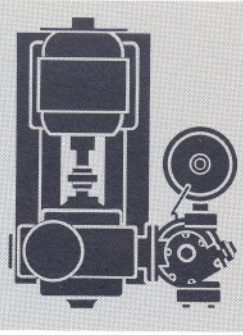
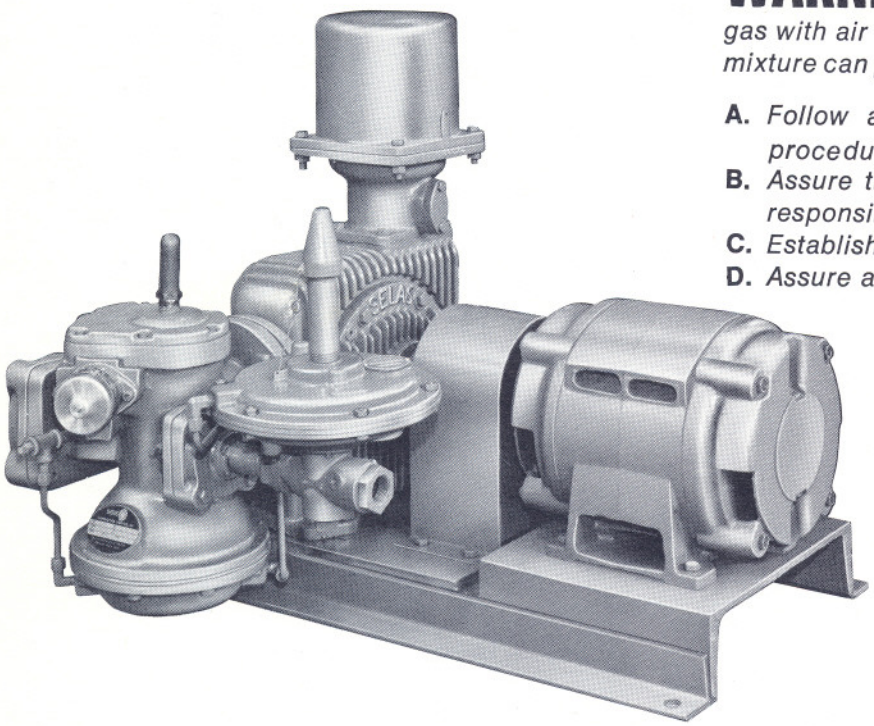
# Instructions for INSTALLATION OPERATION • MAINTENANCE

## of the SELAS COMBUSTION CONTROLLER SERIES 20-CA





**WARNING:** *The Selas Combustion Controller is designed to blend fuel gas with air in a controlled way. Since uncontrolled mixture can prove to be hazardous, it is important to:*

**A.** *Follow all installation and operation procedures.*
**B.** *Assure that care of equipment is assigned to responsible people.*
**C.** *Establish routine maintenance checks.*
**D.** *Assure adequate ventilation.*

FM

ROTARY POSITIVE DISPLACEMENT TYPE

Rated Capacity

2000 cfh of Mixture. (56.6 $m^3/hr$)

Max. Pressure 3 psig (20.7 kPa)

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selas®
The Heat Technology Company


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# INSTALLATION

## LOCATION
Install in an area which will permit frequent air changes to occur. Adequate ventilation is important to the safe operation of this unit.

## HANDLING
Avoid rough handling while unloading and moving to location. Do not use sling around shafts.

## UNPACKING
Remove crating but do not remove skids until machine is placed in final position ready for installation. Remove packing material from inside of pressure governor cap. See Fig. 8 and tag wired to machine. Do not discard instruction tags until installation is completed.

## LEVELING
Machine must be installed on level foundation. Grout surface to a finished level where necessary. Do not bolt base plate tightly to foundation.

## PIPING
All piping must be thoroughly cleaned. Pipe flanges and threaded connections must be properly aligned to avoid straining or distortion of castings. Support piping independently of the machine. Use gaskets between flanges.

## GAS CONNECTION
Remove thread protector cap (Fig. 7). Install a flanged or union connection, and a full ported shut-off valve in the raw gas line close to the gas governor on the machine. (Fig. 5).

## CAUTION:
**Pressure in gas line at the inlet of the gas governor should not be lower than 4" W.C. (1 kPa) nor exceed a maximum of 10" W.C. (2.5 kPa). If pressure in gas supply line is higher, a reducing regulator must be used. This regulator must be located upstream a minimum of ten feet (3.05 m). Consult with Selas if pressure is only slightly higher than 10" W.C. (2.5 kPa).**

## MIXTURE CONNECTION
Remove thread protector cap. Install a full ported shut-off valve in the mixture line leading from the machine.

## AIR CONNECTION
Air filter may be mounted in any direction. If located outdoors, the inlet openings must be weather-protected. Air supply should be clean and dry. Steam, corrosive, hot and dirty atmospheres are harmful to the Combustion Controller. Where it is necessary to have a long run of piping to reach clean, dry air, use oversized pipe and a minimum of elbows to reduce pressure drops.

## ELECTRICAL CONNECTIONS
### CAUTION:
**Motor coupling is shipped disconnected. Do not assemble coupling until electrical connections are made. Serious damage may result if machine is run backwards. See tag wired to machine.**

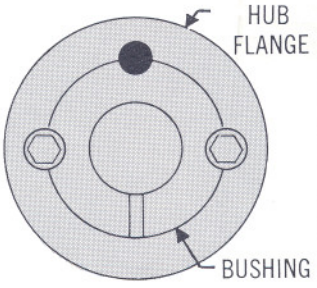
Make proper electrical connections to motor, making sure that motor rotates in direction indicated by arrows on machine (clockwise when looking at shaft end of motor).

Be sure that voltage, phase and cycle on motor nameplate coincide with available electric current.

## COUPLING
**Do not assemble until electrical connections are made.** The coupling used is a taper-lock (disc-type). It requires no lubrication. On machines shipped with bushings attached, install center disc and slide coupling flanges together until flanges are ⅝" (16 mm) apart and flush with shaft ends. Tighten screws on taper-lock bushings. Check alignment using straight-edge across the two flanges (Fig. 7).

Coupling discs can be removed by loosening flanges on shafts (see "Removing Bushing," below) and sliding flanges apart on shafts.

## WHEN NECESSARY TO INSTALL BUSHING:




1. Clean shaft, bore and outside of bushing, and bore of hub (taking bushing from hub if already assembled). Remove any oil, lacquer or dirt. Place bushing in hub.

2. Oil thread and point of screws. Place screws loosely in holes shown thus ⊚ in diagram.

3. Make sure bushing is free in hub. Slip assembly onto shaft and locate bushing flush with end of shaft.

4. Tighten screws alternately and evenly until they are pulled up very tightly. Use a piece of pipe on wrench to increase leverage. Use a wrench torque of 175 lb.-in. (20 N-m).

5. Hammer against large end of bushing using hammer and block or sleeve to avoid damage. Screws can now be turned a little more using the specified wrench torque. Repeat this alternate hammering and screw retightening until the specified wrench torque no longer turns the screws after hammering. Fill other hole with grease to exclude dirt.

## REMOVE BUSHING
1. Remove screws. Oil thread and point of screws.

2. Insert one screw in hole shown thus ● in diagram. Note that one screw in each hub is left over and is not used in this loosening operation.

3. Tighten screw until bushing is loosened in hub.

## TEST RUN
If unit has been in storage, rotate compressor a few revolutions by hand to free moving parts. Make a test run of machine using air only. Start machine with gas inlet valve and mixture outlet valve closed (Fig. 5).

Packing gland on shaft of compressor should be taken up gradually during the first 2 or 3 weeks until worn in and then only at long intervals as required. Do not hurry process of tightening since doing so will overheat the bearing housing and shaft.

# OPERATION

## STARTING THE MACHINE

Many installations, often adapted to the system or process to be served, require special instructions which frequently involve a purge interval and/or the use of safety cocks. In addition to following the specific instructions developed for the installation, several general rules should be observed prior to start-up to avoid delivering mixture to areas not prepared for ignition:-

**INSURE THAT:**

1. **Gas supply to machine is shut off.**
2. **Mixture outlet valve is fully closed.**
3. **All mixture valves at burner position are closed.**

**NOTE: At initial start-up, adjust the mixer to deliver approximately the gas-air ratio required. (Refer to Machine Adjustment).**

Follow established starting procedure; or if none is indicated, proceed as follows:

4. Prepare the lighting torch, standing pilot and all ignition devices for the burners.
5. Start motor.
6. Open gas valve.
7. Open mixture outlet.
8. Light burners as required.
9. Where necessary, readjust air/gas ratio setting to produce desired burning characteristic. (Refer to Machine Adjustment).

## STOPPING THE MACHINE

There are two general procedures to follow in shutting down, depending on the type of mixtures used:

A. When operating with mixture within explosive range, and it is desirable to purge all lines of mixture before shut-down, proceed as follows (Fig. 5):

1. Close gas inlet valve on main gas supply to machine inlet.
2. Allow machine to run long enough to clear all pipes of air-gas mixture and then stop motor.
3. Close all valves at burners connected to machine.
4. Close mixture outlet valve at machine outlet.

B. When operating with a mixture within non-explosive range and where it is desirable to maintain mixture in the lines, proceed as follows:

1. Close all valves at burners connected to machine.
2. Close mixture outlet valve at machine outlet.
3. Stop motor.
4. Close gas inlet valve on main gas supply to machine inlet.

**NOTE:** Where operating conditions appear to warrant a starting and stopping procedure other than listed, consult Selas Corporation of America for special instructions.

**CAUTION:** If unit is used for stand-by purposes, it is essential that machine be run at regular intervals to keep parts properly lubricated and free moving.

**IMPORTANT:** To prevent damage to the machine, do not allow temperature of bearing housing or discharge side of compressor housing to rise above the recommended temperature of 212°F. (100°C). This temperature is generally reached when machine is operating at approximately 5% of the rated capacity for extended periods. It temperature exceeds recommended figure, discharge volume must be increased. If low flow must be continued, water-cooled bearing brackets should be installed.

## ADJUSTING MACHINE

### MIXING VALVE (Fig. 9)

Final mixture adjustment should be made at actual operating conditions. However, if final adjustment is required at other than normal operating conditions, you may do so anywhere between 5% and 100% of rated capacity.

Setting of the range of port opening scale (#48) is done at our factory and position "O" Gas indicates the gas port closed and the air port positioned at its maximum opening.

Desired air-gas ratio mixture may be obtained by turning the adjustment knob (#50).

### CHECK VALVE (Fig. 9)

The check valve (#8) is an integral part of the mixing valve. It is not intended as a positive shut-off, but is installed to protect the mixing valve and its diaphragm from sudden back pressure.

### GAS GOVERNOR (Refer to Selas Form BZR-1)

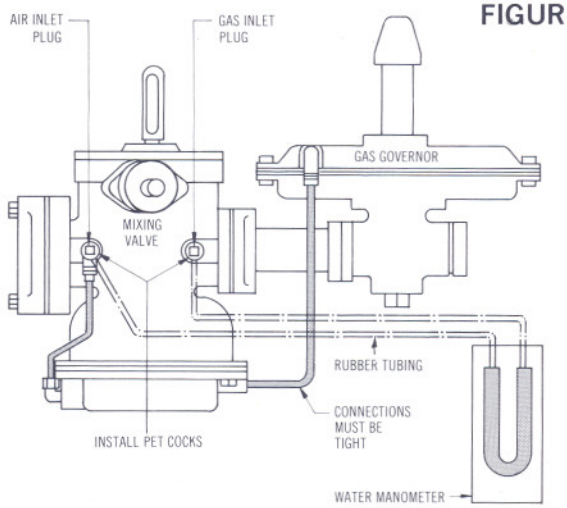
The Balanced Zero Regulator reduces incoming gas pressure to zero or atmospheric. Flow occurs as demanded by the suction created in the Combustion Controller. Typical size used on this machine has ¾" NPT inlet and outlet.

### PRESSURE BALANCE TEST (Fig. 1)

To function properly, a pressure balance must be maintained across the mixing valve. Proceed as follows to check this balance between the mixer air and gas inlet positions:

1. Remove the two ⅛" NPT pipe plugs (#37) (Fig. 9); one on the mixer body air inlet and the other on the mixer body gas inlet. Install a water manometer to these connections with pet cocks.
2. Open gas inlet valve on gas supply and open mixture outlet valve until machine is delivering at least 5% of its capacity. (The mixture should be burned off at some burner position.)
3. Open the pet cocks simultaneously. The water manometer should show a balance in pressure of ± ⅛" W.C. (31 kPa) max. If it does not, refer to Selas Form BZR-1.
4. After pressure test is completed, make sure the water manometer is disconnected and the ⅛" NPT pipe openings are closed with plugs.

**FIGURE 1**




### PRESSURE GOVERNOR (Fig. 8)

The pressure governor can be adjusted for 1, 2 or 3 pounds per square inch (6.9, 13.8, or 20.7 kPa) outlet pressure by adding or removing weights (#37 and #38) from top of diaphragm (#19). Replace pressure governor cap (#35) after adjusting pressure. Maximum recommended outlet pressure is 3 psi. (20.7 kPa).

# MAINTENANCE

**Refer to maintenance check list on page 11 for general guide and schedule.**

## LUBRICATION

### COMPRESSOR

A non-lubricating type compressor blade is used which does not require oiling. It is therefore not necessary to have a lubrication system with an oil reservoir incorporated with the compressor body.

No maintenance is required on blades other than replacement of worn or broken blades. (See Blade Replacement).

### COMPRESSOR BEARINGS

The compressor bearings were lubricated and pre-sealed by manufacturer. No lubrication is necessary for life of bearing.

See Fig. 4 for method of installation.

**WARNING: Do not put grease fittings on bearing covers!**

### MOTOR

Lubricate motor as directed by motor manufacturer.

## CLEANING OF MACHINE

### AIR FILTER

The air filter should be cleaned each month. During cleaning, the machine can be operated without the filter. Do not oil the filter screen.

### PRESSURE GOVERNOR (Fig. 8)

The pressure governor piston (#33) should be checked each month for free movement. Remove cap (#35) and weights (#36, #37 and #38), lift spindle (#39) and piston (#33). If piston does not settle evenly to solid stop, unbolt body (#31) and remove entire assembly. Wipe piston and bore using a solvent if necessary. Do not oil.

Pressure governor orifices (#13, #20 and #21) should be checked periodically. These should be cleaned using wire or correct size drill. Do not increase orifice opening beyond diameter supplied.

### MIXING VALVE (Fig. 9)

Mixer piston (#3) and internal surface of mixer bushing (#2) should be cleaned each month. To expose the internal parts, unscrew socket head machine screws (#27) and remove mixer cover (#6) by lifting straight up. Unscrew piston locknut (#13) which includes upper spindle extension (#66) from mixer spindle (#14). Remove piston.

Thoroughly clean all parts, including mixer body (#1) and guide sleeve (#4) using a cloth saturated with solvent. Do not overlook orifice opening located in mixer body and remove any obstruction.

Remove loose grit and dirt from the mixer piston and mixer bushing and carefully inspect surfaces for corrosion and abrasions. Remove with crocus cloth dipped in a solvent.

It is important during this cleaning operation not to mar or deform in any way the sharp metering edges of both piston and bushing ports. This cleaning must be a preventive maintenance function and the frequency is dictated by the severity of your particular application.

Apply a light film of dry slide to outer surface of piston and carefully line up with guide sleeve, being careful not to cock or force while sliding into bushing.

**Under no conditions should either the mixer piston or the internal surfaces of mixer bushing be oiled or greased, as this will tend to attract abrasive impurities from the gas or air supply. This will eventually cause sticking or excessive wear.**

Remove balancing line tubing (#7) and clean by blowing high pressure air through the tube. (Make sure that both ends of balancing lines are disconnected.)

A drain plug (#44) is located in the diaphragm cap (#16) and should be removed to drain excessive condensation from the mixing valve.

Ordinarily it is not necessary to remove the mixer bushing for cleaning. However, if it does not rotate easily in mixer body, disassemble as follows:

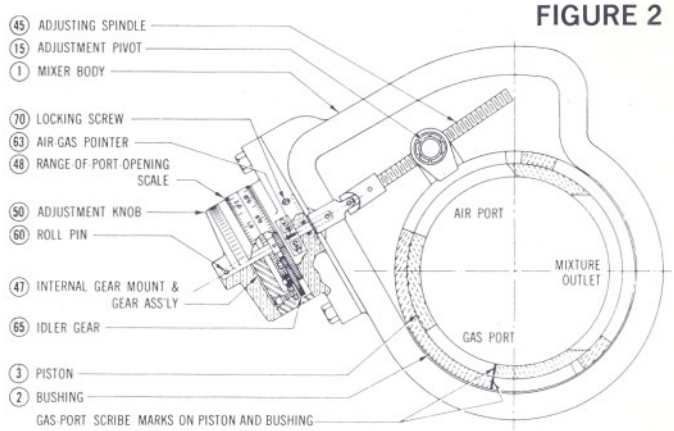
Remove two cap screws (#28) and unscrew ratio adjustment assembly (#9) from adjustment pivot (#15). Lift out mixer bushing from mixer body carefully using a steady vertical lift in order to prevent binding. Clean thoroughly as indicated above.

Before reassembling mixer bushing in mixer body, coat mating surfaces of each with UNIREX-N2 (or equivalent) grease. (Remove all grease from port area.) Replace all parts with care. Do not use force to reassemble parts.

**Reinstall piston as instructed above.**

After replacing upper spindle extension and piston locknut, pull up on upper spindle extension until upward travel is complete. Then release, allowing the mixer piston to return to the "down" position.

FIGURE 2




### RESETTING RANGE-OF-PORT-OPENING SCALE

It is now necessary to reset the range-of-port-opening scale (#48), since the ratio adjustment assembly (#9) was disengaged from the mixing valve during disassembly.

Rotate knurled adjustment knob (#50) until gas port scribemarks on the piston (#3) and bushing (#2) are matched. This position must indicate 100% air 0% gas on the range-of-port-opening scale. Any deviation must be corrected with the following steps:

Remove roll pin (#60) and retract adjustment knob (#50) and internal gear mount and gear assembly (#47) thereby disengaging them from the idler gear (#65). Rotate internal gear mount and gear assembly so the "O" gas position on the range-of-port-opening scale is aligned with the air-gas pointer (#63).

Re-engage internal gear mount and gear assembly with idler gear.

# PIPING DIAGRAMS

**CAUTION:**

**Complete premix gas-air is explosive. A flashback or leak can be dangerous. It is important that the system include the safety devices described and that their specific Instruction Bulletins be understood and followed by responsible operating personnel.**

**NOTES**

**1. AUTOMATIC FIRECHECKS**

A. Type AF-A (without micro switch)

1. Install type AF-A when backfire at one Firecheck must not interrupt operation of remaining burners and no signal or alarm is necessary.

B. Type AFS-A (with micro switch)

1. Install type AFS-A if alarm or signal is necessary.
2. Install type AFS-A if all burners of entire system must shut down in event of backfire at any section. Micro switch should be wired to close manual shut-off valve and allow air to purge line before stopping Controller motor.
3. If burners and their Firechecks are ten feet or more from Controller, or if only one Firecheck is used, install an AFS-A type Firecheck for protection of controller. Wire its micro switch to shut off raw gas and stop Controller motor in case of backfire.

**2. MANUAL RESET SHUT-OFF VALVES**

Install a manual reset shut-off valve to shut off the gas supply in case of backfire, high pressure or low pressure.

**3. PRESSURE SWITCH**

A. The low pressure switch is wired to the safety shut-off valve. In case of low gas line pressure, the valve is actuated by the switch, thereby closing off the gas supply.

B. The high pressure switch is wired to the safety shut-off valve. In case of excessive gas line pressure, the valve is actuated by the switch, thereby closing off the gas supply.

**4. PIPING**

A. The piping from the Controller to the take-off points is generally the same size as the Controller discharge connection depending on allowable pipe line losses and with reference to size of Firecheck or Firechecks being supplied.

B. Insurance company regulations specify that the piping from Automatic Firecheck to burners must not exceed the Firecheck size. Maintain or reduce this size with reference to allowable pressure losses.

C. Always install a manual shut-off valve ahead of each Firecheck.

FIGURE 4

# BEARING INSTRUCTIONS

**INSTALLATION**

**WARNING: Do not put grease fittings on bearing covers!**

The bearings in the Selas Compressor are hand-press fitted. The inner race must be tightly locked by bearing nut. The outer race is not locked which permits it to "float" in its housing. The outer race may also creep around during operation.

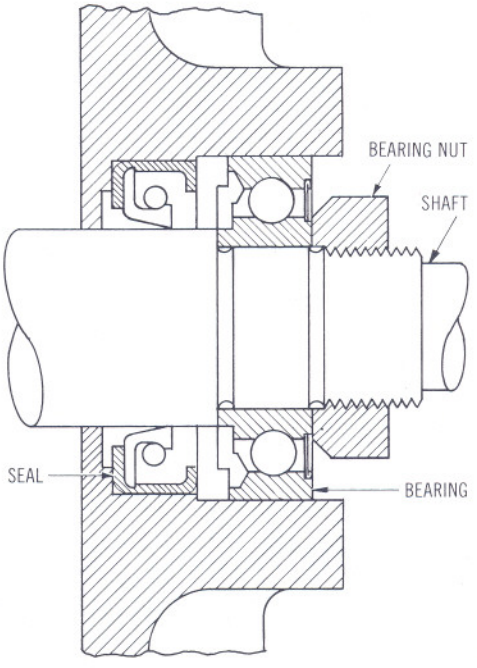
When replacing bearing, make sure to assemble with seal end facing in toward rotor. The bearings have been lubricated and pre-sealed by the manufacturer. No additional lubrication is necessary for the life of the bearing.

**INSPECTION**

Under normal conditions (8 hrs. a day), bearings should be replaced once a year.

Under abnormal conditions, bearings should be replaced more frequently. Some abnormal conditions are:

1. Continuous operation.
2. Reduced output for extended periods causing excessive temperature at bearing.
3. High surrounding temperatures.



Reassemble adjustment knob in proper position. Replace roll pin and select air-gas ratio for proper combustion.

**NOTE: A locking device has been provided on the ratio adjustment assembly. After setting ratio, tighten locking screw (#70) with Allen wrench. Locking screw to be hand tight only (see attached tag).**

**Complete reassembly of mixing valve.**

### CHECK VALVE (Fig. 9)

The spring loaded check valve is located in the mixture outlet of the mixing valve. To remove it, disconnect mixing valve. Disassemble check valve by removing round head machine screws (#26). Clean the valve parts with a cloth saturated in a solvent and reassemble.

### GAS GOVERNOR

**(Refer to Selas Form BZR-1)**

### COMPRESSOR (Fig. 8)

At least once a year, the compressor should be opened and the rotor blades (#15) examined for wear. To remove bearing bracket (#5), first remove bearing cap (#4) and bearing locknut (#9). Remove bolts (#27) holding bearing bracket (#5) to compressor body (#1). The bracket, including bearing (#17) and oil seal unit (#16), can be jacked off the shaft using a bearing puller or the jack screw holes provided.

All internal parts should be thoroughly cleaned. If rotor blades are badly worn, have rough edges, or will not slide in slots freely, a new set should be installed. (See Blade Replacement).

To remove drum and shaft (#8), remove coupling (#3) and stuffing box (#2) from drum and shaft. Remove bearing locknut (#10) and jack out drum and shaft.

Inspect stuffing box and packing (#18). When repacking use Garlock Braided Packing Style 117, 3/16" (4.8 mm) diameter. Do not hurry process of tightening since doing so will overheat the bearing housing and shaft.

**CAUTION: Be sure to align coupling on reassembly.**

## REPLACING DIAPHRAGMS

When installing a new diaphragm, be sure to allow sufficient slack for full movement of parts. Too little or too much will affect the proper control. Coat outer surface of hole area of diaphragm with a good quality grease before reassembling. When installing a new diaphragm, carefully center the spindle and evenly space the folds before clamping. Do not allow more than one fold at any one point under the clamping surface.

### PRESSURE GOVERNOR (Fig. 8)

The pressure governor diaphragm (#19) can be replaced by removing cap (#35), weights (#36, #37 and #38), diaphragm nut (#41), diaghragm washers (#42 and #43) upper diaphragm plate (#40) and diaphragm ring (#32).

When replacing diaphragm (#19) be sure to assemble with one vellumoid gasket (#46) and one vellumoid washer (#43) on top of diaphragm and one of each on the bottom of diaphragm.

### MIXING VALVE (Fig. 9)

Disconnect tubing fitting (#38). Detach mixing valve from compressor and governor. Unscrew hex head machine screws (#31) and remove diaphragm cap (#16). Unscrew hex nut (#33), removing diaphragm assembly (#19), diaphragm plates (#17), and diaphragm washers (#18). Replace diaphragm. Reassemble plates, washers and gaskets. Lift diaphragm cap into position and fasten to mixer body (#1) with machine screws.

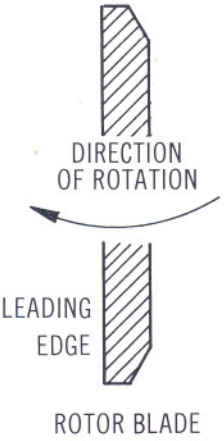
## BLADE REPLACEMENT

### WORN BLADES

Blades should be replaced when dimension across width measures 2 3/16". (55.6 mm).

To replace worn blades (#15 on Fig. 8), remove compressor outboard bearing cap (#4), locknut (#9) and bracket (#5). After removing worn blades, install new blades, radius cornered leading edges facing in the direction of rotation. (Fig. 3).

**FIGURE 3**




### BROKEN BLADES

When blades break, small pieces may lodge in corners and sometimes travel back into the check valve in mixing valve. (Likely "hiding" places are shown by small arrows in Fig. 8). Because these small pieces sometimes work back into the revolving rotor to break the next set of blades, it is absolutely necessary that all pieces, large and small, be removed from corners and recesses before new blades are installed.

In addition to fully exposing the compressor bore, it is advisable to remove the check valve in mixing valve (Fig. 9), and a short section of the compressor discharge piping for inspection. After removing all pieces of broken blades, install new blades as described above.

### NEW BLADES

After new blades are installed and reassembly of compressor is completed, operate the combustion controller for 20 to 30 minutes with all valves closed. This will cause compressor and blades to heat up and expand. If binding occurs (indicated by motor overheating, increased amperage or excessive noise), stop the compressor and file .003" (0.076 mm) to .005" (0.127 mm) off the length of each blade. Reassemble and turn shaft over by hand until free and repeat the performance until the compressor runs quietly when heated. Maximum allowable temperature is 212°F. (100°C.).

**NOTE:**

**The graphite blades used on these machines should not be oiled.**

**FIGURE 5**

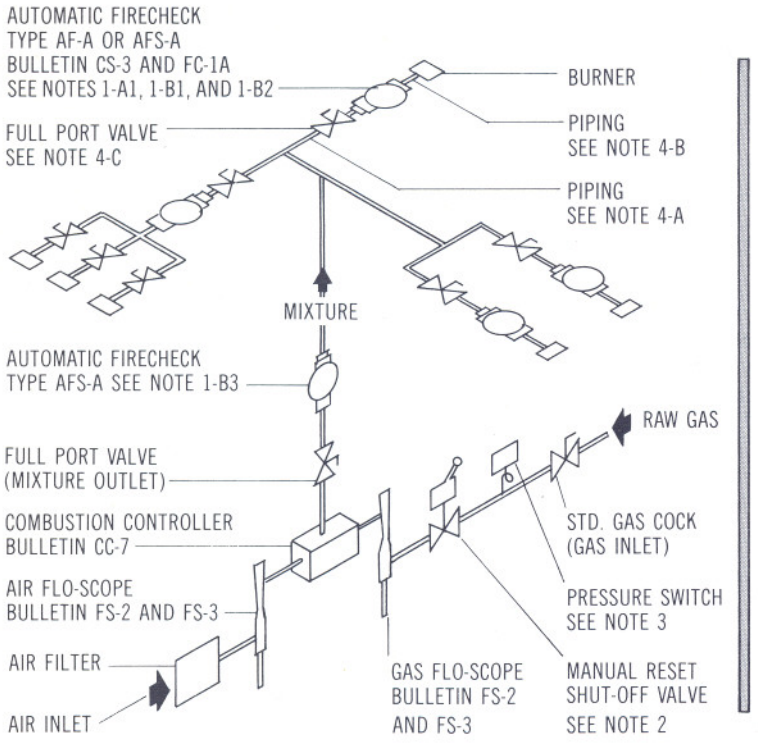
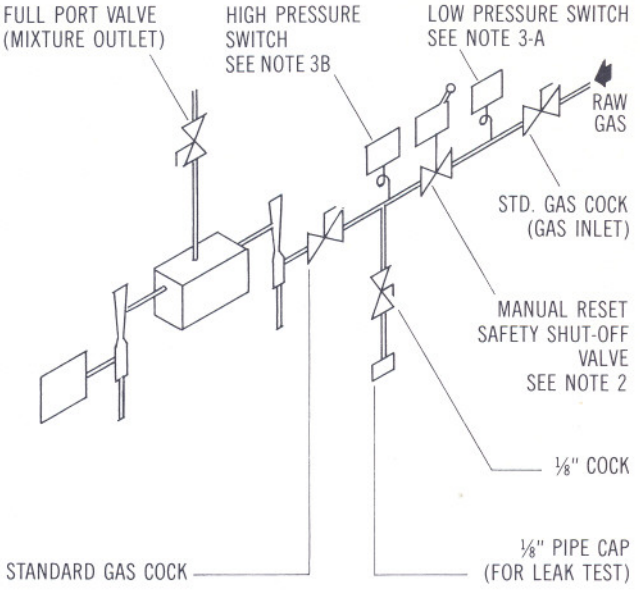



**FIGURE 5A** IRI (FIA) and FM approved piping arrangement for less than 400,000 Btu/hr operation.

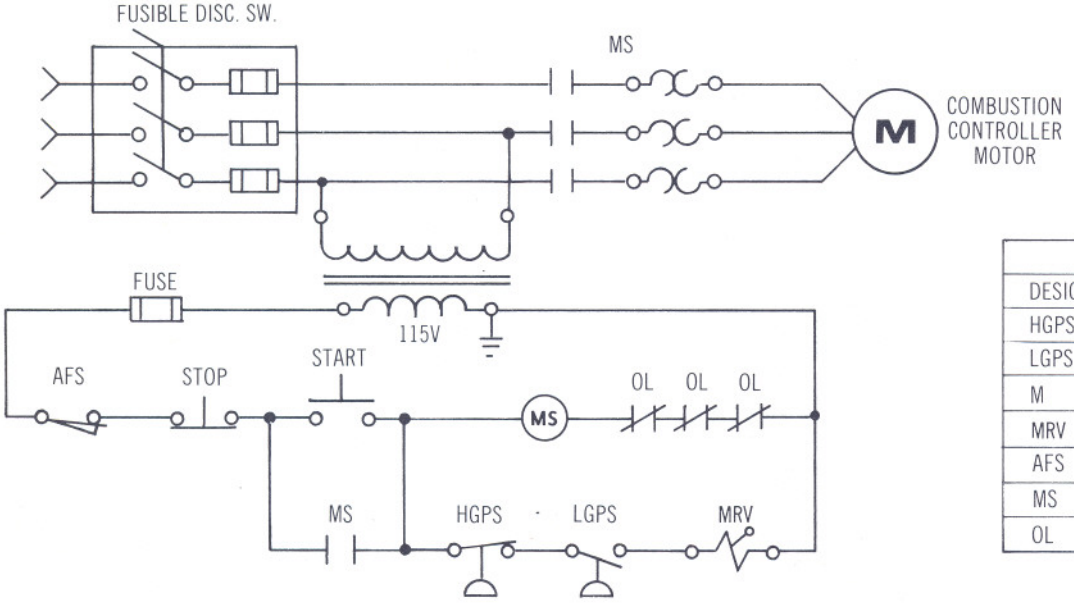



Refer to current IRI (FIA) and FM publications for complete information concerning approved safety equipment.

These diagrams are intended to show the relative positions of Combustion Controller and auxiliary equipment. The above notes can be used as general installation guides. Refer to installation bulletin for each piece of equipment for complete instructions.

**FIGURE 6**

# WIRING DIAGRAM



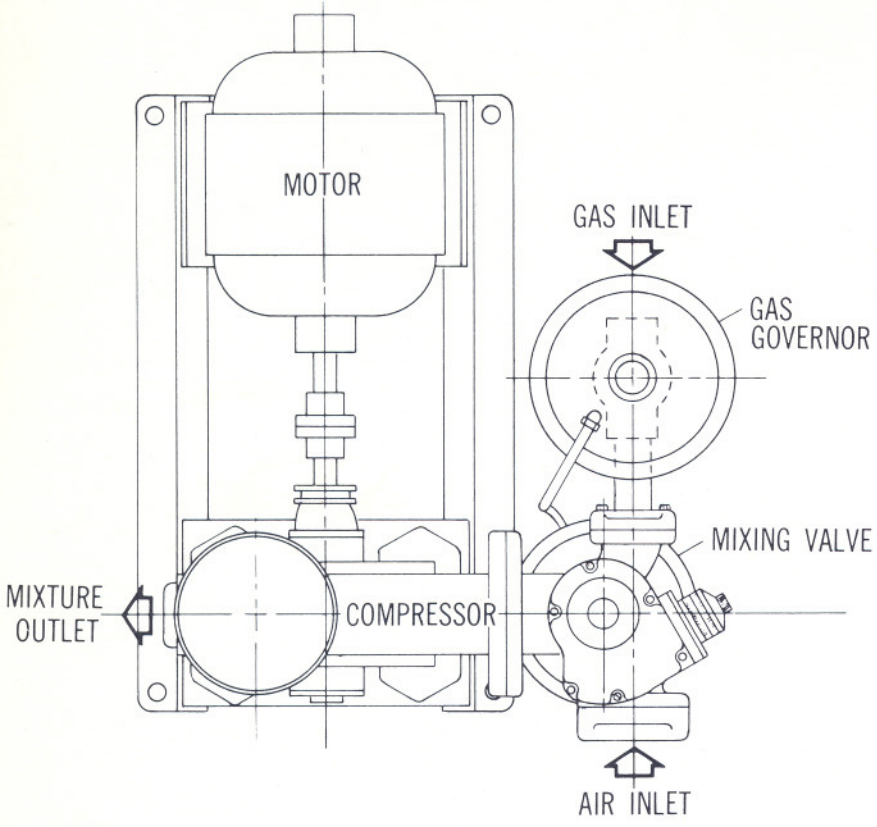

| LEGEND | |
|---|---|
| DESIG. | DESCRIPTION |
| HGPS | HIGH GAS PRESSURE SWITCH |
| LGPS | LOW GAS PRESSURE SWITCH |
| M | MOTOR (COMB. CONT.) |
| MRV | MANUAL RESET VALVE |
| AFS | AUTOMATIC FIRECHECK |
| MS | MOTOR STARTER |
| OL | OVERLOAD |

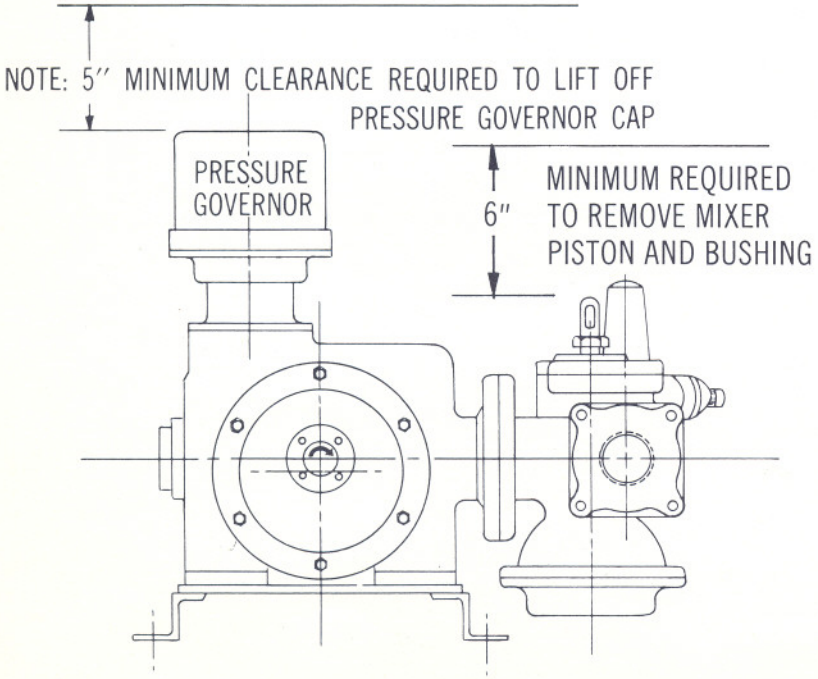
Operation Features of Combustion System Using Firecheck with micro switch, pressure switch and solenoid valve

| CONDITION | MOTOR | GAS SAFETY VALVE |
|---|---|---|
| FLASH BACK | STOPS | CLOSES |
| LOW VOLTAGE OR MOTOR OVERLOAD | STOPS | CLOSES |
| PRESSURE FAILURE IN RAW GAS LINE | RUNS | CLOSES |

# OUTLINE VIEW

**FIGURE 7**

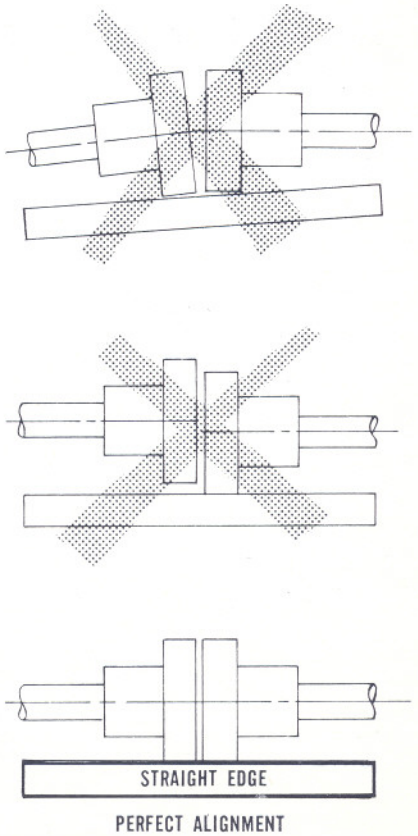



**CAUTION**

Pressure in gas line at inlet of Gas Governor should not be lower than 4″ W.C. (1 kPa) nor higher than 10″ W.C. (2.5 kPa). If pressure is higher than 10″ W.C. (2.5 kPa), a Reducing Governor must be used.

**CORRECT COUPLE ALIGNMENT**




PERFECT ALIGNMENT

# COMPRESSOR AND PRESSURE GOVERNOR

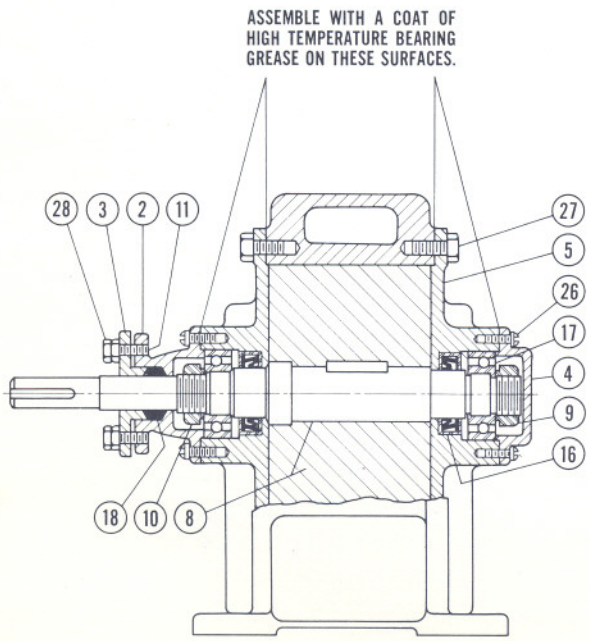
## FIGURE 8

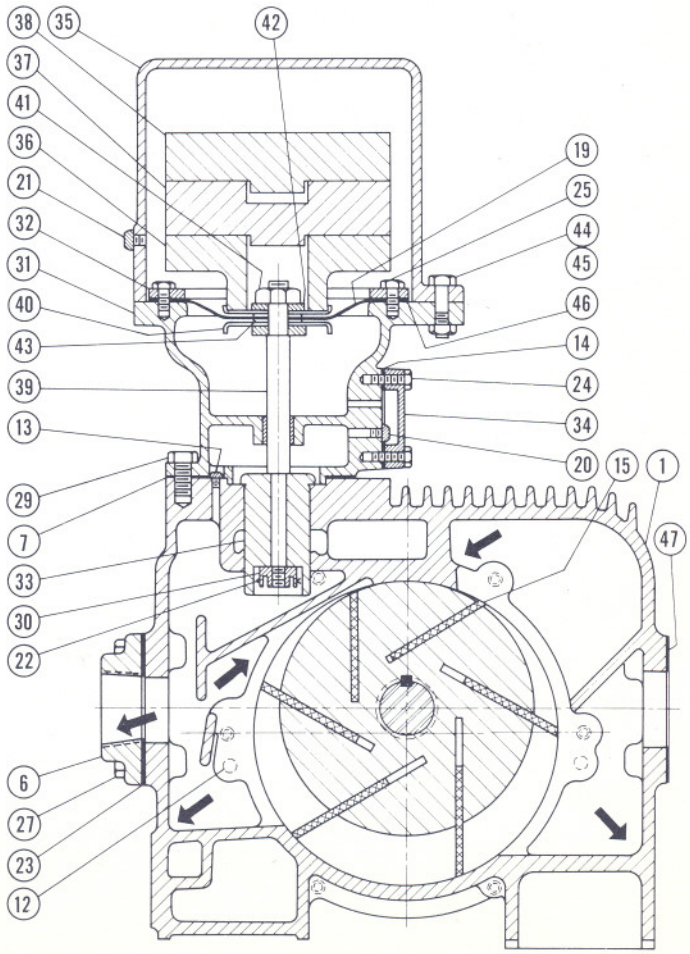
| INDEX NO. | QTY. | PART |
|---|---|---|
| 1 | 1 | COMPRESSOR BODY |
| 2 | 1 | STUFFING BOX |
| 3 | 1 | GLAND |
| 4 | 1 | BEARING CAP |
| 5 | 2 | BEARING BRACKET |
| 6 | 1 | OUTLET FLANGE |
| 7 | 1 | PRESS. GOV. BODY GASKET |
| 8 | 1 | DRUM AND SHAFT ASSEMBLY |
| 9 | 1 | BEARING LOCK NUT L.H. |
| 10 | 1 | BEARING LOCK NUT R.H. |
| 11 | 2 | STUD |
| 12 | 4 | DOWEL |
| 13 | 1 | ORIFICE (COMP. BODY) |
| 14 | 1 | ORIFICE COVER GASKET |
| ‡15 | 6 | BLADE |
| ‡16 | 2 | OIL SEAL |
| ‡17 | 2 | BEARING |
| ‡18 | 1 PC. | PACKING |
| ‡19 | 1 | DIAPHRAGM |
| 20 | 1 | ORIFICE (BODY) |
| 21 | 1 | ORIFICE (CAP) |
| 22 | 1 | 1/16" x 3/4" LG. COTTER PIN |
| 23 | 1 | OUTLET FLANGE GASKET |
| 24 | 2 | ORIFICE COVER SCREW |

| INDEX NO. | QTY. | PART |
|---|---|---|
| 25 | 6 | DIAPHRAGM RING SCREW |
| 26 | 8 | BRG. CAP SCREW |
| 27 | 16 | BRG. BRACKET SCREW |
| 28 | 4 | JAM NUT |
| 29 | 4 | PRESS. GOV. BODY SCREW |
| 30 | 1 | LOCKNUT |
| 31 | 1 | PRESSURE GOVERNOR BODY |
| 32 | 1 | DIAPHRAGM RING |
| *33 | 1 | PISTON |
| 34 | 1 | ORIFICE COVER |
| 35 | 1 | CAP |
| 36 | 1 | WEIGHT |
| 37 | 1 | WEIGHT |
| 38 | 1 | WEIGHT |
| 39 | 1 | SPINDLE |
| 40 | 2 | DIAPHRAGM PLATE |
| 41 | 1 | DIAPHRAGM NUT |
| 42 | 2 | WASHER (BRASS) |
| ‡43 | 2 | DIAPHRAGM WASHER (VELLUMOID) |
| 44 | 4 | HEX HD. C.S. |
| 45 | 4 | HEX NUT |
| ‡46 | 2 | DIAPHRAGM GASKET (VELLUMOID) |
| 47 | 1 | GASKET |

‡ INDICATES RECOMMENDED SPARE PARTS

* PISTON TO BE SUPPLIED OVERSIZE AND LAP FITTED



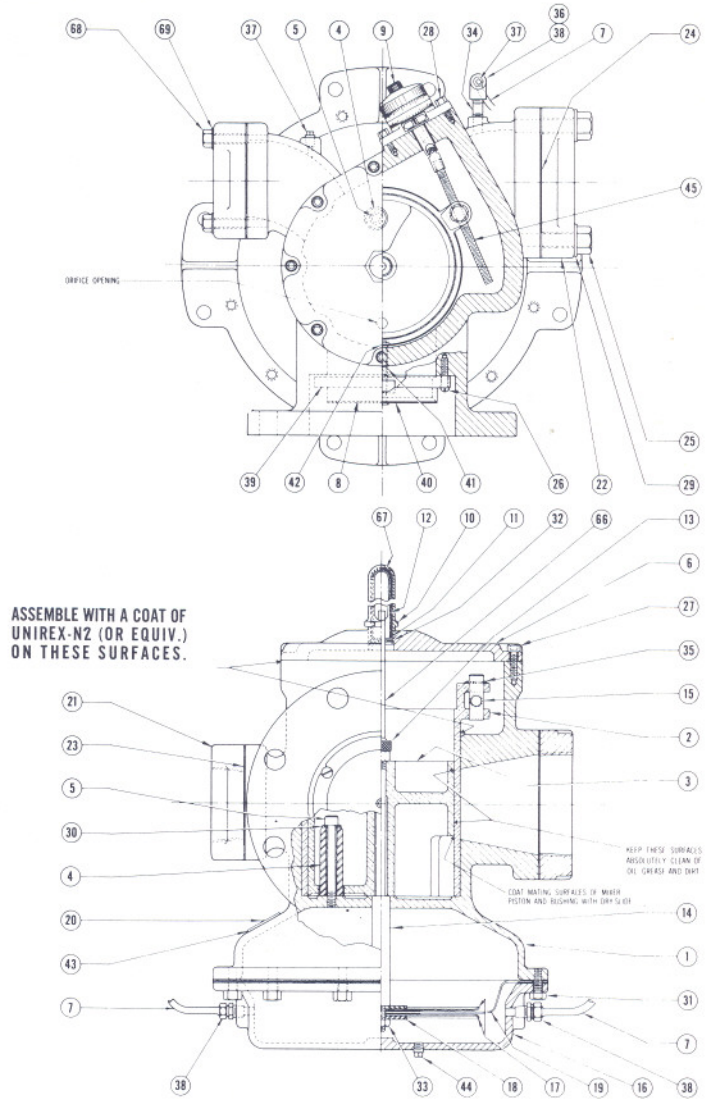



# MIXING VALVE

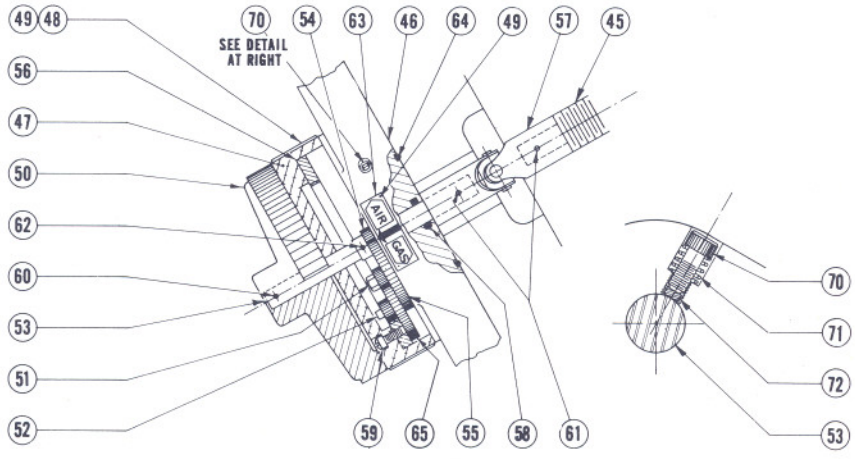
| INDEX NO. | NO. REQ'D | PART |
|---|---|---|
| 1 | 1 | MIXER BODY |
| 2 | 1 | BUSHING |
| 3 | 1 | PISTON |
| 4 | 1 | GUIDE SLEEVE |
| 5 | 1 | GUIDE SLEEVE SCREW |
| 6 | 1 | COVER |
| 7 | 1 | BALANCING LINE TUBING |
| 8 | 1 | CHECK VALVE ASSEMBLY CONSISTING OF NOS. 39 TO 42 |
| 9 | 1 | RATIO ADJUSTMENT ASSEMBLY CONSISTING OF NOS. 45 TO 65 AND 70 TO 72 |
| 10 | 1 | SIGHT GLASS HOUSING |
| ‡11 | 1 | "O" RING |
| ‡12 | 1 | SIGHT GLASS TUBE |
| 13 | 1 | PISTON LOCK NUT |
| 14 | 1 | MIXER SPINDLE |
| 15 | 1 | ADJUSTMENT PIVOT |
| 16 | 1 | DIAPHRAGM CAP |
| 17 | 2 | DIAPHRAGM PLATES |
| 18 | 2 | DIAPHRAGM WASHER |
| ‡19 | 1 | DIAPHRAGM ASSEMBLY |
| 20 | 2 | DRIVE SCREWS |
| 21 | 1 | GAS INLET FLANGE |
| 22 | 1 | AIR INLET FLANGE |
| 23 | 1 | GAS INLET GASKET |
| 24 | 1 | AIR INLET GASKET |
| 25 | 4 | HEX. HEAD CAP SCREW |
| 26 | 3 | ROUND HEAD MACHINE SCREW |
| 27 | 6 | SOCKET HEAD MACHINE SCREW |
| 28 | 2 | ¼"-20 x ½" LG. HEX. HD. CAP SCREW |
| 29 | 4 | PLAIN WASHER |
| 30 | 1 | 5/16" BURR WASHER |
| 31 | 12 | ⅜"-16 x 1" LG. HEX. HD. CAP SCREW |
| 32 | 1 | RETAINING RING |
| 33 | 1 | ⅜"-16 HEX NUT |
| 34 | 1 | ¼" x 1½" LONG NIPPLE |
| 35 | 1 | RETAINING RING |
| 36 | 1 | ¼" N.P.T. STRAIGHT TEE |
| 37 | 2 | ¼" N.P.T. PIPE PLUG |
| 38 | 3 | TUBING FITTING |
| 39 | 1 | CHECK VALVE BODY |
| 40 | 1 | CHECK VALVE DISC AND STEM ASS'LY |
| 41 | 1 | CHECK VALVE SPRING |
| 42 | 1 | CHECK VALVE LOCK RING |
| 43 | 1 | NAMEPLATE |
| 44 | 1 | PIPE PLUG |
| 45 | 1 | ADJUSTING SPINDLE |
| 46 | 1 | MOUNTING FLANGE |
| 47 | 1 | INTERNAL GEAR MOUNT |
| 48 | 1 | RANGE OF PORT OPENING SCALE |
| 49 | 4 | DRIVE SCREW |
| 50 | 1 | ADJUSTMENT KNOB |
| 51 | 1 | GEAR MOUNTING SHAFT |
| 52 | 1 | GEAR MOUNTING SHAFT |
| 53 | 1 | ADJUSTMENT SHAFT |
| 54 | 1 | DRIVE GEAR |
| 55 | 1 | IDLER GEAR |
| 56 | 1 | INTERNAL GEAR |
| 57 | 1 | UNIVERSAL JOINT |
| 58 | 2 | "O" RING |
| 59 | 3 | FILLISTER HEAD MACHINE SCREW |
| 60 | 1 | ROLL PIN |
| 61 | 2 | ROLL PIN |
| 62 | 1 | ROLL PIN |
| 63 | 1 | AIR-GAS POINTER |
| 64 | 1 | "O" RING |
| 65 | 1 | IDLER GEAR |
| 66 | 1 | UPPER SPINDLE EXTENSION |
| 67 | 1 | FELT PAD |
| 68 | 4 | HEX HEAD CAP SCREW |
| 69 | 4 | WASHER |
| 70 | 1 | LOCKING SCREW |
| 71 | 1 | LOCKING SPRING |
| 72 | 1 | LOCKING PLUG |

‡ INDICATES RECOMMENDED SPARE PARTS

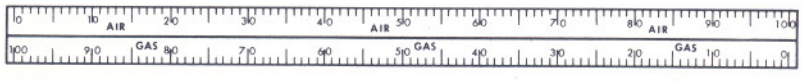
## FIGURE 9




## RATIO ADJUSTMENT SUB ASSEMBLY




## RANGE-OF-PORT-OPENING SCALE



# OPERATIONAL DIFFICULTIES

**(USUAL CAUSES)**

**In case of change in mixture ratio check for**

1. Dirty mixer piston, gas governor valve or air filter element.
2. Leaky diaphragms in mixing valve or gas governor.
3. Dirty or clogged orifice in mixing valve.
4. Dirty or clogged balancing line or equalizing tube in gas governor.
5. Broken or leaking mixing valve sight glass tube.

**In case of abnormal discharge pressure check for**

1. Dirty pressure governor piston.
2. Dirty or clogged orifices in pressure governor.
3. Leaky diaphragm in pressure governor.
4. Exceeding rated machine capacity.

**In case of loss of machine capacity check for**

1. Leaks in piping or connections.
2. Reduced motor RPM.
3. Worn or sticky pressure governor piston.
4. Worn blades.

# MAINTENANCE CHECK LIST

**MAXIMUM OPERATING PERIOD—(NORMAL USE—8 HOURS PER DAY)**

| | 1 Mo. | 3 Mos. | 1 Yr. |
|---|---|---|---|
| Clean Air Filter | | | |
| Clean Mixer Piston and Bushing | | | |
| Check Stuffing Gland for Leaks | | | |
| Check Coupling Alignment | | | |
| Replace Compressor Bearing | | | |
| Clean Entire Machine (Internally) | | | |
| Check Seals | | | |
| Check Blades for Wear, etc. | | | |

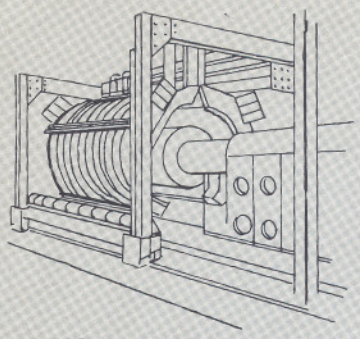
The above schedule is prepared as a guide only.
Definite maintenance schedule will depend on installation, surrounding conditions and operation.

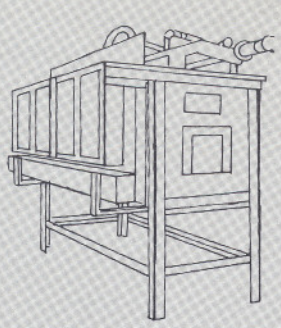
# ORDERING INSTRUCTIONS

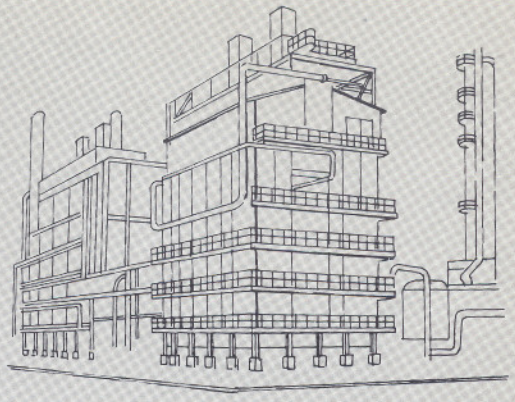
When ordering, the following information must be supplied to accurately identify the items requested:

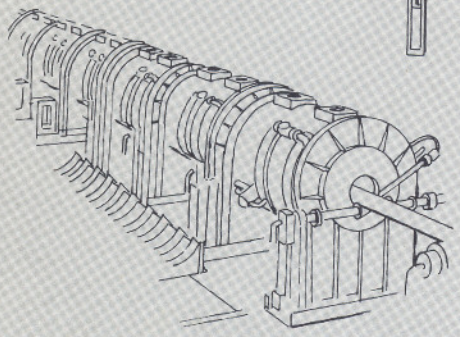
1. **Catalogue number ***
2. **Reference number ***
3. **Serial number ***
4. **Figure number and title**
5. **Part name and index number**
6. **Quantity**

* Found on Combustion Controller nameplate

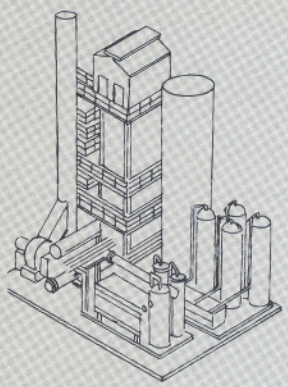


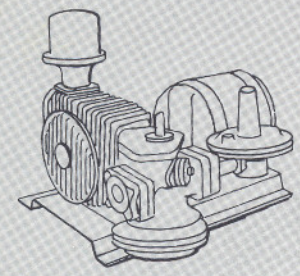


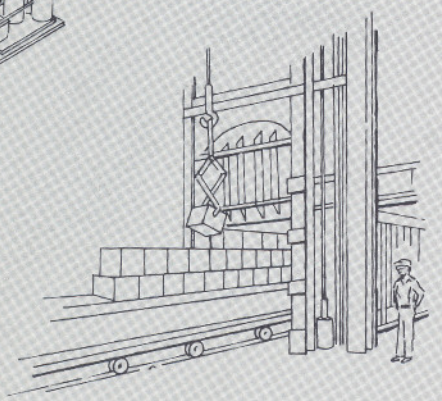


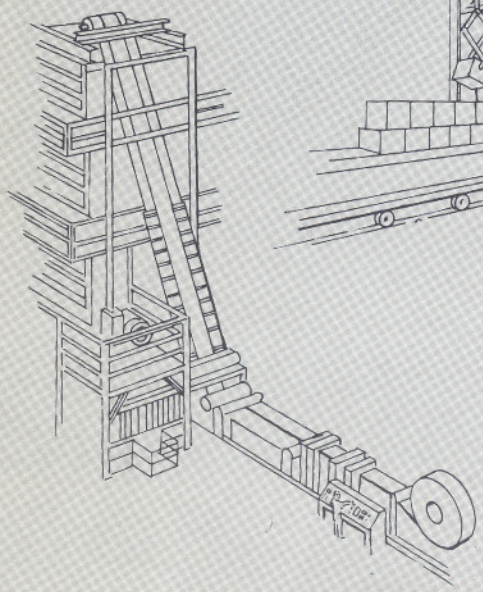


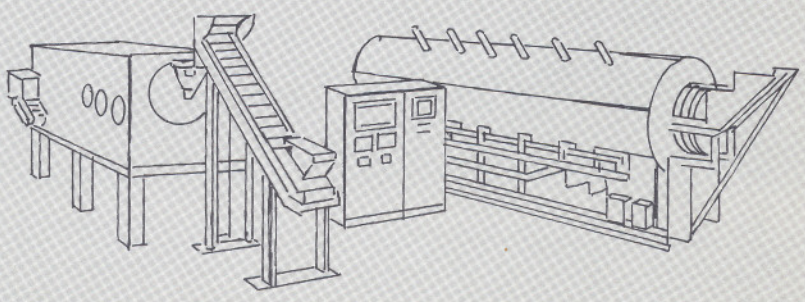
Selas is an international design, development and engineering corporation specializing in precision heat processing plants that operate on gas, oil or electricity. Selas burners, furnaces and associated production systems and controls are used for such applications as metalworking, glass making and food processing. The company also serves the chemical process industry with engineering and construction of high purity hydrogen plants, ethylene pyrolysis systems, synthesis gas generators and reformers, gas purification units and similar process plants. The Heat Treating Equipment Division in California specializes in standardized furnaces and quenching systems that are highly automated, and available with a wide variety of protective atmospheres for treating such items as fasteners, bearings and gears.











selas®
The Heat Technology Company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