drive the cylinder liners out by hand. This can be accomplished by placing a small block of hard wood against the skirt or bottom of the cylinder liner and by tapping against this block of wood with a light hammer. In this fashion, drive the cylinder liner up within the cylinder until the "O"-ring clears the top of the cylinder. The liner can then be removed by hand.

To Install: (Cylinder Liner Assembly Without Unloader)
The bottom of the cylinder liner assembly is tapered for entry of the piston and piston rings. Before placing the liner over the piston, rotate the piston rings on the piston to stagger the gap of the rings. Rotate the crankshaft so that the piston is near the bottom of its stroke. While rotating the shaft and moving the piston, guide the piston so that it does not become wedged in the cylinder hole. Place the liner in the hole in the crankcase until the liner is against the top of the piston. Reach through the liner and center the head of the piston in the bottom of the liner. Push the liner down over the piston so that it does not become wedged in the cylinder hole and until the first ring is contacted. Rock and rotate the liner on the piston, and at the same time press it down firmly against the ring. The rocking and rotating motion will guide the ring into the tapered cylinder liner.

> CAUTION: Do not hammer or attempt to force the liner over the ring. Sudden shock can cause ring breakage.

After the first ring is picked up, push the liner down to contact with the second ring. Rotate the crankshaft and raise the head of the piston about ½". Rock and rotate the cylinder liner, pressing down as before until the second ring is guided into the liner. Repeat the operation until the third ring is guided into the liner. When all rings are in the liner, push the liner all the way down into the cylinder housing. Never use a hammer or try to drive cylinder liner in place after "O"-ring makes contact with the housing. Cylinder liner should be pushed into place. This can be done by hand. If the liner assembly will not go all the way, it may be that the suction valve plate is not properly centered on the top of the liner. Loosen the three socket head cap screws while pushing the liner into place (Figure 16). When liner is in place, tighten the socket head cap screws.

To Install: (Cylinder Liner Assembly With Unloader)
The installation of the cylinder liner assembly with unloader is the same as the installation of the plain liner above as far as entry of the piston and rings is concerned. The main difference, however, is in the proper positioning of the housing. The unloader cylinder housing is fitted with a roll pin and an oil connector as shown in Figure 17. The under side of the unloader assembly has two holes which correspond to the above. The holes are 180° apart. The roll pin dowel protrudes further from the face of the housing than does the oil connector. The roll pin serves as a guide for the unloader assembly and permits proper registration of the oil connector. Before inserting the cylinder liner with unloader assembly into the housing, make sure that the holes of the unloader are positioned so that the dowel and oil connector will register properly.

> CAUTION: The dowel pin hole in the unloader assembly is smaller than the oil connector hole. The oil connector hole will pass over the dowel, but the dowel hole will not go over the oil connector. Forcing the unloader assembly is improperly positioned by 180 ° will cause excessive damage to the oil connector.

The cylinder liner assembly with unloader should be pushed down into the housing the same as described above. When unloader comes in contact with the roll pin dowel, slowly rotate assembly back and forth until roll pin registers in unloader. Push liner assembly into housing. Do not try to force down as small unloader hole may be registering with the oil connector. If liner does not go in readily, remove from housing and check position of holes with respect to the dowel and oil connector. If an attempt has been made to force unloader down while positioned incorrectly, check the oil connector for possible damage. A damaged oil connector "O"-ring can cause erratic functioning of the unloader mechanism. If, after the roll pin dowel and oil connector have registered, the cylinder liner will not go all the way into the housing, check alignment of suction valve (Figure 16) as described in "TO INSTALL CYLINDER LINER WITHOUT UNLOADER," Page 8).

Figure 16

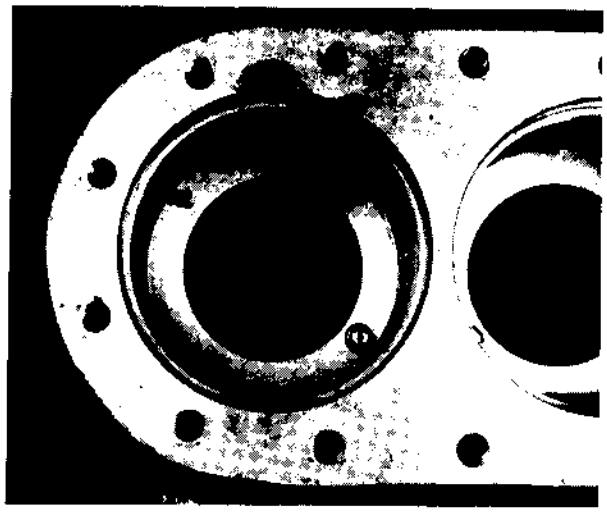

Figure 17

Cylinder Unloader Assembly

Three of the four cylinder liners in the four cylinder model compressors are equipped with unloader assemblies. Four of the six cylinder liners in the six cylinder model compressors are equipped with unloader assemblies. Six of the eight cylinder liners in the eight cylinder model compressors are equipped with unloader assemblies. This mechanism acts to load or unload the compressor cylinder by controlling the seating of the suction valves. The unloader mechanism acts to load or unload the compressor cylinder by controlling the seating of the suction valves. The unloader mechanism slips into place over the cylinder liner and seals against the liner with "O"-rings. No bolts are required to fasten the unloader mechanism to the cylinder liner. The unloader mechanism is a sub-assembly which is not to be serviced in the field. Should the unloader become inoperative, the entire unloader sub-assembly must be replaced.

To Remove:
The unloader mechanism is removed from the cylinder liner by gripping the unloader assembly in the hands and striking the skirt or bottom of the cylinder liner against a soft wood surface (Figure 18). Be sure that the unloader mechanism is held firmly between the two hands and that the bottom of the cylinder liner strikes evenly against the wood surface. Also be sure that the wood surface is soft and free of any hard metal particles or tools that would damage the bottom of the liner assembly when it strikes the wood surface.

Figure 18

To Install:
The unloader mechanism slides onto the cylinder liner and is sealed in position by two "O"-rings. Before placing the unloader mechanism on the cylinder liner, oil the external surfaces of the cylinder liner and the internal surfaces of the unloader with clean compressor oil. Be sure the "O"-rings are well lubricated. Invert the cylinder liner on the table or bench. Be sure that the work surface on which the cylinder liner assembly is resting is clean and free of hard metal particles which would damage the valve seat on the top of the cylinder liner (Figure 18). With the cylinder liner inverted on the bench, place the unloader mechanism squarely in position on the skirt or bottom of the cylinder liner (Figure 19). Slowly and evenly with a firm pressure, push the cylinder unloader mechanism down on the cylinder liner.

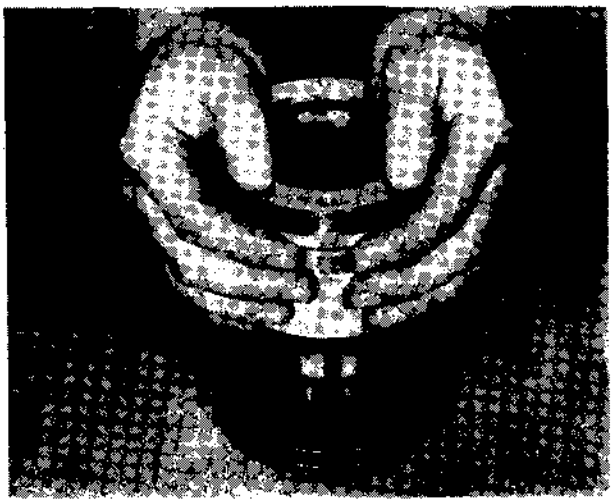

Figure 19

> CAUTION: Be sure that fingers are free and do not get pinched between the cylinder unloader mechanism, and the take-up ring on the cylinder liner.

When the unloader mechanism is finally in place, the unloader mechanism should be touching the surface of the take-up ring. Be sure that retaining ring is properly in place in the slot in the cylinder liner so that unloader mechanism and take-up ring will operate correctly.

Suction Valve Assembly

In the Trane Model A and B Compressors, the discharge valve cage assembly is mounted on the top of the cylinder liner and a part of its valve seat is formed by the valve plate which holds the suction valve mechanism in place on top of the cylinder liner. The top surface of the cylinder liner forms the seat for the suction valve. The discharge valve assembly, the suction valve assembly and cylinder liner assembly are all held in place within the cylinder by the safety head spring which is compressed against the discharge cage by the cylinder head. The compression chamber is isolated from the crankcase by an "O"-ring seal around the liner against the cylinder wall.

This type of valve and seat design differs from the type of design which incorporates a valve plate assembly wherein the suction and discharge valves are bolted to a single plate which covers two cylinders. The valve design of the Trane Model A and B Compressors eliminates the extra bolts and gaskets which are a necessary part of the valve plate assembly type of design.

To Remove:
The suction valve assembly is located on top of the cylinder liner and is held in place by a valve plate and three socket head cap screws. The entire suction valve assembly can be removed and replaced as a unit or it can be disassembled and broken or worn pieces replaced. When the entire suction valve assembly is replaced, the liner and valve plate assembly is replaced as a unit. If parts of the suction valve are to be replaced, stand the cylinder liner in upright position and remove the three socket head cap screws. When the three screws are removed, be careful not to move the valve plate around on the top of the cylinder liner (Figure 20). With the screws removed,

Figure 20

Figure 21

carefully invert the cylinder liner and valve assembly set up in inverted position, the liner can be drawn away from the valve assembly (Figure 21) without the component parts of the valve assembly falling out. With the cylinder liner separated from the valve assembly, the valve ring and the valve springs and the "O"-ring can be removed (Figure 22).

To Assemble:
With the suction valve plate in an inverted position, place the "O"-ring in place on the valve plate. Place the springs in position in the spring pockets (Figure 23). Place the valve ring in position in the valve plate (Figure 24). Be sure the valve ring is centered so that the valve movement is not restricted. Place the valve plate assembly in an inverted position on the work table and carefully locate the cylinder liner on the valve plate (Figure 21). Holding the valve plate against the cylinder liner, invert the liner and valve assembly and set in upright position on the table. Insert the socket head cap screws but do not tighten in place (Figure 20). With the socket head cap screws snug but not fully tightened, invert the cylinder liner and check the movement of the valve to see that it is not restricted or "pinched" within the assembly (Figure 25). The socket head cap screws can now be tightened down as the valve ring is in its proper position.

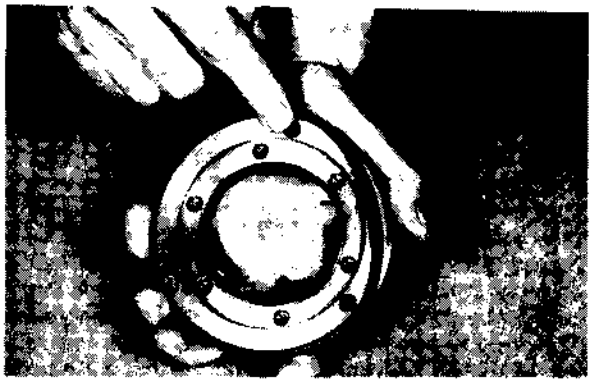

Figure 22

Figure 23

Figure 24

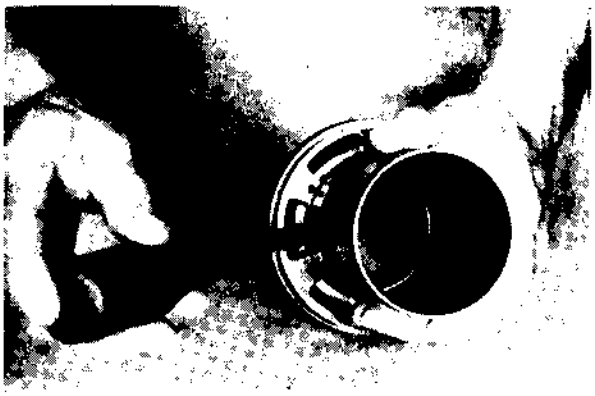

Figure 25

Take-Up Ring and Lift Pins

The cylinder liner which is used in the cylinder without unloading mechanism and the cylinder liner which is used with the unloader are the same and the two are interchangeable. The cylinder liner with the unloading feature includes, besides the unloader mechanism, a take-up ring and lift pins. When the unloader is in the "loaded" position, the take-up ring and lift pins are down and the suction valve is free to operate in a normal fashion. When the unloader mechanism is in the "unloaded" position, the take-up ring and the lift pins are up and the lift pins register against the underneath surface of the suction valve ring and hold the valve off its seat.

To Disassemble:
Place cylinder liner on work area in an inverted position. Release retaining ring and slide off cylinder liner. Slide take-up ring off the cylinder liner. Remove lift pins and lift pin springs.

To Assemble:
Place cylinder liner on work area in an inverted position. Place springs on lift pins and insert lift pins in holes on underside of cylinder liner (Figure 26). After each pin is inserted, push the pin in and out to be sure that it operates freely. Push take-up ring over and down on cylinder liner (Figure 27). Slide retaining ring over cylinder liner and snap into position in ring groove. With retaining ring in position, work the take-up ring up and down to see that the lift pins move freely and can raise and lower the suction valve ring.

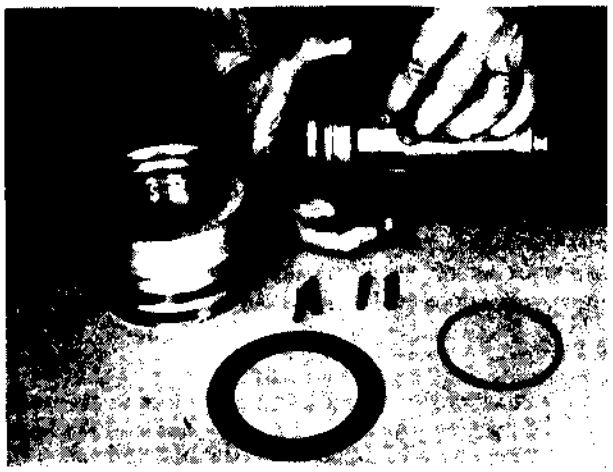

Figure 26

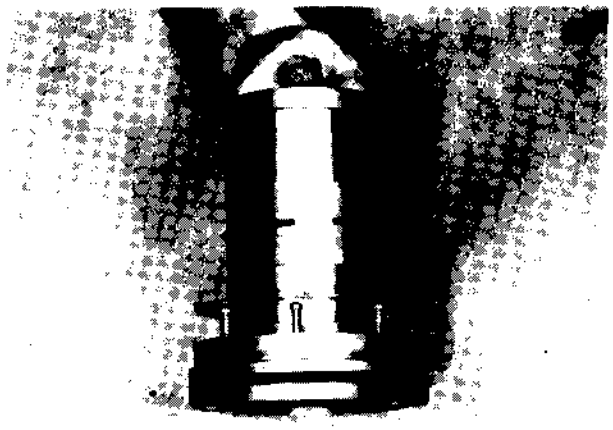

Figure 27

Be sure that lift pins do not bind. The cylinder liner is now ready for the assembly of the unloader mechanism to the cylinder liner (see "TO INSTALL UNLOADER ASSEMBLY" Page 9).

Crankcase Handhole Cover Plates

Trane Compressor crankcase incorporate two large handholes for maximum accessibility with one hole on either side of the crankcase. These handholes are closed off with handhole covers. The handhole cover on the back side of the compressor is fitted with two tappings, one for a crankcase oil equalizing line and the other for a crankcase oil heater, should such a heater be required with a compressor installation.

The handhole on the front side of the compressor contains the oil level sight glass and the complete compressor capacity control actuator. This capacity control actuator is self-contained and its range is adjustable by a screw located in the front side of the cover assembly. The handhole cover also contains a cleanable oil strainer. Figure 28 shows the face or front side of the handhole cover assembly.

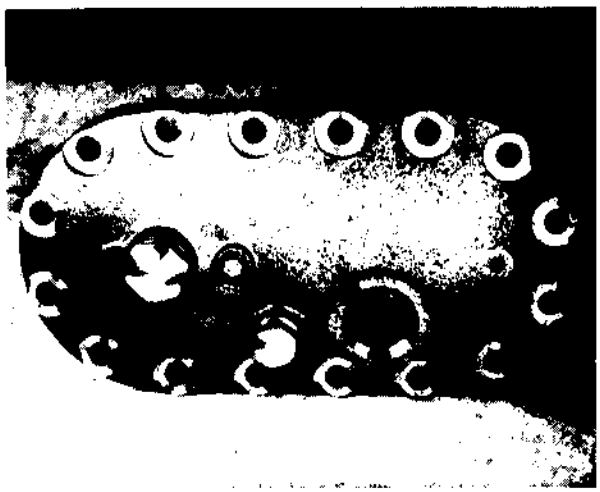

Figure 28

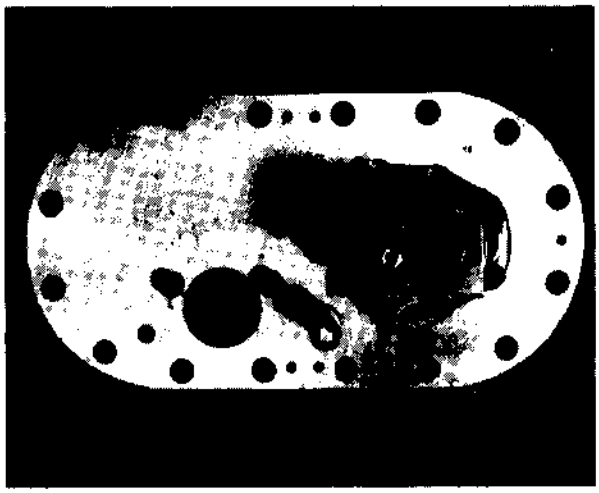

Figure 29

Figure 29 shows the reverse side of the handhole cover assembly with the capacity control mechanism. This capacity control mechanism is a complete assembly and can be removed as a unit with the handhole cover. The capacity control mechanism is a sub-assembly which is not to be serviced in the field. If the capacity control mechanism becomes inoperative, the entire handhole cover assembly and capacity control actuator should be replaced as a unit.

The capacity control mechanism can operate as a self-contained device, which is dependent upon suction pressure variations to load and unload the machine or the mechanism can be fitted with an external electric or pneumatic control. For adjustments to the capacity control mechanism and explanations of the external connections to this control together with information as to the operation of this device, (see OPERATION, "COMPRESSOR CAPACITY CONTROL OCOM-M-2".)

To Remove:
Before removing the handhole covers, the oil must be drained from the compressor (see OCOM-M-2). When the oil has been drained from the compressor, either handhole cover may be removed without breaking any internal connections. However, on the handhole cover with the sight glass and capacity control mechanism, all pressure control tubing must be removed from the connections on the face of the handhole cover. On present Model A and B Compressors, the control tubing is connected to the crankcase housing proper and is not connected to the face of the handhole cover.

Loosen and remove all but the top center cap screw on the handhole cover. The top screw should be backed out approximately 8 to 10 turns but should be left in the compressor housing to support the weight of the handhole cover when it breaks loose from the gasket which seals the opening. With all but one of the screws removed, lightly tap around the rim of the handhole cover to break it loose from the gasket. When the gasket seal behind the crankcase handhole cover is broken, support the cover with the hand at the bottom of the cover and remove the remaining cap screw. The cover can then be drawn away from the compressor as there are no internal connections behind the cover to disconnect.

The blank handhole cover on the back side of the compressor can be removed in a similar fashion. Always leave the top center bolt in place to support the weight of the cover while breaking the gasket seal behind the cover.

To Install:
Before placing the crankcase cover in position against the compressor housing, make sure that the cover is free of dirt. Place two cap screws through the cover. Oil the gasket with clean compressor oil and place the gasket against the two cap screws and against the cover plate. Position the cover gasket and two bolts against the opening in the crankcase and draw up the two bolts, hand tight. Insert the remaining cap screws and pull them up hand tight. When the handhole cover is in position with all cap screws hand tight, the screws can be tightened to final torque. After bolts are torqued up, recheck all bolts to see that the torque is proper. See Table 3

Table 3 — Handhole Cover Bolt Torques

1 - Model A Compressor - 76 Foot Lbs.
2 - Model B Compressor - 43 Foot Lbs.

Piston and Wrist Pin Assembly

Pistons of Trane Compressors are of the automotive type, lightweight, cast aluminum. The flexible can ground skirts of the piston assure close fit under low or normal piston temperatures and prevent seizure under high piston temperatures and prevent seizure under high piston temperatures. Piston pins are of floating type and are held in position by snap rings. The pistons are fitted with two compression rings and one oil control ring. Since the suction valve is not located in the piston, reciprocating weight is held to an absolute minimum.

To Remove:
With a Tru-Arc wrench remove the two snap rings that hold the wrist pin in place in the piston. The wrist pin can now be removed from the piston by driving the pin out through the wrist pin hole, using a wood block or a brass driving rod. Use care not to nick the surface of the piston or distort the shape of the hole.

To Install:
Position the connecting rod in the piston and drive the wrist pin through the wrist pin hole in the piston and through the connecting rod. The wrist pin is driven into position by tapping lightly with a rawhide mallet and brass driving rod. When the wrist pin is in its final position, insert, with a Tru-Arc wrench, the two wrist pin locking rings.

Piston Rings

The three piston rings when replaced should be replaced as a set. A set consists of two compression rings and one oil control ring. These rings should be carefully fitted into the grooves in the piston and should be clean and free from dirt and burrs after assembly on the piston.

To Remove:
The piston rings can be removed from the piston by using shim stock between the rings and the piston. Carefully work the rings out of the groove and slide them over the shim stock and off the piston. Care should be used in removing the rings as they are easily broken.

To Install:
To install the rings, work them carefully down over the piston to their proper groove using shim stock to aid the rings into position. The oil control rings goes in the bottom groove on the piston and the two compression rings go in the upper two grooves. When the rings are in final position, check to see that they move freely on the piston in the grooves.

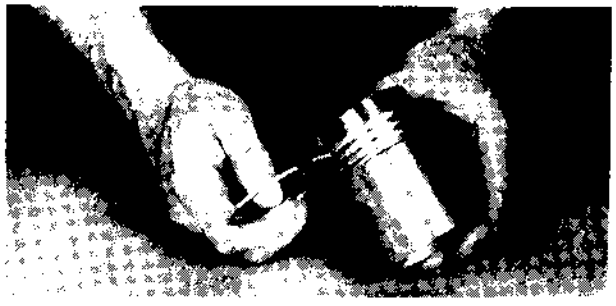

Figure 30

When installing new rings on the piston, be sure that the grooves in the piston do not have any burrs and that the grooves are free of dirt. Before placing the piston rings in the grooves on the piston, check to see that the rings fit the grooves freely. The back edge of the ring can be rolled around the circumference of the piston to see that it fits freely (see Figure 30).

Connecting Rod And Piston Assembly

The connecting rods are heat-treated aluminum alloy having a good bearing quality, high mechanical strength and light weight. No bearing inserts are used, permitting good tolerance control and maximum heat transfer from bearing surfaces. The bearing surface is treated with graphitic material for longer life. Connecting rods are oval-bored at both ends. This oval fit insures good bearing contact at both high and low operating temperatures. When the compressor chills down rapidly, the rod shrinks faster in size than the crankshaft due to the difference of materials in the connecting rod and the crankshaft. With the oval type bore, seizure is prevented as the rod and shaft temperature is decreased.

The connecting rod bolts are undercut for increased strength (see Figure 31).

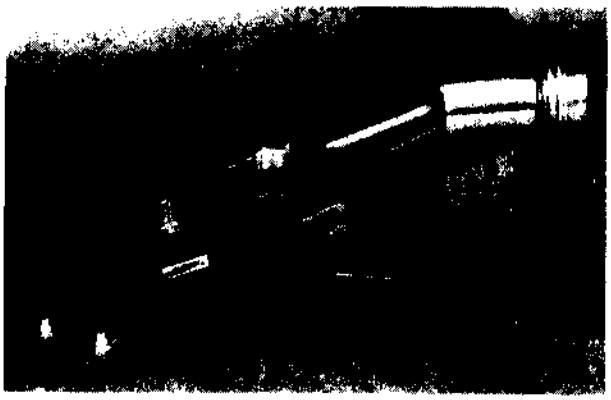

Figure 31

To Remove:
Remove cylinder head (see "TO REMOVE CYLINDER HEAD," Page 4). Remove discharge valve cage (see "TO REMOVE DISCHARGE VALVE CAGE," Page 5). Remove cylinder liner (see "TO REMOVE CYLINDER LINER," Page 7). Remove handhole covers. Rotate the crankshaft until the connecting rod nuts are accessible through the handhole cover. With a box or socket wrench, loosen and remove the two nuts from the connecting rod bolts. These nuts are crimped and must be run all the way off with a wrench. Remove connecting rod washers. Connecting rod bolts are body bound in the connecting rod and rod cap and must be driven out of the connecting rod cap.

With the block of wood or lightweight mallet, slowly and alternatively drive the connecting rod bolts up through connecting rod. When body bound section is free of the connecting rod cap, the cap can be removed. After the cap has been removed, the piston and connecting rod assembly can be drawn out through the top of the cylinder.

To Install:
Before installing the connecting rods on the crankshaft be sure that the bearing surfaces of the shaft and the connecting rod are clean and free of dirt. Lubricate the bearing surfaces on the rod and shaft with clean compressor oil. Inasmuch as connecting rod bolts are body bound, they must be driven into place with a lightweight mallet or hammer (Figure 32). Be sure that the flat side of the head of the connecting rod bolt is properly positioned with respect to the metal keeper and the shank of the connecting rod.

All connecting rods have two match marks which identify the rod and cap as a unit. THESE TWO MATCH MARKS MUST BE ASSEMBLED SO THAT THEY ARE ON THE SAME SIDE OF THE ROD AND when assembling the rods on the shaft, the match marks are always assembled with the match marks facing the seal end of the compressor (Figure 33).

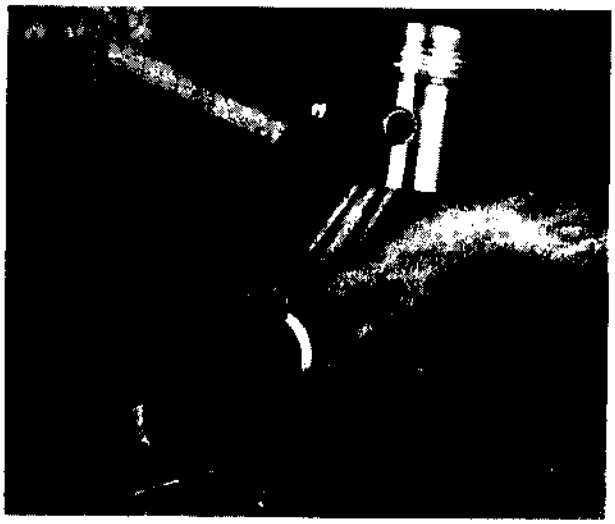

Figure 32

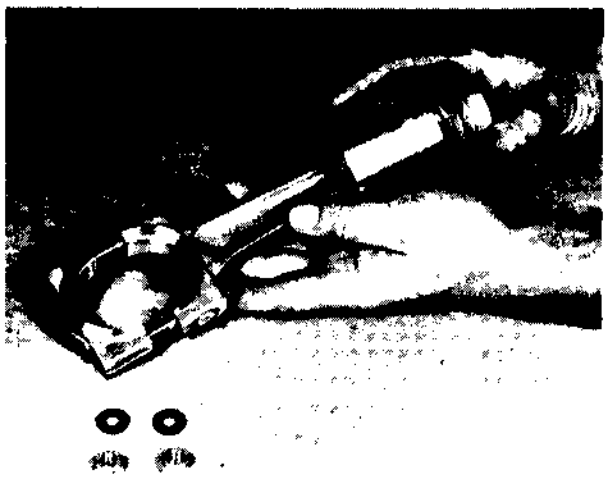

Figure 33

Invert cylinder liner assembly on clean work surface using care not to mar the valve seat on the top side of the liner assembly. Rotate the piston rings on the piston to stagger the gap in the piston rings. Start the head of the piston down into the cylinder liner. The cylinder liner skirt is tapered as is the tip of the piston to assist the entry of the piston and ring into the liner. With the piston started into the liner, rotate and rock the piston and at the same time press down firmly on the skirt of the piston (Figure 34). This rocking and rotating motion will cause the rings to enter the cylinder liner. After all rings have passed the bottom of the liner skirt, push the piston down into the liner until the bottom of the piston is even with the bottom of the cylinder liner. With the piston inserted into the liner, rotate the liner with reference to the connecting rod so that when the side of the rod with the match mark is facing the seal end of the compressor, the register pin hole and oil connector hole are properly aligned for entry and location within the cylinder (see "TO INSTALL CYLINDER LINER ASSEMBLY WITH UNLOADER," Page 8). With the rod and liner in this position (Figure 35), rotate the crankshaft until the shaft journal is in position to accept the connecting rod. Push the entire assembly down into the cylinder and with the locating pin and connecting rod in position in the cylinder liner unloader assembly, press the liner into final position (see "TO INSTALL CYLINDER LINER WITH UNLOADER," Page 8). With the rod in position against the shaft, place the cap onto the connecting rod bolts. Be sure that the match marks on the cap face the seal end of the compressor. The connecting rod cap will not go all the way onto the connecting rod bolts due to the fact that the bolt is of the body bound type. The rod camp must be drawn into final position by the connecting rod bolt nuts. With the cap in position and as far on the bolt as it will go, place the connecting rod bolt, washers and nuts in place and tighten the connecting rod nuts on the bolts.

When drawing up the connecting rod nuts, do so alternately so as not to pull the cap up against the rod unevenly. If the cap is pulled on the bolts unevenly, it can be badly distorted and will be damaged when the compressor is placed in operation. The connecting rod nuts should be drawn up hand tight and their final tightening should be done with a torque wrench. It is essential that these nuts be finally drawn up with a torque wrench as improper tension on these rods will cause distortion of the fit of the rod and will result in premature wear and possible complete failure of the connecting rod bearing. After torqueing the nuts, recheck to make sure that the torque is correct. See Table 4.

Table 4 — Connecting Rod Bolt Torques

1 - Model A Compressors - 20 Foot Lbs.
2 - Model B Compressors - 14 Foot Lbs.

CAUTION: After a connecting rod has been tightened up to proper torque, rotate the crankshaft to make sure that the rod turns freely. Repeat as each rod is installed.

Figure 34

Figure 35

Compressor Shaft Seal

The compressor shaft seal is of the standard rotary type. One piece construction on seal cover plate permits fast removal of heat from the sealing surface, thereby providing longer life.

To Remove:
Remove compressor drive coupling (see COUPLING, "TO REMOVE," OCOM-M-3). Loosen and remove all but two of the socket head cap screws that hold the valve plate against the bearing housing. Slowly and alternately back out the two remaining cap screws (Figure 36). The seal plate should be forced away from the bearing housing by the tension of the shaft seal spring. However, if the plate does not follow the two cap screws, lightly tap around the outer rim of the cover plate until it is free from the gasket seal on the housing. Carefully back out the two cap screws so that the plate is removed evenly so as not to distort the seal and cause breakage of the carbon ring within the seal. When the plate has been removed, the seal assembly can be drawn out of the compressor. In some cases the neoprene ring will adhere to the crankshaft. If the seal spring pressure does not force the carbon nose ring and retaining flange clear of the seal housing, it can be loosened from the shaft by the use of a seal puller or hooking small Allen wrenches behind the neoprene ring and forcing the ring off the shaft shoulder. Use extreme care in handling the seal assembly as the carbon nose ring can be cracked very easily.

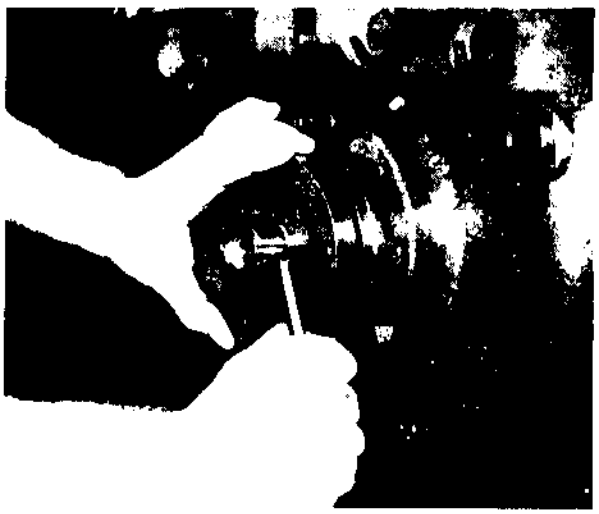

Figure 36

To Install:
In some instances it may be possible to reuse the shaft seal assembly. However, if the seal has had excessive wear or is damaged, it should be replaced with a complete new seal assembly. Never attempt to replace any of the single components of the seal assembly. The seal must always be replaced as a complete unit consisting of spring, neoprene ring, retainer, carbon nose ring, gasket and seal cover face plate. Before inserting the seal in the bearing housing and on the shaft, make sure that the shaft is smooth and free of dirt (Figure 37). To assist the entry of the neoprene ring into the seal housing, lubricate the crankshaft with clean compressor oil or clean white petroleum jelly. After the shaft is cleaned and lubricated, do not touch the surface again with the fingers.

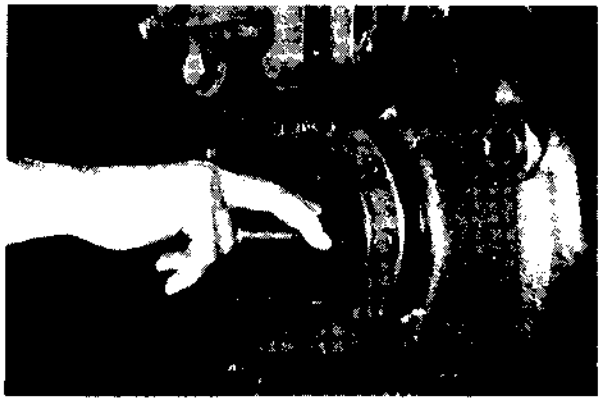

Figure 37

Position seal spring on shaft (Figure 38). Place neoprene ring and retainer ring in position on shaft and slide onto shaft as far as the ring will go. Use care not to cut neoprene on sharp edges of shaft keyway. Thoroughly clean carbon nose ring with a suitable refrigeration compressor parts cleaner. Examine face of carbon nose ring to see that it is free of dirt and is not cracked or chipped. After carbon nose ring has been cleaned, do not touch the sealing surfaces again with the fingers.

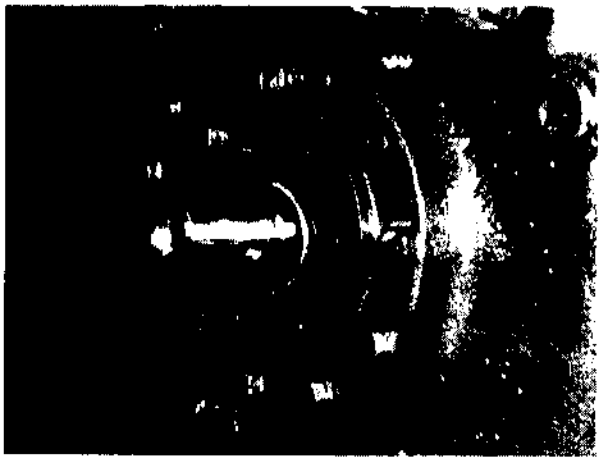

Figure 38

Wet the face of the carbon nose ring with clean compressor oil before putting it in position on the shaft. Place the carbon nose ring into the ring retainer making sure that the notches in the retainer are properly aligned with the notches in the carbon nose ring (Figure 40). Carefully clean and lubricate the face of the seal housing cover plate. Insert two socket head cap screws through holes on opposite sides of the plate (Figure 36). Lubricate gasket with clean compressor oil and place it over cap screws and against flange on cover plate. Position the cover plate and bolts against the compressor housing. Press the seal assembly into the housing evenly and engage both socket screws in the bearing head. Do not pull one screw down more than the other as distortion at this point may cause breakage of the delicate carbon nose ring. Slowly and alternately draw the seal housing cover plate against the seal housing until the two socket head screws are hand tight. Insert and tighten the remaining screws. After all the screws are in place, they should be tightened into final tension with a torque wrench. See Table 5.

Table 5 — Seal Housing Cover Plate Bolt Torques

1 - Model A Compressors - 23 Foot Lbs.
2 - Model B Compressors - 23 Foot Lbs.

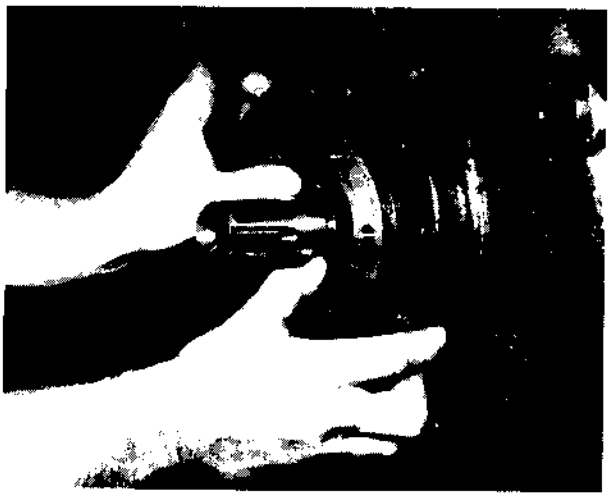

Figure 39

Figure 40

Suction Strainer Assembly

In operation, the suction gas enters the large volume separation chamber of the compressor from the top. Immediately upon entry, the gas strikes the rounded surface of a large circular suction strainer pan. At this point, heavy foreign particles, droplets of oil or liquid refrigerant, if present, are separated from the refrigerant by a combination of gas velocity and gravity and drop to the bottom of the suction chamber.

The suction gas is then deflected at right angles from the suction strainer pan and again by the suction end cover. Changes in direction of gas flow effectively separate foreign particles before they can damage the suction strainer screens.

Heat from the compressor tends to vaporize any slugs of refrigerant into dry gas. This insures maximum dry gas return to the cylinders.

The large suction chamber also insures the delivery of uncontaminated gas to the cylinders. Its size makes it possible to collect oil, metal shavings or liquid refrigerant slugs and hold them for proper disposal.

One suction strainer screen is provided for every two cylinders. These strainers are in a horizontal position, protected by the suction strainer screen.

An uninterrupted flow of refrigerant is conducted to the suction valves through the gas passages in the compressor housing.

The small amount of oil returning with the suction gas collects in the suction chamber. After a certain level is reached, the oil flows back into the crankcase through a fiber wool filter and an oil check valve.

To Remove:
Remove all of the suction cover cap screws with the exception of the top screw. Back out this top screw 10 or 12 full turns. The screw is left engaged in the threads to support the weight of the suction cover plate when the gasket seal is broken between the cover plate and the crankcase housing. The cover plate is provided with jack screw holes and two of the cap screws should be inserted into these jack screw holes to assist in breaking the gasket seal. Run the jack screws in through the cover plate until the seal is broken. Remove the top cap screw and at the same time support the weight of the cover with the hand at the bottom of the cover plate.

After the cover plate has been removed, the strainer pan can be removed from the suction chamber. The suction strainer screens can now be cleaned and if the oil filter at the bottom of the strainer assembly is badly contaminated, it can be replaced. This oil filter is a sealed assembly and cannot be cleaned. If it is dirty, it must be replaced. If it is found necessary to replace this filter, remove the two screws and lockwashers and replace filter and reinsert the screws and lockwashers.

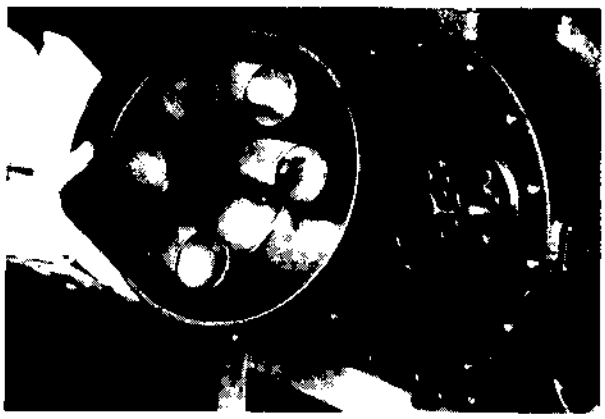

Figure 41

To Install:
When the strainer pan is inserted in the suction chamber, the guide post must register in the slot in the bottom of the bearing head (Figure 41). The strainer pan, when in proper position, is supported by the two legs on the underneath surface of the strainer pan assembly. The strainer pan is held firmly in position by a spring action of the housing cover pressed against the face of the strainer

pan. As the cover cap screws are drawn into place, the inner face of the cover will depress the face of the pan and hold it securely in place. Before placing the cover in position, insert a cap screw in the top and bottom of the cover, lubricate the surface of the gasket with clean compressor oil and position the gasket on the two cap screws and against the cover plate.

Position the cover plate against the face of the suction chamber and tighten the two cap screws. Insert the remaining cap screws and draw them up hand tight. When all of the cap screws are hand tight, final tightening should be made with a torque wrench. After the bolts have been drawn up to the proper torque, recheck the torque to insure that it is correct. See Table 6.

Table 6 — Suction Cover Bolt Torques

1 - Model A Compressors - 115 Foot Lbs.
2 - Model B Compressors - 58 Foot Lbs.

Oil Pump Assembly

The oil pump used in Model A and B Compressors is a force feed, direct drive, positive displacement pump which is self-reversing in operation. The pump will operate regardless of the direction of rotation of the compressor; thus, even though the electric line phasing is accidentally reversed, the compressor will still operate properly. The oil pump is a complete assembly and should not be serviced in the field. If the oil pump becomes inoperative, the complete oil pump assembly should be replaced.

To Remove:
The oil pump assembly is held in position on the bearing head and against the end of the crankshaft by four socket head cap screws. Loosen and remove the four cap screws and lockwashers. Rock the oil pump assembly up and down to break the gasket seal. Do not strike the oil pump assembly with a hammer.

To Install:
Before placing oil pump in position on the bearing head, be sure that the face of the bearing head and the face of the oil pump flange are clean and free of dirt. Place two cap screws through the holes in the flange of the oil pump. Lubricate the gasket with clean compressor oil and position gasket over screws against the flange of the oil pump assembly. Be sure that the holes in the gasket register with the holes in the bearing head. The drain slot in the oil pump assembly must be at the bottom (Figure 42). Oil pump drive key must be turned to the position required to fit properly in the slot in the end of the crankshaft. Assemble oil pump with the four bolts and lockwashers, pulling up the bolts to the required torque. See Table 7.

Table 7 — Oil Pump Bolt Torques

1 - Model A Compressors - 14 Foot Lbs.
2 - Model B Compressors - 14 Foot Lbs.

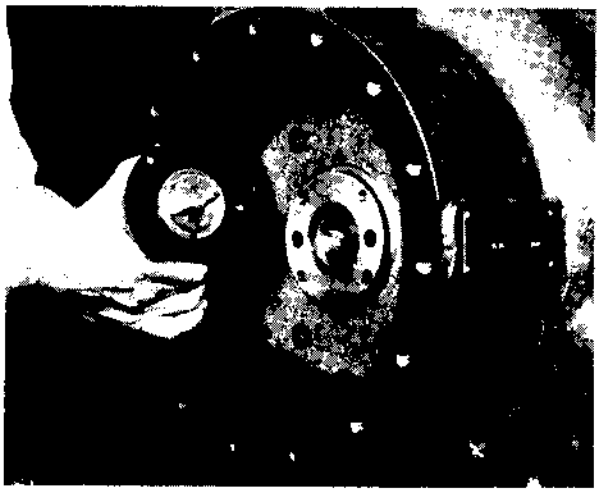

Figure 42

Main Bearings

The main bearings in the compressor are sleeve type, steel backed babbitt. The bearings are pressed into bearing heads and cannot be replaced in the field. If the bearings become damaged or worn, the entire bearing head assembly must be replaced.

The bearing head on the pump end of the compressor contains the foam-breaker.

Within the pump end bearing head is a magnetic plug to filter steel particles out of the oil before the oil passes into the crankshaft and bearings.

The bearing head also contains a pressure relief valve. This valve is a spring-loaded ball seating type valve (Figure 43). Whenever the crankshaft or main bearings are replaced, adjustment of the crankshaft end play must be made.

Crankshaft

The crankshaft can easily be slipped in and out of the large opening in the compressor suction chamber. Because of the compactness and weight of the shaft, no blocking is necessary when the shaft is removed. The crankshaft is built in one piece and does not have detachable counterweights. Because of this feature, shaft balance is always maintained.

The crankshaft is one of the main parts of the compressor lubricating system. Separate oil feed lines to bearings and other wearing parts of the compressor have been eliminated. Crankshaft oil passages are scientifically arranged to feed from the inside of the crankshaft throw. Centrifugal force thus keeps any dirt particles that have escaped previous cleanings away from the bearings. Two magnetic plugs in the oil passage in the shaft trap steel particles. Because of this feature, the bearings run dirt free, aiding in long compressor life.

Oil escapes between the connecting rod bearings and is converted into a mist to lubricate wrist pins and cylinder walls. A tapered hold at the top of the connecting rod collects the oil mist and allows it to feed down into the wrist pin bearing surfaces.

To Remove Pump End Bearing:
Remove shaft seal assembly (see "TO REMOVE SHAFT SEAL ASSEMBLY," Page 15). Remove suction cover (see "TO REMOVE SUCTION COVER," Page 16). Remove oil pump (see "TO REMOVE OIL PUMP," Page 17). Remove handhole covers (see "TO REMOVE HANDHOLE COVERS," Page 12). Remove piston and connecting rod assemblies (see "TO REMOVE PISTON AND CONNECTING ROD ASSEMBLIES," Page 13). Remove bearing head cap screws and lockwashers from pump end bearing. Insert cap screws in jack screw holes and break gasket seal between face of bearing and compressor housing. If the shaft is frozen within the bearing on the pump end but not on the seal end, the shaft may follow the pump end bearing as it is withdrawn from the housing. While withdrawing the pump end bearing, watch the shaft and if it is following the bearing head, support the shaft with hand through the handhole cover in the crankcase. However, if the shaft does not follow the bearing head back the bearing head out and support the bearing head with the hand at the bottom. The bearing head has a lip which fits into the compressor housing (see Figure 43). When the lip of the bearing head is free of the housing, it can be removed from the end of the shaft. The shaft does not have to be supported, for it will balance in the seal end bearing housing without damage to the seal end bearing.

Figure 43

To Remove Crankshaft:
The crankshaft is removed from the compressor through the suction end of the compressor. Before removing the crankshaft remove the connecting rods and piston assemblies (see "TO REMOVE HANDHOLE COVER," Page 12). Remove Seal (see "TO REMOVE SHAFT SEAL," Page 15) and pump end bearing (see "TO REMOVE PUMP END BEARING," Page 18). Grip the crankshaft at the center and at the pump end of the shaft. One hand is through the handhole opening and the other at the end out of seal end bearing. Do not bump bearing with shaft end. When shaft end is clean of bearing, rest counterweight of shaft on bearing housing of compressor (see Figure 45). Shift hands so that shaft is gripped through suction end of compressor. Draw shaft out of compressor housing.

If the seal end bearing is to be removed (see "TO REMOVE PUMP END BEARING," and "TO REMOVE CRANKSHAFT," Page 18). The main bearing on the seal end is removed from the housing by first removing the cap screws from the bearing housing and inserting the cap screws into the jack screw holes in the bearing housing. Run the cap screw into the jack screw holes and break the gasket seal between the bearing head and the crankcase housing. The bearing housing has a lip which fits into the crankcase housing.

To Install Main Bearings and Crankshaft:
Cover smooth face of bearing thrust collar with clean compressor oil. Place thrust collar against bearing head

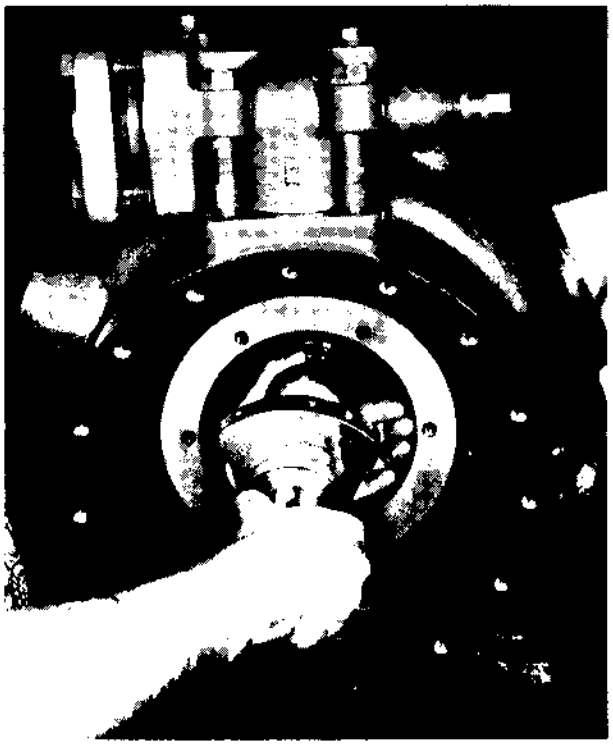

Figure 44

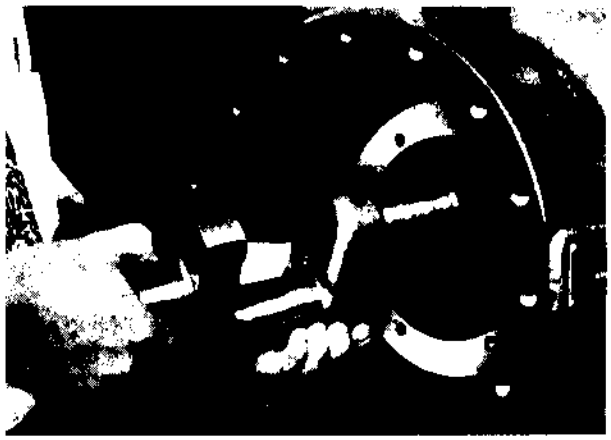

Figure 45

with smooth face against bearing head and groove side toward crankcase. Be sure thrust collar is properly located on bearing head register pin.

Lubricate all bearing surfaces on crankshaft. Insert crankshaft into compressor housing and support the weight of the shaft counterweight on the compressor housing (see Figure 45). With the shaft in this position, shift grip on shaft so that one hand is supporting the crankshaft through the handhole in the crankcase and the other hand is supporting the end of the crankshaft at the suction chamber end of the crankcase (see Figure 44). Carefully guide the seal end of the shaft into the main bearing on the seal end of the compressor. Do not bump bearing with the end of the shaft as the bearing surface is very soft and can become badly scratched or raised if struck by the end of the shaft. When the end of the shaft is started into the bearing, carefully push the shaft all the way into the bearing until the shoulder of the shaft is against the thrust collar.

When the shaft has been positioned as above, it can be released and does not need to be supported or blocked from the underside.

Cover smooth face of pump end bearing and smooth face of thrust collar with clean compressor oil and position thrust collar on bearing head register pin. Smooth face of thrust collar is toward the bearing head and the grooved side of the thrust collar is toward the shaft and crankcase.

Before placing shims in position on bearing head, be sure that face of flange on bearing head is clean and free of dirt. Also be sure that base of crankshaft is free of dirt. Lubricate end of crankshaft.

When reinstalling the main bearings, the seal end bearing is first placed into the housing and then the shaft is installed, then the pump end bearing is installed. Before installing the seal end bearing, make sure that the crankcase housing face and the flange on the bearing housing are clean and free of dirt. Place two of the bearing head cap screws into the seal end bearing housing. Lubricate the bearing gasket with clean compressor oil and position the gasket over the cap screws against the face of the flange on the bearing head. Position the bearing head, making sure that the marking "Top" on the face of the bearing head is in the proper position.

Slide the bearing head into position in the crankcase and insert all cap screws in the bearing housing. Tighten cap screws to the proper torque with a torque wrench. See Table 8.

Table 8 — Seal End Bearing Head Bolt Torques

1 - Model A Compressors - 43 Foot Lbs.
2 - Model B Compressors - 43 Foot Lbs.

Pump End Bearing Head And End Play Adjustment

Included with each replacement pump end bearing head is a set of paper spacer shims. These shims are of .010" and .015" thickness. Select three .015" shims and place these three shims over the cap screws and against the flange of the bearing head. Do not lubricate these shims and do not lubricate the face of the flange of the bearing head and the face of the crankcase. These shims are to be installed dry. With the shims in place, and the thrust collar properly located on the bearing head register pin, carefully place the gearing head assembly on to the end of the crankshaft. When the lip of the bearing head comes in contact with the hole in the crankcase, raise the bearing head assembly and crankshaft slightly to relieve the weight of the shaft and to position bearing head properly for entry into crankcase. When the bearing head is in the correct position, the lip on the bearing head will slide easily into the crankcase housing. With the bearing head over the shaft and entered into the housing, be sure to locate the "Top" mark on the casting in the proper position. Tighten the two cap screws hand tight. Install remaining cap screws and tighten all bolts to proper torque. See Table 9.

Table 9 — Pump End Bearing Head Bolt Torques

1 - Model A Compressors - 51 Foot Lbs.
2 - Model B Compressors - 23 Foot Lbs.

Crankshaft end play measurement and adjustment is to be made without the shaft seal or connecting rods installed. It cannot be regulated with rods or seal installed.

Push crankshaft against pump end bearing thrust collar. With feeler gauge, measure distance between end of shaft and face of seal end thrust collar. Push shaft against seal end bearing thrust collar and with feeler gauge measure distance between shaft and pump end thrust collar. This measurement should be the same on both ends of the shaft. When taking this measurement, measure around the entire circumference of the shaft to take into account any small burrs that may be present on the thrust collars. A second method of measuring end play utilizes the dial indicator as illustrated in Figure 46. The reference point on the dial indicator is placed against the shaft. The shaft is first pushed against the seal end and then back against the pump end. The difference in dial readings gives total end play clearance.

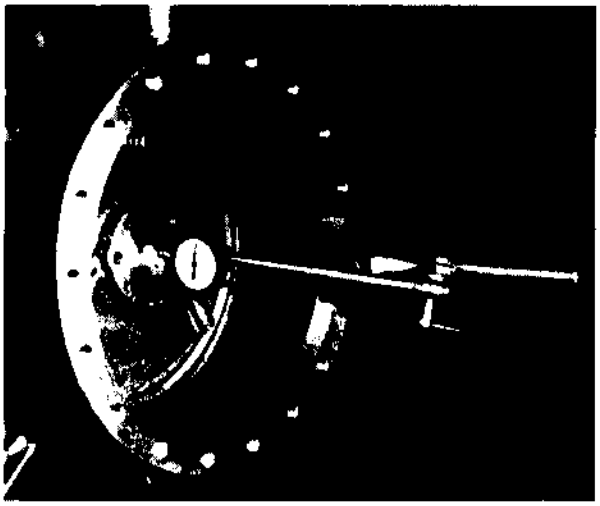

Figure 46

Crankshaft end play clearance on Model A Compressors should be .012" to .020". Crankshaft end play clearance on Model B Compressors should be .008" to .015". Crankshaft end play is adjusted by the number and thickness of gaskets installed between the pump end bearing flange and the housing. If end play, as measured above, is greater than the top allowance, decrease the thickness of the shims. Final end play should be between the limits of .012" and .020" on Model A Compressors and .008" and .015" on Model B Compressors. Enclosed with the bearing head are three shims of .010"thickness and three shims of .015" thickness. A combination of shims should be selected to give proper end play clearance.

When final selection of shims have been placed between pump end bearing and crankcase housing, install bearing head in compressor housing and draw cap screw to proper torque. See Table 9. Recheck end play measurements with feeler gauge.

Foam-Breaker

When compressors are shut down or during the off period, refrigerant pressure within the crankcases tends to build up. When the compressors start up, the pressure within the crankcases is quickly reduced. As the pressure within the crankcases is lowered, refrigerant is leaving the crankcases rapidly. The crankcase oil also tends to leave the compressors and be entrained with the refrigerant. The result is foaming within the compressor oil. The bearing head on the pump end of the Model A and B Compressors contains a foam-breaker which separates the oil from the refrigerant and returns this trapped oil to the crankcase while allowing free passage of the gas into the suction chamber. This reduces the amount of foaming and loss of oil from the crankcase at startup.

The foam-breaker is not a filter or strainer to remove dirt from the crankcase oil. All straining and cleaning of the oil is done by the filter in the suction strainer pan assembly and the filter in the sump of the compressor. Therefore, the foam-breaker should not require any servicing in the field. However, in some instances the oil within the compressor may become excessively dirty or gummed and it may be necessary to take the foam-breaker assembly apart for cleaning.

To Remove:
If it becomes necessary to clean the foam-breaker assembly within the pump end bearing head, remove retaining ring and end ring. This operation is illustrated in Figure 47 and Figure 48. With the end ring removed, the foam-breaker screen can be removed. This is illustrated by Figure 49. The screen and bearing housing can now be cleaned.

Figure 47

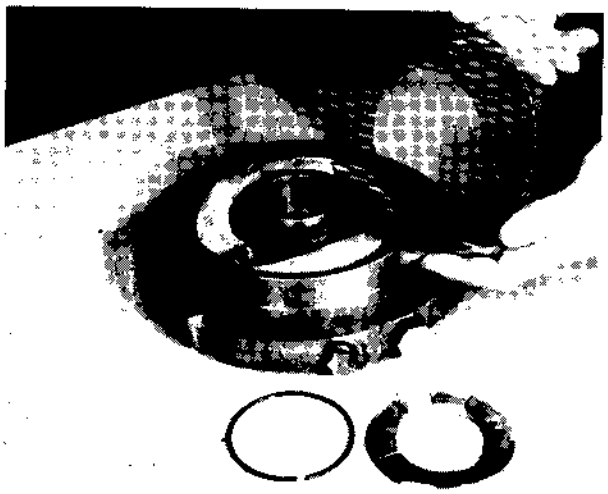

Figure 48

Figure 49

It may be necessary to remove the magnetic plug and the pressure relief valve from the bearing head to clean the passages within the bearing head assembly. This entire assembly can be washed with a suitable refrigeration compressor parts cleaner.

To Install:
Carefully roll foam-breaker screen into approximate shape and insert into bearing head (Figure 49 and Figure 48). Replace end ring and retaining ring. This is shown in Figure 48 and 47. Replace magnetic plug and relief valve.

Crankcase Oil Strainer Assembly

Located in the base of each compressor crankcase is an oil strainer screen assembly. This trainer assembly is connected to the lubricating system through a tube and flare nut attached to the inside wall of the compressor housing.

Oil that returns to the crankcase enters the crankcase suction chamber and filters into the crankcase through the oil filter in the suction strainer pan assembly. Oil enters the crankcase proper through a check valve located in the wall of the compressor housing. The main oil reservoir is located in the crankcase of the compressor housing.

Lubricating oil is drawn from the crankcase through the strainer assembly at the bottom of the crankcase. This strainer, a fine mesh screen covered by an inverted pan, allows a narrow slot between the lip of the pan and the bottom of the crankcase to insure suction to the oil pump even when the oil level is excessively low.

The force-feed positive displacement type oil pump draws the oil from the crankcase through the strainer screen assembly.

Whenever a compressor is opened for repair and cleaning, the strainer pan should be removed and the face of the strainer screen cleaned with a suitable refrigeration compressor parts cleaner.

To Remove:
The strainer screen assembly is held in position in the bottom of the crankcase by a hold-down strip and this hold-down strip is positioned and locked in place by two roll pins. The connection to the crankcase is made by a tube and a flare nut. Loosen but do not disconnect the flare nut connection. Grip the hold-down strip with the fingers on one side of the strainer pan assembly. Rotate the hold-down strip in a circular motion toward the seal end of the compressor. By carefully rolling or rotating the strip, it will turn over and spring free of the roll pins.

When the hold-down strip has been removed, the flare nut is disconnected from the housing and the pan can be removed from the crankcase housing through the handhole opening in the crankcase.

To Install:
Before installing strainer assembly, be sure that strainer assembly is clean and that the inside of the crankcase is also clean.

Place strainer assembly in position and connect flare nut and tube to crankcase housing. Do not tighten flare nut at this time. Leave the connection loose so that the pan can be shifted and positioned within the crankcase.

Place the ends of the hold-down strip against the roll pins in the crankcase housing. The strip should be arched upward at this point. Place the palms of the two hands against the top arch of the hold-down strip (Figure 50). This waving motion will depress the arched strip and snap it into position against the top of the strainer pan. Be careful not to pinch the fingers between the strip and the pan as it snaps into position (see Figure 51). After the hold-down strip has snapped into position, shift the strainer pan so that it is centered under the hold-down strip. With the pan in position under the strip, tighten flare nut connection to crankcase.

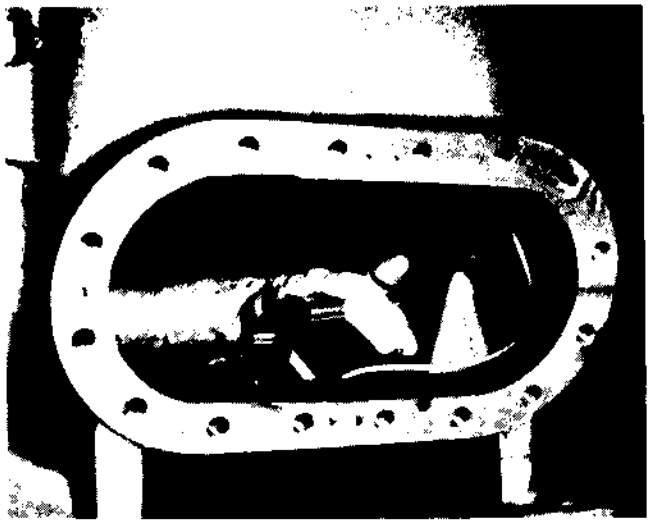

Figure 50

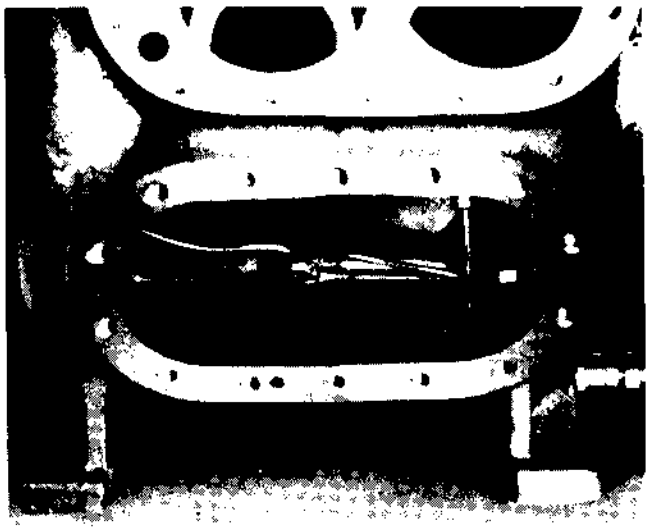

Figure 51