## INSTRUCTIONS and PARTS LIST for Oxweld M-13, M-14, M-15 and M-16 FUEL GAS MANIFOLDS

**CONTENTS**

| DESCRIPTION | 4 |
| INSTALLATION INSTRUCTIONS | 4 |
| TEST FOR LEAKS | 5 |
| OPERATING INSTRUCTIONS | 7 |
| Initial Starting | 7 |
| Alternately Operating the Two Banks of the Manifold | 8 |
| Simultaneously Operating the Two Banks of the Manifold | 8 |
| To Take the Manifold Out of Service | 8 |
| GENERAL INSTRUCTIONS | 8 |
| OPERATING PRECAUTIONS | 9 |
| MAINTENANCE INSTRUCTIONS | 9 |
| PARTS LIST FOR M-13, M-14, M-15, & M-16 | 13 |

**ILLUSTRATIONS**

- Fig. 1-A M-13 and M-15 -- Dimensions and Location of Principal Parts 2
- Fig. 1-B M-14 and M-16 -- Dimensions and Location of Principal Parts 3
- Fig. 2 Support Bracket Installation 4
- Fig. 3 Regulator Connections 5
- Fig. 4 Parts Drawing for M-13 11
- Fig. 5 Parts Drawing for M-14 11
- Fig. 6 Parts Drawing for M-15 12
- Fig. 7 Parts Drawing for M-16 12
- Fig. 8 Parts Drawing for H-12-3M Hydraulic Back-Pressure Valve 14
- Fig. 9 Parts Drawing for V-4 Manifold Valve 15
- Fig. 10 Parts Drawing for RV-26 Relief Valve 15

Be Sure this Booklet Reaches the Operator. You Can Get Extra Copies Through Any LINDE Office.
FIG. 1-B - M-14 AND M-16 FUEL GAS MANIFOLDS — Dimensions and Location of Principal Parts
IMPORTANT

This booklet contains instructions for installing and operating the OXWELD M-13, M-14, M-15, and M-16 Fuel Gas Manifolds. Read it and keep it for future use. If you are not familiar with the general principles of operation and safe practices, which should be understood before using oxy-fuel gas equipment, we recommend your reading the OXWELD Instruction Manual (in addition to these instructions) which you can obtain without charge from any LINDE Office.

Fuel gas manifolds should be installed and operated in accordance with the "Standards of the National Board of Fire Underwriters for the Installation and Operation of Gas Systems for Welding and Cutting," NBFU Pamphlet No. 51.

DESCRIPTION

The M-13 and M-14 are 6-cylinder fuel gas manifolds consisting of two three-cylinder high-pressure headers, six cylinder leads, and one OXWELD R-67-MFD Regulator. In addition, the M-13 is equipped with a hydraulic back-pressure valve.

The M-15 and M-16 are 4-cylinder fuel gas manifolds consisting of two two-cylinder high-pressure headers, four cylinder leads, and one OXWELD R-67-MFD Regulator. In addition, the M-15 is equipped with a hydraulic back-pressure valve.

CAUTION: The M-14 and M-16 Manifolds are "for use only where an oxy-gas or air-gas mixture, together with an ignition source, cannot occur in the supply line." This means the M-14 and M-16 Manifolds should be used only where oxygen or air cannot back up into the fuel gas supply line and only where the combination of an oxy-gas or air-gas mixture in the fuel gas line, together with a possible ignition source, cannot occur.

The manifold headers are mounted on a support rail, which is furnished with brackets for mounting on a wall as shown in Figs. 1 and 2. The two headers are connected by a yoke assembly. The regulator is attached to the yoke assembly and controls the delivery from both sides of the manifold.

Virtually continuous service, without delays for replacing cylinders after they have become exhausted, can be obtained by operating the two sides of the manifold alternately. This is accomplished by operating one side at a time and replacing the exhausted cylinders from the other side before those on the operating side are exhausted. However, if the fuel gas consuming operations are of intermittent occurrence, both sides of the manifold can be operated simultaneously. Thus all of the cylinders on the manifold will supply the consumption load. This method of operation is an advantage in that it extends the serviceability of the manifold by doubling its delivery capacity rate, or where increased capacity is not a factor, by decreasing its discharge rate per cylinder.

I. INSTALLATION INSTRUCTIONS
(Refer to Figs. 1-A and 1-B for dimensions and location of principal parts.)

A. FASTEN THE MANIFOLD HEADER SUPPORT BRACKETS TO THE WALL.

1. If the wall is of masonry construction, use 3/8-in. bolts or lag screws. Thread the bolts into expansion shields placed in holes drilled in the wall (Fig. 2).

2. If the wall is hollow tile, use bolts instead of lag screws. Extend them all the way through the wall and fasten them over a plate or toggle on the opposite side.

3. In setting up a manifold, it is important that the wall brackets be located so that all sections of the manifold header be level and in true horizontal alignment. To prevent misalignment, in locating by measurement from sloping floors or uneven wall surfaces, one bracket should be installed and the other leveled and aligned with it. The manifold header should be level irrespective of the floor surface; any differences in elevation between the cylinder valve outlets and the cylinder connections on the header valves will be taken up by the flexible cylinder leads.

FIG. 2 - SUPPORT BRACKET INSTALLED ON A WALL OF MASONRY CONSTRUCTION
4. Mark the position of the bolt holes on the wall.

5. Disconnect the hydraulic from the outlet pipe and drill the holes for the bracket bolts in or through the wall (see paragraphs A-1 and A-2).

6. Place the hydraulic in position for connection to the manifold outlet pipe. Bolt the support brackets to the wall, using shims if necessary to keep the hydraulic connection union in alignment. Then make up the union connection joining the hydraulic inlet to the manifold outlet pipe.

E. CONNECT THE VENT PIPES

Connect a vent pipe to the manifold relief valve. Also connect a vent pipe to the hydraulic relief valve on the M-13 and M-15. Each of the vent pipes must be run separately to a point outside of the building. This piping must be of good quality, standard weight, galvanized steel pipe with galvanized fittings; must be of the same size as the relief valve vent outlet for its entire length; must terminate not less than 12 feet above the ground at a location remote from windows or openings into buildings, and as far as possible from flues or chimneys. The end must be fitted with a return bend or elbow opening downward, preferably screened or otherwise protected from obstruction by snow, ice, birds, and insects, and be located at least 3 feet from combustible construction. The vent pipes must be installed without traps, and are not to be connected to each other or to any other piping. It is recommended that a long screw or malleable iron union be installed in the vent pipes just above the relief valves.

F. FILL THE HYDRAULIC ON THE M-13 AND M-15

Fill the hydraulic to the indicated liquid-level with PRESTONE brand anti-freeze. Use undiluted PRESTONE brand anti-freeze unless the hydraulic may be exposed to temperatures below 5°F. Where anti-freeze protection at lower temperatures must be provided, use a water solution of PRESTONE brand anti-freeze as directed in the booklet “Cold Weather Care of Acetylene Generating and Distributing Equipment,” Form 3088. This booklet is packed with the hydraulic and additional copies are available from any LINDE Office.

II. TEST FOR LEAKS

A. TEST THE MANIFOLD FOR LEAKS

1. Install a pipe plug in the manifold outlet (in the manifold hydraulic outlet on the M-13 and M-15).

2. Close all header valves except the one on the extreme left-hand side, furthest from the regulator.

3. Close the manifold valves.

4. Connect a full fuel gas cylinder to the left-hand header valve left open in step 2 above. Use the same gas the manifold will carry in service. Before attaching the cylinder, “crack” the cylinder valve (open the valve slightly for an instant, then close) to blow any dust or dirt from the cylinder-valve outlet. DO NOT “CRACK” HYDROGEN CYLINDER VALVES. Connect the cylinder to the header inlet tee by means of the cylinder connection lead. Tighten the connection nut at each end of the lead firmly with a wrench.

5. Release the pressure-adjusting screw of the regulator (turn left counter-clockwise until it turns freely).

6. Open the manifold valves slowly to avoid a sudden surge of pressure into the regulator.
7. Test all joints up to the regulator for leaks with soapy water.

B. TEST THE RELIEF VALVES AND CONNECTIONS
1. Turn in the pressure-adjusting screw of the regulator (turn right — clockwise). The pressure will build up in the piping (and in the hydraulic on the M-13 and M-15) until the relief valves blow off. Observe the pressure at which this occurs. The blow-off pressure should be approximately 50% above the normal line working pressure and the relief valves should seat tightly at normal working pressure. To adjust relief valves, see the RV-26 instruction booklet (F-6978) packed with the manifold. Make all necessary adjustments after all parts of the manifold and piping system have been tested.

2. Back-off (turn left — counter-clockwise) the pressure-adjusting screw of the regulator until the relief valve resets itself.

3. Test all connections on the outlet side of the regulator (including the hydraulic back-pressure valve on the M-13 and M-15) with soapy water.

4. If any leakage is disclosed by this test, relieve the pressure as described in the following steps and remedy the leakage.

5. Close the cylinder valve and header valve to which the cylinder is attached.

6. Lift the cap on the manifold relief valve to release the pressure in the manifold headers. Lift the cap on the relief valve on the hydraulic back-pressure valve on the M-13 and M-15 to release the pressure in the hydraulic.

7. Release the pressure-adjusting screw of the regulator (turn left — counter-clockwise — until it spins freely).

C. TEST THE SERVICE LINE FOR LEAKS
The piping should first be tested for leaks with compressed air. A second leak test using the fuel gas to be manifolded also must be performed. The advantage of using compressed air for the first test is that any major leaks can be detected and repaired without purging the piping. The second testing is necessary because hydrogen and other gases lighter than air will leak through small apertures that do not show up when compressed air is used.

1. Fill the hydraulic back-pressure valves to the indicated level with PRESTONE brand anti-freeze. See paragraph F, Part I.

2. Temporarily disconnect the relief valves on all hydraulic back-pressure valves and close the openings with pipe plugs. If the system contains branch line hydraulic see that the line shutoff valves at the inlet and outlet sides of these hydraulic are open.

3. Cap the outlets of the station valves and open these valves. Where the stations are equipped with hydraulics, cap the hydraulic service outlet and open the shutoff valve on the hydraulic inlet pipe.

4. Fill the piping with compressed air to a pressure equal to 1-1/2 times the normal line working pressure. Test all joints in the piping and all joints in valves or hydraulics for leaks with soapy water. Note the pressure of the air in the piping and the temperature of the atmosphere in the vicinity of the piping about 1 hour after filling and again after the pressure has been in the piping at least 5 hours.

5. If the final temperature is more than 5-deg. F. different from the temperature at the start of the test, adjust the final pressure to correct it for this temperature change as instructed in step 11 following. If the final pressure after making this adjustment is more than 2 psi lower than the pressure at the start of the test, check the pipe itself for leaks using soapy water. Release the air pressure and repair all leaks in the pipe or joints. Retest the repaired joints with air at 1-1/2 times the normal working pressure as described in steps 1 to 5 above.

6. Drive the air out of the piping system and fill it with fuel gas.

(a) Connect a hose to the end of the service line that is to be joined to the manifold. Connect the other end of the hose to a fuel gas cylinder provided with a regulator designed to deliver the fuel gas used.

(b) At the far end of each branch of the piping system connect to a station valve a length of clean 1/4-in. hose of ample strength to stand 1-1/2 times the normal working pressure. This hose must be long enough to extend to a location out-of-doors, remote from all doors, windows, chimneys, flames or fire. The end that is out-of-doors should be left open. If there is a second station valve near the end of the line, connect to it a fairly short hose to lead to an oxy-acetylene welding blowpipe equipped with a welding tip, or to a laboratory type Bunsen burner provided with a valve. If a second station is not near the end of the line, then arrange so that both hose lines can be connected to the one station at the far end of the branch line.

(c) Adjust the cylinder regulator to deliver a pressure of not more than 5 lb. per sq. in.

(d) Open the station valve to allow flow through the hose leading to out-of-doors. Using a clock or watch, note the time at which the valve is opened. At intervals of about two minutes, open the blowpipe or Bunsen burner valve and try to light the gas issuing from the tip. The blowpipe or burner valve should be opened to give only a gentle stream of gas from the tip. No oxygen should be used.

NOTE: (1) Hydrogen is odorless and, therefore, cannot be detected by smelling. Because of this, extreme precautions must be taken so that the gas issuing from the out-of-doors hose does not drift toward windows, doors, chimneys or fires, (2) hydrogen burns with a practically colorless flame.
(e) When it is possible to light the gas issuing from the blowpipe or Bunsen burner, note the time. Calculate the elapsed time from the starting of the flow to the lighting of the flame. Divide this by 4 and allow the flow to continue for this much longer. Then close the station valves.

(f) Repeat operations (b) through (e) at the far end of each branch of the piping system.

7. Fill the piping with fuel gas to a pressure equal to 1-1/2 times the normal line working pressure.

8. Wait at least two hours, then test all hydraulic back-pressure valve joints for leaks with soapy water.

9. Close the inlet valves of the station hydraulics.

10. Close the shutoff valves on both sides of the branch line hydraulics.

11. Test the piping on each side of the hydraulic separately. Allow the piping to stand under pressure at least 5 hours. Measure the pressure of the fuel gas in the piping and the temperature of the atmosphere in the vicinity of the piping at the end of the first hour and again at the end of the test.

An increase in the temperature of the piping will cause the pressure of the fuel gas to increase, and a decrease in temperature will cause the pressure to decrease. The final pressure must be adjusted to correct the temperature effect if the final temperature is more than 5° F. different than the temperature at the start of the test.

To make this correction adjustment, add 1 lb. per sq. in. to the final pressure for each 5° F. decrease in temperature or subtract 1 lb. per sq. in. for each 5° the temperature has increased.

If the final pressure, after making this adjustment, is more than 2 lb. per sq. in. lower than the pressure at the start of the test, check the pipe and all joints, valves and outlets for leaks using soapy water. All leaks must be located and repaired before the manifold system is placed in service. After testing, close the station valves, open the shutoff valves on both sides of all branch line hydraulics and relieve the pressure in the piping through the hoses that lead out-of-doors.

12. If the repair of any leak requires the use of high temperatures for welding, brazing, or soldering, the fuel gas must be purged from the line before such work is performed.

(a) First see that all branch line shutoff valves are open. Then relieve the pressure in the piping system through the purging hose lines leading to the out-of-doors. Then close the valves.

(b) Disconnect the fuel gas hose and cylinder from the manifold end of the piping system. Replace it with a hose and cylinder to introduce either nitrogen or clean dry compressed air.

(c) Allow nitrogen or air to flow into the line at a pressure of not more than 5 lb. per sq. in. Open the blowpipe or Bunsen burner valve and light the flame. Also open the valve to allow gas to flow through the purging hose to the out-of-doors.

(d) Note the time on a watch. When the gas issuing from the blowpipe or Bunsen burner will no longer burn, shut off the valve and note the time.

(e) Calculate the elapsed time from the starting of the flow to when the flame went out for each branch of the piping system. Divide this by 4 and allow the flow to continue through each branch this much longer.

(f) Repeat steps (c) and (d) for each branch of the piping system.

(g) Make the needed repairs to overcome the leaks in the piping system.

(h) Repeat steps II-C-6 and II-C-7, and test the repaired joints using soapy water.

(i) Relieve the pressure in the piping through the hoses that lead out-of-doors.

13. Remove the pipe plugs previously installed in the line and station hydraulics and reconnect the relief valves.

14. Remove the pipe plug from the manifold or manifold hydraulic outlet. Connect the service line to the outlet. Test this connection and joints made in reconnecting the relief valves to the line and station hydraulics, for leaks using soapy water after the normal operating pressure is turned into the service line.

III. OPERATING INSTRUCTIONS

The two sides of the manifold can be operated (a) alternately for a continuous supply of fuel gas; or (b) simultaneously where the supply can be interrupted to allow replacing the cylinders after their contents have been discharged.

Refer to Figs. 1-A and 1-B for location of the parts mentioned in the following instructions.

A. INITIAL STARTING OF THE MANIFOLD

1. Release the pressure-adjusting screw of the regulator (turn left — counter-clockwise — until it spins freely).

2. Close both manifold valves.

3. Close all header valves.
4. Connect full cylinders to all header valves, after "cracking" each cylinder valve. DO NOT "CRACK" HYDROGEN CYLINDER VALVES. Connect the cylinders to the header valves by means of the cylinder connection leads. Tighten the connection nuts at both ends of the lead firmly with a wrench.

5. Open the cylinder valves of all cylinders on both banks of the manifold.

6. Open all header valves on both sides of the manifold, slowly, one by one. Open the valves nearest the manifold regulator first.

B. ALTERNATELY OPERATING THE TWO BANKS OF THE MANIFOLD

1. Complete steps A-1 and A-6 above.

2. Open the manifold valve of the left bank slowly to avoid a sudden surge of pressure into the regulator.

3. Turn the regulator pressure-adjusting screw to the right (clockwise) slowly until the delivery pressure gauge indicates the desired line pressure. The system is now ready for service use. As soon as usage at stations on the piping system develops a normal working load flow through the regulator, readjust the regulator to compensate for the drop in delivery pressure occasioned by the flow load.

4. When the cylinders on the operating bank are exhausted, close the manifold valve for that bank. Near cylinder exhaustion is evidenced by a low cylinder-pressure reading on the cylinder-pressure gauge of the regulator together with a continuous gradual lowering of the line pressure as shown by the line-pressure gauge on the regulator.

5. Put the other bank, the reserve bank, of cylinders into service immediately. First open the cylinder valves. Then open the header valves slowly, opening those nearest the regulator first. Then open the manifold valve slowly to avoid a sudden surge of pressure into the regulator.

6. Close the header valves and cylinder valves on the empty bank. Disconnect the exhausted cylinders. Connect full cylinders in their place as directed in paragraph A-4. This should be done before the cylinders of the bank now in operation are more than half exhausted.

7. When the bank of cylinders in operation is exhausted, repeat the cycle of operations described in steps B-1 to B-6.

8. Check the liquid level of the hydraulic on the M-13 and M-15 as often as necessary to maintain a sufficient quantity of liquid for satisfactory operation of the hydraulic. (See paragraph C, Part IV. "General Instructions.")

C. SIMULTANEOUSLY OPERATING BOTH BANKS OF THE MANIFOLD

1. Complete steps A-1 to A-6, "Initial Starting of the Manifold."

2. Open both manifold valves slowly to avoid a sudden surge of pressure into the regulator.

3. Turn the regulator pressure-adjusting screw to the right (clockwise) slowly until the delivery pressure gauge indicates the desired line pressure. The system is now ready for service use. As soon as usage at stations on the piping system develops a normal working load flow through the regulator, readjust the regulator to compensate for the drop in delivery pressure occasioned by the flow load.

4. When the cylinders are nearly exhausted, notify all operators using equipment that service will be temporarily discontinued. Close both manifold valves, close all header valves, and close all cylinder valves. Near cylinder-exhaustion is evidenced by a low reading of the cylinder pressure gauge on the regulator and by a continuous gradual decrease in the line pressure as shown by the line-pressure gauge on the regulator.

5. Disconnect all of the exhausted cylinders. Connect full cylinders in their place as directed in paragraph A-4.

6. Repeat steps A-5 and A-6 and steps C-2 and C-3. Then notify all operators of equipment that the system is ready for service.

D. TO TAKE THE MANIFOLD OUT OF SERVICE

When the manifold is to be out of service for any extended length of time (such as overnight, week-ends or longer non-operating periods) adjust the manifold as follows:

1. Close both manifold valves, all header valves, and the cylinder valves of all cylinders connected to the manifold.

2. Close the service line shutoff valve.

3. Leave the pressure-adjusting screw of the regulator in the position to which it was adjusted so that it will support the diaphragm against the thrust of the pressure in the regulator.

When work is stopped and the manifold is to remain idle with pressure in the piping system for shorter periods of time, close only the manifold valves and cylinder valves. Leave the pressure-adjusting screw of the regulator in its normal operating position.

IV. GENERAL INSTRUCTIONS

A. TO ADJUST THE DELIVERY PRESSURE

1. To increase the delivery pressure, turn the regulator pressure-adjusting screw to the right (clockwise).

2. To decrease the delivery pressure, turn the regulator pressure-adjusting screw to the left (counter-clockwise).

Pressures preferably should be adjusted
when there is some flow through the regulator. Minor adjustments of the line pressure can be made when the system is supplying equipment in operation.

To reduce the pressure when there is no equipment in operation, open the manifold relief valve until the line pressure is reduced to a value slightly lower than that wanted. Then increase the pressure to that desired.

Do not make any extensive change of pressure when the manifold is in operation without first notifying all persons operating equipment. Operators should be prepared for the change and ready to adjust their equipment for use of the new pressure.

B. CYLINDERS
1. When connecting cylinder leads, make sure that the correct ends of the cylinder leads are connected to the header valves. Look for the ends marked "connect this end to manifold."

2. Before opening cylinder valves, make sure that the header valves to which the cylinders are connected are closed. After the cylinder valves have been opened, open the header valves.

3. When disconnecting cylinders, first close the header valves to which the cylinders are connected. Then close the cylinder valves.

C. TO FILL THE HYDRAULIC BACK-PRESSURE VALVE
Keep a sufficient quantity of liquid in the hydraulic. The evaporation rate of concentrated (undiluted) PRESTONE brand anti-freeze for temperatures at which hydraulic back-pressure valves operate is extremely slow. Consequently, if the hydraulic is initially filled with concentrated PRESTONE brand anti-freeze, a check of liquid level once every two weeks is sufficient providing that no unusual operating condition, such as an abnormal surge of flow that might have entrained and carried some of the liquid out of the hydraulic, has occurred. However, if a water solution of PRESTONE brand anti-freeze is used it will be necessary to check the liquid level at least twice a week to replenish the water which has been absorbed by the fuel gas.

The liquid level should be checked during off hours—preferably in the morning before putting the manifold into operation. To check the liquid level:

1. Close the regulator by turning the pressure-adjusting screw to the left (counter-clockwise) until it turns freely.

2. Close the service line shutoff valve.

3. Lift the cap at the top of the hydraulic outlet relief valve to relieve all pressure within the hydraulic.

4. Remove the liquid level plug.

5. After checking the liquid level, and adding liquid if necessary, replace the plug.

6. Open the service line shutoff valve.

7. Turn the regulator pressure-adjusting screw to the right (clockwise) until the delivery pressure gauge indicates the desired delivery pressure.

D. RELIEF VALVES
Relief valves should be operated at least once a week to keep them in good working order. Lift up the caps for an instant to open the valves and permit gas to escape through the vent pipes.

V. OPERATING PRECAUTIONS

A. Keep All Flames, Sparks, and Lights Away from the manifold and cylinders; do not permit smoking in the vicinity of the manifold.

B. Hydrogen Has No Characteristic Odor to Warn of Its Escape. Therefore, if the manifold should be subject to any force that might damage it, immediately test the manifold for leaks with soapy water. The manifold should be shut down and the necessary repairs made to the system before regular operation is resumed.

C. Never "Crack" a Cylinder Near an Open Flame or Other Possible Source of Ignition. Never "crack" the valve any wider nor leave it open any longer than is necessary to clear the valve of dust or dirt. DO NOT "CRACK" HYDROGEN CYLINDER VALVES.

VI. MAINTENANCE INSTRUCTIONS

Never use equipment that is in need of repair. When apparatus has to be equipped or a replacement part, only a standard part listed herein should be used. For repairs and replacements other than those mentioned below, send the apparatus to the nearest repair station of The Linde Air Products Company.

If any repairs are required which involve welding, cutting, soldering, hacksawing, or any other operation which might produce flame, sparks, or heat, the parts to be so repaired must be removed from the manifold, completely purged of all traces of fuel gas, and removed outdoors or to a place where welding and cutting are regularly carried on.
A. TO REPAIR A LEAK IN A SOLDERED HEADER CONNECTION

1. Remove all cylinder leads from the header in which the leak is located.
2. Disconnect and remove the header from the manifold room. Purge it with nitrogen or compressed air to remove all traces of fuel gas before repair is started.
3. Remove the handwheel, adjusting screw, and all internal parts of the header valve next to the joint being made.
4. Hold the fitting containing the joint to be repaired firmly to prevent it from turning. Heat the joint carefully to avoid melting the joint at the other end of the fitting and unscrew the tubing.
5. Remove loose solder from the threads on the tube and fitting. Retin the threads on the tube and reassemble the joint. Reflow the solder in both ends of the fitting after the joint is made.
6. Reassemble the header valve.
7. Test the entire header for leaks as described in Part II-A.

B. TO CLEAN THE FILTER ASSEMBLY

The filters are on the manifold to remove particles of scale or rust that may be carried from the cylinders to the regulator seats and cause faulty regulation due to seat damage. Occasionally it may become necessary to replace a filter unit that has become clogged (the filter unit cannot be cleaned — it must be replaced). This condition will be indicated by a gradual drop in line pressure when the consumption rate of fuel gas is high. If this occurs, observe the cylinder pressure gauge. When the consumption rate is being increased the gauge reading will probably decrease quite rapidly. When the consumption is decreased the gauge reading will probably increase slightly.

To replace the filter unit, remove the body plug, sealing gasket, spacer and spring. Carefully pull out the filter and replace it with a new unit. Replace the spring and spacer, install a new filter body gasket and retighten the body plug. Test the plug for leaks, using soapy water.

C. TO REPACK THE MANIFOLD VALVES

1. Dismantle the Valve (See Fig. 9)
   (a) Loosen the packing screw and open the valve stem (turn the handwheel to the left) fully.
   (b) Unscrew the stuffing box from the valve body.
   (c) Screw in the valve stem until the valve tip can be removed. Then remove the tip.
   (d) Unscrew the packing screw from the stuffing box.
   (e) Unscrew the valve stem from the stuffing box.
   (f) Remove the cap nut, washer, and handwheel.
   (g) Slide the packing screw, packing and washers off the valve stem.
   (h) Remove the gasket from the valve body.
2. Reassemble the Valve
   (a) Place the valve packing between the packing washers and install this assembly and the packing screw on the valve stem.
   (b) Attach the handwheel, washer, and cap nut to the valve stem.
   (c) Screw the valve stem into the stuffing box and push the washers and packing into the stuffing box.
   (d) Loosely screw the packing screw into the stuffing box.
   (e) Insert a new gasket in the recess in the valve body. Always replace the gasket you remove with another of the same type. (See parts picture, and note, on page 15.)
   (f) Attach the valve tip to the valve stem and back out the valve stem as far as possible.
   (g) Assemble the stuffing box and valve stem assembly to the valve body.
   (h) Tighten the packing screw very tight with a crescent or monkey wrench; then back it off just enough so that the valve handle turns readily. After this is done, there is no further need to adjust the packing screw unless tests show leakage.
3. Test the Valve

With normal pressure at the valve, and with the valve open, test for leakage around the threads of the stuffing box and the packing nut. Also test for leakage around the valve stem. Use only a water solution of grease-free soap (such as Ivory) applied with a new or clean brush.

Usually the initial adjustment will serve for the life of the valve. Where the valve is subject to wide temperature variations, it may be necessary to tighten the packing nut under colder conditions to effect a seal, or to release the packing nut slightly so that the handle may be readily turned under warmer conditions.
## REPLACEMENT PARTS LIST

For M-13 Fuel Gas Manifold (Part No. 07X75) M-14 Fuel Gas Manifold (Part No. 07X77)
M-15 Fuel Gas Manifold (Part No. 07X90) M-16 Fuel Gas Manifold (Part No. 07X82)

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>410</td>
<td>Dust Plug Nut (Included in 10Y02)</td>
</tr>
<tr>
<td>3508</td>
<td>Cap Nut (8 Used) (2 Also Included in 4306)</td>
</tr>
<tr>
<td>4108</td>
<td>Header Yoke Elbow (2 Used)</td>
</tr>
<tr>
<td>4111</td>
<td>Union Stud Nut (4 Used)</td>
</tr>
<tr>
<td>4112</td>
<td>Union Stud (4 Used)</td>
</tr>
<tr>
<td>4165</td>
<td>Dust Plug, Chain and Ring Assembly Support Ring (Included in 10Y02)</td>
</tr>
<tr>
<td>4169</td>
<td>Header Tube (2 Used)</td>
</tr>
<tr>
<td>4210</td>
<td>V-4 Manifold Valve (2 Used) (See Valve Illustration for Parts)</td>
</tr>
<tr>
<td>4305</td>
<td>Header Tube (4 Used on M-13 and M-14; 2 Used on M-15 and M-16)</td>
</tr>
<tr>
<td>4306</td>
<td>U-Bolt Assembly (4 Used) (Includes 2) 3508 and 73A20</td>
</tr>
<tr>
<td>4307</td>
<td>U-Bolt Liner (4 Used)</td>
</tr>
<tr>
<td>4652</td>
<td>Header Yoke Tube (2 Used)</td>
</tr>
<tr>
<td>4681</td>
<td>Pipe Plug (2 Used)</td>
</tr>
<tr>
<td>643</td>
<td>Lead to M-15 and M-18 (Includes 38A72, 40A44, 53A61, (2) 38229 (Supplied))</td>
</tr>
<tr>
<td>9042</td>
<td>T-Inlet Connection (6 Used on M-13 and M-14; 4 Used on M-15 and M-16)</td>
</tr>
<tr>
<td>32A28</td>
<td>Dust Plug Nipple (Included in 10Y02)</td>
</tr>
<tr>
<td>38A72</td>
<td>Lead Locking Screw (Included in 71A53)</td>
</tr>
<tr>
<td>40A44</td>
<td>Lead Spring (Included in 71A53)</td>
</tr>
<tr>
<td>44A24</td>
<td>Header Valve (6 Used on M-13 and M-14; 4 Used on M-15 and M-16)</td>
</tr>
<tr>
<td>45A25</td>
<td>Dust Plug Washer (Included in 10Y02)</td>
</tr>
<tr>
<td>53A52</td>
<td>Plate Holder (2 Used)</td>
</tr>
<tr>
<td>53A62</td>
<td>Lead Ball (Included in 71A53)</td>
</tr>
<tr>
<td>70A17</td>
<td>Warning Plate</td>
</tr>
<tr>
<td>71A53</td>
<td>Straight Manifold to Cylinder Lead Assembly for Hydrogen (6 Used on M-13 and M-14; 4 Used on M-15 and M-18) (Includes 38A72, 40A44, 53A61, (2) 38229 (Supplied))</td>
</tr>
<tr>
<td>72A53</td>
<td>U-Bolt (Includes 2) N-H-40</td>
</tr>
<tr>
<td>72A54</td>
<td>U-Bolt Liner</td>
</tr>
<tr>
<td>73A20</td>
<td>U-Bolt (Included in 4306)</td>
</tr>
<tr>
<td>06F07</td>
<td>H-12-1M P-O-L Hydraulic Back Pressure Valve (M-13 and M-15 only) (Supplied) (See Hydraulic Illustration for Parts)</td>
</tr>
</tbody>
</table>

### PARTS NOT ILLUSTRATED

- Adaptor Washer (2 Req'd) (Included in 18X23)
- R-67 Hydrogen Manifold Regulator (Supplied)
- Fuel Gas Regulator Outlet to Service Line Lead Adapter (Includes 2) 6985 (Supplied)
- Fuel Gas Manifold to Regulator Inlet Adapter
- No. 86 Wrench (Supplied)
- No. 87 Wrench (2 Supplied)

**NOTE:** Part No. 10Y2, which includes all parts listed for Part No. 10Y02 except Ring, Part No. 4165, may be ordered if desired.

## HARDWARE

All the items which follow are either:

a. Standard hardware (screws, bolts, nuts, washers, pipe fittings, etc.) made by many manufacturers, which can be purchased locally by the description given, or

b. Standard parts or assemblies which we purchase complete from specific manufacturers. For these we give the manufacturer's name, catalog number, etc.

It will save you time and money to purchase these items through local outlets, or directly from the specified manufacturer. If no other source of supply is available, you may order these from us.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>M-N-P-7 (6-1/2)</td>
<td>1-1/4-in. x 6-1/2-in. Lg. Nipple, Wrought Steel</td>
</tr>
<tr>
<td>M-N-P-7 (2)</td>
<td>1-1/4-in. x 2-in. Lg. Nipple, Wrought Steel (2 Used) (M-13 and M-15 only)</td>
</tr>
<tr>
<td>M-N-P-7 (5)</td>
<td>1-1/4-in. x 5-in. Lg. Nipple, Wrought Steel (M-13 and M-15 only)</td>
</tr>
<tr>
<td>M-N-P-7 (8)</td>
<td>1-1/4-in. x 8-in. Lg. Nipple, Wrought Steel (M-13 and M-15 only)</td>
</tr>
<tr>
<td>M-N-P-C-5</td>
<td>3/4-in. Close Nipple, Standard, Wrought Steel</td>
</tr>
<tr>
<td>M-BU-P-15</td>
<td>1-1/4-in. to 3/4-in. Malleable Iron Bushing (M-13 and M-15 only)</td>
</tr>
<tr>
<td>M-BU-P-B-23</td>
<td>2-in. to 1-1/4-in. Brass Flush Bushing (M-13 and M-15 only)</td>
</tr>
<tr>
<td>M-TE-R-X-26</td>
<td>1-1/4-in. x 1-1/4-in. x 3/4-in. Extra Heavy Malleable Iron Tee (M-14 and M-16 only)</td>
</tr>
<tr>
<td>M-TE-X-7</td>
<td>1-1/4-in. x 1-1/4-in. x 1-1/4-in. Extra Heavy Malleable Iron Tee (M-13 and M-15 only)</td>
</tr>
<tr>
<td>M-EL-X-7</td>
<td>1-1/4-in. Extra Heavy Malleable Iron Elbow (3 Used) (M-13 and M-15 only)</td>
</tr>
<tr>
<td>M-U-N-6</td>
<td>1-1/4-in. Extra Heavy Malleable Iron Navy Union (With Brass Seat) (M-13 and M-15 only)</td>
</tr>
<tr>
<td>M-U-R-8</td>
<td>2-in. Malleable Iron 250# Railroad Union (With Brass Seat) (M-13 and M-15 only)</td>
</tr>
<tr>
<td>N-H-3</td>
<td>3/8-in.-16 U.S.S. Hex Steel Nut (2 Used) (Included in 72A53)</td>
</tr>
<tr>
<td>N-H-40</td>
<td>5/16-in.-18 U.S.S. Hex Steel Nut (2 Used) (Included in 72A53)</td>
</tr>
<tr>
<td>S-D-PK-U-15</td>
<td>#6 x 3/8-in. Parker-Kalon Type &quot;U&quot; Hardened Metallic Drive Screw (4 Used) (Also Included in 10Y02)</td>
</tr>
<tr>
<td>S-H-35</td>
<td>5/16-in.-18 x 1-in. Hex Head Steel Cap Screw (8 Used)</td>
</tr>
<tr>
<td>S-H-65</td>
<td>3/8-in.-16 x 1-in. Hex Head Steel Cap Screw (2 Used)</td>
</tr>
</tbody>
</table>
FIG. 8 - H-12-3M HYDRAULIC BACK-PRESSURE VALVE PART NO. 06567
FIG. 9 - V-4 MANIFOLD VALVE Part No. 4210

* NOTE: Earlier models of the V-4 Valve have a tinned copper gasket. The tinned copper gasket must be replaced with a like gasket, part number 4219.

** NOTE: On old style valves having a spoked packing screw, it is desirable to replace the spoked packing screw with the new hexagonal screw. This should be done so that a wrench can be used to tighten the screw sufficiently to compress the new packing material.

FIG. 10 - RV-26 RELIEF VALVE Part No. 16R73
LINDE Supplies These Quality Products
to the Nation's Industries

INDUSTRIAL GASES
LINDE Oxygen, Nitrogen, Argon, Hydrogen
PREST-O-LITE Acetylene
LINDE Rare Gases:
Argon, Neon, Helium, Krypton, Xenon

CALCIUM CARBIDE
UNION Carbide
CARBIC Processed Carbide

OXY-ACETYLENE EQUIPMENT
OXWELD Apparatus for:
Welding, Cutting, Deseamming, Hard-Facing,
Heating, Forming, Flame-Hardening,
Flame-Softening, Flame-Strengthening,
Flame-Priming, Flame-Descaling, and
Flame-Gauging
Low Temperature Stress Relieving
Acetylene Generators
Manifolds, Regulators and Valves
Welding Rods and Supplies
PREST-O-WELD Welding and Cutting Apparatus
PUROX Welding and Cutting Apparatus
PREST-O-LITE Air-Acetylene Apparatus and Small Tanks
CARBIC Acetylene Flood Lights
Acetylene Generators

SPECIAL MACHINES
LINDE Plate-Edge Preparation Equipment
Steel-Conditioning Machines
Sub-Zero Cold Treatment Equipment
OXWELD Oxy-Acetylene Cutting Machines
Pressure-Welding Machines

ELECTRIC WELDING EQUIPMENT
UNIONMELT Automatic Welding Apparatus and Supplies
HELIArc Welding Torches
LINDE Argon Metal Arc Welding Equipment

SYNTHETIC CRYSTALS
LINDE Synthetic Sapphire, Ruby, Spinel, and Titania
Synthetic Calcium- and Cadmium Tungstates
Fine Alumina Abrasive

ORGANOSILICON
LINDE Silane Monomers
Polysiloxane Polymers and Resins

THE LINDE AIR PRODUCTS COMPANY
Unit of Union Carbide and Carbon Corporation

DOMINION OXYGEN COMPANY, LIMITED, TORONTO

"Prest-O-Weld," "Purlox," "Union," and "Unionmelt" are trade-marks
of Union Carbide and Carbon Corporation or its Units.

Lincoln Supplies These Quality Products
to the Nation's Industries

INDUSTRIAL GASES
LINDEC Oxygen, Nitrogen, Argon, Hydrogen
PREST-O-LITE Acetylene
LINDE Rare Gases:
Argon, Neon, Helium, Krypton, Xenon

CALCIUM CARBIDE
UNION Carbide
CARBIC Processed Carbide

OXY-ACETYLENE EQUIPMENT
OXWELD Apparatus for:
Welding, Cutting, Deseamming, Hard-Facing,
Heating, Forming, Flame-Hardening,
Flame-Softening, Flame-Strengthening,
Flame-Priming, Flame-Descaling, and
Flame-Gauging
Low Temperature Stress Relieving
Acetylene Generators
Manifolds, Regulators and Valves
Welding Rods and Supplies
PREST-O-WELD Welding and Cutting Apparatus
PUROX Welding and Cutting Apparatus
PREST-O-LITE Air-Acetylene Apparatus and Small Tanks
CARBIC Acetylene Flood Lights
Acetylene Generators

SPECIAL MACHINES
LINDE Plate-Edge Preparation Equipment
Steel-Conditioning Machines
Sub-Zero Cold Treatment Equipment
OXWELD Oxy-Acetylene Cutting Machines
Pressure-Welding Machines

ELECTRIC WELDING EQUIPMENT
UNIONMELT Automatic Welding Apparatus and Supplies
HELIArc Welding Torches
LINDE Argon Metal Arc Welding Equipment

SYNTHETIC CRYSTALS
LINDE Synthetic Sapphire, Ruby, Spinel, and Titania
Synthetic Calcium- and Cadmium Tungstates
Fine Alumina Abrasive

ORGANOSILICON
LINDE Silane Monomers
Polysiloxane Polymers and Resins

GENERAL OFFICE
30 East 42nd Street, New York 17, N. Y.

EASTERN STATES
Baltimore 19, Md.
552 East 25th Street
BOSTON 16, MASS.
441 Stuart Street
BUFFALO, N. Y.
P. O. Box 124
East Park Drive
Tonawanda, N. Y.
CHARLESTON 1, W. VA.
2 Virginia Street
NEW YORK 17, N. Y.
205 East 42nd Street
PHILADELPHIA 22, PA.
1221 North Broad Street
PITTSBURGH 29, PA.
311 Ross Street

CENTRAL STATES
CHICAGO 3, ILL.
210 North Michigan Avenue
CINCINNATI 29, OHIO
709 Mellenth Avenue
CLEVELAND 14, OHIO
1513-17 Superior Avenue
DETROIT 2, MICH.
6-240 General Motors Building
INDIANAPOLIS 4, IND.
729 North Pennsylvania Street
MILWAUKEE 46, WIS.
1623 South 30th Street
MINNEAPOLIS 2, MINN.
257 Second Avenue South
ST. LOUIS 6, MO.
4229 Forest Park Boulevard

SOUTHERN STATES
ATLANTA 1, GA.
310 Peachtree Street, N. E.
BIRMINGHAM 5, ALA.
1001-13 South 22nd Street
JACKSONVILLE 3, FLA.
2410 Dennis Street
MEMPHIS 5, TENN.
48 West McLemore Avenue
NEW ORLEANS 13, LA.
820-32 Howard Avenue

SOUTHWESTERN STATES
DALLAS 1, TEXAS
2202 Commerce Street
DENVER 9, COLOR.
605 South Broadway
HOUSTON 11, TEXAS
6169 Harrisburg Boulevard
KANSAS CITY 6, MO.
314 Baltimore Avenue
TULSA 3, OKLA.
814 National Bank of Tulsa Bldg.

WESTERN STATES
EL PASO, TEXAS
810 Texas Street
LOS ANGELES 58, CALIF.
2724 Leona Boulevard
PHOENIX, ARIZ.
401 East Buchanan Street
PORTLAND 9, ORE.
1205 Northwest Marshall Street
SALT LAKE CITY 2, UTAH
362 Pierpoint Avenue
SAN FRANCISCO 33, CALIF.
22 Battery Street
SEATTLE 4, WASH.
2903 First Avenue, South
SPokane 12, WASH.
2025 West Maxwell Avenue

IN CANADA
Dominion Oxygen Company, Limited
TORONTO • MONTREAL
WINNIPEG • VANCOUVER