OPERATION, MAINTENANCE
and
REPLACEMENT PARTS

Oxweld
Trade-Mark

MP-11
Stationary, Medium-Pressure
ACETYLENE GENERATOR

Listed Under Re-examination Service of Underwriters' Laboratories, Inc.

IMPORTANT!
Mixtures of acetylene and air in certain proportions (2.6% to 80% acetylene) are flammable and explosive when ignited.

Therefore, be sure you are familiar with the instructions for operating your OXWELD Generator before you charge it, or do any work on it whatever. If the instructions are not thoroughly understood, communicate with the nearest representative or office of Linde Air Products Company, and obtain further instructions before attempting the work.

Efficiency and safety require compliance with ALL instructions.

Acetylene generators 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.
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The terms "Oxweld" and "Union" are registered trade-marks of Union Carbide and Carbon Corporation.
Operating Principles

Making Acetylene

Acetylene is a hydrocarbon gas made up of carbon and hydrogen bonded together. The gas cannot be seen, but it has a characteristic odor that is easily recognized after one has once smelled it.

Acetylene is produced from the reaction of calcium carbide with water. Calcium carbide, frequently called simply "carbide," is a dark gray, stonelike material manufactured by smelting coke and lime in an electric furnace. The resultant product is crushed and carefully screened for size. It is important in acetylene generators to use only the size of carbide for which the generator was designed. This assures complete reaction due to proper passage of the carbide particles through water in the generating chamber. The correct carbide size is always indicated on the nameplate of OXWELD generators.

When carbide is dropped into water, acetylene gas is formed and bubbles up through the water. A whitish residue of hydrated or slaked lime remains in the water. The reaction gives off heat. In fact, when carbide is wet with an insufficient amount of water, the heat given off is sufficient to raise the temperature of the carbide enough to ignite an acetylene and air mixture. For this reason water must never be used to put out a fire involving carbide.

In OXWELD MP-11 Acetylene Generators, carbide is fed into a large amount of water and the heat given off simply raises the temperature of the water. It is very important that there be enough water in the generator to keep the temperature rise within reasonable and safe limits. That is why so much emphasis is placed upon the instruction to fill the generating chamber with fresh water to the NORMAL water level before each charging with carbide. It is also the reason for the installation of the float which automatically locks the feed tube shut to prevent feeding of carbide if the water in the generating chamber drops below the REFILL level.

Carbide also will react with water vapor in the air, thereby giving off acetylene. For this reason UNION carbide is packed in sturdy airtight and watertight steel drums. Carbide should never be left exposed to the atmosphere any longer than absolutely necessary.

Both carbide and the slaked lime residue are somewhat caustic and tend to irritate a person's skin and mucous membranes. Touching the carbide or lime or breathing the dust should be avoided as much as possible. It is advisable to wear a respirator and gloves when opening carbide drums or dumping carbide from the drums, or when working with lime residue.

Regulations and laws generally forbid the generation, distribution and use of free (undissolved) acetylene at pressures higher than 15 lb. per sq. inch. The reason for this is that acetylene, under certain conditions at pressures greater than 15 lb. per sq. in., may tend to break down explosively into its constituents, carbon and hydrogen.*

Testing laboratories have established standards which closely control the manufacture of acetylene generators. The Re-examination Service marker of the Underwriters' Laboratories, Inc. on the OXWELD MP-11 Acetylene Generators shows that these generators meet the standards set up by this testing organization.

It is essential that all persons who operate or work on MP-11 Generators thoroughly understand and carefully follow the recommendations in the NBFU Pamphlet No. 51, "Standards of the National Board of Fire Underwriters for the Installation and Operation of Gas Systems for Welding and Cutting."

Operation and Design Features

OPERATION

The OXWELD MP-11 acetylene generator represents a major advance in the design of generators for the production of medium-pressure acetylene. It makes possible the continuous operation of single-generator installations. (This is a distinct advantage over previous types of medium-pressure generators which operate on the batch-charging principle.) The MP-11 has a carbide capacity of 500 lbs., and a total hourly output rating of 1000 cu. ft. It will operate satisfactorily to deliver acetylene at rates of up to 2000 cu. ft. per hr. if the aggregate hourly output load does not exceed 1000 cu. ft.

During MP-11 operation, carbide is fed from the generator hopper (Fig. 1) to the water in the generating chamber at a rate which is automatically proportioned to produce the generating rate desired. When acetylene generation has reduced the carbide supply to 150 lbs., the generator can be partially drained and refilled with water while it continues to operate. At no time during this refilling period is there less than 250 gallons of water in the generating chamber. After draining and refilling have been completed, a recharge of 350 lbs. of carbide can be transferred to the generator from the charging hopper. The charging hopper becomes part of the generator during the recharging period. This feature, plus the ability to partially drain and refill the generating chamber while generation takes place, makes possible the continuous operation of the MP-11.

When acetylene demand exceeds the rated capacity of a single MP-11, two or more of these generators can be operated simultaneously by GC-4 con-

*These statements do not apply to acetylene dissolved in a suitable solvent in steel cylinders which meet the specification of the Interstate Commerce Commission.
FIG. 1 - Schematic Drawing of OXWELD MP-11 Medium-Pressure Acetylene Generator (with Charging Hopper Attached)
controls. With GC-4 Control Units, the flow of acetylene from individual generators can be adjusted so that each carries an equal share of the load. See Form 9510, "Installation, Operation and Maintenance of GC-4 Control Units," for a description of these controls.

**MP-11 SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Capacity</th>
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<tbody>
<tr>
<td>Lbs. of Carbide</td>
<td></td>
</tr>
<tr>
<td>Cu. Ft. Acetylene per Hr</td>
<td>1000</td>
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<tr>
<td>Refill Charge (Lbs. Carbide)</td>
<td>350</td>
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<tr>
<td>Carbide Size</td>
<td>1/4 x 1/12</td>
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<tr>
<td>Water Capacity (Gals.)</td>
<td>600</td>
</tr>
<tr>
<td>Generator Delivery Pressure (Psi)</td>
<td>13 ± 1/2</td>
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<tr>
<td>Overall Dimensions</td>
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<tr>
<td>Generator Diameter</td>
<td>60 in.</td>
</tr>
<tr>
<td>Height (Generator)</td>
<td>10 ft. 6 in.</td>
</tr>
<tr>
<td>Height (Charging Hopper (incl. lift handle))</td>
<td>3 ft. 4 in.</td>
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<td>Weights</td>
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<td>Generator (Dry)</td>
<td>1865 Lbs.</td>
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<td>Charging Hopper (Empty)</td>
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<td>Charging Ladder</td>
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<td>Water Supply</td>
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<td>Recommended Pressure</td>
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<td>Minimum Pressure</td>
<td>30 Psi</td>
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<tr>
<td>Flow</td>
<td>65 Gpm</td>
</tr>
<tr>
<td>Water Filling</td>
<td>35 Gpm</td>
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**DESIGN FEATURES (Refer to Figure 1.)**

**Water Shell**

The water shell is of heavy-walled, completely steel-welded construction, insuring a strong, pressure-tight generating vessel. It rests on four flanged-pipe legs. (This assures adequate ventilation under the generator.) The 30-degree cone bottom makes it unnecessary to agitate the residue before draining an MP-11; the heavier portion of the residue is carried out when the drain valve is opened. This is a considerable advantage over flat or dished bottoms which require the use of mechanical agitators. The bottom of the MP-11 maintains itself exceptionally free of accumulated lime.

Two lugs are welded to the upper edge of the water shell to facilitate handling of the generator during shipment and installation. All gauges, indicators, control handles and manually-operated valves are conveniently located at the front of the water shell. This facilitates the inspection and control of generator operation. A handhole provides quick access to the generator interior; it is a convenient, good-sized opening for performing many maintenance and inspection operations without having to remove the hopper cover.

The volume of water in the water shell, when filled to capacity, is 600 gallons; this volume is 250 gallons when the water is at the REFILL level.

**External Pressure-Equalizing Line**

The pressure-equalizing line provides an unrestricted passage through which acetylene enters the generator hopper to fill the space vacated by the discharged carbide. This makes for smooth carbide flow since full generator pressure exists on both sides of the carbide charge. The external location of the equalizing line cools the saturated acetylene and minimizes the amount of moisture carried into the hopper.

**Water Filling**

Water enters the generator through a directly-connected, manually-operated water fill valve. This valve is provided with a side port so that any leakage through the valve, when it is closed, will flow to the outside and be plainly visible.

An automatic shutoff system has been provided to automatically prevent overfilling if this manual valve is not closed at the right time. A stainless-steel float rises with the water level and closes the automatic valve (Fig. 2) if the water rises above the NORMAL level. This shutoff valve will also close if the float should sink to a low level. In this way the generator is protected against overfilling even if the float should fail. Since this valve opens against the pressure in the water-supply line, it will automatically close if any part of the float-operating mechanism should become inoperative.

**LEGEND FOR FIG. 1**

1. Acetylene Filter  
2. Atmospheric Vent Line  
3. Carbide Charging Valve  
4. Carbide Contents Indicator  
5. Charging Hopper  
6. Charging-Hopper Pressure Gauge  
7. Charging-Hopper Vent Valve  
8. Feed-Control Unit  
9. Feed Tube  
10. Feed-Tube Handle  
11. Feed Valve  
12. Feed-Valve Handle  
13. Float, Water Level Indicator and Feed Tube  
14. Float, Water Shutoff Valve  
15. Float-Operated Water Shutoff Valve  
16. Generating Chamber  
17. Generating-Chamber Pressure Gauge  
18. Generating-Chamber Relief Valve  
19. Generator Hopper  
20. Handhole Cover  
21. Hydraulic Back-Pressure Valve  
22. Hydraulic Back-Pressure Valve Relief Valve  
23. Low-Level Water-Fill Valve  
24. Pressure Equalizing Line  
25. Relief-Valve Trip Mechanism  
26. Residue Drain Valve  
27. Water Fill Valve  
28. Water-Level Indicator  
29. Water Shell
A swing check valve should be provided in the water fill line to prevent a back flow of acetylene into the water main in the event of water-pressure failure during the refilling operation.

**Water-Level Indicator**

The water-level indicator is a direct-acting index of the amount of water present in the generating chamber. It is operated by the rise and fall of a hollow stainless-steel sphere which floats on the surface of the water in the chamber. This float is mounted at one end of the arm which is attached to the side of the indicator shaft as shown in Figures 1 and 3. With this arrangement, any change in the position of the float, due to a change in the water level, causes the indicator shaft to rotate. A pointer at the end of the shaft indicates the water level on the indicator scale.

The indicator shaft is provided with an arm for actuating the high-water signal of the optional alarm system. See page 14 for a description of the alarm system.

**Carbide-Contents Indicator**

This is a dependable arrangement for indicating the weight of carbide in the generator hopper. The hopper is supported at three points, one of which is the piston of a closed fluid-pressure system (Fig. 4). The pressure in this system is, therefore, directly proportional to the weight of carbide in the hopper. The pressure is transmitted through the fluid to the carbide-contents gauge. This direct-weighing system provides continuous and accurate readings of the amount of carbide in the hopper. Carbide measurement is independent of its distribution in the hopper, which seriously affects the accuracy of float-type carbide indicators.
Carbide-Charging Valve

The carbide filling port of the generator is a 3-in. plug valve. A tapered nipple at the top of this valve fits into the outlet of the carbide charging hopper (Fig. 5).

A plug-type vent valve is connected to the side of the tapered nipple. When the charging valve is closed after the hopper has emptied, this valve is opened to vent the pressure in the hopper before it is lifted off the generator. (The vent valve handle is positioned so that the charging-valve handle will close the vent valve if the vent valve is not already closed before the charging valve is opened.)

Charging Hopper

The charging hopper is designed as a pressure vessel and becomes a part of the generator during recharging. It is equipped with an unloading valve at the bottom to retain the carbide while the hopper is being filled and placed atop the generator. The hopper outlet is provided with spring-loaded plungers which engage a groove in the tapered nipple of the carbide charging valve. These plungers secure the hopper to the generator when the hopper is lowered into position on the charging valve. The hopper-to-generator connection is sealed gas-tight by a molded rubber gasket. Transfer of carbide occurs when the charging-hopper unloading valve is opened. The hopper is equipped with an acetylene pressure gauge to indicate when the pressure has been vented enough to allow the hopper to be removed from the generator.

Carbide Feed Control

This mechanism automatically controls the feeding of carbide in proportion to consumption rates. The feed control is preset at the factory to maintain a generator pressure of 13 psi, and will maintain this pressure within very narrow limits (±1/2 psi).

Carbide in the hopper flows down toward the cylindrical hopper outlet (Fig. 6). Its passage through this outlet is controlled by the position of the valve plug, which is connected to the feed-control dia-

phragm. Generator pressure is exerted against the bottom side of the diaphragm, and is opposed on the top side of the diaphragm by the feed-control springs. Pressure changes in the generating chamber, exerted against the diaphragm, cause the plug to move toward or away from the hopper outlet, thus adjusting the size of the outlet opening and the rate of carbide flow.

In operation, as acetylene is withdrawn from the generator the pressure within the generating chamber tends to decrease. The feed-control diaphragm then starts to move downward because the upward force exerted by the acetylene pressure is slightly less than the downward force of the springs. This downward movement of the diaphragm moves the valve plug away from the hopper outlet. Carbide then flows through the valve opening into the generating chamber to produce more acetylene. The rise of pressure produced by this generation forces the diaphragm upward until this upward thrust balances the downward force of the springs.

At low rates of acetylene withdrawal, the valve plug is moved to and away from the hopper outlet to stop and start the carbide flow; at higher rates of acetylene withdrawal, the diaphragm holds the valve open, the size of the opening being proportional to the rate of generation required. When all acetylene consumption stops, the diaphragm pulls the plug into the hopper outlet to stop further feeding of carbide. (When all acetylene consumption stops, the pressure within the generator may increase slightly beyond the generator pressure setting but will then remain at a constant value. This is caused by the time lag between the feed-valve closure and the pressure rise due to the acetylene subsequently produced from the last portion of carbide fed into the generating chamber.)

The valve-plug stem is equipped with a disc to prevent the flow of carbide if the ball socket or retaining screw should fall at any time. In such a case the plug will drop through the hopper outlet, and the disc will block the outlet from above. This will prevent the uncontrolled feeding of carbide into the generating chamber.

The manual shutoff provided with this feed control is direct and positive. Rotating the feed-valve handle to the LOCK position moves the entire feed control upward until the valve plug is pulled into the hopper outlet. By means of this arrangement you do not have to close the valve against the force of the springs. Nor is it necessary to close the valve against the weight of the carbide; the feed-control cover keeps carbide off the control itself, and prevents carbide from clogging the sleeves which position the control mechanism.

The MP-11 requires no separate feed-valve cleaner. Operation of the manual shutoff (feed-valve handle) breaks up any slaked carbide around the feed valve. This assures unrestricted feeding of carbide after shutdown periods.
Feed Tube

The feed tube is a rubber sleeve through which carbide is discharged into the generating chamber. It is clamped around the hopper outlet and extends downward into the generating chamber (Fig. 6).

The feed tube serves two purposes. Its first function is to keep moisture from reaching the feed-control valve. It prevents slaking of the carbide at the feed valve (that might cause the feed valve to stick). This is particularly important when the generator is not in use, but has carbide in the hopper and water in the generating chamber. In such a case the feed-tube control handle would be turned to CLOSE, pinching the feed tube shut against the metal plate located behind the tube. The handle can be kept in the CLOSE position by the latch on the generator shell. The feed tube's second function is to provide the generator with a low-water-level carbide feed shutoff. An arm attached to the feed-tube control rod (Fig. 6) is connected to the water-level-indicator float arm by a link chain. This arrangement will close the feed tube and prevent further feeding of carbide if the volume of water in the generator should decrease to approximately 180 gallons. Carbide feeding will not resume until water is added through the low-level water fill valve to raise the level to within the operating range.

Hydraulic Back-Pressure Valve

The MP-11 is equipped with a hydraulic back-pressure valve (or "hydraulic," as it is usually called) to prevent a back flow of gas into the generator from the service line. An acetylene filter is housed within the dome of the hydraulic (see page 9).

The back-pressure valve system is designed so that acetylene first enters a water reservoir located inside the generating chamber (Fig. 7). The gas then passes into the hydraulic through a check valve, with a tangential flow that minimizes the entrapment of water as the gas moves through it. This method of entrance, together with the baffle arrangement, enables operation at high rates without loss of water from the hydraulic.

As shown in Figure 7, the hydraulic is provided with a standpipe inside the baffle tube. This allows the water level to be checked while gas flows through the hydraulic. Checking is accomplished by opening the hydraulic drain valve and inserting the test plug in the self-closing, quick-disconnect valve. Any water above the top of the standpipe will drain out through this valve. If the water level is below the top of the standpipe, this condition will be indicated by a discharge of gas. The quick-disconnect valve will remain open only as long as the test plug is held in it. It closes automatically as soon as the test plug is released.
During generator operation the level of the water in the hydraulic is usually increased by condensation of some of the moisture in the acetylene. To assure satisfactory operation of the hydraulic, the water level should be checked and adjusted each time the generator is recharged (see page 13).

A relief valve is installed in the acetylene outlet line of the hydraulic. In the event that service operations develop a back pressure in the service line, the water seal at the bottom of the hydraulic will prevent the gas from being pushed back into the generator. The excess pressure will then be vented to the atmosphere by the relief valve. A special safety feature of this hydraulic is that water is not forced back into the generator by the reverse flow but collects in the reservoir through which acetylene leaves the generating chamber. When normal delivery is resumed, the water returns from the reservoir and automatically re-establishes the water seal. It is important that the hydraulic always be filled to the correct level. (See also "Cold Weather Care," page 10.)

**Acetylene Filter**

Some of the lime formed during the generation of acetylene tends to be carried along with the moisture in the acetylene. The amount carried along depends a great deal upon the rate of acetylene use. It is necessary to filter out this lime to prevent its accumulation in the service lines, regulators or appliances.

The filter in MP-11 generators is mounted within the dome of the hydraulic back-pressure valve (Fig. 7). Since it is self cleaning and is resistant to decomposition or water logging, the filter will give satisfactory service over a long period of time. The filter location makes it easily accessible for inspection or replacement, while the seal of water in the hydraulic prevents air from entering the generator proper during these operations.

**Relief Valves**

The MP-11 generator has two pressure relief valves, one serving the hydraulic and the other serving the generating chamber. The generator relief valve will prevent excessive pressures from building up inside the generator; the hydraulic relief valve will release any excessive pressure that may develop on the outlet side of the hydraulic back-pressure valve.

A sectional view of the relief valves is shown in Figure 8. The lower opening is the inlet; the side opening is the outlet, which is piped through a vent line to the outdoors. The spring inside the bonnet provides the force for holding the poppet closed against its seat. The amount of spring compression determines the pressure at which the valve will open automatically.
Relief Valve Trip Mechanism

The generator is provided with a mechanical linkage (Fig. 9) that automatically trips the generator and hydraulic relief valves each time the charging valve is opened. This "cracks" the valve seats to make sure the valves are free to operate. A momentary sound of escaping gas should be heard at this time, before the valve springs force the poppets back against the seats. There is no need to open the relief valves during normal generator operation. The generator relief valve is set at 15 psi; the hydraulic relief valve is set at 20 psi.

Precautionary Instructions

General Precautions

1. Protect the generator from all flames and sparks. Do not smoke around the generator. Do not permit a lighted cigar, cigarette or pipe, or fire of any kind, or any other possible source of ignition within or near the generator room or near the generator. This includes electric flashlights. Mixtures of acetylene and air in certain proportions (2.6 to 80% acetylene) are flammable and explosive when ignited.

2. Do not work on or near the generator with tools or other implements that may cause a spark.

3. If ever an odor of acetylene is detected in the generator room, open the doors and windows and then locate the source of the odor and correct the cause of leakage at once. Use nothing but soapy water to locate leaks.

4. Do all charging, cleaning, adjusting and manipulating of the generator by daylight, as far as practicable.

5. Never allow the generator to be empty of water while there is carbide in the hopper.

6. Never fill the carbide hopper with carbide until after the generator has been filled with cool, clean, fresh water to the NORMAL level.

7. Keep the generator room clean. Do not allow rubbish to accumulate in corners or out-of-the-way places. Keep all passageways free from obstructions.

8. Be sure the packing glands on the water-indicator and control-rod shafts are tight enough to prevent leakage, yet loose enough to permit the shafts to operate correctly.

9. Always follow the printed operating instructions in the order specified. Short cuts may result in unsafe operation.

Periodic Inspection Procedure

1. Every ninety days, inspect and clean the generator as directed in "Quarterly Inspection Procedure" of this instruction book.

2. Every year, thoroughly inspect and clean the generator as directed in "Annual Inspection Procedure" of this instruction book.

Cold Weather Care *

1. Protect the generator from freezing: The temperature of the generator room should never be allowed to go below 40 deg. F. Where artificial heat is necessary, the heating shall be by steam, hot water, or other indirect heating system. The furnace should be so located that no flame or fire is in or near the generator enclosure. Electric heaters should not be employed.

2. If water in any part of the generator should freeze (in the generating chamber, filter, swing check valve, hydraulic back-pressure valve, relief

* For additional details refer to Form 3088, "Cold-Weather Care of Acetylene Generating and Distributing Equipment." This booklet is available through your LINDE representative.
valves, residue valve, water-filling valve, or in any of the piping or pipe fittings), thaw it with hot water only. Before putting the generator back in service, make a careful examination for any damage which the freezing may have caused. If there is any doubt as to the safe method of procedure after ice has formed in any part, communicate with a LINDE representative before attempting to thaw out or operate the generator or do any work on it whatever.

**Repair Precautions**

1. Do not attempt to operate an acetylene generator that is in need of repair.

2. All repairs involving welding, soldering or any other operation liable to produce flame, sparks, or heat, should be made outside of the generator room. Sections of the generator to be so repaired must be completely flooded with water to make sure that all traces of acetylene are expelled before the repair work is performed. First withdraw the generator from service as directed in Section E, page 19.

3. Repairs should be made in strict accordance with instructions given in this booklet, using only standard parts listed in the Replacement Parts section, pages 36 to 44.

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**Carbide Handling**

1. When carbide containers are opened, use only a wooden mallet or a tool especially designed for opening carbide cans. Never strike the cover or containers with a metal tool.

2. Do not throw carbide with a scoop or shovel, or pour it any greater distance than is necessary.

3. Do not poke or ram carbide into the charging hopper.

4. Do not allow carbide to come in contact with water or moisture outside the generator.

5. Do not allow carbide to remain in contact with the atmosphere longer than is absolutely necessary. Always replace and securely fasten covers on empty or partially full carbide containers, making sure that the screw cover is closed with the gasket in place. Empty containers should be free from particles of carbide before being closed.

6. Never put a light of any kind into a carbide container.

7. If carbide or carbide dust is spilled on the outside of the generator or on the floor, sweep it up at once and throw it on the ground out-of-doors and clear of any building.
Single-Generator Installation

See page 14 for multiple-generator installation.

Initial Charging Instructions

When a generator installation is put into service for the first time, or when a generator is started again after being shut down for the quarterly or annual inspection, or for repair, the procedure followed is different in some respects from the recharging procedure. The instructions given here are for this "initial" charging.

Initial Charging

(Refer to Figure 1 for MP-11 operating components.)

1. Close the acetylene service valve.
2. Move the feed-valve handle to the LOCK position.
3. Move the feed-tube handle to the CLOSE position.
4. Make sure the generator drain valve is closed.
5. Close the charging-hopper vent valve by lifting the valve handle.
6. Close the charging valve on top of generator.
7. Open the water-filling valve. Leave it open. Water will not flow into the generator, however, since the automatic water-level float valve is closed.
8. Open the low-level water-filling valve.
9. Insert the manual water-filling plug connection and hold it in position, allowing water to flow into the generating chamber. Disengage the manual connection as soon as the pointer on the water-level indicator reaches the REFILL position; then close the low-level water-filling valve. The automatic water-level float valve will then be open and water will be flowing into the generator through the water-filling valve.
10. Close the water-filling valve as soon as the generating-chamber pressure gauge reads 13 psi.
11. Watch the pressure gauge for about fifteen minutes. If the pressure starts to drop after the generator is filled, this decrease may be due to the cooling effect of the cold water on the air in the generating chamber. In such a case, wait to see if the pressure levels off and holds at a lower value. If the pressure continues to drop during this period, it is an indication that there is a leak. Thoroughly soap test all joints and correct the leaks as instructed in the Maintenance Section of this book.
12. Open the water fill valve again and continue to fill the generator. Close the valve as soon as the pointer on the water-level indicator reaches the NORMAL mark.
13. Fill the hydraulic back-pressure valve. Open the drain valve at the bottom of the hydraulic, open the valve on the water supply to the filling hose, and insert the plug on the end of the filling hose into the drain outlet to add water. Then remove the filling plug and insert the test plug into the drain outlet to check for the discharge of excess water. Repeat the filling and checking until a check shows a discharge of excess water. Hold the test plug in place to drain this excess, then remove the test plug and close the drain valve.
14. Fill the charging hopper with carbide. Be sure the unloading valve at the bottom of the charging hopper is closed. Open the charging door and place the charging hopper in the hopper pit. Place the filling funnel in the hopper door opening and pour in 350 lb. of 1/4 in. x 1/12 in. UNION carbide. Never use any other size carbide, nor attempt to overfill the hopper, nor pack carbide into it. Swing the funnel back from the charging hopper. Clear any excess carbide or dust away from the charging door opening. Be sure the ring gasket on the charging door itself is clean. Wipe it off with a dry cloth if necessary.
15. Raise the charging hopper waist high; close the charging door and tighten the handwheel to clamp the door down securely.
16. Lift the hopper to the monorail, move it to the generator, and lower it into position on the tapered nipple on the charging valve.
17. Open the charging valve.
18. Open the charging-hopper unloading valve to allow carbide to flow down into the generator hopper.
19. Rotate the unloading-valve handle to "feel" whether or not there is any carbide left in the charging hopper. When the hopper is empty, close the unloading valve and lock the handle in position.
20. Close the charging valve on top of the generator.
21. Remove the charging hopper from the generator.
22. Turn the feed-tube handle to the OPEN position.
23. Build the generator up to 5 lb. per sq. in. pressure. Turn the feed-valve handle from the LOCK position to the FEED position, pause at the FEED position several seconds, then return the handle to the LOCK position. Repeat the process of turning the feed-valve handle toward the FEED position, pausing at the FEED position several seconds and then returning it to the LOCK position until the generator pressure gauge shows 5 lb. per sq. in.
24. Vent the air-acetylene mixture. Slowly pull outward on the link which connects the two relief valves, thus venting the air-acetylene mixture from the generator. Do not pull the link all the way outward at once. When the generator pressure gauge indicates zero pause momentarily, and then return the link to its normal operating position.
25. Again build the generator up to 5 lb. per sq. in. pressure. Repeat the procedure in step 23.
26. Again vent the air-acetylene mixture. Repeat the procedure in step 24.

27. Build the generator up to operating pressure. Repeat the procedure given in step 23 until the generator pressure gauge shows about 12-1/2 lb. per sq. in; then move the feed-valve handle to the FEED position and leave it in that position.

28. Inspect the service line outlets. Check over all of the acetylene lines connected to the generator to see that the valves at all station outlets are closed tightly.

29. Slowly open the service valve.

30. Purge air out of all the service piping system that may contain air. All new service piping or piping which was disconnected in any way (thus permitting entrance of air) should be purged.
   a. Open the main line shutoff valve, and be sure that all section shutoff valves and line-pressure regulators are open.
   b. At the far end of each branch of the system, connect blowpipes equipped with cutting nozzles or welding heads to one or more stations equipped with either regulators or hydraulic back-pressure valves.
   c. At each of these stations, open the station valve and the blowpipe acetylene valve. (Do not open the blowpipe oxygen valve.) Light the blowpipes as soon as the issuing gas will burn. The flames will gradually increase in size and depth of color (becoming a deeper yellow), as the acetylene concentration increases.
   d. After the character of appearance of the flames remains constant for at least ten minutes, close the blowpipe valves and the station valves.

31. Leak test all stuffing boxes and joints. Apply soapy water liberally with a clean, one-inch paint brush at all threaded joints, union connections and valve stuffing boxes along the piping from the generator throughout the entire piping system. If any leaks are found, correct them at once in accordance with the maintenance instructions of this book.

An MP-11 generator will automatically supply acetylene at the preselected service pressure as long as carbide and water are supplied to the generator. The length of time that the generator will continue to operate without recharging will depend upon the rate of use at the service outlets. The carbide indicator on the generator indicates how much carbide is in the generator hopper.

Recharging

When the carbide content of the generator hopper is reduced to about 150 lb., the needle on the carbide indicator gauge will indicate REFILL on the gauge dial. Recharge the generator as instructed below:

1. Fill the charging hopper with carbide. Be sure the unloading valve at the bottom of the charging hopper is closed. Open the charging door and place the charging hopper in the hopper pit.

Place the filling funnel in the hopper door opening and pour in 350 lb. of 1/4 in. x 1/12 in. UNION carbide. Never use any other size carbide, nor attempt to overfill the hopper, nor pack carbide into it. Swing the funnel back from the charging hopper. Clear any excess carbide or dust away from the charging door opening. Be sure the ring gasket on the charging door itself is clean. Wipe it off with a dry cloth if necessary. Raise the hopper waist high; close the charging door and tighten the handwheel to clamp the door down securely.

2. Drain the residue. Open the drain valve and allow the residue to drain from the generating chamber. Close the drain valve as soon as the pointer on the water-level indicator reaches the REFILL mark. (If the water level is allowed to drop below the REFILL level, water must be added through the low-water-level connection.)

3. Fill the generator with water. Open the water-filling valve and allow water to flow into the generating chamber. Close the water-filling valve as soon as the pointer on the water-level indicator reaches the NORMAL mark.

4. Raise the charging hopper to the monorail, move it to the generator, and lower it into position on the tapered nipple on the charging valve.

5. Be sure the charging-hopper vent valve is closed.

6. Open the charging valve on top of the generator.

7. Open the charging-hopper unloading valve to allow carbide to flow down into the generator hopper.

8. Rotate the unloading-valve handle to "feel" whether or not there is any carbide left in the charging hopper. When the charging hopper is empty, close the unloading valve and lock the handle in position. The carbide-contents indicator may not read FULL when the charging hopper is empty. This is due to the fact that the generator has been feeding carbide during the recharging operation.

9. Close the charging valve on top of the generator.

10. Open the charging-hopper vent valve to release the acetylene pressure in the hopper. When the pressure gauge on the hopper indicates zero, close the vent valve.

11. Remove the charging hopper from the generator.

12. Check the water level in the generator hydraulic back-pressure valve. Open the drain valve at the bottom of the hydraulic and insert the test plug in the drain outlet. If water is discharged, hold the plug in place until the water discharge stops; then remove the test plug and close the drain valve. If acetylene is discharged, remove the test plug immediately; then open the valve on the water supply to the filling hose, and insert the plug (on the end of the filling hose) in the drain outlet to add water. Remove the filling plug and insert the test plug in the drain outlet to check for a discharge of excess water. Repeat the filling and checking until a check shows a discharge of excess water. Hold the test plug in place to
drain this excess, then remove the test plug and close the drain valve.

IMPORTANT: Drain the residue and refill the generating chamber with fresh water in accordance with these instructions each time the generator is recharged. Keep the generating chamber filled to the NORMAL level when there is any carbide in the hopper—even when the generator is not in use.

Short-Period Shutdown

If the generator is being operated on a one- or two-shift basis and is to be left unattended overnight or over a week end, or if there is no demand for acetylene for an extended period due to interrupted operations, the following procedure should be followed in shutting down the generator:

1. Close all of the valves at the station outlets. Check to see that they are closed tightly. Upon shutting off all of the station valves, the pressure within the generator may increase slightly beyond the pressure setting point but will then remain at a constant value. This is caused by the lag time between the feeding of carbide to the water and the consequent pressure rise upon generation of acetylene.
2. Move the feed-valve handle to the LOCK position.
3. Move the feed-tube handle to the CLOSE position.
4. Close the service valve.

Re-starting After a Short-Period Shutdown

The following procedure should be followed after a short-period shutdown when the acetylene demand is resumed:

1. Make sure all outlet valves in the piping system are closed.
2. Move the feed-tube handle to the OPEN position.
3. Move the feed-valve handle to the FEED position.
4. Slowly open the service valve.

Multiple-Generator Installation

When acetylene demand exceeds the rated capacity of a single MP-11, two or more of these generators are operated simultaneously by GC-4 controls. With GC-4 Control Units, the flow of acetylene from individual generators can be adjusted so that each carries an equal share of the load. Refer to Form 9510 for operating instructions for GC-4 controlled generators. Form 9510 also contains installation and maintenance instructions for the control units.

Alarm System

Purpose

An alarm system has been designed to provide audible and visual signals if the carbide supply or water conditions should deviate from normal. With this arrangement, the operator can be notified of these conditions even if he is some distance from the generator building. The alarm system is of particular advantage where the generators are not constantly attended.

Description

The alarm system for the MP-11 is optional. It is made up of standard parts produced by well-known electrical manufacturers, and available directly from LINDE. If you desire this extra protection, the generator is already prepared for the installation of the alarm actuators. (A thermometer well is located at the back of water shell for the high-water-temperature actuating bulb; a tapped hole under the carbide-contents gauge is provided for connecting the low-carbide pressure lead; an arm for actuating the bellows of the high-water lead is mounted on the water-level indicator shaft.) No additional parts are required for the generator, nor is it necessary to rework any generator parts. See Form 9508, "Installation Instructions for the MP-11 Acetylene Generator." This booklet lists the parts required for and describes the installation of an MP-11 alarm system.

The alarm system consists of a pressure-actuated switch, an alarm unit and a hower. The pressure switch is located in a weatherproof cabinet on an exterior wall of the generator building, and is connected to its respective actuating element on the generator by a fluid-pressure lead. The action of the pressure switch opens and closes an electrical circuit to the alarm unit. This unit has vapor-tight construction, which permits outdoor installation without the need of weatherproof housings. Each alarm unit contains a white light to indicate that the system is in operation, a red light to indicate the abnormal condition, and a reset switch to silence the howler.

A separate pressure lead, pressure switch and alarm unit is required for each of the generator conditions; however, only one howler is required to provide an audible signal for an alarm system consisting of one, two, or three alarm units.

Operation

During generator operation the white running light will remain ON as long as the electrical circuit is energized. If the water level, water temperature or carbide condition becomes abnormal, the respective alarm unit will operate. The howler will sound and the red light will go ON. When this happens, turn the reset button to RESET to silence the howler, then take the steps necessary to correct the abnormal condition. The red light will remain ON until the condition returns to normal. Then the red light goes OUT and the alarm unit is ready to operate again if the abnormal condition recurs.

Each alarm unit operates independently of the others. If a second abnormal condition should develop before the first is remedied, the signal light of the alarm for the second condition will go ON and the howler will sound again. In such a case, acknowledge the second signal with its RESET button, and correct the condition.
Maintenance and Overhaul Instructions

If you encounter difficulties in operating an MP-11 generator, first consult the Trouble-Shooting Check List on pages 17 and 18. When the source of trouble is determined, carry out the specific maintenance and overhaul instructions which apply to the defective part or parts of the generator. In case there is doubt as to the correct procedure, consult the nearest office of Linde Air Products Company.

Extra parts such as rollpins, rubber cement or a new handhole-cover gasket may be needed during an inspection or even for minor adjustments. It will be helpful to have them ready before proceeding with an inspection or any maintenance work. (See Spare Parts List, page 36.)

When a replacement part is needed for the generator, refer to the back of this book and locate the part on one of the parts illustrations. Refer to the "Complete Hardware List," page 44, for complete descriptions of hardware items. When placing an order for a replacement part, be sure to give the generator serial number, the part number, and the complete description of the part as given in the Replacement Parts section.

A few of the maintenance operations may be performed after closing the service valve and feed tube, locking the feed valve, and relieving the generator pressure; for example, adjusting the pressure valve interference, cleaning the charging-handhole vent valve and vent line, and checking the pressure gauges. Before starting any other inspection or maintenance, first withdraw the generator from service as instructed in Section E. Section G then gives the specific instructions for carrying out a definite maintenance job, at the same time indicating what preparatory work (Section F) is necessary. Finally, Sections H and I contain the procedures for replacing the handhole cover on the generating chamber and for returning the generator to service.

Before starting a given piece of maintenance work, carefully read the instructions (Section G) applying to the specific work. Pay special attention to the preparation which will be required. After making sure that the scope of the job is fully understood, proceed with the work.

Record the date and the name of the person performing the maintenance or overhauling of the generator. A "Generator Record," on page 34, is provided for this purpose. It is good practice to keep a record of the specific maintenance operations performed each time.

Section A. Lubrication Schedule

Daily. Lubricate the carbide charging valve. (Section G-15, page 29.)

Weekly. Lubricate all plug valves. (Section G-14, page 29.)

Section B. Quarterly Inspection Procedure

For a regular quarterly inspection, it will not be necessary to remove the generator hopper cover from the water shell. The entire inspection procedure, as outlined below, can be performed with just the handhole cover removed. Some cleaning of interior parts can be done through the handhole, using a wooden stick - never use metal. If further cleaning or maintenance is indicated by this inspection, refer to the appropriate subsection in Section G for detailed instructions. These instructions will also indicate what additional preparations, if any, are necessary for each maintenance operation.

Thorough and careful inspection of each item ensures reliable and uninterrupted operation.

1. Withdraw the generator from service. (Section E, page 19.)
2. Inspect the filter and replace it if conditions warrant. (Section G-2, page 21.)
3. Remove the handhole cover. (Section G-1, page 20.)
4. Examine the carbide feed tube for cracks or tears.
5. Inspect the control rods and fittings. Clean and inspect the feed-tube shutoff system.
6. Check the operation of the water-level indicator. (Section G-7, page 24.)
7. Clean the pressure-equalizing line. (Section G-10, page 27.)
8. Replace the handhole cover. (Section G-1, page 20.)
9. Check for leakage at the automatic water-shutoff valve. (Section G-6, page 23.)
10. Check the operation of the relief-valve mechanism. (Section G-4, page 22.)
11. Inspect the charging-handhole gaskets. (Section G-12, page 28.)
12. Check the stuffing boxes. (Section G-18, page 31.)
13. Lubricate the plug valves. (Section G-14, page 29.)
14. Return the generator to service. (Section I, page 32.)
Section C. Annual Inspection Procedure

Carefully inspect every item to insure continuous and reliable operation. Follow the specific instructions for maintenance work in Section G.

1. Withdraw the generator from service. (Section E, page 19.)
2. Remove the hopper cover. (Section F, page 19.)
3. Remove the hopper. (Section F, page 19.)
4. Remove the handhole cover. (Section G-1, page 20.)
5. Clean and examine the carbide feed control. (Section G-5, page 22.)
6. Inspect the control rods and fittings. Clean and inspect the feed-tube shutoff system. (Section G-8, page 25.)
7. Replace the feed-control atmospheric connection. (Section G-5, page 22.)
8. Replace the feed tube. (Section G-5, page 22.)
9. Examine the generating chamber. (Section G-16, page 29.)
10. Clean the pressure-equalizing line. (Section G-10, page 27.)
11. Clean the charging valve. (Section G-15, page 29.)
12. Check the generator-hopper gasket (main gasket). (Section H, page 32.)
13. Replace the hopper.
14. Replace the hopper cover. (Section H, page 32.)
15. Replace the handhole cover. (Section G-1, page 20.)
16. Clean the relief valves. (Section G-17, page 30.)
17. Clean the charging-hopper vent valve and vent line. (Section G-11, page 27.)
18. Inspect the filter and replace it if necessary. (Section G-2, page 21.)
19. Wash out the hydraulic back-pressure valve. (Section G-3, page 21.)
20. Check the operation of the relief-valve trip mechanism. (Section G-4, page 22.)
21. Inspect the charging-hopper gaskets. (Section G-12, page 28.)
22. Check the operation of the carbide indicator system. (Section G-9, page 26.)
23. Tighten or repack all stuffing boxes. (Section G-18, page 31.)
24. Lubricate the plug valves. (Section G-14, page 29.)
25. Inspect the pressure gauges. (Section G-13, page 28.)
26. Return the generator to service. (Section I, page 32.)
## Section D. Trouble-Shooting Check List

The following chart will assist operators in locating generator difficulties, ascertaining the probable cause, and making proper adjustments.

<table>
<thead>
<tr>
<th>CONDITION</th>
<th>CAUSE</th>
<th>REMEDY</th>
<th>PROCEDURE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Carbide feed valve clogged.</td>
<td>Operate feed-valve handle to clean valve opening.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Insufficient water in generating chamber; float interference holding feed tube shut.</td>
<td>Add water to bring water level to NORMAL.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Float filled with water.</td>
<td>Check drain valve for leakage.</td>
<td>Section G-14, page 29.</td>
</tr>
<tr>
<td></td>
<td>Feed-tube rod stuck.</td>
<td>Replace float.</td>
<td>Section G-8, page 25.</td>
</tr>
<tr>
<td></td>
<td>Feed-control diaphragm ruptured.</td>
<td>Replace plug.</td>
<td>Section G-5, page 22.</td>
</tr>
<tr>
<td>Generator feeds carbide indiscriminately; generator pressure is uncontrollable and relief valve vents.</td>
<td>Feed-control atmospheric line clogged.</td>
<td>Replace plug.</td>
<td>Section G-5, page 22.</td>
</tr>
<tr>
<td>Generator pressure is normal, but line pressure is low or variable.</td>
<td>Filter clogged.</td>
<td>Replace filter.</td>
<td>Section G-2, page 21.</td>
</tr>
<tr>
<td>Water level drops below NORMAL.</td>
<td>Improper operation of pressure regulators in piping system.</td>
<td>Turn pressure-adjusting screw to desired line pressure.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Insufficient water in generating chamber.</td>
<td>Check drain valve for leakage.</td>
<td>Section G-14, page 29.</td>
</tr>
<tr>
<td>Generator pressure remains unchanged when water level drops to LOW.</td>
<td>Interference float chain broken.</td>
<td>Replace chain.</td>
<td>Section G-8, page 25.</td>
</tr>
<tr>
<td></td>
<td>Feed tube damaged.</td>
<td>Replace feed tube.</td>
<td>Section G-5, page 22.</td>
</tr>
<tr>
<td>Control-rodd stuffing box leaks acetylene.</td>
<td>Packing loose or worn.</td>
<td>Tighten or repack stuffing box.</td>
<td>Section G-18, page 31.</td>
</tr>
<tr>
<td>Charging hopper does not hold generator pressure.</td>
<td>Charging-door gasket worn.</td>
<td>Replace gasket.</td>
<td>Section G-12, page 28.</td>
</tr>
<tr>
<td></td>
<td>Engagement gasket worn.</td>
<td>Replace gasket.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Leakage past unloading-valve shaft seal.</td>
<td>Replace &quot;O&quot; ring.</td>
<td></td>
</tr>
<tr>
<td>Relief valve leaks.</td>
<td>Worn &quot;O&quot; ring.</td>
<td>Replace &quot;O&quot; ring.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dirt on seat.</td>
<td>Clean and inspect relief-valve poppet.</td>
<td>Section G-17, page 30.</td>
</tr>
<tr>
<td></td>
<td>Spring damaged.</td>
<td>Clean relief valve and install new spring.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Improper adjustment.</td>
<td>Readjust relief valve.</td>
<td></td>
</tr>
<tr>
<td>Relief valves do not vent acetylene.</td>
<td>Vent pipe clogged.</td>
<td>Inspect relief-valve vent pipes to see that no obstructions have closed or restricted them.</td>
<td>Section G-19, page 32.</td>
</tr>
<tr>
<td>Charging hopper has acetylene pressure after it is vented.</td>
<td>Charging-hopper vent line clogged.</td>
<td>Clean charging-hopper vent line.</td>
<td>Section G-11, page 27.</td>
</tr>
</tbody>
</table>

(Continued)
<table>
<thead>
<tr>
<th>CONDITION</th>
<th>CAUSE</th>
<th>REMEDY</th>
<th>PROCEDURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbide indicator gives faulty reading.</td>
<td>Pointer is loose.</td>
<td>Adjust pointer.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lack of fluid in indicator system.</td>
<td>Add fluid to fluid pressure system. Check system for leaks.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fluid pressure system clogged.</td>
<td>Clean fluid pressure system.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Worn “O” ring.</td>
<td>Replace “O” ring.</td>
<td></td>
</tr>
<tr>
<td>Generator becomes abnormally hot during operation.</td>
<td>Filling water too warm.</td>
<td>See that the water line supplying the generator does not parallel steam lines or hot air ducts. Always fill generator with cool, fresh, clean water.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Insufficient fresh water added to generating chamber.</td>
<td>Always drain generator to REFILL water level before refilling each time generator is recharged. Then fill the generating chamber with cool, clean, fresh water until the water level is at NORMAL.</td>
<td></td>
</tr>
<tr>
<td>Odor of acetylene is present in generator room.</td>
<td>Acetylene leak.</td>
<td>Immediately open doors and windows to obtain maximum ventilation. Do not make any sparks. Listen for hissing sound of escaping gas. Test all stuffing boxes, gasket joints, charging valve and pipe connections with soapy water until leak is found. Close service valve and turn feed-valve handle to LOCK position. Then make proper repairs.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Carbide spilled during recharging.</td>
<td>Always clean up spilled carbide.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Carbide cans left open.</td>
<td>Always replace and securely fasten covers on carbide containers. Be sure cover gasket is in place.</td>
<td></td>
</tr>
<tr>
<td>Residue valve, charging-hopper vent valve, or water-filling valve is difficult to operate.</td>
<td>Insufficient lubrication.</td>
<td>Add lubricant by turning down lubricant screw or putting in a fresh lubricant stick.</td>
<td>Section G-14, page 29.</td>
</tr>
</tbody>
</table>
Section E. Withdrawing a Generator From Service

1. If the generator hopper is not already empty, use up the remaining charge of carbide. This may be done by allowing the generator to exhaust itself in regular service, or by consuming the acetylene by lighting one or more blowpipes connected to station outlets equipped with either regulators or hydraulic back-pressure valves. Do not use up the acetylene under any circumstances by allowing it to discharge directly from station outlets. Likewise do not attempt to consume carbide at a rate which exceeds the generating capacity of the MP-11.

2. When the generator pressure begins to drop, close the generator service valve.

3. Make sure the carbide charge is exhausted. Turn the feed-valve handle to the LOCK position and then to the FEED position. Repeat this operation several times, pausing at the FEED position for several seconds each time, and watch the generator pressure gauge for an increase in pressure which would indicate further generation of acetylene.

4. Lock the feed valve. Turn the feed-valve handle to the LOCK position until the latch drops to hold it there.

5. Close the feed tube. Turn the feed-tube handle to the CLOSE position until the latch drops to hold it there.

6. Open the residue drain valve for several seconds and then close it.

7. Relieve the acetylene pressure by slowly pulling outward on the interference link which connects the two relief valves. Do not pull the link all the way outward at once. When the generator pressure gauge indicates zero, pause momentarily, and then return the link to its normal position.

8. Make sure the generator room is adequately ventilated. Open windows and doors; however, do not allow water in the piping and generator to freeze.

9. Open the charging valve on top of the generator.

10. Open the drain valve and allow the residue to drain into the generating chamber. Close the drain valve as soon as the pointer on the water-level indicator reaches the REFILL mark.

11. Open the water-filling valve and allow water to flow into the generating chamber. Close the water-filling valve as soon as the pointer on the water-level indicator reaches the NORMAL mark.

12. Repeat the procedure of draining the generating chamber to the REFILL level and then filling it to the NORMAL level one additional time.

13. Drain the generating chamber until it is completely empty and close the drain valve.

14. Open the water-filling valve.

15. Open the low-level water-filling valve.

16. Insert the water-filling plug in the manual water-filling connection and hold the plug in position, allowing water to flow into the generating chamber. Disengage the manual connection as soon as the pointer on the water-level indicator reaches the REFILL position; then close the low-level water-filling valve.

17. Close the water-filling valve.*

IMPORTANT: All repairs involving welding, soldering or any other operation liable to produce flame, sparks, or heat should be made outside the generator room. Sections of the generator to be so repaired must be completely flooded with water to make sure that all acetylene is expelled before the repair work is performed.

Section F. Removing the Generator Hopper From the Generating Chamber

After the generator has been withdrawn from service and purged as instructed in Section E, the generator hopper may be removed from the generating chamber.

Hopper Cover (Refer to Fig. 10)

Disconnect the lower section of the pressure-equalizing line at the union just above the generating chamber.

Disconnect the lower section of the charging hopper vent line at the union which is just about level with the hopper flange.

Remove the relief-valve interference link from the generator. Unscrew the ball and socket joint at each end of the interference link and place the link where it will be out of the way during maintenance operations.

Rig a sturdy sling by passing rope under the charging valve. Secure the rope firmly around the

*If the generator is to remain out of service for an extended period of time, close the charging valve. Make sure that the feed-tube handle is held in the LOCK position and the feed-valve handle is held in the LOCK position.

If the water in the generator is likely to freeze, drain it and close the drain valve before closing the charging valve. After closing the charging valve, attach to the valve handle a tag with this warning: "This generator is empty of water. Before placing in operation, charge the generator as directed in the instructions for initial charging."

After an extended shutdown period, carefully inspect all parts subject to deterioration before charging with carbide.
valve and provide a loop in the rope to extend directly over the charging connection.

Locate a block and tackle or hoist securely at some point above the generator hopper so that the latter can be lifted clear of the generating chamber and then swung out and down on the floor. Fasten the lifting hook of the block and tackle or chain hoist securely to the loop of the lifting sling.

Remove all the bolts which hold the hopper cover to the generating chamber around the gasketed flange joint.

Lift the hopper cover off the flange joint, about 1 inch. If the gasket adheres to the cover flange, carefully separate the gasket so that it will remain in place on the generator flange. Then raise the hopper cover and swing it clear from the generating chamber and carefully lower it to the floor. Move the hopper cover outside the generator room to work on any of its parts.

Hopper Funnel

The hopper funnel is held in place by the same flange bolts that hold the hopper cover to the generating chamber.

To remove the hopper funnel, it is first necessary to disconnect the atmospheric vent line from the hollow foot of the feed control unit. Pass a rope through the two lifting rings on the funnel and fasten the rope to the lifting hook of a hoist or block and tackle. Turn the feed-tube handle to the OPEN position. Then slowly lift the funnel about a foot off its three supports. If the gasket adheres to the generator flange, carefully separate it from the generator flange. Reach into the space between the funnel and the water shell and disconnect the atmospheric vent line from the hollow foot of the feed control unit. Then swing the funnel clear from the generating chamber and carefully lower it. Remove the feed-control cover and invert the funnel before it reaches the floor, so that it comes to rest on the ring of gasket bolts instead of on the feed-tube backup plate.

Whenever maintenance work requires the removal of the hopper funnel, inspect all interior parts of the generator.

Section G. Maintenance and Repair of Generator Parts

G-1. Handhole Cover

The main purpose of the handhole located at the side of the generating chamber is to permit visual inspection of internal parts of the generator. The only parts which can be reached through the handhole for convenient servicing are the float arms (Sec. G-8) and the float-operated water valve (Sec. G-6).
IMPORTANT: Never remove the handhole cover without first thoroughly purging the generator as instructed in Section E. The cover may then be taken off the generator by removing the eight flange bolts (Fig. 11).

After a particular inspection or maintenance operation has been completed, inspect the remaining interior parts of the generator. Examine the handhold-cover gasket for cut or worn spots which may cause a leak, and install a new gasket, if necessary. Replace the handhold cover and tighten all bolts evenly and securely.

G-2. Filter Unit

Before inspecting or replacing the filter, prepare the generator in accordance with the following instructions:

1. Close the service valve.
2. Close the feed valve. Turn the feed-valve handle to the LOCK position until the latch drops to hold it there.
3. Close the feed tube. Turn the feed-tube handle to the CLOSE position until the latch drops to hold it there.
4. Relieve the acetylene pressure by slowly pulling outward on the interference link which connects the two relief valves. Do not pull the link all the way outward at once. When the generator pressure gauge indicates zero, pause momentarily, then return the link to its normal position.

The acetylene filter is located in the dome of the hydraulic back-pressure valve. Remove the eight bolts from the flange of the hydraulic and carefully lift the dome straight up. Do not tear the flange gasket. Invert the dome and fill it with water to displace any acetylene that may still be present. Then empty the dome and place it on the floor. Displace any acetylene remaining in the bottom part of the hydraulic by filling this part with water up to the flange.

To remove the filter, remove the thumbscrew that holds the filter to the mounting post (Fig. 12); then lift off the filter. With a damp cloth wipe any accumulated lime from the filter outlet. Also, remove the plug from the tee in the acetylene outlet, just outside of the hydraulic. Direct a stream of water into the filter outlet until the issuing water appears clean. Replace the plug, using a good grade of pipe compound. Then place a new filter in position and tighten it in place with the retaining thumbscrew. Application of a small amount of oil or grease to the threads of the thumbscrew and mounting post will assist future maintenance.

Examine the flange gasket for cut or worn spots which may cause a leak. Install a new gasket if necessary. With a damp cloth wipe the lime deposit from the inside of the hydraulic dome and replace the dome on the flange. Replace the flange bolts, tightening them evenly and securely.

Re-establish the normal operating level of the water in the hydraulic. Open the drain valve at the bottom of the hydraulic, insert the test connection into the quick-disconnect valve and drain the hydraulic until the flow of water stops. The hydraulic water level is now correct. Remove the test connection and close the drain valve.

If no further maintenance work is to be performed, return the generator to service as instructed in Section I.

G-3. Hydraulic Back-Pressure Valve

To clean the hydraulic back-pressure valve, first withdraw the generator from service according to the instructions in Section E, page 19. Then remove the hydraulic dome and the filter (see G-2). Fill the bottom half and the dome of the hydraulic with water to displace any acetylene that may still be present.

Place a large pail or similar container under the hydraulic to catch the water as it drains from the valve. Unscrew the first coupling below the hydraulic and remove the complete standpipe, drain valve and quick-disconnect valve assembly (see Fig. 7).
Flush out the hydraulic bottom by directing a stream of clean water from a hose into the opening between the acetylene outlet and the flange. With a hooked wire or other suitable device, lift up the baffle tube as far as it will go and continue to flush until the discharge water is clean.

Remove the cap on the check valve in the acetylene inlet connection to the hydraulic. If any accumulation of lime is observed in the valve body, remove the lime with a wooden stick - never use metal. Clean and examine the check flap to see that it opens freely. Flush out this connection with a stream of clean water and replace the cap.

Clean and replace the standpipe, drain valve and quick-disconnect valve assembly. Use stringy white lead or other suitable pipe compound on all male pipe threads. Install a new filter if necessary and assemble the dome to the hydraulic.

Re-establish the correct water level in the hydraulic. Open the valve in the water-supply line. Open the hydraulic drain valve and insert the fill connection into the quick-disconnect valve. Remove the fill connection and insert the test plug into the quick-disconnect valve to check for a discharge of excess water. Repeat this filling and checking until a check shows a discharge of excess water. Hold the test plug in place until all of the excess has drained; then remove the test plug and close the drain valve.

If no additional maintenance is to be performed, return the generator to service as instructed in Section I, page 32.

G-4. Relief-Valve Interference

Inspect the operation of the relief valve interference mechanism at the time the generator is being recharged. See that the mechanical linkage (Fig. 9) works properly when the handle of the charging valve is lifted to open the valve. Both relief valves should open at this time, but only for a moment before the interference spring pulls the linkage back to its original position.

Check the spring tension and action of the linkage members. Make sure that all connections are tight and that all movable parts work freely.

G-5. Carbide Feed Control

Before performing any maintenance work on the carbide feed control, prepare the generator in accordance with Section E, page 19. Then remove the hopper cover and hopper funnel as instructed in Section F, page 19.

Cleaning the Feed Control. Remove the hose clamp that holds the feed tube to the hopper outlet (Fig. 13). Remove the feed tube, clean it under a stream of clean water, and inspect it for cracks or worn spots. Unscrew the two feet from the control unit. Clean all lime from the cover, control unit and feed valve with a rag or soft wood stick - never use metal. (Avoid getting lime into the hollow leg of the feed-control unit.) Replace the feed tube, making sure it is completely dry. Use a new tube if necessary and fasten it to the hopper outlet with the hose clamp. If no further maintenance is to be performed, replace the hopper funnel and hopper cover and return the generator to service as instructed in Sec. I, page 32.

**FIG. 13 – Feed-Control Assembly**

Atmospheric Vent Line. To clean a clogged atmospheric vent line, first withdraw the generator from service. Remove the hopper cover and hopper funnel, unscrewing the fitting that connects the vent line to one foot of the carbide feed control (see Section F). Temporarily fasten this end of the line to one of the control rods with a piece of cord to prevent the line from swinging out of reach. Unscrew the plug from the pipe cross (Fig. 14) located in the generator relief-valve vent line a short distance past the relief valve. Directly below the opening in this pipe cross is the other end of the atmospheric vent line. Blow a stream of clean, dry air into this end of the vent line until all accumulations or obstructions are removed. Examine the vent hose and replace the hose if it shows any sign of deterioration. To replace the vent hose, unscrew the hose clamp that holds the other end of the vent line to a fitting.
below the pipe cross. Slide the bare end of a new vent hose over the same fitting and fasten it there with a hose clamp. If no further maintenance is to be performed, connect the other end of the vent line to the feed-control unit, and replace the generator hopper. Return the generator to service as instructed in Section I, page 32.

Replacing a Ruptured Diaphragm. If the feed-control diaphragm has ruptured, acetylene will enter the upper part of the feed control and pass through the atmospheric vent line into the generator relief-valve vent line. The sign of a broken diaphragm is continuous, uncontrolled feeding of carbide due to the presence of generator pressure on both sides of the diaphragm. However, this condition of uncontrolled feeding could also be caused by the generating chamber relief valve being improperly seated. First check the relief valve as instructed in Section G-17, page 30, and perform any necessary cleaning and replacement. Then build up the generator pressure again and note if there is a continuous discharge of acetylene from the generating chamber vent line. If there is, it will be necessary to replace the diaphragm.

Remove the generator hopper cover and lift the hopper funnel about one foot (Sec. F). Reach into the space between the hopper funnel and the water shell and unscrew the atmospheric vent-line connection at the hollow foot of the feed control. Tie the vent line to the feed-valve control rod to prevent it from swinging out of reach; then swing the funnel clear of the generator and lower it to a convenient working position near the floor. Unscrew both feet from the feed control. Reach into the hopper funnel and remove the feed-control cover and feed control.

Unscrew the nut holding the diaphragm retaining plate and the eight bolts holding the diaphragm retaining ring (Fig. 15). Remove the defective diaphragm. Clean the internal surfaces of the feed control of any lime or dirt that may have accumulated there. Place a new diaphragm in position and carefully replace the retaining ring and retaining plate. Be sure that all parts are dry. Tighten the bolts and nut evenly and securely to prevent leaks.

Replace the feed-control unit in the hopper funnel. Slip the feed-control legs into the hopper-funnel guides and lower the control unit until the diaphragm retaining ring rests on the two guides. Replace the feed-control cover and reconnect the feet to the control unit. Raise the hopper funnel into position over the generator, making sure that the funnel is aligned properly. The three pads on the underside of the funnel rim should be directly over the three hopper supports. Then, through the space between the hopper funnel and water shell, reconnect the atmospheric vent line to the feed control. Make certain that the stirrups on the feed-control feet properly engage the two lugs on the feed-valve lifting rod. Replace the hopper funnel and hopper cover and, if no further maintenance is to be performed, return the generator to service as instructed in Section I, page 32.

IMPORTANT: Do not disassemble the feed control any further than instructed above. The control springs are powerful and could cause injury if improperly released. The feed control is set at the factory to maintain a generator pressure of 13 psi and should not be adjusted in the field. If the feed control should develop any defect other than a ruptured diaphragm, return the entire control unit to the factory for repairs.

![FIG. 15 - Removing the Feed-Control Diaphragm](image)

Adjusting the Feed Valve. Whenever the feed-control unit is removed from the generator hopper, or when installing a new feed-control unit, the following adjustment should be checked. Install the feed-control unit in the bottom of the hopper so that the retaining ring rests on the two guide bushings. In this position the plug will extend through the hopper outlet. Measure the distance between the lower edge of the hopper outlet and the edge of the plug formed by the intersection of the cylindrical and conical surfaces. (See the illustration above.) This distance should measure 1-1/16 inch. To make any required adjustments, first loosen the jam nut at the top of the stem assembly. Rotate this assembly until the correct distance of 1-1/16 in. is established between the hopper and plug surfaces, as indicated above. Then advance the jam nut as far as it will go to hold this setting. As a further assurance that the position of the plug will not change during operation of the generator, pinch the stem threads immediately below the jam nut. The feed valve is now in proper adjustment.

G-6. Float-Operated Water Valve

Before starting maintenance work on the float-operated water valve, withdraw the generator from service according to the instructions in Section E, page 19. Drain the generator to the LOW level and remove the handhole cover (Sec. G-1).
Replacing the Valve Seat. The valve seat is a reinforced-rubber washer located on the valve plug (Fig. 16). To remove the seat, first remove the pipe plug in the tee leading into the valve. Back out the setscrew in the side of the valve housing until it is flush with the interior wall of the housing. Insert a screwdriver in the slot at the back of the valve plug and unscrew the plug from the valve body (Fig. 17). (This operation can be done more easily if the water in the generator is raised to a level just below the valve opening.) Remove the retaining ring and retaining washer from the plug, then lift off the seat. Clean the shoulder on the valve plug before putting a new seat in place. Reassemble the seat, retaining washer and retaining ring on the plug in the proper sequence. Make sure the seat sits properly on the shoulder of the plug.

Checking the Valve Linkage. At the same time the valve seat is replaced (see above), check for looseness in the valve linkage. Insert a needle-nosed Monel pliers into the valve body and grasp the unthreaded tip of the stud. Check for looseness of the movable pivots by trying to move the stud from side to side. Check for looseness in the fixed pivot by reaching through the handhole and trying to move the float arm sideways at the valve body. If there is looseness in any of the pivots, replace the rollpins forming these pivots. To do this, it will be necessary to remove the valve body from the water shell. First fill the generator through the low-water fill connection until the water level is a few inches below the float-operated water valve. Then disconnect the water-supply line at the union located between the pipe cross and the sediment separator. Remove the pipe cross, nipple, water fill valve and tee. Now unscrew the valve body from the water shell and withdraw the float-arm assembly far enough to expose the fixed pivot. Drive out the rollpin forming the fixed pivot (caution: use only Monel tools to prevent sparking) and insert a new rollpin.

To reach the movable pivots, drive out the fixed pivot as instructed above and draw the float arm farther back into the generating chamber. The float-arm assembly (Fig. 16) can now be removed through the handhole for replacing the movable pivots. Direct a stream of water on the float, arm and linkage to wash off any lime accumulation. If necessary, use a wooden stick to remove caked line — never use metal. Install a new float if the old one is punctured or filled with water.

Wipe the valve plug and valve body with a damp rag, and reinstall the float and valve assemblies in the reverse order from which they were removed. With the generator water level at LOW, screw the plug onto the stud until the valve seat just makes contact with the valve body. At this point lift the float arm and screw the plug in another half turn. Turn down the setscrew far enough to prevent the valve plug from turning, but not far enough to prevent it from moving back and forth in the valve body. Then replace the pipe plug and handhole cover and tighten all connections. Use a good pipe compound on all male threads, but do not allow any compound to enter the valve body.

Valve Adjustment. To check for proper adjustment of the valve, open the water fill valve and see if the float-operated valve closes when the water rises to the HIGH level. Allow the generator to stand in this condition (with the manual water fill valve open) for at least one hour. Further movement of the water-level indicator would indicate inadequate seating of the valve in its closed position; readjust the valve plug in the manner described above. After checking the valve adjustment, clean and inspect the sediment separator and the check valve in the water-supply line. Return the generator to service as instructed in Section I, page 32, if no further maintenance is to be performed.

G-7. Water-Level Indicator

The water-level indicator is connected directly to one of the floats in the generating chamber. As the float rises and falls with the water level, its motion is transmitted to the indicator pointer through the indicator assembly.

If water seeps out around the indicator shaft, first attempt to stop the leak by tightening the stuffing-box nut. CAUTION: Avoid over-tightening of the stuffing-box nut. If a normal amount of tightening fails to stop the leakage, replace the packing material. (See Figure 33 in the Replacement Parts section of this
book for the proper packing material to use.) Prepare the generator by withdrawing it from service as outlined in Section E. Then unscrew the stuffing-box nut as far as it will go (Fig. 18) and remove the old packing from the stuffing box. Be sure that all of the old packing rings are removed. Insert the new packing rings in the stuffing box, taking care to see that the packing is pushed on straight, and not at an angle. With the packing completely replaced, screw the stuffing-box nut back in place by hand.

After all maintenance work has been taken care of, return the generator to service as outlined in Section I, page 32. Check the water-level indicator for leakage and ease of movement while the generator is being refilled. Add water and check to see that the pointer moves steadily to indicate the rising water level. At the same time, tighten the stuffing-box nut just enough to stop any leakage. If the pointer moves smoothly and there is no leakage, further tightening of the stuffing-box nut will be unnecessary at this time.

**G-8. Low-Water Carbide Shutoff**

The same float that operates the water-level indicator activates the low-water carbide shutoff. Before starting any maintenance work on this carbide interference system, withdraw the generator from service as instructed in Section E, page 19.

**Replacing the Chain.** Drain the water to LOW and remove the handhole cover (Sec. G-1). To disconnect the chain from the float arm, unbolt the indicator housing from the water shell, draw the float arm forward through the water-shell opening, and reach through the handhole. To disconnect the other end of the chain from the feed-tube clamping lever, it is necessary to remove the generator hopper as instructed in Section F, page 19. Fasten the replacement chain (29 in. long) to the same two points. Check to make sure that the feed-tube control rod operates freely (see Sec. G-18, page 31). If no further maintenance is to be performed, replace the indicator housing, generator hopper and handhole cover, and return the generator to service as instructed in Section I, page 32.

**Replacing the Float.** Drain the water to LOW and remove the handhole cover and indicator housing. Reach into the generating chamber and disconnect the end of the interference chain from the float arm, as instructed in the preceding paragraph. Then remove the pipe plug (Fig. 19) at the end of the water-indicator shaft and back out the setscrew located behind this plug. Unscrew the indicator housing from the float arm to free the end of the float arm from the water-indicator housing. Back the arm and float assembly farther into the generating chamber and withdraw it through the handhole.

Direct a stream of water on the float and float arm to wash off any lime accumulation. If necessary, use a wooden stick to remove caked lime — never use metal. To replace the float, drive out the rollpin from the threaded float hub and unscrew the float from the float arm. Screw the new float to the arm using a small amount of oil or cup grease on the threads. Then reinstall the float-and-arm assembly in the reverse order from which it was removed. Make sure that the float arm is properly aligned in the threaded socket in the indicator shaft. The bend in the float arm should point down, and hole near the end of the float arm should line up with the setscrew in the indicator shaft. Turn the setscrew into the hole in the arm until the end of the setscrew is flush with the end of the indicator shaft. Replace the pipe plug at the end of the indicator shaft, applying pipe compound to the plug threads. Check to make sure that the feed-tube control rod operates freely (see Section G-18, page 31).
Replace the handhole cover and, if no further maintenance is to be performed, return the generator to service as instructed in Section I, page 32.

G-9. Carbide Indicator

If readings of the carbide contents gauge are erratic, or if the gauge pointer appears to be stuck, the "O" ring (Fig. 20) may be binding between the hydraulic piston and piston housing. Turn the adjusting screw to the left and right a few times to free the "O" ring. Correct readings of carbide contents would now indicate that the cause of the faulty readings has been removed.

A leak in the hydraulic system would result in sluggish operation of the carbide indicator. Check for oil around the plug, gauge and adjusting-screw connections, and make sure that all connections are tight. If a slight leakage is detected, the carbide indicating system can be kept in operation by turning down the adjusting screw. Oil can be added to the system at the next regular maintenance period to make up for any slight losses.

All other maintenance work on the carbide indicator system requires the removal of the generator hopper (cover and funnel). Withdraw the generator from service as instructed in Section E, page 19, and remove the hopper as instructed in Section F, page 19.

![Fig. 20 - Carbide Indicating System](image)

Replacing the Oil Ring. Carefully remove the rubber cap that fits over the hydraulic piston. Hold the cap under a stream of clean water to remove any accumulation of lime, and examine the cap for cracks or worn spots. Slowly lift the hydraulic piston straight up until it is clear of the cylinder. Remove the "O" ring from the piston and install a new "O" ring in its place. Make sure the new "O" ring fits snugly and evenly in the recess provided for this purpose. To minimize the amount of air entering the hydraulic system when replacing the piston, first turn down the adjusting screw as far as it will go. Note the number of turns. Then slide the piston into the cylinder until the "O" ring is covered, and replace the rubber cap over the assembly. Back off the adjusting screw to its original position.

If no further maintenance is to be performed, replace the hopper and return the generator to service according to the Instructions in Section I, page 32.

Filling the Hydraulic System. Remove the gauge, adjusting-screw body and piston housing from the indicator body. Screw the 1/4-in. pipe plug into the end of the indicator body. Pour hydraulic fluid into the system through one of the openings on top of the body until the fluid is level with the top of the openings. Unscrew the 1/4-in. pipe plug until a stream of fluid flows out around it, and then immediately replace the plug. Do not allow the fluid level to drop below the threaded portions of the top holes. Bring the level back up to the top of the openings by adding more fluid.

Assemble the "O"-ring gasket on the piston housing and screw the housing into its opening in the indicator body. Screw the adjusting-screw body, minus the adjusting screw, into its opening in the indicator body. Make sure the oil level in the gauge opening is at the top of the opening. The gauge is filled with fluid at the factory and under ordinary operating conditions does not have to be refilled. Screw the gauge into its threaded hole. Add enough fluid to bring the level up to the top of the piston housing.

Assemble the "O" ring in its groove on the piston and insert the piston into its housing until the top of the piston is 5/8 in. above the top of the water shell flange. Make certain the fluid level reaches the threads in the adjusting screw body; if it does not, add more fluid. Assemble the "O" ring in its groove on the adjusting screw and screw the adjusting screw into its body until the top of the piston is raised to a height of 11/16 in. above the top surface of the water shell flange.

Checking for Air in the System. Push down on top of the piston. A solid reaction indicates absence of air. A spongy feeling indicates the presence of air. If air is present in the system, the carbide indicator should be disassembled and refilled with hydraulic fluid as indicated in the previous paragraph. If there is no air in the system, assemble the rubber dust shield around the piston and the piston housing.

Clean and inspect the rubber cap before replacing it over the piston. Use a new cap if the old one has any cracks or worn spots. If no further maintenance is to be performed, replace the hopper and return the generator to service as instructed in Section I, page 32.

Checking the Indicator Gauge. After the necessary maintenance is performed on the hydraulic system, check the gauge accuracy before returning the generator to service if the pointer is not at the EMPTY mark. Unscrew the indicator gauge cover and remove the glass. Carefully pull the pointer off the shaft, rotate it to EMPTY, and press it back on the shaft in this position. Replace the glass and screw the cover down tightly. When the generator
hopper is recharged with 350 lb. of carbide, the indicator pointer should travel to the fourth division past REFILL. If there is any doubt about the accuracy of this gauge, install a new carbide gauge. Defective gauges should not be repaired by the customer.

G-10. External Pressure Equalizer

Withdraw the generator from service as instructed in Section E, page 19. Then disconnect the equalizer line at the unions leaving the generating chamber and entering the hopper cover (Fig. 21). Remove the length of pipe between the two unions and tap the pipe with a wooden mallet — never use metal — to clear the pipe of all accumulations or obstructions. Then blow clean, dry air through the pipe. Examine the equalizer-line connections at the generating chamber and hopper cover and clean out any accumulations with a wooden stick. Reinstall the pipe and tighten all connections. If no further maintenance is to be performed, return the generator to service as instructed in Section I, page 32.

FIG. 21 — Pressure-Equalizer Assembly

G-11. Charging-Hopper Vent Valve and Vent Line

Remove the charging-hopper vent piping between the charging-hopper fitting and the pipe union (Fig. 22). Disconnect all the pieces in this assembly and tap each piece with a wooden mallet — never use metal — to remove all accumulations and obstructions. Then blow clean, dry air through each piece. (The horizontal run of vent piping from the generator to the wall of the generator room should be disconnected and cleaned at this time.) Examine all connections and fittings and clean out any remaining lime deposits with a wooden stick.

The charging-hopper vent valve should be disassembled and cleaned at this time. Remove the two nuts from the front of the valve and pull the cover and plug assembly out of the valve body. Clean the lubricant grooves with a wooden stick (Fig. 23) and damp cloth, then clean the inside of the valve body with a damp cloth. Turn the lubricant screw in a few turns to make sure the lubricant passageways and check valve in the stem end of the plug are clear. Dry both parts thoroughly and reassemble

the valve. Turn down the lubricant screw to fill the lubricant grooves (insert a fresh lubricant stick if necessary). Open and close the valve several times and advance the lubricant screw until the valve operates smoothly.

Connect all pieces of the charging-hopper vent line assembly and reinstall the assembly in its original position. Apply pipe compound to all male threads and tighten the connections securely.

FIG. 22 — Vent-Line Assembly

FIG. 23 — Cleaning the Vent Valve
G-12. Charging Hopper

Never perform any maintenance work on the charging hopper while the hopper is connected to the generating chamber. Before starting the maintenance work, make sure the hopper is empty of carbide and free of carbide dust.

Charging-Door Gasket. Inspect the charging door gasket, fastened in the circular groove of the door, for cracks, wear, distortion, and hardness because of age. If necessary, remove the old one and install a new gasket using 2 coats of rubber cement on both the groove and the mating surface of the gasket. Let each coat dry until tacky. Then fasten the gasket in the groove (Fig. 24).

Engagement Gasket. Inspect the engagement gasket fastened in the recessed shoulder below the unloading valve (Fig. 25). Check for cracks, wear, distortion, and hardness because of old age. If necessary, remove the old gasket and install a new one.

Unloading Valve Shaft Seal. The unloading valve shaft is sealed from the atmosphere by an "O" ring located in the shaft bushing. To replace this "O" ring, first drive out the two rollpins that fasten the unloading-valve disk to its shaft. Remove the shaft by pulling it straight out through the side of the hopper; then unscrew the shaft bushing. Remove the worn "O" ring from inside the bushing and insert a new "O" ring in its place. Reinstall the bushing, shaft and disk in the reverse order from which they were removed, and lock the disk to the shaft with new rollpins.

Charging-Hopper Spring Plungers. Test the spring plungers by pushing the plungers in with thumb pressure. Replace any spring plunger that operates sluggishly. Unscrew the stop nut and withdraw the old spring plunger from the hopper. Screw a new spring plunger in place until the plunger projects into the hopper the same distance as the other plungers. Then replace the stop nut.


G-13. Generator and Charging-Hopper Pressure Gauges

When the charging hopper is disconnected from the generating chamber, check the charging-hopper...
pressure gauge. When the generator is not in service, with the service valve closed and the pressure vented, check the generator pressure gauge. The pressure-indicating pointer should rest on the dial pin.

If the pointer rests on the pin when there is no pressure in the vessel, remove the bezel and glass from the gauge, and lift the pointer over to the other side of the pin. The pointer should rest below the pin at a distance equal to that between the pin and the first graduation line. If the pointer rests at any other position remove it carefully and replace it firmly on the shaft in the correct position. Then raise the pointer to the upper side of the pin and replace the glass and bezel. If the gauge has been damaged in any way to impair operation, a new one should be installed.

G-14. Stick-Lubricated Valves

Plug valves such as the residue valve, water-filling valve and charging-hopper vent valve depend upon a stick-type lubricant to assure easy operation of the valves and to maintain them tight against leakage. To insure the proper working of these valves, they should at all times be supplied with adequate lubrication. Lubricant is fed to the valve cock by occasionally turning the lubricant screw several turns (Fig. 28). Rotate the valve handle while turning in the lubricant screw, and stop when the valve turns easily. Further addition of lubricant at this time will NOT improve valve operation; the additional lubricant would be wasted, and might clog the lines. When the lubricant screw has been turned in all the way, remove the screw and add a fresh stick of lubricant.

G-15. Charging Valve

The charging valve is a grease-lubricated valve which must be lubricated frequently through a grease port on one end of the valve stem (Fig. 27). Annual cleanings are required to remove the grease-carbide dust accumulations in the valve grooves.

Before performing any maintenance work on the charging valve, withdraw the generator from service as instructed in Section E, page 19. To dismantle the valve, remove the handle, unscrew the back plate of the valve and push the valve plug out of the back of the valve. Use a wooden stick — never use metal — to clean the grooves in the valve plug, and with a damp cloth clean the remainder of the plug and body. Turn the lubricant screw in a few turns to make sure the plug passageways are clear. Reassemble the valve and tighten the back plate securely. Apply grease to the valve through the grease port, operating the valve handle until the valve turns smoothly. If no further maintenance is to be performed, return the generator to service as instructed in Section I, page 32.

G-16. Generating Chamber

Remove the cap from the check valve in the water supply line. If any accumulation of lime is observed in the valve body, remove the lime with a wooden stick — never use metal. Clean and examine the check flap to see that it opens freely. Flush out this connection with a stream of clean water and
replace the cap. Unscrew the cap on the sediment separator in the water-filling line and remove any dirt or other foreign material from the screen. Replace the screen and the cap, using pipe compound on the cap threads.

Remove the plugs from the pipe cross leading from the residue drain valve to the main residue drain line. Open the residue drain line and break loose all caked lime, using a wooden stick. Replace the plugs and thoroughly flush all loose particles out through the drain line.

If either the hopper funnel or the generating chamber above the water line appear to be rusting and in need of paint, remove the hopper as instructed in Section F, page 19. Apply the paint as instructed in Section L, page 33.* When the paint is thoroughly dry, replace the handhole cover, close the residue drain valve and refill the generating chamber with fresh water to the NORMAL level as shown on the water-level indicator. Examine the remaining parts inside the generator before replacing the hopper and returning the generator to service according to the instructions in Section I, page 32.

G-17. Relief Valves

During each recharging operation, a small amount of acetylene is vented through the relief valves. When this occurs, foreign particles may be deposited on the upper and lower "O" rings of the poppet, (Fig. 28) and may eventually result in continuous acetylene leakage. If the relief valves become dirty or worn so as to cause leakage, they must be cleaned or repaired as instructed below. It is not necessary to drain the generator before cleaning the relief valves. Close the acetylene service valve, carbide feed valve and feed tube. Then release all pressure in the generator by manually operating the interference mechanism linked to the two relief valves.

To Disassemble:

Rotate the pressure-adjusting cap three or four times in a counter-clockwise direction to reduce spring pressure on the poppet. To turn the cap, insert a short piece of drill rod into the hole in the cap and use the rod as a handle.

Unscrew the bonnet assembly from the body and remove the spring from the bonnet. The spring can be spiraled out by turning it from the bottom, counter-clockwise.

Lift out the poppet.

Remove the operating lever by first removing the screw and washer which hold it in position and then sliding the lever off the lifting shaft.

Remove the operating shaft by first removing the screw and washer which hold it in position and then sliding the shaft out of the relief-valve body.

To Clean and Inspect:

For cleaning all parts, a clean damp cloth is all that you need. The cleaning and inspection must be thorough.

Disassemble the valve according to instructions above.

Body. Wipe away any foreign material from the inside of the body. Pay particular attention to the poppet seat and the bore for the operating shaft. Examine these two places as well as the threads for nicks and scratches. If they are marred or damaged, the whole valve should be replaced.

Operating Shaft. Remove the "O" ring from the shaft and clean both the ring and the shaft. Clean the "O" ring groove wall. Lubricate the groove and reset the "O" ring. Lubricate the outside of the "O" ring.

LUBRICATION

Use Standard Oil Company of Indiana No. I-4762 Grease or Freedom Valvoline Barium Grease #5. In case of emergency, a good grade of water-insoluble cup grease may be temporarily used.
If the shaft is damaged, a new one should be ordered along with mated "O" ring. If the ring is nicked or scratched, replace it with a new one.

Poppet. Remove the "O" rings from the poppet and clean both the rings and the poppet. Clean the "O" ring grooves well. Lubricate the groove of the upper "O" ring. After the rings have been placed back in their grooves, lubricate the outside of the upper "O" ring. Do NOT lubricate the lower groove or its "O" ring. If the poppet is excessively damaged a new one should be ordered along with new "O" rings. If the "O" rings are damaged, replace them.

Bonnet Assembly. Wipe the threads and the inside of the bonnet where the upper "O" ring of the poppet rubs. If the bonnet threads, shoulder or interior surfaces should be excessively nicked or damaged, the bonnet must be replaced.

Spring. If the spring has been damaged, it should be replaced.

To Reassemble:

Insert the shaft into the body so that the flat section of the shaft will be in a position to receive the poppet. NOTE: Be sure the "O" sealing ring is in place on the shaft. Secure the shaft in place with the washer and screw provided.

Replace the operating lever and secure it to the shaft with the washer and screw provided. Make sure the lever is indexed properly to fit up with the extensions on the interference link.

Place the poppet in the body so that the lower "O" ring is resting snugly on the seat.

Replace the spring in the bonnet. Turn it a few times until the bonnet can be placed on the body without too much spring pressure against the poppet.

Screw the bonnet into the body of the valve.

Reconnect the interference link to the operating levers.

Open the acetylene service valve.

After the valve is adjusted (see below) test for leakage around the end of the shaft which protrudes from the body.

To Reset Relief Pressures:

To reset the generating chamber relief valve (RV-27):

1. Unlock the feed tube. Unlock the feed valve and slowly feed carbide into the generator. Insert a rod in the pressure-adjusting cap and turn it clockwise (increases opening pressure) or counter-clockwise (decreases opening pressure) until the valve just starts to relieve when 13 psi shows on the generator pressure gauge.

2. Close the carbide feed valve and reduce the generator pressure to about 10 psi by slowly opening the relief valves. Then open the carbide feed valve and slowly raise the pressure again to make sure the valve starts to relieve at 13 psi.

3. Then by turning the pressure-adjusting cap just one-half turn clockwise, the pressure setting will be increased to 15 psi. THIS IS THE MAXIMUM PRESSURE ALLOWED BY THE NATIONAL BOARD OF FIRE UNDERWRITERS.

To set the back-pressure valve relief valve (RV-28):

1. Allow the pressure in the back-pressure valve to rise to 13 psi and adjust the relief valve until it just starts to relieve at this pressure. Check this setting as in step 2, above.

2. Carefully turn the pressure-adjusting cap two additional turns clockwise to increase the pressure setting to 20 psi (THE MAXIMUM PRESSURE ALLOWED BY THE NATIONAL BOARD OF FIRE UNDERWRITERS).

G-18. Generator Stuffing Boxes

Occasionally the stuffing boxes on the water-level indicator, the feed-tube rod and the feed-valve rod require attention. If a leak is revealed by the application of soapy water solution around the shaft at the stuffing box, or if water seeps out around the indicator shaft, first attempt to stop the leak by turning down the stuffing-box nut.

If a leak cannot be stopped or if the shaft operating through it becomes difficult to turn, replace the packing material. Stuffing boxes should be repacked only after the generator has been removed from service (see Sec. E, page 19). To renew the packing in the water-indicator stuffing box, it is also necessary to drain the residue. (Refer to Section G-7, page 24.)

To replace the packing in either the feed tube or feed valve stuffing box, first loosen the nut and...
pull out the gland. Pull out the old packing and repack the stuffing box as shown in Figure 29. Refer to the Spare Parts List at the back of this book for the proper packing to use. After the packing is in place, insert the gland and tighten the stuffing-box nut sufficiently to stop a leak but not so tight as to bind the shaft.

Recharge the generator as instructed under "Single Generator Installation" on page 12, or "Multiple Generator Installation" in Form 9510.

G-19. Vent Piping

Remove the generator from service as instructed in Section E, page 19. Unscrew the relief-valve vent pipes at the relief-valve outlet connections. Remove the vent piping from between the valve outlets and the points where the piping passes to the outside through the wall of the generator room. Tap the disconnected pipe with a wooden block — never use metal — to shake down any dirt inside the pipe. Make sure the vent piping is free from obstruction. If necessary, flush out this piping by directing a stream of clean water into the pipe openings. After flushing, make sure the piping is thoroughly dry before reassembling it to the generator.

Inspect the relief-valve outlets and the vent pipe connections at the generator-room walls. Loosen and remove any accumulation of lime or scale with a wooden stick — never use metal. Replace the vent piping between these connections, using stringy white lead on the male threads. Then restore the generator to service as instructed in Section I on this page.

Section H. Replacing the Generator Hopper

When all maintenance work on the generator hopper and the generating chamber has been completed and the two assemblies have been carefully inspected to make sure they are ready for use, they may be assembled together.

Before replacing the hopper funnel, check the flange gasket for cracks, tears, distortion, and hardness due to old age. Remove the gasket bolts and gasket ring to check the gasket completely, and install a new gasket if necessary.

Rig a sturdy sling with rope running through the lifting rings on the funnel. Locate the hoist in the spot originally used to remove the hopper. Put the lifting hook through the lifting point on the funnel rigging.

Be sure the mating flanges of both the hopper and the generating chamber are clean. Check the hopper flange gasket to make sure it is clean too.

Lift the funnel up and swing it over into position above the generating chamber. Gently lower it and be certain that it is properly oriented with respect to the generating chamber. The two lugs on the feed-valve control rod must engage the stirrups on the feed-control feet. The metal plate forming the feed-tube backstop must be parallel with the feed-tube and feed-valve control rods. Connect the atmospheric vent line to the hollow foot of the feed control. Let the funnel rest on its three supports in the generating chamber. Place the feed-control cover in position inside the funnel.

Rig a sturdy sling for the hopper cover with rope running under and around the charging valve. Locate the hoist in the spot originally used to remove the cover. Put the lifting hook through the lifting point in the cover rigging.

Lift the cover and swing it over into position above the generating chamber. Gently lower it and be certain that it is properly oriented with respect to the generating chamber. Before taking all its weight off the rope, insert all the flange bolts so that the bolt holes in the flanges and gasket will be lined up. Then let the cover rest on the generating chamber and remove the lifting rig. Tighten all of the flange bolts evenly and securely.

Reconnect the pressure-equalizer line and the charging-hopper vent line. Use pipe compound on the male threads of the connections.

Reconnect the interference link to the lifting shaft and to the relief valves. Lift the charging valve handle to check the operation of the interference mechanism.

Restore the generator to service as instructed in Section I, below.

Section I. Restoring the Generator to Service

When all maintenance work has been completed as instructed in the preceding sections, and the unit has been carefully inspected, replace the hopper, if it was removed, according to the instructions in Section H, above. Then return the generator to service according to the following instructions.

Check the operation of the relief-valve interference mechanism as instructed in Subsection G-4, page 22.

Charge and start the generator, following the instructions for "Single Generator Installation, Initial Charging," starting on page 12.

If the relief valves were disassembled for inspection or repair, be sure to reset and test the relief valves as instructed in Subsection G-17, page 30.

Test all stuffing boxes and all joints in the generator and in the service piping. Use nothing but soapy water to locate leaks. The entire system must be free from leaks before the generating equipment is placed in regular service.

Repaint the exterior of the generator to prevent rust and to maintain the appearance of the acetylene plant. (See Section I, page 33.)

Enter the date and the name of the person performing the maintenance or overhauling of the generator on the "Generator Record," page 34. It is good practice to keep a record of the specific maintenance operations performed each time.
Section J. Suggestions on Piping Maintenance

In doing certain maintenance work on the MP-11 generator, it will be necessary to disassemble piping and in some cases new piping may have to be made up to replace the old. It is imperative that all this piping work be handled in accordance with the best recognized practice. Leaks in acetylene piping cannot be allowed. A few general hints are given in this section with the thought that they may be of assistance in carrying out such work.

As a general rule when disassembling piping, detach it at union connections and disengage as few threaded joints as practicable. Use pipe wrenches of adequate size (but not oversize -- not over 14 in.) and always support the adjoining pipe and prevent its turning and straining by using a supporting wrench. Avoid loosening of threaded joints other than the ones to be disengaged; however, if a connection is loosened unintentionally, disconnect it and remake it with a good grade of red or white lead on the male threads.

Always be careful not to damage the mating surfaces of unions. It is recommended that metal-to-metal seal unions be used in acetylene service. Gasket-joint unions should not be used. Careless handling of tools or rough separation of the joint will frequently result in damage to these surfaces. When this occurs, replace the union.

When threaded joints are taken apart, be careful not to damage the threads by careless handling. Do not take a chance with a section of pipe having doubtful threads. Replace it with a new section of galvanized pipe of the same length as the original piece.

To make up new sections of pipe, first cut them to exact length. Cut clean, continuous threads using a sharp, accurate die and a liberal amount of cutting oil. Ream the pipe ends to remove any burrs.

Before reassembling any pipe be sure that it is in good condition, free from rust, corrosion and dirt accumulations. The application of an oil film on ground joint unions will help to prevent rust and greatly ease future service work.

Apply a liberal amount of pipe thread compound (high grade white or red lead) to the male thread of a joint to be made up. Carefully start screwing it in by hand and continue until it can no longer be turned. Then, supporting all the adjoining pipe to prevent its twisting or straining, pull the joint up tight with a pipe wrench of adequate size (not over 14 in.).

When the piping work has been completed, carefully clean off excess pipe thread compound. Thoroughly leak test the piping by means of soapy water when the generator is put back into operation.

Shortly after the generator maintenance work has been completed, paint all of the piping which had been disassembled.

Section K. Electrical Equipment

Lighting equipment contained in the generator room has been particularly selected and approved for use in this location. The continued safe usage of such equipment is dependent on regular inspection and prompt, adequate maintenance. The time required for such inspection and maintenance is minor compared with the hazard which may be introduced by improper care.

Glass enclosures for lights should remain completely assembled at all times except when being cleaned or repaired. Replace broken glass enclosures promptly. Open the switch controlling the lighting circuit before removing enclosures and leave it open until the enclosures have been replaced. Make sure that the gasket against which the glass enclosure seats is in good condition and in place.

Section L. Painting the Generator

Both the interior and the exterior of the generator should be kept well painted. Painting should be done regularly as part of the routine of inspection and maintenance. However, the exterior of the generator may be painted at any time to improve its appearance and prevent rust. Individual spots may be touched up as required, but a new paint job will make for better appearance.

If possible, select a time for painting when the generator will not be recharged for several hours. Do any necessary sweeping or cleaning in the generator room before starting to paint. Do no cleaning or other work which might raise dust while the paint is being applied or before it is perfectly dry.

The surface to be painted must be clean and dry. Remove any surface gloss, loose paint, dirt, lime or rust with a wooden stick and washing powder. Rinse well and allow the surface to dry thoroughly. Never use metal scrapers, files, steel wool, sandpaper or anything else that might cause heat, flame or sparks within the generator room.

The primer and finish coats may be applied by brush or by spraying. Brush application produces a more desirable film, as a rule, than spray applications because of a more thorough coverage of all places where moisture may find entrance. For the exterior, use a good grade of aluminum paint* as a primer on bare metal spots. Allow sufficient time for the primer coat to dry before applying the finish coat. For the finish coat use a light-grey enamel** -- be sure the coat is dry before applying additional coats.

Apply the aluminum paint to the entire interior surface of the generating chamber above the water line.

Decalcomanias. Decalcomanias (decals) for the generator recharging instructions and for testing the water level in the hydraulic back-pressure valve are available from the Linde Air Products Co. (See the Replacement Parts section at the end of this book.) Replace the decals that have been covered up by the paint, or are otherwise difficult to read.

---

* Thresher Varnish Company No. 12791 Metallic Silver Enamel.
** Sherwin-Williams Rex No. F4546 Gray Enamel, or equivalent.
Section M. Generator Record

OXWELD MP-11 Stationary Medium-Pressure Acetylene
Generator . . . 500 lb. Carbide Capacity

Installation Record

Generator Serial No.: ......................
Installed: Date ......................... By ................................
At ....................................................

Inspection Record

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<tr>
<th>Period</th>
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</table>
Operation and Maintenance Record

It is suggested that a record also be kept of all maintenance or overhauling performed on the generator outside of the regular quarterly and annual inspections. This should include a record of all parts repaired or replaced, the date, and the name of the person performing the work. Such records may be simplified by referring to the section covering the particular work involved.

Data pertaining to the operation of the generator should be kept in a daily log for future reference. A suggested form for this log is shown below.

### ACETYLENE GENERATOR OPERATING LOG

|------|----------|----------------|-----------------------------------------|-----------------------------|------------------------|---------|---------------------|

*CARBIDE RE-ORDER POINT: __________ LBS. CARBIDE*
Replacement Parts for the "Oxweld" MP-11 Acetylene Generator

How to Order Replacement Parts

1. All replacement parts are keyed on the drawings which follow. Two types of numbers are used on these drawings:
   A. Standard Part Numbers. These are usually formed by two pairs of digits with a letter between (for example: 01N21, 18V68). A few parts may have straight digits sequence (3389) or one letter followed by several digits (A-654221). Each standard part number is accompanied by a descriptive word or words.
   B. Hardware Symbols. These usually have several letters preceding one or two digits. (For example: M-LO-2, M-PP-S-3). Hardware symbols are usually accompanied on drawings by a one word description.

2. Order standard parts by part number and part name, as shown on drawings. DO NOT ORDER BY PART NUMBER ALONE.

3. For hardware, look up symbol in hardware list at back of book. You will find there a full description. "Hardware" items can usually be purchased locally.

4. When ordering, be sure to state quantity of each part needed.

5. Always state the series or serial number of the generator on which the parts are to be used. The serial number is stamped on the unit nameplate. The "series no." is the first digit of the serial number, wherever the serial number starts with a digit, followed by a letter. When the serial number starts with one or two letters, always give the complete number.

6. Indicate any special shipping instructions.

7. Order replacement parts from the LINDE district office nearest you.

NOTE: When ordering a replacement part, it is suggested that mating gaskets, "O"-rings, rollpins, fasteners, or any parts which may be damaged during the replacement process, be ordered with the replacement part.

Recommended List of Spare Parts That Should Be Kept on Hand at All Times

This list of spare parts is not meant to be a complete list of all the parts which may be required during an overhaul. It does, however, include all the parts (rubber gaskets and the like) which should be replaced every time the generator is given a complete overhaul, and other parts which may be damaged in dismantling or reassembling the generator. Additional parts should be procured before the overhaul is started, if preliminary inspection indicates that extensive repairs will be needed.

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<thead>
<tr>
<th>PART NO.</th>
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<tbody>
<tr>
<td>793-9</td>
<td>1</td>
<td>Door Gasket - Charging Hopper</td>
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<tr>
<td>25R46</td>
<td>1</td>
<td>Feed-Control Vent Hose Assembly</td>
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<tr>
<td>10S06</td>
<td>1</td>
<td>Stick Lubricant for EMCO Nordstrom Valves (1 Carton)</td>
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<td>15S87</td>
<td>1</td>
<td>Water-Float Valve Seat</td>
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<td>69S88</td>
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<td>Gasket, Hopper to Water Shell</td>
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<td>70S03</td>
<td>2</td>
<td>&quot;O&quot; Ring, Relief-Valve Poppet Seal</td>
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<td>&quot;O&quot; Ring, Relief-Valve Operating Shaft Seal</td>
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<td>70S10</td>
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<td>Feed-Control Diaphragm</td>
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<td>1 Lb.</td>
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36
Supplementary Spare Parts List

This list consists of additional parts which are not necessary to have on hand during each complete overhaul, but which may, on rare occasions, need replacement. Each customer should decide how extensive a spare parts list he wishes to have.

<table>
<thead>
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</tr>
</tbody>
</table>

NOTE: These lists do not include hardware items which are readily available in most hardware stores.

Important

It is strongly recommended that immediate steps be taken to replenish the spare parts stock whenever withdrawals are made.

Decalcomanias (Decals)

It is good practice to have replacement decals on hand at all times, to continually provide attendants with instructions for safe generator operation.

<table>
<thead>
<tr>
<th>PART NO.</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>12S28</td>
<td>Efficiency and Safety Decalcomania</td>
</tr>
<tr>
<td>73S31</td>
<td>Hopper Cover Decalcomania</td>
</tr>
<tr>
<td>73S32</td>
<td>Recharging Instructions Decalcomania</td>
</tr>
<tr>
<td>73S33</td>
<td>Hydraulic Back-Pressure Valve Decalcomania</td>
</tr>
<tr>
<td>73S35</td>
<td>Feed Tube Decalcomania</td>
</tr>
<tr>
<td>73S36</td>
<td>Feed Valve Decalcomania</td>
</tr>
</tbody>
</table>

"Sparkproof" Monel Tools

These tools are especially made to reduce the possibility of creating sparks when repairing or making adjustments on internal parts of the generator. The tools are considered to be "spark-proof," in that they themselves will not spark. However, sparking can be caused by the careless use of these tools on materials such as steel, that will spark. Therefore, all instructions for complete purging of generators must be followed. Each tool is marked "MONEL."

<table>
<thead>
<tr>
<th>PART NO.</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>51S49</td>
<td>8-in. Combination Pliers, Monel, Ampco Catalog No. P-31</td>
</tr>
<tr>
<td>51S51</td>
<td>8-in. Adjustable End Wrench, Monel, Ampco Catalog No. W-71</td>
</tr>
<tr>
<td>51S52</td>
<td>8-in. Screwdriver, Monel, Ampco Catalog No. S-50</td>
</tr>
<tr>
<td>PART SUPPLIED</td>
<td>ACCESSORY</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td>CHARGING LADDER ASSEMBLY</td>
<td>CHARGING HOPPER ASSEMBLY</td>
</tr>
<tr>
<td>PART NO. 25R29</td>
<td>PART NO. 25R07 (SEE FIG. 40)</td>
</tr>
</tbody>
</table>

FIG. 30 — MP-11 500-lb. Stationary Medium-Pressure
FIG. 31 – Hopper Bottom and Feed Control Parts

FIG. 32 – Atmospheric Vent Line Details

*PARTS WITH THIS SYMBOL INCLUDED IN HOSE ASSEMBLY 25R46*
FIG. 33 - Water-Level Indicator Details

FIG. 34 - Carbide Indicating System
FIG. 39 – Hydraulic Assembly – Part No. 25R09

FIG. 40 – Charging-Hopper Assembly (Accessory) – Part No. 25R07
<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>DESCRIPTION</th>
<th>SYMBOL</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>M-BU-P-8</td>
<td>3/4-in. x 3/8-in. Galvanized Outside Hex Bushing</td>
<td>M-U-R-MF-C-5</td>
<td>1-in. Crane #519-1/2 Galvanized Railroad Male &amp; Female Union</td>
</tr>
<tr>
<td>M-BU-P-10</td>
<td>1-in. x 3/4-in. Galvanized Outside Hex Bushing</td>
<td>M-VA-4</td>
<td>1-in. Crane #34 125 lb. Brass Check Valve</td>
</tr>
<tr>
<td>M-BU-P-14</td>
<td>1-1/4-in. x 1-in. Galvanized Outside Hex Bushing</td>
<td>M-VA-7</td>
<td>3/8-in. Crane #1 Brass Globe Valve</td>
</tr>
<tr>
<td>M-CU-CR-2</td>
<td>3/4-in. x 1/2-in. x 1-in. Crane No. 588 Galvanized Circulating Boiler Coupling</td>
<td>M-VA-27</td>
<td>1-in. Nordstrom Fig. 142 Semi-Steel Valve</td>
</tr>
<tr>
<td>M-E-U-M-R-C-5</td>
<td>1-in. Crane No. 592 Galvanized Railroad Male Union Elbow</td>
<td>M-VA-29</td>
<td>3-in. American Car and Foundry Co. Fig. D-450 Semi-Steel Screwed Valve with Teflon Seal including Adaptor with 1/8-in. Alenite No. 1610 Lubricating Fitting</td>
</tr>
<tr>
<td>M-EL-F-5</td>
<td>3/4-in. Galvanized 45-deg. Banded Elbow</td>
<td>N-H-1</td>
<td>1/4-in. -20 Hex Nut</td>
</tr>
<tr>
<td>M-EL-F-5-6</td>
<td>3/4-in. Galvanized 45-deg. Banded Street Elbow</td>
<td>N-H-5</td>
<td>1/4-in. -16 Hex Nut</td>
</tr>
<tr>
<td>M-EL-S-2</td>
<td>1/4-in. Galvanized Street Elbow</td>
<td>N-H-7</td>
<td>1/4-in. -16 Hex Nut</td>
</tr>
<tr>
<td>M-EL-S-6</td>
<td>1-in. Galvanized Banded Street Elbow</td>
<td>N-H-37</td>
<td>No. 10-24 Hex Nut</td>
</tr>
<tr>
<td>M-N-P-4</td>
<td>1/2-in. x 7-1/2-in. lg. Galvanized Butt Nipple</td>
<td>N-HJ-10</td>
<td>1-in. -14 Hex Jam Nut</td>
</tr>
<tr>
<td>M-N-P-5</td>
<td>3/4-in. x 2-1/2-in. lg. Galvanized Nipple</td>
<td>N-HJ-15</td>
<td>1/4-in. -20 Hex Jam Nut</td>
</tr>
<tr>
<td>M-N-P-6</td>
<td>1-in. Galvanized Nipple</td>
<td>P-C-2</td>
<td>1/16-in. Dia. x 7/16-in. lg. Cotter Pin</td>
</tr>
<tr>
<td>M-N-P-8</td>
<td>1-in. x 3-in. lg. Galvanized Nipple</td>
<td>P-C-7</td>
<td>3/32-in. Dia. x 5/8-in. lg. Cotter Pin</td>
</tr>
<tr>
<td>M-N-P-C-5</td>
<td>3/4-in. Galvanized Close Nipple</td>
<td>P-C-M-24</td>
<td>1/8-in. x 1-3/4-in. lg. Monel Cotter Pin</td>
</tr>
<tr>
<td>M-N-P-C-6</td>
<td>1-in. Galvanized Close Nipple</td>
<td>S-H-3</td>
<td>1/4-in. -20 x 3/4-in. lg. Hex Head Cap Screw</td>
</tr>
<tr>
<td>M-N-P-C-9</td>
<td>2-in. Galvanized Std. Wrought St. Close Nipple</td>
<td>S-H-4</td>
<td>1/4-in. -20 x 7/8-in. lg. Hex Head Cap Screw</td>
</tr>
<tr>
<td>M-N-SH-5</td>
<td>3/4-in. x 2-in. lg. Galvanized Short Nipple</td>
<td>S-H-6</td>
<td>1/4-in. -20 x 1-1/4-in. lg. Hex Head Cap Screw</td>
</tr>
<tr>
<td>M-PP-2</td>
<td>1/4-in. Galvanized Square Head Pipe Plug</td>
<td>S-H-228</td>
<td>1/2-in. -13 x 1-1/4-in. lg. Hex Head Cap Screw</td>
</tr>
<tr>
<td>M-PP-5</td>
<td>3/4-in. Galvanized Square Head Pipe Plug</td>
<td>S-H-232</td>
<td>1/2-in. -13 x 2-1/4-in. lg. Hex Head Cap Screw</td>
</tr>
<tr>
<td>M-RI-2</td>
<td>1-1/8-in. I.D. Std. Split Key Ring</td>
<td>S-R-103</td>
<td>No. 6-32 x 1/4-in. lg. Round-Head Machine Screw</td>
</tr>
<tr>
<td>M-TE-6</td>
<td>1-in. Galvanized Tee</td>
<td>W-L-1</td>
<td>1/4-in. x 3/32-in. x 1/16-in. Steel Lock Washer</td>
</tr>
<tr>
<td>M-TE-R-40-1</td>
<td>1-1/2-in. x 1-1/4-in. x 3/4-in. Galvanized Banded Reducing Tee</td>
<td>W-SH-L-22</td>
<td>1/4-in. Type 12 Internal Tooth Shakedown Lock Washer</td>
</tr>
</tbody>
</table>