

# OPERATING MANUAL

## GASOLINE ENGINE AND ADJUSTMENT:

(For SA-200-F163 welders with an electronic idler, see IM-277)

### TIMING, CARBURETOR, GOVERNOR & IDLER

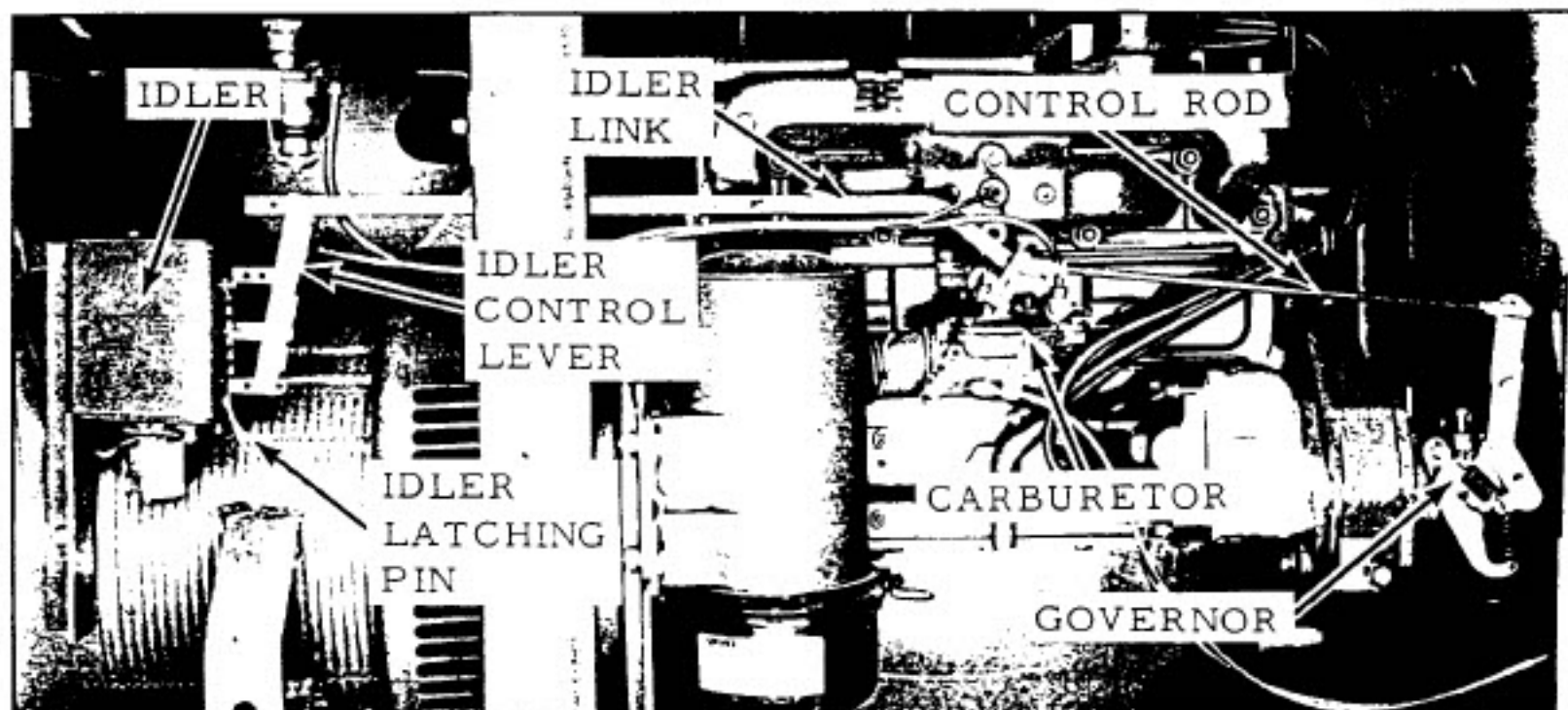


FIGURE 1 — Fuel Control System.

This manual covers equipment which is obsolete and no longer in production by The Lincoln Electric Co. Specifications and availability of optional features may have changed.

#### GENERAL INSTRUCTIONS

This manual is designed to help a qualified mechanic time the engine and adjust the fuel control system. Inexperienced workmen can do more harm than good in attempting to make many of these adjustments. If in doubt, call the nearest Lincoln authorized Field Service Shop.

The engine fuel control system consists of three major parts — carburetor, governor and idler. To save fuel and reduce engine wear, the idler slows the engine to *low idle speed*

when no welding is being done. When the arc is struck, the idler disengages allowing the governor to accelerate the engine to *load speed* for welding. When the arc is broken the governor keeps the engine operating at *high idle speed* until the idler takes over to reduce the speed.

**NOTE:** For air cooled engine carburetor and governor adjusting instructions, see the appropriate engine manufacturer's Operator's Manual. For idler adjustments, see pages 7 and 8.



# ARC WELDING SAFETY PRECAUTIONS



**WARNING: PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH.**



## **ELECTRIC SHOCK can kill.**

1. a. The electrode and work (or ground) circuits are electrically "hot" when the welder is on. Do not touch these "hot" parts with your bare skin or wet clothing. Wear dry, hole-free gloves to insulate hands.
- b. In semiautomatic or automatic wire welding, the electrode, electrode reel, welding head, nozzle or semiautomatic welding gun are also electrically "hot".
- c. Insulate yourself from work and ground using dry insulation. When welding in damp locations, on metal framework such as floors, gratings or scaffolds, and when in positions such as sitting or lying, make certain the insulation is large enough to cover your full area of physical contact with work and ground.
- d. Always be sure the work cable makes a good electrical connection with the metal being welded. The connection should be as close as possible to the area being welded.
- e. Ground the work or metal to be welded to a good electrical (earth) ground.
- f. Maintain the electrode holder, work clamp, welding cable and welding machine in good, safe operating condition. Replace damaged insulation.
- g. Never dip the electrode in water for cooling.
- h. Never simultaneously touch electrically "hot" parts of electrode holders connected to two welders because voltage between the two can be the total of the open circuit voltage of both welders.
- i. When working above floor level, protect yourself from a fall should you get a shock.
- j. Also see Items 4c and 6.



## **ARC RAYS can burn.**

2. a. Use a shield with the proper filter and cover plates to protect your eyes from sparks and the rays of the arc when welding or observing open arc welding. Headshield and filter lens should conform to ANSI Z87.1 standards.
- b. Use suitable clothing made from durable flame-resistant material to protect your skin and that of your helpers from the arc rays.
- c. Protect other nearby personnel with suitable non-flammable screening and/or warn them not to watch the arc nor expose themselves to the arc rays or to hot spatter or metal.



## **FUMES AND GASES can be dangerous.**

3. a. Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. When welding, keep your head out of the fume. Use enough ventilation and/or exhaust at the arc to keep fumes and gases away from the breathing zone. When welding on galvanized, lead or cadmium plated steel and other metals which produce toxic fumes, even greater care must be taken.
- b. Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.
- c. Shielding gases used for arc welding can displace air and cause injury or death. Always use enough ventilation, especially in confined areas, to insure breathing air is safe.
- d. Read and understand the manufacturer's instructions for this equipment and the consumables to be used, including the material safety data sheet (MSDS) and follow your employer's safety practices.
- e. Also see item 7b.



## **WELDING SPARKS can cause fire or explosion.**

4. a. Remove fire hazards from the welding area. If this is not possible, cover them to prevent the welding sparks from starting a fire. Remember that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas. Have a fire extinguisher readily available.
- b. Where compressed gases are to be used at the job site, special precautions should be used to prevent hazardous situations. Refer to "Safety in Welding and Cutting" (ANSI Standard Z49.1) and the operating information for the equipment being used.
- c. When not welding, make certain no part of the electrode circuit is touching the work or ground. Accidental contact can cause overheating and create a fire hazard.
- d. Do not heat, cut or weld tanks, drums or containers until the proper steps have been taken to insure that such procedures will not cause flammable or toxic vapors from substances inside. They can cause an explosion even though they have been "cleaned." For information purchase "Recommended Safe Practices for the Preparation for

Welding and Cutting of Containers and Piping That Have Held Hazardous Substances", AWS F4.1-80 from the American Welding Society (see address below).

- e. Vent hollow castings or containers before heating, cutting or welding. They may explode.
- f. Sparks and spatter are thrown from the welding arc. Wear oil free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes and a cap over your hair. Wear ear plugs when welding out of position or in confined places. Always wear safety glasses with side shields when in a welding area.
- g. Connect the work cable to the work as close to the welding area as practical. Work cables connected to the building framework or other locations away from the welding area increase the possibility of the welding current passing through lifting chains, crane cables or other alternate circuits. This can create fire hazards or overheat lifting chains or cables until they fail.
- h. Also see item 7c.



## **CYLINDER may explode if damaged.**

- 5. a. Use only compressed gas cylinders containing the correct shielding gas for the process used and properly operating regulators designed for the gas and pressure used. All hoses, fittings, etc. should be suitable for the application and maintained in good condition.
- b. Always keep cylinders in an upright position securely chained to an undercarriage or fixed support.
- c. Cylinders should be located:
  - Away from areas where they may be struck or subjected to physical damage.
  - A safe distance from arc welding or cutting operations and any other source of heat, sparks, or flame.
- d. Never allow the electrode, electrode holder, or any other electrically "hot" parts to touch a cylinder.
- e. Keep your head and face away from the cylinder valve outlet when opening the cylinder valve.
- f. Valve protection caps should always be in place and handtight except when the cylinder is in use or connected for use.
- g. Read and follow the instructions on compressed gas cylinders, associated equipment, and CGA publication P-1, "Precautions for Safe Handling of Compressed Gases in Cylinders," available from the Compressed Gas Association, 1235 Jefferson Davis Highway, Arlington, VA 22202.



## **FOR ELECTRICALLY powered equipment.**

- 6. a. Turn off input power using the disconnect switch at the fuse box before working on the equipment.
- b. Install equipment in accordance with the National Electrical Code, all local codes and the manufacturer's recommendations.
- c. Ground the equipment in accordance with the National Electrical Code and the manufacturer's recommendations.



## **FOR ENGINE powered equipment.**

- 7. a. Turn the engine off before troubleshooting and maintenance work unless the maintenance work requires it to be running.
- b. Operate engines in open, well-ventilated areas or vent the engine exhaust fumes outdoors.
- c. Do not add the fuel near an open flame, welding arc or when the engine is running. Stop the engine and allow it to cool before refueling to prevent spilled fuel from vaporizing on contact with hot engine parts and igniting. Do not spill fuel when filling tank. If fuel is spilled, wipe it up and do not start engine until fumes have been eliminated.
- d. Keep all equipment safety guards, covers and devices in position and in good repair. Keep hands, hair, clothing and tools away from V-belts, gears, fans and all other moving parts when starting, operating or repairing equipment.
- e. In some cases it may be necessary to remove safety guards to perform required maintenance. Remove guards only when necessary and replace them when the maintenance requiring their removal is complete. Always use the greatest care when working near moving parts.
- f. Do not put your hands near the engine fan. Do not attempt to override the governor or idler by pushing on the throttle control rods while the engine is running.
- g. To prevent accidentally starting gasoline engines while turning the engine or welding generator during maintenance work, disconnect the spark plug wires, distributor cap or magneto wire as appropriate.
- h. To avoid scalding, do not remove the radiator pressure cap when the engine is hot.



**HAVE ALL INSTALLATION, OPERATION, MAINTENANCE AND REPAIR WORK performed by qualified people.**

For more detailed information, it is strongly recommended that you purchase a copy of "Safety in Welding & Cutting — ANSI Standard Z49.1" from the American Welding Society, P.O. Box 351040, Miami, Florida 33135.



## PROPER GROUNDING DURING INSTALLATION

The 1985 National Electrical Code does not require this machine to be grounded under normal operating circumstances.

Some State, local or other codes or unusual operating circumstances may require the machine frame to be grounded. It is recommended that you determine the extent to which such requirements may apply to your particular situation and follow them explicitly.

In general, if the machine is to be grounded, it should be connected with a #8 or larger copper wire to a solid earth ground such as a metal pipe going into the ground for at least ten feet and having no insulated joints, or to the metal framework of a building which has been effectively grounded. The National Electrical Code lists a number of alternate means of grounding electrical equipment. (If an older portable welder does not have a grounding stud, connect the ground to an unpainted frame screw or bolt.)

## INSTALLATION, CONNECTION, AND MAINTENANCE OF BATTERY

To prevent EXPLOSION when:

- a) Installing a new battery — disconnect the negative cable from the old battery first and connect the negative cable to the new battery last.
- b) Connecting a battery charger — remove the battery from the welder by disconnecting the negative cable first, then the positive cable and battery clamp. When reinstalling, connect the negative cable last.
- c) Using a booster — connect the positive lead to the battery first then connect the negative lead to the copper strap on the engine foot.

To prevent ELECTRICAL DAMAGE when:

- a) Installing a new battery.
- b) Using a booster.

Use correct polarity — Negative Ground.

To prevent BATTERY DISCHARGE, if you have an ignition switch, turn it off when the engine is not running.

To prevent BATTERY BUCKLING, tighten nuts on battery clamp only until snug.

(S-17851)

## OPERATION OF ENGINE WELDERS

**WARNING:** Operate internal combustion engines in open, well ventilated areas or vent engine exhaust fumes outdoors.

## OPERATION OF ALL WELDERS

DO NOT TURN THE "CURRENT RANGE SELECTOR" WHILE WELDING because the current may arc between the contacts and damage the switch.

## MAINTENANCE AND TROUBLESHOOTING WARNINGS

**WARNING:** Have qualified personnel do the maintenance and troubleshooting work. Turn the engine (or electrical power at the switchbox) off before working inside the machine. In some cases, it may be necessary to remove safety guards to perform required maintenance. Remove guards only when necessary and replace them when the maintenance requiring their removal is complete. Always use the greatest care when working near moving parts.

## ATTENTION OWNERS OF ENGINE WELDERS

**WARNING:** Do not put your hands near the engine fan. Do not attempt to override the governor or idler by pushing on the throttle control rods while the engine is running. If a problem cannot be corrected by following the instructions, take the machine to the nearest Lincoln Field Service Shop.


## CAUTION WHEN INSPECTING THE COMMUTATOR AND BRUSHES

**WARNING:** Uncovered rotating equipment can be dangerous. Use care so your hands, hair, clothing or tools do not catch in the rotating parts. Protect yourself from particles that may be thrown out by the rotating armature when stoning the commutator.

## NAMEPLATES

Whenever routine maintenance is performed on this machine — or at least yearly — inspect all nameplates and labels for legibility. Replace those which are no longer clear. Refer to the parts list for the replacement item number.

## TIMING



**MOVING PARTS can injure.**

**! WARNING**

- Only qualified personnel should do maintenance and troubleshooting work. If possible, turn the engine off and disconnect the battery before working inside the machine.
- Remove guards only when *necessary* to perform maintenance and replace them when the maintenance requiring their removal is complete.
- If fan guards are missing from a machine, obtain replacements from a Lincoln Distributor. (See operating manual parts list.)

Engines on Lincoln welders are timed in the same general manner as all other gasoline engines. When timing the engines use #1 cylinder (nearest to fan). Timing marks shown in the table are on the flywheels of the Continental and Hercules engines and on the crank shaft pulley of International Harvester engines.

Firing sequence for six cylinder engines is 1 — 5 — 3 — 6 — 2 — 4. Firing sequence for four cylinder engines is 1 — 3 — 4 — 2.

If the leads between the spark plugs and the magneto or distributor were removed, reconnect as follows: Connect the lead from #1 spark plug to #1 terminal. This terminal is generally marked by a number 1 molded in the magneto or distributor cover. Connect the rest of the spark plug leads to the terminals in the same order as the firing sequence. Follow the sequence around the terminals clockwise or counterclockwise depending upon the direction of rotation of the rotor. To check the direction of rotation, remove the



**ENGINE EXHAUST can kill.**

**! WARNING**

- Run engine in open well ventilated areas or vent exhaust outside.

magneto or distributor cover, crank the engine and note the direction of rotation.

The distributor point gap setting for International Harvester engines should be .016" (31 — 34° dwell angle). See the engine manufacturer's Operator's Manual for settings with other engines.

Engine	Mark	Comments
<b>TIMING MARKS — MAGNETO IGNITION</b>		
F162, F163, F226, F227, F244, F245	T	Marked by red spot
QXLD3	QX	Stamped next to SPARK
JXD & JXLD	JX	Stamped next to SPARK
G339 & G3400	SPARK	Marked by White Line
<b>TIMING MARKS — DISTRIBUTOR IGNITION</b>		
All Engines	DC	Time at 400 to 500 RPM

Set IH engines from DC to 2° retard.

## CARBURETOR

The carburetor idle speed screw (A) and idle jet adjusting screw (B) should be adjusted periodically for smooth operation and fuel economy. These instructions cover both Zenith and Marvel Schebler carburetors.

**NOTE:** Although the arrangement of the parts for welders driven by International Harvester and Hercules engines are different than shown in these pictures, the adjustments are basically the same as described here.

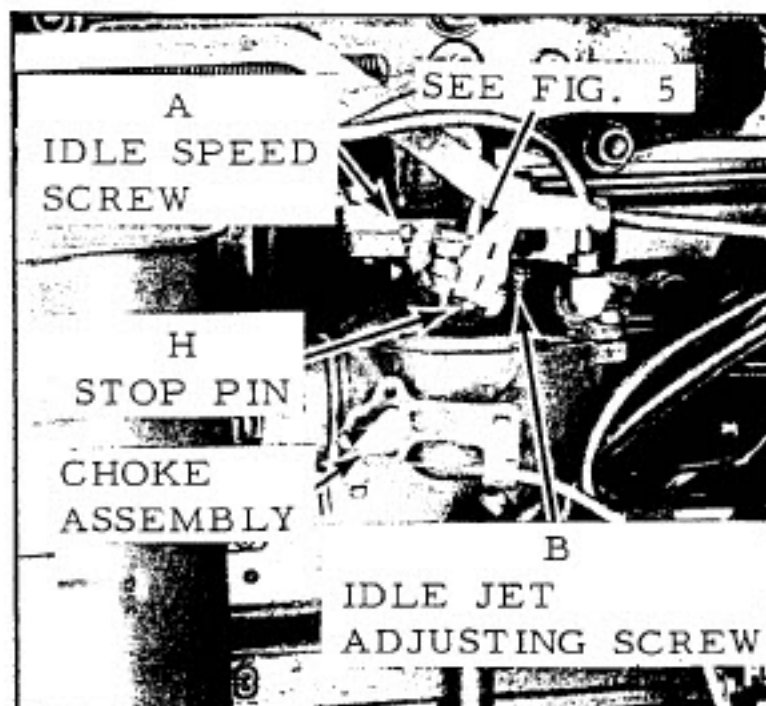
### IDLE SPEED SCREW (Figures 2 and 3)

The purpose of the idle speed screw (A) is to set the low idle speed of the engine. Turn the screw clockwise to increase the low idle speed. Turn it counterclockwise to decrease the low idle speed. For recommended idle speed for Lincoln engine driven welders, see the table on page 8.

### IDLE JET ADJUSTING SCREW (Figures 2 and 3)

Purpose of the idle jet is to give smoothness of operation at low idle speed. To adjust the idle jet, latch the idler in the low idle position. Turn the idle jet adjusting screw (B) clockwise until the engine begins to falter and roll from richness. Then turn the adjusting screw out or counterclock-

wise until the engine runs smoothly. (This can best be done by using a tachometer to locate the setting at which the engine runs at highest speed.)



**FIGURE 2 — Marvel Schebler Carburetor**

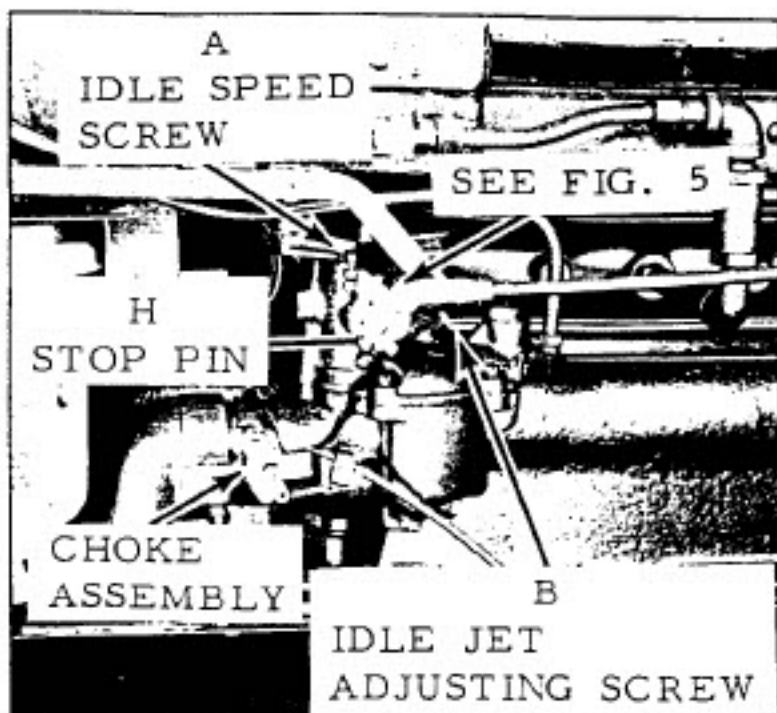


FIGURE 3 — Zenith Carburetor

#### YOKE (Figures 2, 3 and 5)

The stop nut (F) on the yoke (E) acts as a stop for the idler link lever (G). Check the yoke and screw for tightness. If they are tight, leave them alone. If the yoke slips its position on the throttle shaft (D), the idler will fail to reduce engine speed all the way to low idle speed. Reset the yoke as follows:

Latch the idler in low idle position. Turn the throttle shaft counterclockwise until the idle speed screw (A) touches the

stop pin (H) on the carburetor casting. Loosen the yoke screw. Turn the yoke clockwise until the stop nut is flush against the idler link lever. Tighten the yoke screw.

#### THROTTLE CONTROL LEVER (Figures 4 and 5)

The control lever screw holds the throttle control lever (C) onto the throttle shaft (D). Check the lever and screw for tightness. If they are tight, leave them alone. If they are loose or if you suspect the lever has slipped in its position on the shaft, loosen the control lever screw and reset the lever so angle A equals angle B in Figure 4. This angle should be about 35°. **NOTE:** This lever is not adjustable on the G339 and G3400 engines.

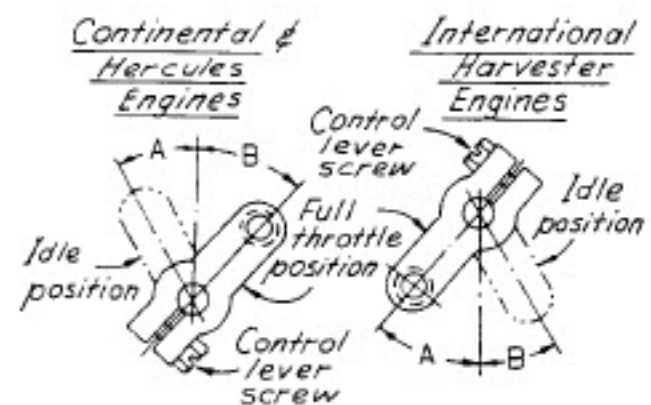


FIGURE 4 — Throttle Control Lever

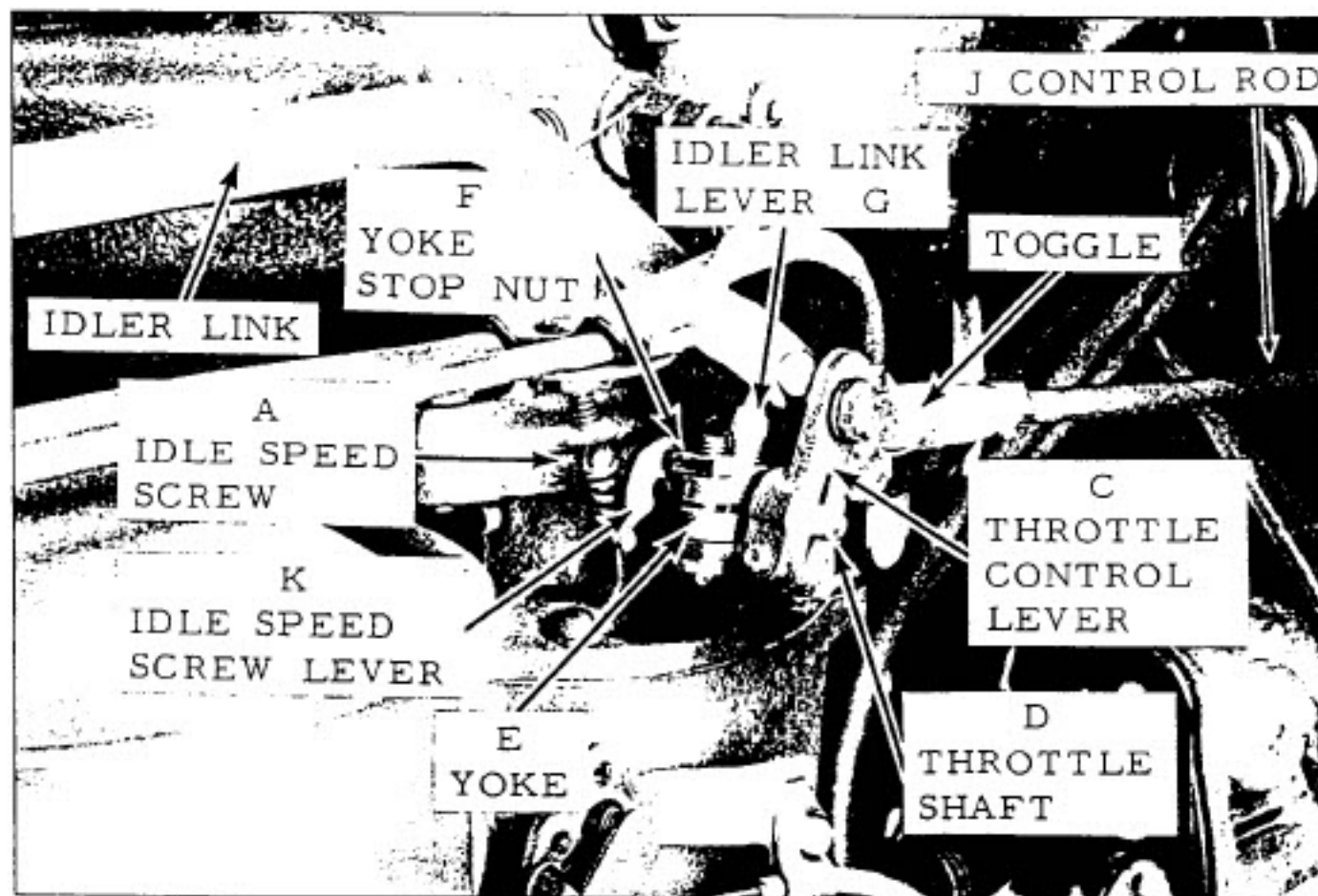


FIGURE 5 — Throttle Shaft and Control Assembly



## CONTROL ROD (Figures 2, 3, 5, 6 and 7)

The carburetor to governor control rod (J) is set at the factory and should require no field adjusting. When the engine is stopped, the stop on the idle speed screw lever (K) should be  $\frac{1}{32}$ -inch off the stop pin (H) on the carburetor casting.

If this adjustment was changed, reset the control rod length as follows: Remove the toggle (L) at the governor end of the rod. Loosen the locknut (M). Screw the toggle out or into the rod to obtain the proper rod length. Once the length is set, DO NOT attempt to remove engine surge by adjusting the Control Rod.

## GOVERNOR

### ! WARNING



**MOVING PARTS can injure.**

- Do not attempt to override the governor or idler by pushing on the throttle control rods while the engine is running.
- If a problem cannot be corrected by following the instructions, take the machine to the nearest Lincoln Field Service Shop.
- If fan guards are missing from a machine, obtain replacements from a Lincoln Distributor.

## GENERAL INSTRUCTIONS

The governor is set and locked for proper performance under actual welding conditions at the factory. Poor engine performance, including surging, can be caused by bad spark plugs, misadjusted carburetor, dirty air filter or many other troubles. Therefore make the following checks *before* touching the governor adjustments:

1. Check the Troubleshooting section in the engine manufacturer's operating manual.
2. Check the carburetor adjustments.
3. Be sure the locknuts on the control rod and on the governor and carburetor adjustment screws are tight.

4. Be sure the toggles, the throttle shaft and all other parts of the governor and carburetor control systems are oiled and work smoothly without binding.

If these checks indicate the governor adjustments have slipped, adjust the governor according to the following instructions. These instructions are given for Hoof and Pierce governors.

## SPEED CONTROL SCREW

The purpose of the speed control screw (N) is to set the high idle speed. To adjust this screw, latch the idler in the high idle position. Loosen the locknut and turn the screw in (clockwise) to increase the high idle speed. Turn the screw out (counterclockwise) to decrease the high idle speed. After making the adjustment, tighten the locknut.

As the engine becomes worn, it begins to lose power. When this happens, the load speed may drop below normal.

**CAUTION:** DO NOT adjust the speed control screw to raise the load speed. Doing this increases the high idle speed above normal. With excessive high idle speed the exciter output voltage can cause serious damage to the exciter output circuit. If full rated output is required, overhaul the engine.

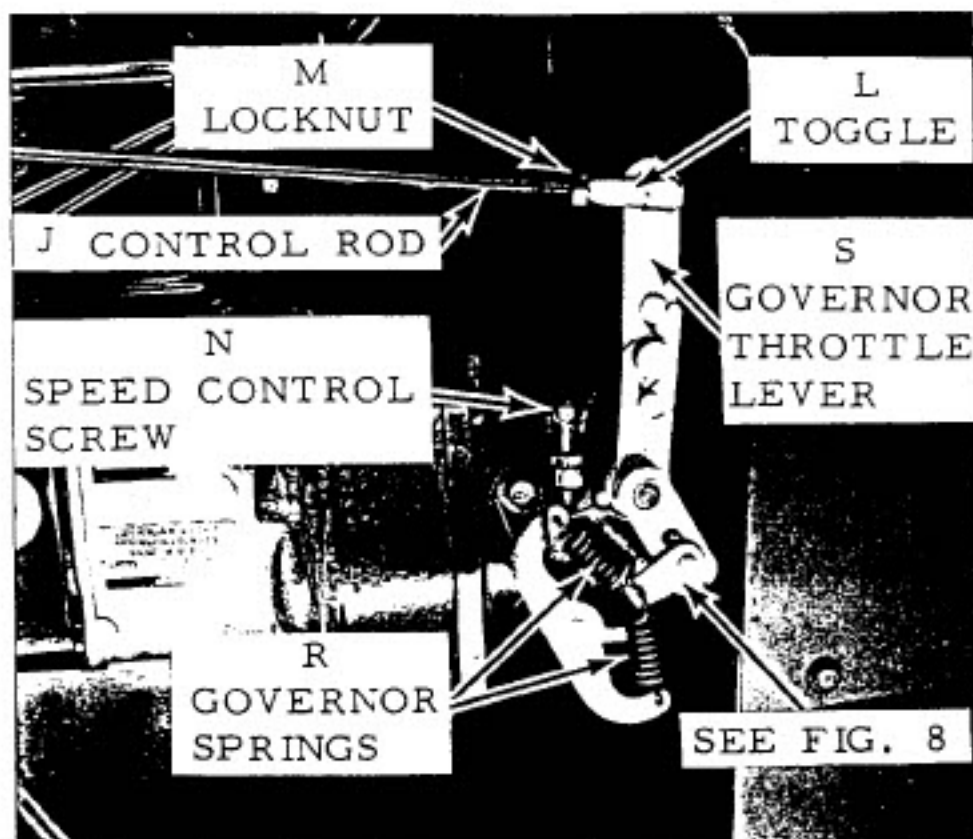


FIGURE 6 — Hoof Governor

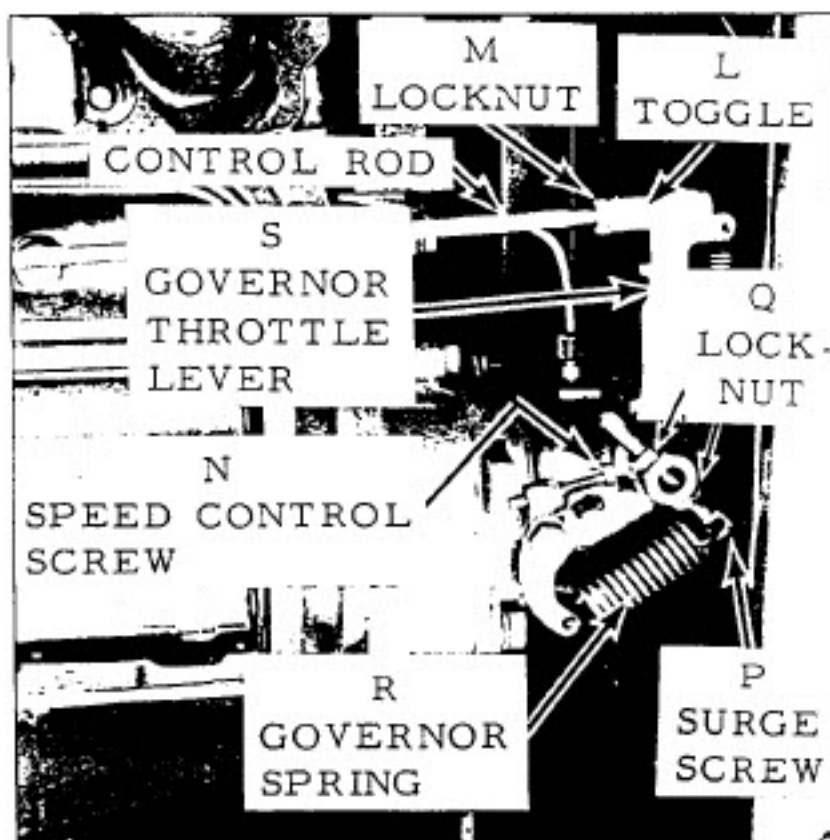


FIGURE 7 — Pierce Governor

## SENSITIVITY ADJUSTMENT

The governor sensitivity adjustment has two purposes: (1) to control speed fluctuations (surge) at idle and load speeds, and (2) to control speed drop from high idle to load speed. Specific instructions for the method of changing this adjustment for Pierce and Hoof governors are given below.

**CAUTION:** Never use the sensitivity adjustment to eliminate surge which is present at load speed but not at high and low idle speeds. This type surge is almost never caused by governor misadjustment.

Changing the sensitivity adjustment in one direction reduces surge but increases the speed drop. Changing it in the other direction reduces the speed drop but increases the surge. Changing the sensitivity adjustment affects the idle speed. Therefore, *always* readjust the speed adjustment screw after changing the sensitivity adjustment.

**NOTE:** Although the governors on welders driven by International Harvester and Hercules engines appear different than shown in these pictures, the adjustments are basically the same.

To eliminate excess engine surge, latch the idler in high idle position. Adjust the sensitivity adjustment just far enough to eliminate all the surge. Readjust the speed adjustment screw after eliminating surge.

Normally the engine surges three times when changing speeds. If it surges more often, the number of surges can usually be reduced by adjusting the sensitivity adjustment in the direction for less surging. This adjustment should only be made if the excess number of surges is objectional.

The normal speed drop from high idle to load speed is 100 RPM  $\pm$  25 RPM. The speed drop is usually increased too much when surge is eliminated. If the speed drop is too great, change the sensitivity adjustment in the direction opposite to that used to eliminate surge until the drop falls within the limits. If the speed drop is less than the limit there is no harm done so long as the engine does not surge. Readjust the speed adjustment screw after completing this adjustment.

When the engine surges the generator output varies. This can be detrimental to arc characteristics. If the speed drop is excessive, the load speed is low and the generator output is reduced. In adjusting the governor on a worn engine, you must balance the importance of eliminating surge with the need for full rated generator output. If you cannot obtain the proper adjustment, engine repair may be necessary.

## HOOF GOVERNOR SENSITIVITY ADJUSTMENT

Refer to Figure 8. The governor springs (R) are attached to the lower half of the throttle lever (S) by a spring link (T) which oscillates on a pin (U). The pin has serrated teeth (V) which engage a tooth rack (W) in the throttle lever slot.

The governor spring tension maintains contact between the pin teeth and rack teeth at all times.

To change the sensitivity adjustment, loosen the nut (X) holding the pin, and turn the pin with a screwdriver. The pin teeth operate with the rack teeth as a gear system. Turning the pin down or away from the throttle lever pivot point (Y) reduces surge but increases speed drop. Turning the pin up or toward the pivot point (Y) increases surge but decreases speed drop.

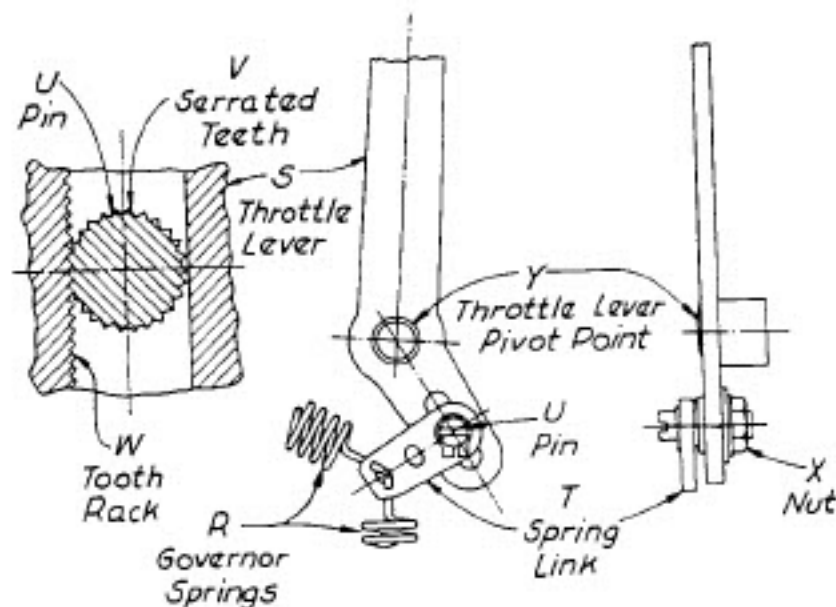


FIGURE 8 — Hoof Governor Sensitivity Adjustment

## PIERCE GOVERNOR SENSITIVITY ADJUSTMENT

Refer to Figure 7. The surge screw (P) is the sensitivity adjustment on the Pierce governor. To change this adjustment, loosen one locknut (Q) and tighten the other. This changes the position of the surge screw. Moving the screw down or to the right reduces surge but increases speed drop. Moving the screw up or to the left increases surge but reduces the speed drop.

## BUMPER SPRING SCREW ADJUSTMENT

SAE-300-QXLD3 Hercules engine welders have a Pierce governor equipped with a bumper screw. The only purpose of this screw is to control surging as the engine goes from load to high idle speed after the arc is broken. To adjust the bumper spring screw, loosen the locknut and turn the screw out (counterclockwise) several turns. Then turn it in (clockwise)  $\frac{1}{4}$  to  $\frac{1}{2}$  turn. Strike and break the arc to check the surging. Repeat this operation until the surging is at a minimum. Never turn the bumper spring screw in more than just enough to correct surging.

## ENGINE STARTING

Starting at idle speed (with the latching pin — item 15 — hanging loose) is recommended. Engines can also be started with the idler held in full speed position by the latching pin.



Model	Recommended Engine RPM		
	Low Idle	Full Load	High Idle
SA-200-F162 <sup>(1)</sup> & F163 <sup>(1)</sup>	1000	1450	1550
SAF-300-F163 <sup>(1)</sup>	1100	1500	1590
SAE-300-F244 <sup>(1)</sup> & QXLD3 <sup>(1)</sup>	1000	1450	1550
SAE-300-F226 <sup>(1)</sup> & F227 <sup>(1)</sup>	1000	1500	1600
SAE-300-C221 <sup>(1)</sup>	1000	1500	1600
SAM-300-F227 <sup>(1)</sup>	1000	1550	1650
SAM-400-F245 <sup>(1)</sup>	1000	1690	1790
SAE-400-JXD <sup>(1)</sup>	1000	1690	1790
SAE-400-F244 <sup>(1)</sup> & F245	1200	1700	1800
SAE-400-C263 <sup>(1)</sup>	1000	1450	1550
SAE-600-JXLD <sup>(1)</sup> & G339 <sup>(1)</sup>	1000	1450	1550
SAE-600-G3400 <sup>(1)</sup>	1000	1450	1550
SAF-600-C301 <sup>(1)</sup>	1200	1690	1790
SAM-600-C301 <sup>(1)</sup>	1200	1690	1790
SAF-650-G3400 <sup>(1)</sup> (Up to Code 6830)	1200	1600	1700
SAF-650-G3400 <sup>(1)</sup> (Above Code 7210)	1200	1700	1800
SAM-650-G3400 <sup>(1)</sup>	1200	1690	1790

<sup>(1)</sup> These models are no longer in production. SA-200-F163 models with electric starters built after May 1973 (above code 7275) have an electronic idler. See IM-277 for idler and engine adjusting instructions.

### WARNING

- If possible, turn to engine off and disconnect the battery before working inside the machine.
- Do not put your hands near the engine fan.
- Do not attempt to override the governor or idler by pushing on the throttle control rods while the engine is running.
- If a problem cannot be corrected by following the instructions, take the machine to the nearest Lincoln Field Service Shop.

**MOVING PARTS can injure.**

## POWER TOOLS AND WIRE FEEDERS

When using auxiliary power for these operations, latch idler in full speed position with the latching pin (15).

## IDLER

### IDLER OPERATION

#### General Operation:

- The throttle on the carburetor is connected to the idler diaphragm assembly (Item 2) by a rigid rod.
- The diaphragm assembly is operated by the engine intake manifold vacuum. The diaphragm vacuum is controlled by a spring loaded valve (6).
- The needle valve is operated by a spring loaded solenoid (3).
- The solenoid is connected to the welding generator circuit.



#### When Idling:

- The needle valve is closed so air is exhausted from the diaphragm assembly by the manifold vacuum.

#### Upon Striking the Arc:

- Voltage energizes the solenoid coil.
- The plunger (8) is pulled down into the coil.

- The needle valve spring (7) pushes the valve off its seat allowing air to enter the diaphragm chamber.
- A spring on the idler to carburetor rod pulls the throttle to the full speed position set by the governor.

#### After Weld is Completed:

- The solenoid coil is de-energized allowing the plunger to rise. The plunger spring (9) overcomes the needle valve spring and closes the valve.
- Air is exhausted from the diaphragm chamber by the engine manifold vacuum pulling the diaphragm, idler-to-carburetor rod, and throttle to the idle position.

NOMINAL OPERATING VOLTAGES		
Solenoid Coil Assem. <sup>(1)</sup>	Min. Coil Volts	Max. Coil Volts (60% Load Factor)
S-8951-A	.65	5.75
S-8951-B	.38	4.25
S-8951-C	.75	7.65
S-8951-D	.32	2.90

<sup>(1)</sup> Suffix letters stenciled on assembly.

## TIME ADJUSTMENTS

A time delay feature prevents the idler from slowing the engine speed when the arc is momentarily broken. The recommended time delay is 8 to 12 seconds to allow enough time to change rods without slowing the engine. To adjust:

1. Time delay is controlled by a petcock adjustment. Turning the petcock (11) clockwise compresses a felt inside the petcock lengthening the time it takes to exhaust air from the diaphragm chamber and move the idler to idle position.

**NOTE:** Occasional cleaning or replacement of felt will improve idler operation.

2. Turning the petcock counterclockwise shortens the time it takes to exhaust air from the diaphragm chamber and move the idler to idle position.
3. After adjusting the petcock, tighten the sealing nut just snug enough to prevent leaking.
4. Do not reduce the delay to less than 8 seconds because this may prevent the engine from coming to full speed when welding.

## IDLER MAINTENANCE

The idler is adjusted at the factory and should require minimum maintenance. If the following steps do not correct the difficulty, see the Troubleshooting section on page 11.

1. Be sure the time delay is adjusted according to the instructions under "Time Adjustments".
2. The engine may fail to pick up speed when the arc is struck because the low idle speed is too slow to provide the required solenoid voltage. If it is set too slow, readjust the carburetor idle speed adjusting screw. When the engines run at idle speed for a length of time in damp weather at temperatures under 40°F, ice tends to form on the carburetor throttle plate reducing the idle speed. Try connecting the carburetor de-icer hose to eliminate idle speed variations.

On welders with Continental F163 and Hercules G3400 engines and serial numbers higher than A-594908 (1968), a ball check valve is installed in the air line at the manifold. It is also included with replacement idlers for these engines. At the time of engine servicing, remove this valve for inspection and cleaning with any commercial solvent.

## ASSEMBLY AND DISASSEMBLY

Normally the idler should be disassembled only by Lincoln Field Service Shop personnel. If it does become necessary to disassemble the idler mechanism, the following procedure is recommended:

Remove solenoid assembly (3), which is fastened to the case (1) with two sheet metal screws. Valve (6) and valve spring (7) may then be removed. Care should be taken to avoid loss due to their small size. Remove the valve seat with a screwdriver and the petcock (11) with a wrench.

In reassembly of the idler, be sure all connections are leak-proof. Check to see that the large tapered solenoid armature spring is positioned with the wide end next to the solenoid coil. Center the head of the solenoid armature upon the valve and tighten the solenoid mounting screws.

After reassembly adjust the solenoid plunger travel using the long screw (27) on the top of the idler. Lift the edge of the rubber dust cap and insert a feeler gage between the armature and the valve stem. Recommended clearance is .018 to .022. After adjusting screw (27), tighten the locknuts. Be sure the rubber dust cap is in place.



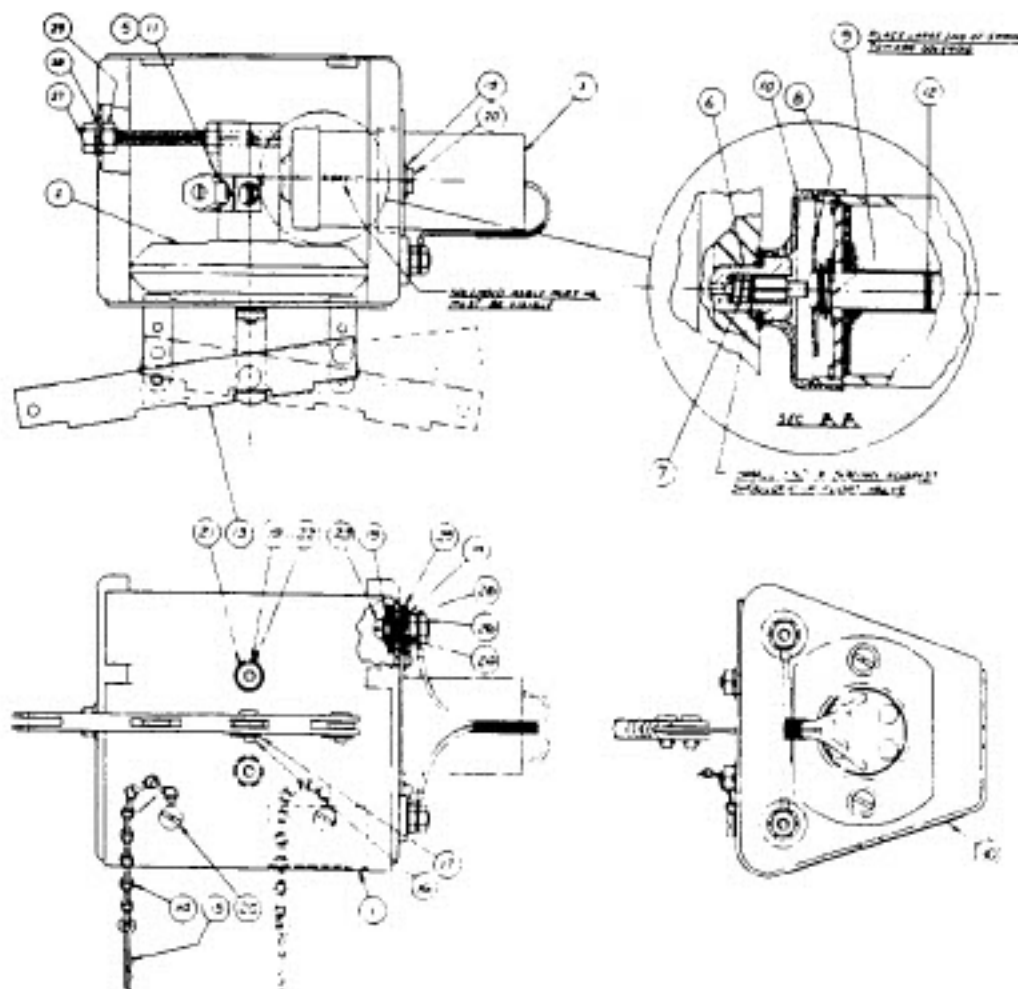
## HOW TO ORDER IDLER PARTS

Give the Item No., Part Name and No. Req'd from P-71-G. Also give the Model Name and Code No. from the welder nameplate.

Kits are available for many models of Lincoln welders to permit replacing the old bellows type idler, L-2299, with this new type idler. When ordering give the full welder

nameplate data and current rating to insure getting an idler with a coil of the proper voltage rating.

Order parts from The Lincoln Electric Co., its branch offices, or the nearest Authorized Field Service Shop. (The "Lincoln Service Directory" listing these shops geographically is available on request.) All Authorized Field Service Shops and branch offices can quote current prices for replacement parts.



## IDLER

Parts List P-71-G

ITEM	PART NAME & DESCRIPTION	NO. REQ'D
1	Idler, Includes All Below Case Assembly	1
2	Diaphragm Assembly	1
3	Solenoid Assembly	1
5	Gasket	1
6	Float Valve Assembly	1
7	Float Spring	1
8	Core and Cap Assembly	1
9	Core Spring	1
10	Dust Seal	1
11	Petcock, Includes:	1
12	Felt for Petcock	1
13	Spacer	1
13	Control Lever	1
14	Chain	1
15	Latching Pin	1
16	Pivot Pin	2

ITEM	PART NAME & DESCRIPTION	NO. REQ'D
17	Spring Clip	2
18	Flat Washer	8
19	Self Tapping Screw	2
21	Lock Washer	2
22	Hex Nut	2
23	Sems Screw	2
24	Insulating Bushing	2
25	Insulating Washer	4
26	Hex Nut	4
27	Hex Head Cap Screw (Full Thread)	1
28	Flat Washer	1
29	Hex Nut	2
30	Instruction Decal	1

## TROUBLESHOOTING

<b>WARNING</b>	
<p><b>MOVING PARTS can injure.</b></p>	<ul style="list-style-type: none"> <li>Have qualified personnel do maintenance and troubleshooting work.</li> <li>If possible, turn the engine off and disconnect the battery before working inside the machine.</li> <li>Remove guards only when necessary to perform maintenance, and replace them when the maintenance requiring their removal is complete.</li> <li>If fan guards are missing from a machine, obtain replacements from a Lincoln Distributor. (See Operating Manual Parts List.)</li> </ul>

Trouble	Cause	What To Do
Engine runs irregularly	a. Carburetor may be set too lean.	a. Adjust the carburetor per instructions in this manual.
Engine surging	a. Poor engine operation. b. Spark plugs may be bad. c. Air filter may be dirty. d. Control rod length may be wrong. e. Governor may be misadjusted.	a. See troubleshooting in engine manufacturer's operating manual. b. Check and replace if necessary. c. Check and clean if necessary. d. Check and adjust per instructions in this manual. e. Adjust the governor per instructions in this manual.
Low output	a. High idle speed may be too low.	a. Adjust the governor for the proper high idle speed per instructions in this manual.
Large decrease in speed when the arc is struck	a. Governor may be misadjusted.	a. Adjust the governor per instructions in this manual.
<b>IMPORTANT:</b> Before making the adjustments described in the following troubles, carefully read the section describing idler adjustment.		
Idler does not slow the engine in less than 12 seconds	a. There may be a leak in the vacuum system. b. Needle valve may not be sealing. c. Felt in petcock may be dirty. d. Spacer (12) may be missing.	a. Check for cracked or leaky vacuum line, fitting or diaphragm. b. Check for dirt in the valve. Make sure the core spring (9) is not missing. c. Replace felt. In emergencies cut about 1/32" off clogged end of felt. d. If removable bronze disc in older idlers is missing, residual magnetism will hold the core and cap assembly down. Insert part T-10172.
Engine does not pick up speed when the arc is struck. See if solenoid is pulling in by lifting rubber seal (10) to see if core assembly moves when the arc is struck. Be sure rubber seal is back in place after correcting the trouble. Check solenoid coil voltage (Table on page 8).	a. If solenoid pulls in, needle valve may be stuck closed. b. If there is no voltage on the coil, there may be poor or broken electrical connections. c. If voltage on the coil is too low, idle speed may be too low. d. If there is no voltage on the coil but it is not pulling in, coil may be burned out. e. If there is voltage on the coil but it is not pulling in, air gap may be excessive. Check by lifting rubber seal and inserting feeler gage.	a. Be sure spring (7) is in the valve and not broken. b. Correct any poor connections. c. See "Idler Maintenance" on page 9. d. Replace coil if necessary. e. Gap should be .018" to .022". Adjust with screw (27) and locking nuts. (See "Assembly and Disassembly" on page 9.)
Engine stalls when throttle is snapped open	a. Engine may not be warmed up. May have too lean a fuel mixture or accelerator pump in the carburetor may be functioning improperly.	a. Warm up the engine. Check and adjust the carburetor.



## LIMITED WARRANTY

### STATEMENT OF WARRANTY:

The Lincoln Electric Company (Lincoln) warrants to the original purchaser (end-user) of new equipment that it will be free of defects in workmanship and material.

This warranty is void if Lincoln finds that the equipment has been subjected to improper care or abnormal operation.

### WARRANTY PERIOD:

All warranty periods date from the date of shipment to the original purchaser and are as follows:

#### Three Years:

Transformer Welders  
Motor-generator Welders  
Semiautomatic Wire feeders  
Plasma-cutting power source  
Engine Driven Welders (except engine and engine accessories) with operating speed under 2,000 RPM

#### Two Years:

Engine Driven Welders (except engine and engine accessories) with operating speed over 2,000 RPM

All engine and engine accessories are warranted by the engine or engine accessory manufacturer and are not covered by this warranty.

Equipment not listed above such as guns and cable assemblies, automatic wire feeders and field-inverter optional equipment is warranted for one year.

### TO OBTAIN WARRANTY COVERAGE:

You are required to notify Lincoln Electric, your Lincoln Distributor, Lincoln Service Center or Field Service Shop of any defect within the warranty period. Written notification is recommended.

### WARRANTY REPAIR:

If Lincoln's inspection of the equipment confirms the existence of a defect covered by this warranty, the defect will be corrected by repair or replacement at Lincoln's option.

### WARRANTY COSTS:

You must bear the cost of shipping the equipment to a Lincoln Service Center or Field Service Shop as well as return shipment to you from that location.

### IMPORTANT WARRANTY LIMITATIONS:

Lincoln will not accept responsibility for repairs made without its authorization.

Lincoln shall not be liable for consequential damages (such as loss of business, etc.) caused by the defect or reasonable delay in correcting the defect.

- Lincoln's liability under this warranty shall not exceed the cost of correcting the defect.

- This written warranty is the **only** express warranty provided by Lincoln with respect to its products. Warranties implied by law such as the Warranty of Merchantability are limited to the duration of this limited warranty for the equipment involved.



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