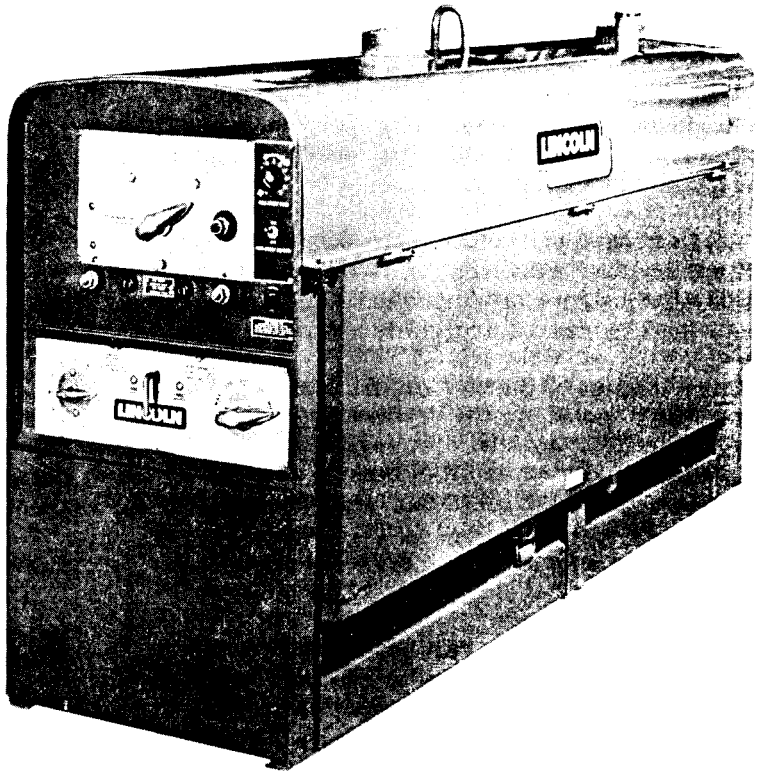
LINCOLN WELDERS®

IM-251-B

IM251
November, 1973
Shield-Arc SAF-300-F163 Continental
5404; 5469; 5543; 5577; 5614; 5615; 5637; 5652; 5653; 5654; 5655; 5656; 5708; 5709; 5710; 5711; 5712; 5768; 5789; 5851; 5924; 6081; 6095; 6096; 6098; 6133; 6350; 6351; 6376; 6385; 6391; 6443; 6553; 6599; 6635; 6636; 6637; 6638; 6719; 6772; 6774; 6775; 6793; 6794; 6852; 7031; 7043; 7169; 7227; 7258

OPERATING MANUAL



Shield-Arc®
SAF-300-F163
DC Arc Welder

This manual covers equipment which is obsolete and no longer in production by The Lincoln Electric Co. Specifications and availability of optional features may have changed.

SAFETY DEPENDS ON YOU

Lincoln welders are designed and built with safety in mind. However, your overall safety can be increased by thoughtful operation on your part. Observe the common machine operating and welding safety precautions as outlined on the back of this manual. And, most importantly, think before you act and be careful.

A grounding stud marked with the symbol ⏚ is located on the welding generator frame foot. As a safety factor connect this stud to a solid earth ground such as a metal pipe which goes into the ground or the metal framework of a building which is effectively grounded. For other alternatives, see the section on "Grounding Electrodes" in the National Electrical Code. The ground connector **must** be No. 8 or larger wire. If an older portable welder does not have a grounding stud, connect the ground wire to an unpainted frame screw or bolt.

For Stick Electrode Welding

Set the SAF-300 for Variable Voltage output.

For Semiautomatic Welding

Set the SAF-300 for **Constant** Voltage output. Can be used with the LN-7 and LN-8 (and discontinued LN-5 and LN-6) wire feeders. Use a SAF-300 with optional AC auxiliary power output. The optional contactor is also recommended. See the appropriate wire feeder operating manual for installation instructions. When connected to an LN-7 or LN-8, set the welding voltage with the SAF-300 "Fine Adjustment."

LINCOLN ELECTRIC®
THE LINCOLN ELECTRIC COMPANY
World's Largest Manufacturer of Arc Welding Equipment and Electrodes · Manufacturer of Motors Since 1895
Cleveland, Ohio 44117 U.S.A.
Toronto, Ontario, Canada • Sydney 2211, N.S.W., Australia • Grand-Quevilly, 76—France

DAMAGE CLAIMS

When this equipment is shipped, title passes to the purchaser upon receipt by the carrier. Consequently, claims for material damaged in shipment must be made by the purchaser against the transportation company at the time the shipment is received.

STARTING THE ENGINE

See the engine manufacturers operating manual supplied with the welder for detailed engine operating instructions.

Engines equipped with starters are furnished with dry charged batteries. Fill with the electrolyte per the instructions furnished with the welder. Use caution as the electrolyte is a strong acid.

Upon receipt of the welder, fill the crankcase to the "full" mark on the bayonet gage. Use the weight oil recommended by the engine manufacturer. Fill the radiator and fuel tank. Check the oil level of the air filter oil bath. Open the fuel feed valve on the sediment bowl by turning the needle valve counter-clockwise. Turn the ignition switch on.

To start the engine pull out the choke. Start the engine. Allow the engine to run for 5 minutes at low idle speed. As the engine warms up push in the choke. (The colder the engine, the more choking is necessary.) Be sure the oil pressure builds up properly after the engine is started.

When an engine is started for the first time, some of the oil will be needed to fill the passages of the lubricating system. Therefore, on initial starting, run the engine for about five minutes and then stop and recheck the oil. If the level is down fill to the full mark again. The engine controls were properly set at the factory and should require no adjusting when received.

Before starting the engine every day, check the fuel supply (running out of fuel may draw dirt into the fuel system), crankcase oil, radiator and battery.

The fan belt tends to loosen after about 40 hours of operation. Check and tighten, if necessary. Check and tighten all internal and external connections as necessary.

IDLING DEVICE

An engine idling device is provided on this welder to conserve fuel and reduce engine wear. When starting the engine it is usually best to latch the idler in the low idle position.

To have automatic idling with stick electrode welding, remove the latching pin from the idler control lever allowing the lever to swing freely. When using the machine as a power source for automatic welding, latch the idler in full speed position.

For detailed description of the idler operation, see IM-179.

Engine operating speeds are as follows:

Full Load	1500 rpm
High Idle	1590 rpm
Low Idle	1100 rpm

CARBURETOR DE-ICER

This welder is provided with an anti-frosting device. This frosting generally occurs when the humidity is high and the temperature is between 26 and 40° F. To connect the de-icer, remove the molded rubber hose that is hung underneath the gas tank and connect it between the air filter inlet tube and the heater tube mounted on the engine manifold. This provides positive pre-heated air to the carburetor.

Disconnect this hose for warm weather operation.

RECOMMENDED CABLE SIZES

Amperes	Duty Cycle	Cable Sizes for Combined Lengths of Electrode and Ground Cables		
		150 ft. or less	150 to 200 ft.	200 to 250 ft.
300	80	1/0	2/0	3/0

AUXILIARY POWER

A 115 volt DC power plug is located on the control panel. This plug furnishes power to operate power tools and lights. The 115 volt DC power can also be drawn from terminals #1 and #2 on the terminal strip inside the machine. The total power available from plug and terminal strip is 8.7 amps or 1000 watts. Attempting to draw more power may damage the welder exciter.

As an optional feature a special exciter which will furnish both 1000 watts of 115 volt DC and 350 volt amperes of 115 volt 50 cycle AC power can be factory installed on new machines. An additional terminal strip is installed for connecting to the AC power.

Latch the idler in full power position when using these auxiliary power receptacles.

OUTPUT CHARACTERISTICS

This machine is either a variable voltage or constant voltage welder. Variable voltage is always used for stick electrode welding and is usually used for submerged arc welding. Constant voltage is required for the Innershield process and other constant wire feed processes.

This welder is NEMA rated 300 Amperes at 32 Arc Volts on an 80% Duty Cycle. Duty Cycle is based on a 10 minute period; thus, the welder can be loaded at Rated Output, for 8 minutes out of every 10 minute period.

OPERATION: VARIABLE VOLTAGE

Turn the "Slope Selector" to the "Stick Electrode Submerged Arc" position. Connect the electrode lead to the "Stick Electrode-Submerged Arc" stud. Select the welding current and voltage as follows:

a. "Current Range Selector"

This selector provides a rough setting of the welding current. There are five positions indicated on the dial. The number assigned to each position is the approximate center of the current range available at the setting. For each setting there is a maximum and minimum current available through the "Fine Adjustment" rheostat. There is overlapping of each of the current ranges so you have continuous current control.

NOTE: DO NOT ATTEMPT TO SET THE SELECTOR SWITCH BETWEEN ANY OF THE FIVE DESIGNATED SETTINGS. DO NOT CHANGE THE SETTING WHILE WELDING.

b. "Fine Adjustment"

This control varies the current over the range provided by the "Current Range Selector." It is also an open circuit voltage control so you can vary the arc characteristics. High voltage for a soft arc. Low voltage for a forceful digging arc.

For best normal operation when stick electrode welding, set the "Fine Adjustment" as high as possible for whatever current setting is used. This will provide a soft arc and high open circuit voltage to prevent pop-outs. However, for vertical or overhead work, a low open circuit voltage is needed to give a snappy digging arc.

For best operation when submerged arc welding, keep the "Fine Adjustment" setting high.

OPERATION: CONSTANT VOLTAGE

Turn the "Slope Selector" to the "Innershield" position. Connect the electrode lead to the "Innershield" stud.

Set the welding current with the controls on the semi-automatic wire feeder. The "Current Range selector" has no effect when connected to the "Innershield" stud.

a. The "Fine Adjustment" on the SAF-300 and the voltage control on the wire feeder both affect the welding voltage. The "Fine Adjustment" is usually set to give the open circuit voltage (o.c.v.) needed for good starting characteristics. Welding voltage adjustments are then made with the wire feeder voltage control.

OPERATION: OPTIONAL CONTROLS

a. Output Contactor

This contactor can only be factory installed on machines equipped with the optional exciter that produces AC power. It operates only when the electrode lead is connected to the "Innershield" stud.

This contactor disconnects the welding current when the appropriate switch on the wire feeder is released. Thus, it is installed when it is desired to have the electrode electrically "cold" when not welding.

b. Hot Start Circuit

This circuit can only be factory installed on machines equipped with the optional exciter that produces AC power. It is only used with a constant voltage process.

With the "Hot start Switch" set to 'on,' the starting OCV is higher by a fixed amount. The OCV remains at the higher figure for 0 to 2-1/2 seconds as controlled by the "Hot Start Timer." The voltage drops to regular welding voltage automatically when the timer is timed out.

The hot start circuit is removed from the welding circuit when the "Hot Start Switch" is turned to 'off.'

The increase in starting OCV over welding OCV and the amount of time delay can be easily measured using the "Hot Start Switch." Just turn the switch 'on.' Note the starting OCV reading on the wire feeder volt meter (output contactor must close). Then turn the switch 'off.' After the time set by the "Hot Start Timer" elapses, the voltage reading will drop to welding OCV.

PIPE THAWING

This welder can be used to thaw frozen water pipes. For overload protection we recommend use of a protective device called the "Linc-Thaw." For further description of the "Linc-Thaw" and pipe thawing procedures and safety precautions, write for bulletin E695.

CIRCUIT PROTECTION

An 8 amp 115 volt fuse in the DC circuit and a 4 amp 115 volt fuse in the AC circuit protect the exciter. These fuses are located below the "Slope Selector" switch on the SAF-300 control panel.

BEARINGS

Your welder is equipped with double-shield ball bearings having sufficient grease to last indefinitely under normal service conditions. Where the welder is used constantly or in excessively dirty locations, it may be necessary to add one ounce of grease per year.

When greasing the bearings keep all dirt out of the area. Wipe the fittings completely clean and use clean grease and equipment. More bearing failures are caused by dirt indroduced during greasing than from insufficient grease.

COMMUTATOR AND BRUSHES

The commutator and brushes are inspected by removing the commutator cover. Do not remove or replace the cover while the welder is running.

The brushes on the generator and exciter are properly adjusted when the welder arrives. No particular attention is required to keep the brushes in good condition. When the brushes wear within 1/8 in. of the pigtails, they must be replaced. One complete set of brushes should always be kept on hand. Lincoln brushes have a contact face specially curved to fit the commutator surface. These brushes are seated by lightly stoning the commutator while the armature rotates at full speed. This operation is completed when the brushes make contact over the entire contact face. Visually inspect the brushes to make sure they are fully seated. After stoning, blow out the dust with low pressure air. DO NOT SHIFT THE BRUSHES.

The commutator requires practically no attention. It should be cleaned from time to time with a clean rag or, while running, with a commutator stone or a piece of fine sandpaper. Never use emery cloth or paper for this purpose.

COOLING SYSTEM

Lincoln engine driven welders are equipped with pressure radiators. Keep the radiator cap tight to prevent loss of coolant. Clean and flush the cooling system periodically to prevent clogging the passages and overheating the engine.

Cooling system capacity is 10-1/2 quarts.

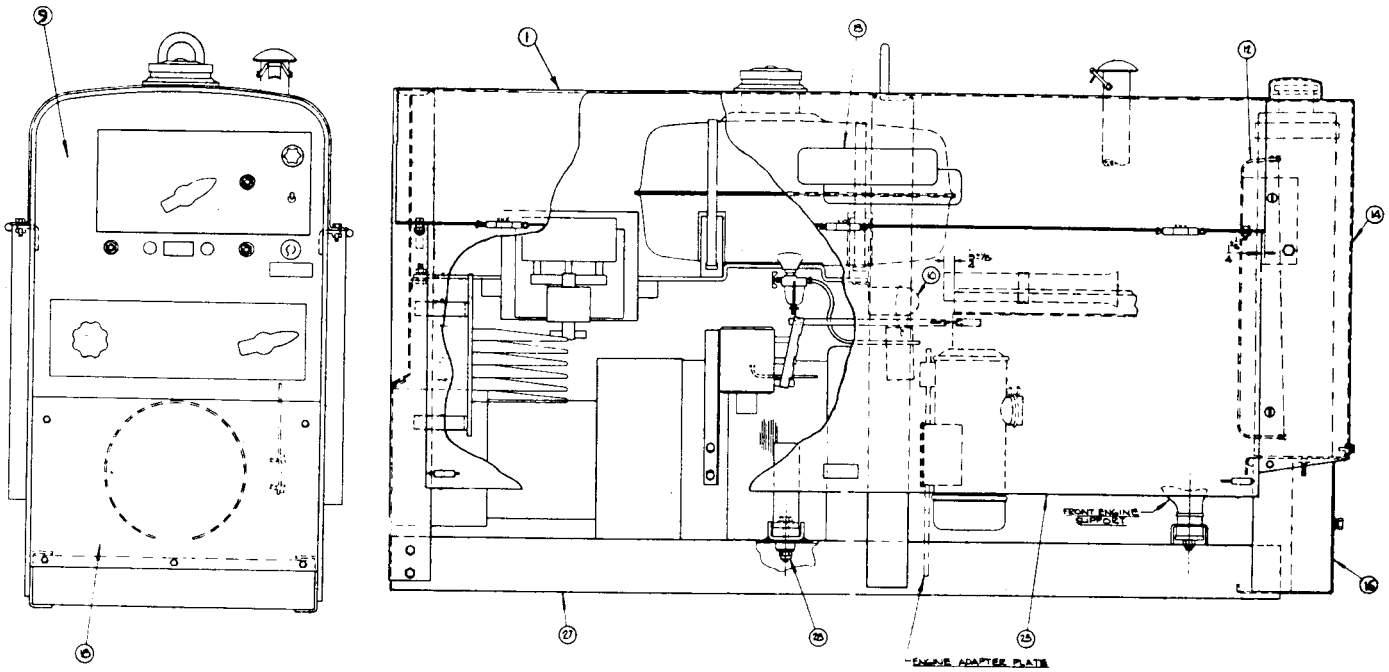
MAINTENANCE INSTRUCTIONS

1. Blow out the welder and controls with an air hose at least once every two months - once every week in dirty locations. Use low air pressure to avoid driving dirt into the insulation.
2. Current control contacts are self lubricaing and should not be greased. To keep the contacts clean rotate the current control through its entire range frequently. Good practice is to turn the handle from maximum to minimum setting twice each morning before starting to weld.
3. Drain the crankcase oil every 50 hours of operation under average conditions.
4. Replace the oil filter per instructions on the filter. It will require 5 quarts of oil to refill the system when filter is changed.
5. Keep governor and carburetor toggles and butterfly valve shaft clean and lubricated.
6. Inspect air filter (oil bath type) daily - more often under dusty conditions. Clean and fill with oil to bead. The oil cup should never be removed while the engine is running.
7. Put a drop of oil on the current control shaft at least once every month.

TROUBLE-SHOOTING

TROUBLE	CAUSES	WHAT TO DO
Machine fails to hold the "heat" constantly.	Rough or dirty commutator.	Commutator should be trued or cleaned.
	Brushes may be worn down to limit.	Replace brushes.
	Brush springs may be broken.	Replace brush springs.
	Field circuit may have variable resistance connection or intermittent open-circuit, due to loose connection or broken wire.	Check field current with ammeter to discover varying current. This applies to both the main generator and exciter.
	Electrode lead or work lead connection may be poor.	Tighten all connections.
	Wrong grade of brushes may have been installed on generator.	Use only Lincoln spare parts.
	Field rheostat may be making poor contact and overheating.	Inspect rheostat and clean and adjust finger tension on contact.
Welder starts but fails to generate current	Generator or exciter brushes may be loose or missing.	Be sure that all brushes bear on the commutator and have proper spring tension.
	Exciter may not be operating.	Check exciter output voltage with voltmeter or lamp.
	Field circuit of generator or exciter may be open.	Check for open circuits in rheostat, field leads, and field coils.
	Exciter may have lost excitation.	Flash exciter fields.
	Series field and armature circuit may be open-circuited.	Check circuit with ringer or voltmeter.
Welding arc is loud and spatters excessively.	Current setting may be too high.	Check setting and current output with ammeter.
	Polarity may be wrong.	Check polarity. Try reversing polarity or try an electrode of the opposite polarity.
Welding current too great or too small compared to indication on the dial.	Exciter output low causing low output compared to dial indication.	Check exciter field circuit.
Arc continuously pops out.	Selective Current control switch may be set at an intermediate position.	Set the switch at the center of the current range desired.
Engine fails to start.	Out of fuel.	Fill with at least 75 octane gasoline.
	Clogged fuel system.	Check all supply lines to carburetor.
	Choke not closing tightly.	Loosen choke cable screw and slack off choke wire.
	Lead attached to stud on outside of magneto is grounded.	Check for ground and insulate lead.
	Magneto points are pitted and fused.	Dress points and adjust to 0.020".
	Ignition switch shorted.	Replace
	Moisture or carbon on spark plugs.	Remove plugs, clean and adjust gap to 0.025".
Engine operation is irregular	See Engine Manufacturer's Manual and Lincoln Instruction Manual "Gasoline Engine Adjustment" - - -IM-179	

GENERAL ASSEMBLY



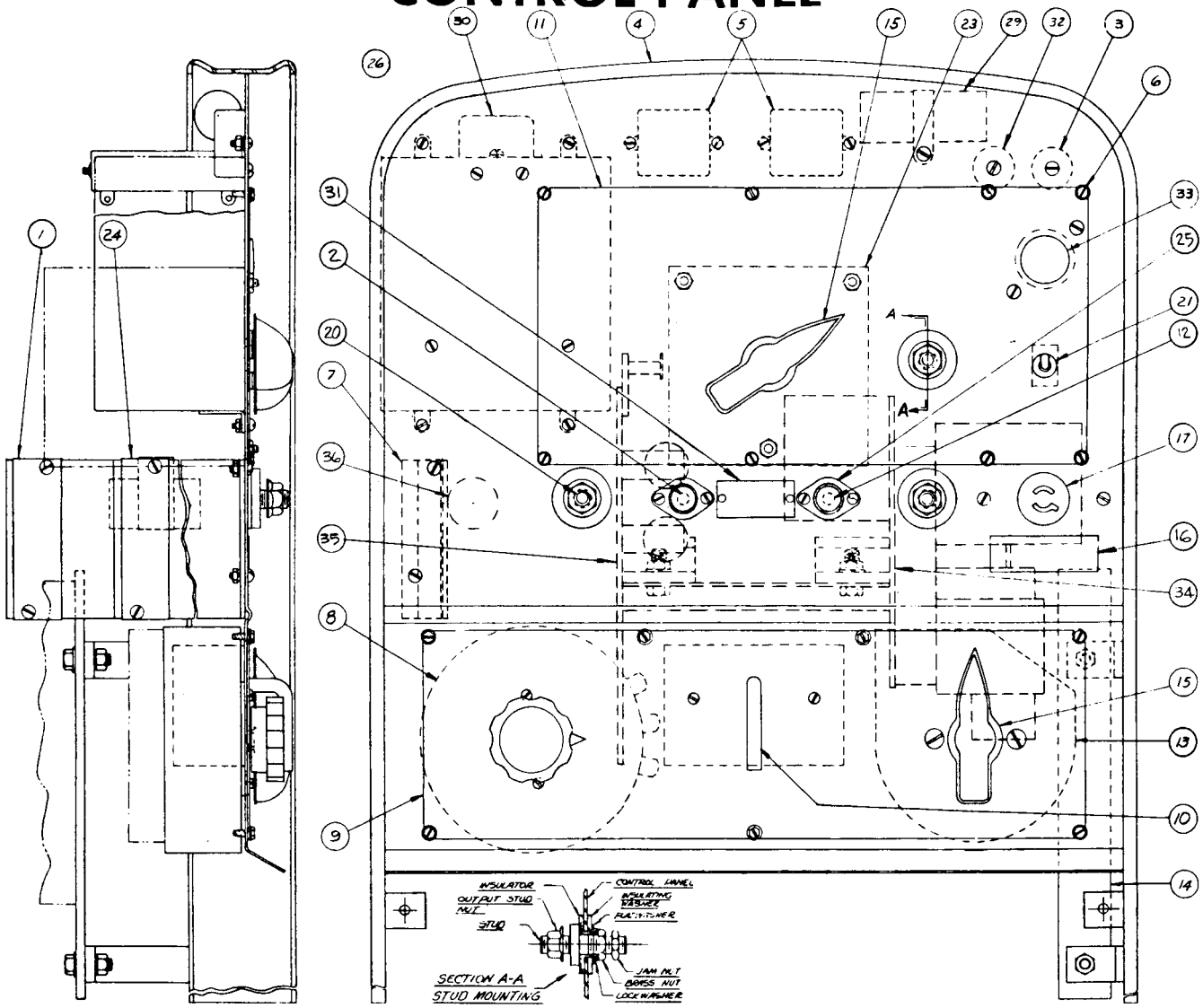
WHEN ORDERING GIVE: Item No., Part Name, Parts List No. and Welder Code.

Parts List P-76-C

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
18	Lower Panel Assembly	1
	Thread Cutting Screw	5
23	Door	2
24	Door Hook	2
	Self-Tapping Screw	4
25	Door Hook	2
	Self-Tapping Screw	4
27	Base	1
28	Foot Support	2
	Upper Foot Cushion	2
	Lower Foot Cushion	2
	Hex Head Cap Screw	2
	Washer	4
	Huglock Nut	2

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
1	Roof	1
	Roof Mounting Angle	2
8	Decal	2
9	Control Panel	1
10	Air Heater Hose	1
12	Radiator Shroud Assembly	1
	Sems Screw	4
14	Radiator Shell and Screen Assembly	1
	Thread Cutting Screw	4
15	Heater Tube	1
	Heater Tube Clamp Strap	1
16	Base Panel	1
17	Stabilizer	1

CONTROL PANEL

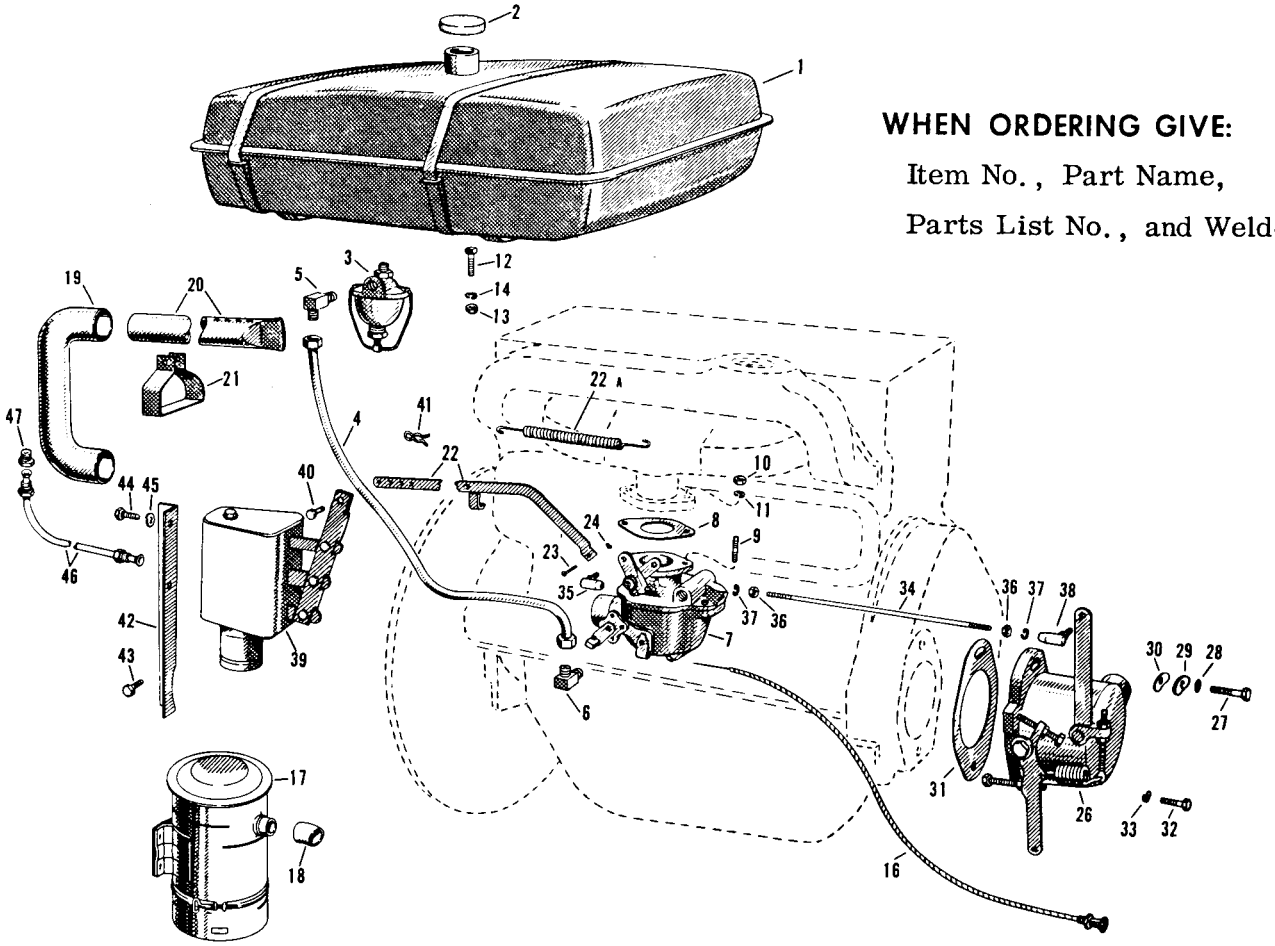


WHEN ORDERING GIVE: Item No., Part Name, Parts List No., and Welder Code.

Parts List P-76-D

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
1	Terminal Strip	1
	Number Plate	1
2	Fuse	1
	Discharge Resistor	1
	Insulation	1
4	Rear Support Assembly	1
5	Capacitor	2
	Mounting Clamp	2
6	Self-Tapping Screw	15
7	Terminal Strip Mounting Bracket	1
8	Rheostat	1
	Self-Tapping Screw, Rheostat Mounting	2
	Rheostat Handle	1
9	Nameplate	1
10	Polarity Reversing Switch	1
	Self-Tapping Screw, Switch Mounting	2
11	Nameplate	1
12	Fuse	1
13	Selector Switch	1
14	Grid Assembly	1
15	Switch Handle	1
16	Decal	1
17	Receptacle	1
20	Stud	3
	Insulator	3
	Insulating Washer	3
	Flat Washer	3
	Lockwasher	3
	Steel Hex Nut	3
	Brass Hex Nut	3
	Output Stud Nut	3
21	Hot Start Switch	1
21	Plug Button	1
23	Slope Selector Switch	1
24	Terminal Strip	1
	Number Plate	1
25	Fuse Holder	2
26	Relay Panel Assembly, Includes:	1
	Control Relay	1
	Pilot Relay	1
	Delay Relay	1
29	Capacitor	1
	Mounting Clamp	1
30	Capacitor	1
31	Fuse Nameplate	1
	Drive Screw	2
32	Resistor	1
	Insulating Washer	2
33	Potentiometer	1
	Potentiometer Mounting Plate	1
	Knob	1
33	Plug Button	1
34	Support Assembly	1
35	Support Assembly	1
36	Capacitor	1
	Mounting Clamp	1

FUEL SYSTEM



WHEN ORDERING GIVE:

Item No., Part Name,

Parts List No., and Welder Code.

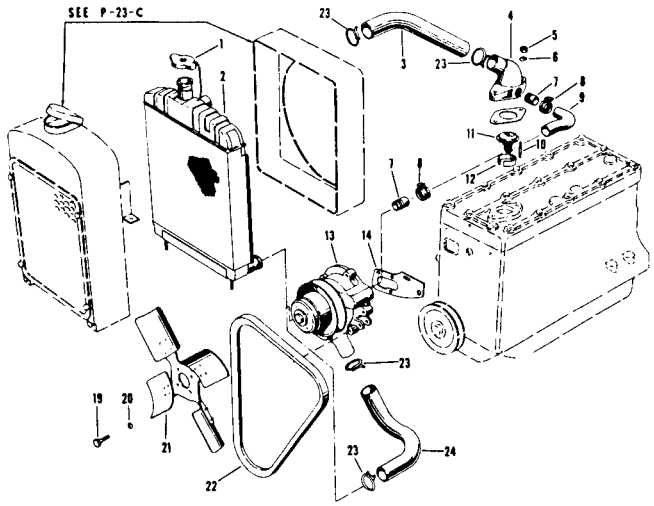
Parts List P-23-F

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
1	Fuel Tank	1
	Filler Neck Gasket	1
2	Filler Cap	1
3	Fuel Strainer Includes:	1
	Bowl	1
	Screen	1
	Gasket	1
4	Fuel Line Includes:	1
	Fitting	2
5	Fitting - Fuel Line to Strainer	1
6	Elbow - Fuel Line to Carburetor	1
7	Carburetor	1
8	Gasket	1
9	Stud - Carburetor Mounting	2
10	Nut - Carburetor Mounting	2
11	Lockwasher - Carburetor Mounting	2
12	Square Head Bolt - Gas Tank Mounting	4
13	Clamp Nut - Gas Tank Mounting	4
14	Lockwasher - Gas Tank Mounting	4
16	Choke Control	1
17	Air Filter Assembly Includes:	1
	Body Assembly	1
	Clamp Assembly - Oil Cup Retaining	1
	Oil Cup Assembly	1
	Mounting Plate - Air Filter	1
18	Hose - Air Filter to Carburetor	1
	Hose Clamp	2
19	Hose - Heater Tube to Air Filter	1
20	Heater Tube	1

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
21	Clamp Heater Tube to Manifold	1
22	Throttle Rod	1
22A	Throttle Rod Spring	1
23	Pivot Pin - Throttle Rod to Carburetor	1
24	Spring Clip - Throttle Rod to Carburetor	1
25	Governor Assembly	1
27	Screw - Top Mounting	1
28	Washer, Copper Asbestos	1
29	Cover Plate	1
30	Gasket (Cover Plate)	1
31	Gasket (Governor)	1
32	Hex Head Screw	1
33	Lockwasher	1
34	Governor Rod	1
35	Ball Joint (Carburetor End)	1
36	Hex Nut	2
37	Lockwasher	2
38	Ball Joint (Governor End)	1
39	R-57 Idler	1
	R-57 Idler Separate Parts - See IM-179	
40	Pivot Pin - Idler to Throttle Rod	1
41	Spring Clip - Idler to Throttle Rod	1
42	Idler Mounting Bracket	1
43	Thread Cutting Screw - Idler Bracket to Frame	2
44	Hex Head Cap Screw	2
45	Lockwasher	2
	Hex Head Cap Screw - Idler Mounting (Old Style)	2
46	Air Line - Idler to Manifold	1
47	Connector - Air Line to Manifold	1

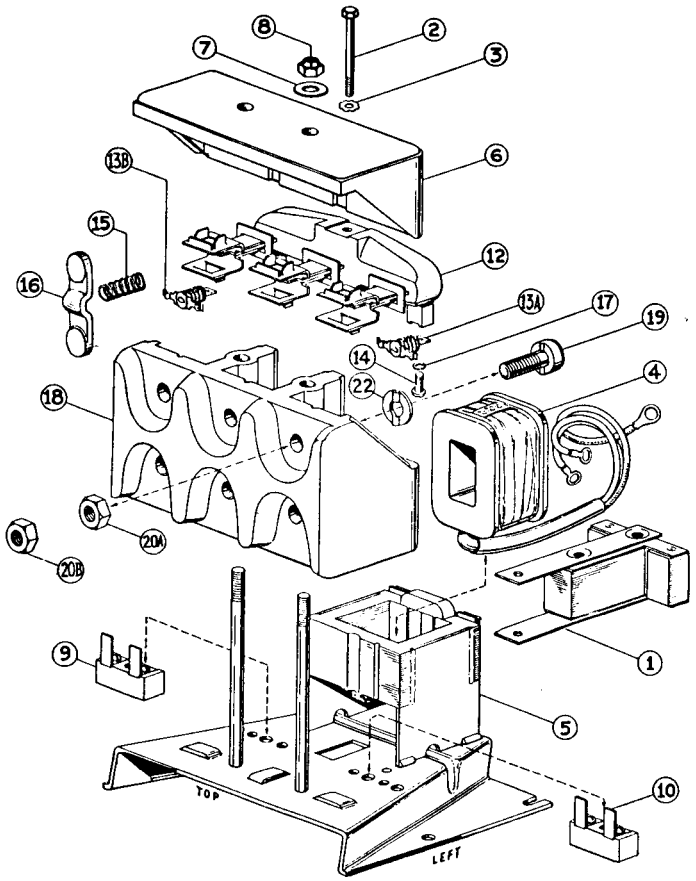
COOLING SYSTEM

WHEN ORDERING GIVE: Item No., Part Name, Parts List No., and Welder Code.



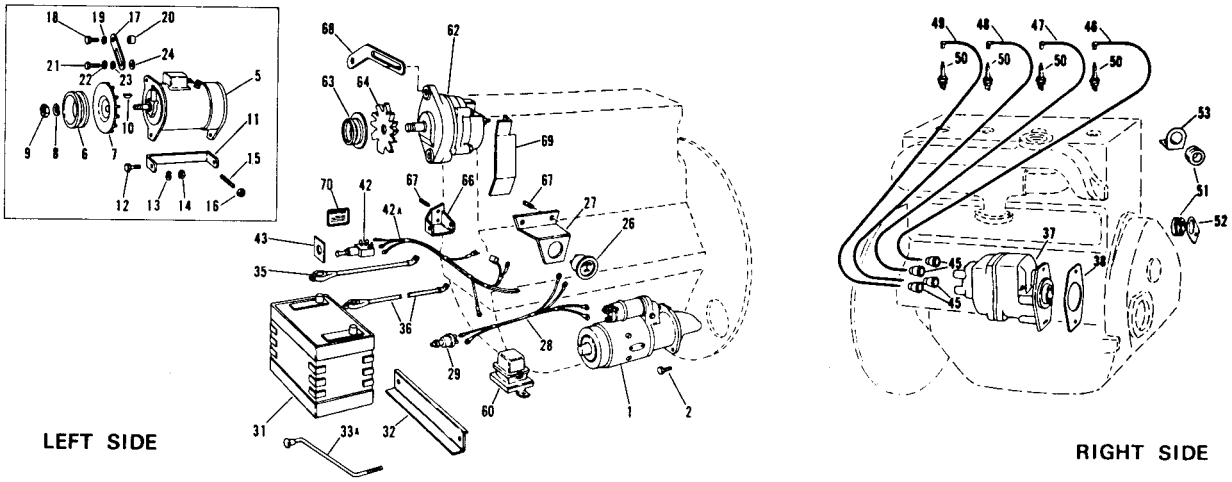
Parts List P-23-E		
ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
1	Radiator Cap	1
2	Radiator	1
	Hex Nut	2
	Washer	2
	Lockwasher	2
3	Radiator Hose - Upper	1
4	Cylinder Water Outlet Elbow	1
5	Nut - Cylinder Water Outlet Elbow to Head	2
6	Lockwasher - Cylinder Water Outlet Elbow to Head	2
7	Nipple - Thermostat Bypass	2
8	Hose Clamp - Thermostat Bypass	2
9	Hose - Thermostat Bypass	1
10	Stud - Cylinder Water Outlet Elbow to Head	2
	Gasket - Cylinder Water Outlet Elbow	1
11	Thermostat	1
12	Thermostat Adapter Ring	1
13	Water Pump	1
	Water Pump Repair Kit	1
14	Gasket	1
19	Hex Head Screw	4
20	Lockwasher	4
21	Fan Blade Assembly	1
22	Fan Belt - No Starter	1
22	Fan Belt - With Starter	1
23	Radiator Hose Clamp	4
24	Radiator Hose - Lower	1

S—45 CONTACTOR



Parts List P-28-E		
ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
	S-45 Contactor Assembly Includes: (Less NVR Coil)	1
1	Moving Lamination Assembly	1
2	Screw - Lamination Mounting	1
3	Lockwasher	1
4	*	1
5	Lamination and Panel Assembly (Specify Input Cycles)	1
	Plastic Insert	1
6	Contact Block Cover	1
7	Plain Washer	2
8	Hugnut	2
9	Stationary Interlock Contact Assembly	1
10	Stationary Interlock Contact Assembly	1
	Contactor Assembly	1
12	Moving Contactor Block	1
13A	Moving Interlock Contact Assembly	1
13B	Moving Interlock Contact Assembly	1
14	Round Head Screw	1
15	Spring - Main Contact	3
16	Moving Contact	3
17	Lockwasher	1
	Main Contact Block Assembly	1
18	Main Contact Block	1
19	Main Stationary Contact	6
20A	Hex Jam Nut - Brass	As Needed
20B	Hex Jam Nut - Brass	As Needed
22	Spacer Washer	4
*	NVR Coil (Specify Input Voltage)	1

ELECTRICAL SYSTEM



LEFT SIDE

RIGHT SIDE

WHEN ORDERING GIVE: Item No., Part Name, Parts List No., and Welder Code.

Parts List P-23-H

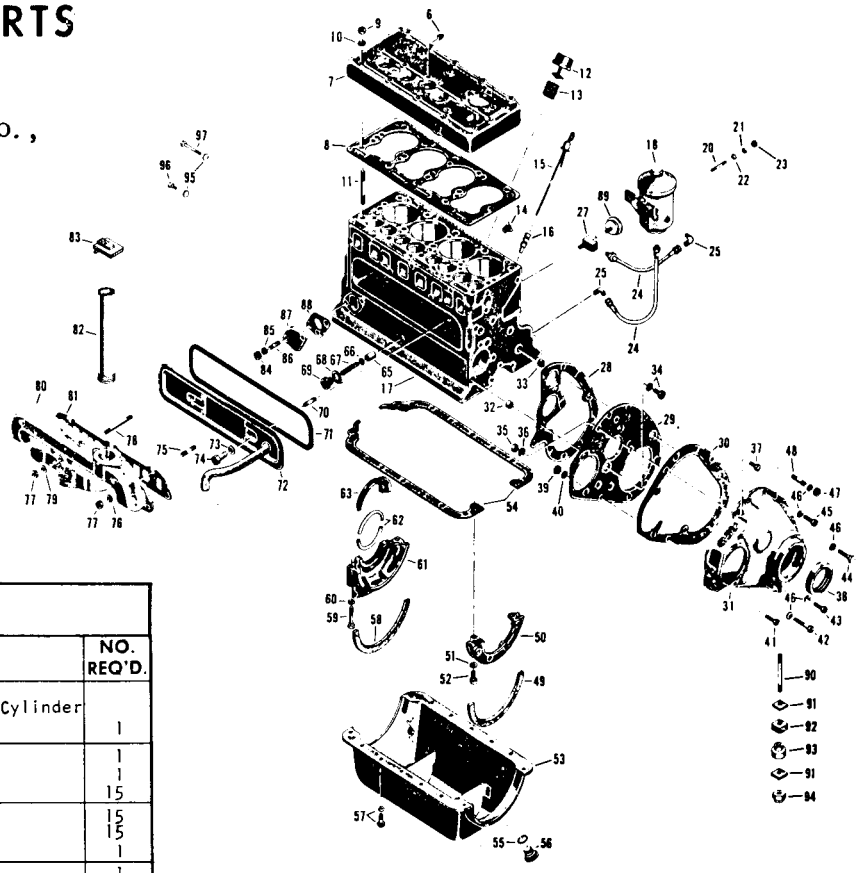
ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
1	Starting Motor	1
2	Hex Head Screw (Starter Mounting)	2
	Items 5 thru 24 Below Code 6900 Only	
	Generator Assembly Includes: (Below Code 6900)	1
5	Generator	1
6	Generator Pulley	1
7	Generator Pulley Fan	1
8	Lockwasher (Generator Pulley)	1
9	Nut (Generator Pulley)	1
10	Woodruff Key (Generator Pulley)	1
11	Bracket	1
12	Hex Head Screw (Generator to Bracket)	2
13	Lockwasher (Generator to Bracket)	2
14	Hex Nut (Generator to Bracket)	2
15	Stud (Generator Bracket to Engine Block)	2
16	Hex Nut (Generator Bracket to Engine Block)	2
17	Adjusting Strap	1
18	Hex Head Screw (Adjusting Strap to Engine)	1
19	Lockwasher (Adjusting Strap to Engine)	1
20	Spacer (Adjusting Strap to Generator)	1
21	Hex Head Screw (Adjusting Strap to Generator)	1
22	Lockwasher (Adjusting Strap to Generator)	1
23	Plain Washer (Adjusting Strap to Generator)	1
24	Plain Washer (Adjusting Strap to Generator)	1
	Ammeter Panel Assembly Includes:	1
26	Ammeter	1
27	Ammeter Panel	1
28	Harness	1
29	Starter Switch	1

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
31	Battery	1
32	Battery Mounting Bracket	1
33A	Battery Holder Bolt (12 Volt System)	2
35	Ground Lead*	1
36	Battery Lead to Starter*	1
37	Magneto	1
38	Magneto Gasket	1
42	Switch - Ignition	1
42A	Harness	1
43	Switch Nameplate	1
45	Nipple	4
46	Ignition Wire #1 Cylinder	1
47	Ignition Wire #2 Cylinder	1
48	Ignition Wire #3 Cylinder	1
49	Ignition Wire #4 Cylinder	1
50	Spark Plug	4
51	Grommet	3
52	Bracket (Wire Support)	2
53	Bracket (Wire Support)	1
	Following Parts Above Code 6900 Only	
60	Voltage Regulator	1
	Alternator Assembly Includes	1
62	Alternator	1
63	Pulley	1
64	Fan	1
66	Mounting Bracket	1
67	Stud-Mount Alternator Bracket and Ammeter Panel	2
68	Adjusting Strap	1
69	Alternator Fan Guard	1
70	Caution Decal	1

* Ground lead is positive (+) on machines with a generator (Item 5). It is negative (—) on machines with an alternator (Item 62).

ENGINE EXTERIOR PARTS

WHEN ORDERING GIVE: Item No., Part Name, Parts List No., and Welder Code.



Parts List P-23-J

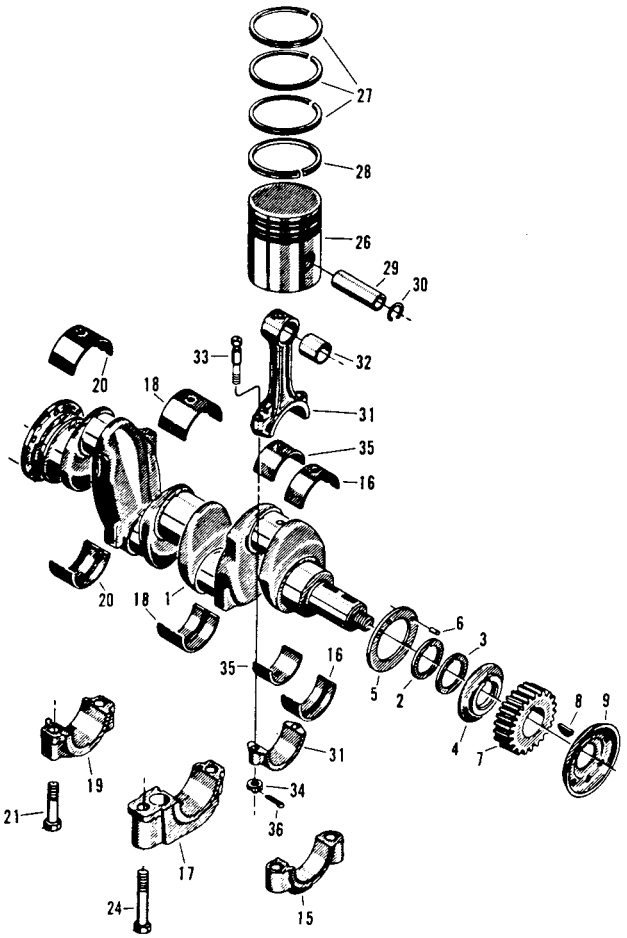
ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
6	Pipe Plug - Temperature Gauge Hole in Cylinder Head	1
7	Cylinder Head	1
8	Cylinder Head Gasket	1
9	Cylinder Head Nut	15
10	Washer - Cylinder Head Nut	15
11	Stud - Cylinder Head to Block	15
12	Oil Filler Cap Assembly	1
13	Oil Filler Tube	1
14	Drain Cock	1
15	Oil Gauge Rod	1
16	Oil Rod Support	1
17	Block	1
18	Oil Filter	1
20	Stud - Oil Filter to Cylinder Head	2
21	Lockwasher - Oil Filter to Cylinder Head	2
22	Washer - Oil Filter to Cylinder Head	2
23	Hex Nut - Oil Filter to Cylinder Head	2
24	Oil Filter Hose	2
25	Oil Filter Elbow	2
27	Tee Fitting	1
	Front End Plate Assembly - Includes:	1
28	Gasket - Front End Plate	1
29	Front End Plate	1
30	Gasket, Gear Cover	1
31	Gear Cover	1
32	Ring Dowel, Front Plate	1
33	Ring Dowel, Gear Cover	1
34	Screw and Lockwasher Assembly	1
35	Nut - Gear Cover to End Plate	1
36	Lockwasher - Gear Cover to End Plate	1
37	Screw, Gear Cover to End Plate	1
38	Oil Seal	1
39	Nut - Gear Cover Dowel Screw	1
40	Lockwasher - Gear Cover Dowel Screw	1
41	Gear Cover Dowel Screw	1
42	Hex Head Screw - Gear Cover to Filler Block	1
43	Hex Head Screw - Gear Cover to Filler Block	3
44	Hex Head Screw - Gear Cover to Block	1
45	Hex Head Screw - Gear Cover to Block (At Ring Dowel)	1
46	Lockwasher - Gear Cover Mounting Screws	8
47	Hex Nut - Gear Cover to Stud	2
48	Stud - Gear Cover to Block (Upper Holes)	2
49	Cork - Oil Pan to Front Filler Block	1
50	Front Filler Block	1
51	Lockwasher - Front Filler Block to Engine Block	2
52	Hex Head Screw - Front Filler Block to Engine Block	2
53	Oil Pan	1
54	Oil Pan Gasket	2
55	Gasket - Oil Pan Drain Plug	1
56	Oil Pan Drain Plug	1
57	Screw and Lockwasher Assembly - Oil Pan to Block	14
58	Cork - Oil Pan to Rear Filler Block	1

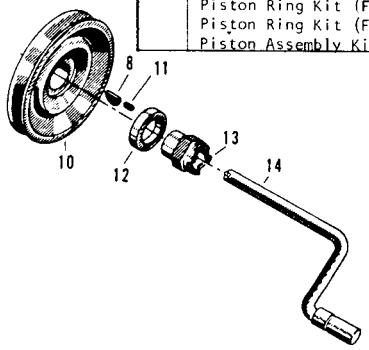
Parts List P-23-J

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
59	Hex Head Screw	2
60	Lockwasher	2
61	Rear Filler Block	1
	Rear Bearing Oil Guard Assembly - Includes:	1
62	Seal - Rear Filler Block	2
63	Rear Bearing Oil Guard	1
64	Felt - Rear Bearing Oil Guard	1
65	Oil Pressure Relief Valve	1
66	Washer - Oil Pressure Relief Spring Adjusting	As Req'd
67	Oil Pressure Relief Valve Spring	1
68	Gasket - Oil Pressure Relief Valve	1
69	Plug - Oil Pressure Relief Valve	1
70	Stud - Valve Chamber Cover	2
71	Gasket - Valve Chamber Cover	1
72	Valve Chamber Cover	1
73	Gasket - Valve Chamber Cover Nut	2
74	Hex Nut - Valve Chamber Cover	2
75	Stud - Manifold to Block	6
76	Washer - Manifold to Block - End and Center Studs	3
77	Hex Nut - Manifold to Block	7
78	Stud - Manifold to Block (Center Hole)	1
79	Washer - Manifold to Block	4
80	Manifold	1
81	Manifold Gasket	1
82	Exhaust Pipe	1
83	Rain Cap - Exhaust Pipe	1
	Thread Cutting Screw	2
84	Nut - Fuel Pump Hole in Block	2
85	Lockwasher - Fuel Pump Hole in Block	2
86	Stud - Fuel Pump Hole in Block	2
87	Cover - Fuel Pump Hole in Block	1
88	Gasket - Fuel Pump Hole in Block	1
89	Oil Pressure Gauge	1
90	Stud - Front Engine Mounting	1
91	Washer - Front Engine Mounting	2
92	Engine Mount - Front Engine Mounting	2
	Rubber Washer - Front Engine Mounting	1
94	Huglock Nut - Front Engine Mounting	1
95	Lockwasher - Engine Rear End Plate to Engine	5
96	Dowel Screw - Engine Rear End Plate to Engine	2
97	Screw - Engine Rear End Plate to Engine	3

CRANKSHAFT AND PISTON ASSEMBLY

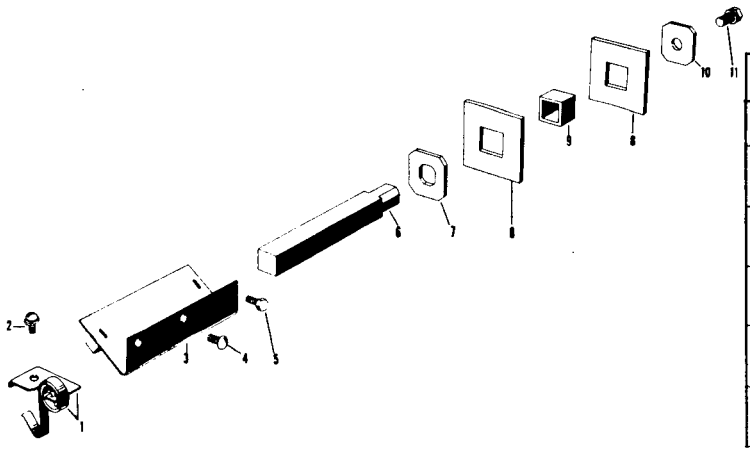
WHEN ORDERING GIVE: Item No., Part Name, Parts List No., and Welder Code.





Parts List P-23-K		
ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
1	Crankshaft Assembly - Includes:	1
	Crankshaft	1
2	Crankshaft Thrust Shim (.002)	8
3	Crankshaft Thrust Shim (.008)	8
4	Crankshaft Thrust Plate	1
5	Thrust Washer	2
6	Pin-Crankshaft Thrust Washer to Crankcase	3
7	Crankshaft Gear	1
8	Key - Crankshaft Gear to Crankshaft	1
9	Oil Thrower	1
10	Pulley	1
11	Cork - Fan Drive Pulley Keyway Plug	1
12	Spacer Collar - Crank Starting Jaw	1
13	Starting Jaw	1
14	Crank	1
15	Bearing Cap - Front Main	1
16	Bearing Assembly - Front Main (One Bearing Assembly is Two Halves)	1
17	Bearing Cap - Center Main	1
18	Bearing Assembly - Center Main (One Bearing is Two Halves)	1
19	Bearing Cap - Rear Main	1
20	Bearing Assembly - Rear Main (One Bearing Assembly is Two Halves)	1
21	Place bolt-Front and Rear Main Bearing Cap Mounting	4
24	Place bolt-Center Main Bearing Cap Mounting	2
26	Piston	4
27	Piston Ring - Taper Face (Top 3)	12
28	Piston Ring - Oil Control (Bottom)	4
29	Piston Pin	4
30	Piston Pin Retaining Ring	8
	Connecting Rod and Cap Assembly - (#1 and #3 cylinders) - Includes:	2
31	Rod and Cap	2
32	Piston Pin Bushing	2
33	Connecting Rod Bolt	4
34	Connecting Rod Bolt Nut	4
35	Connecting Rod Bearing - Upper and Lower	4
	Connecting Rod and Cap Assembly - (#2 and #4 cylinders) - Includes:	2
31	Rod and Cap	2
32	Piston Pin Bushing	2
33	Connecting Rod Bolt	4
34	Connecting Rod Bolt Nut	4
35	Connecting Rod Bearing - Upper and Lower	4
36	Cotter Pin - Connecting Rod Bolts	8
	Piston Ring Kit (For Reringing Std. Bore)	1
	Piston Ring Kit (For Rebored Engines)	1
	Piston Assembly Kit	1

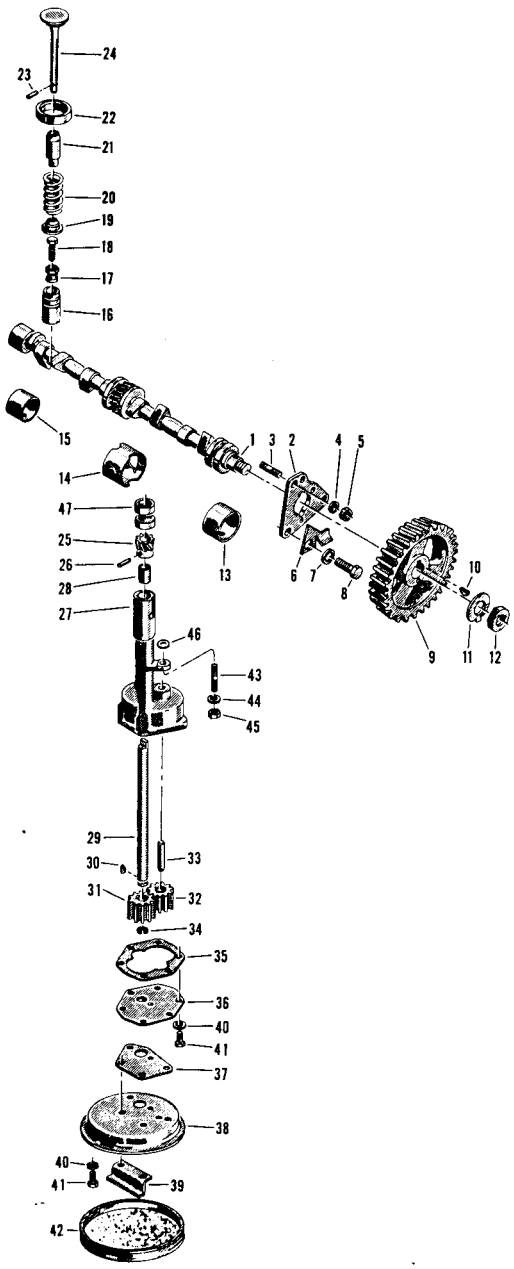
GENERATOR BRUSH HOLDER



Parts List P-25-L		
ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
	Brusholder Assembly Includes:	4
1	Spring and Clip Assembly	2
2	Round Head Cap Screw	2
3	Plate and Retainer Assembly	1
4	Round Head Cap Screw	2
5	Hex Head Cap Screw	1
6	Stud	1
7	Clamping Washer	1
8	Insulating Washer	1
9	Insulating Tube	1
10	Clamping Washer	1
11	Hex Head Cap Screw, Sems Kantlink	1

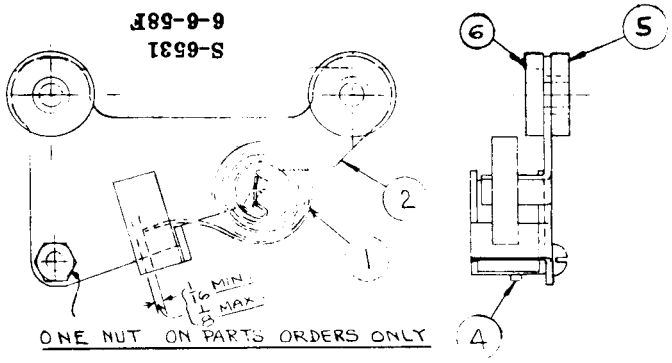
CAMSHAFT AND VALVE ASSEMBLY

WHEN ORDERING GIVE: Item No., Part Name, Parts List No., and Welder Code.



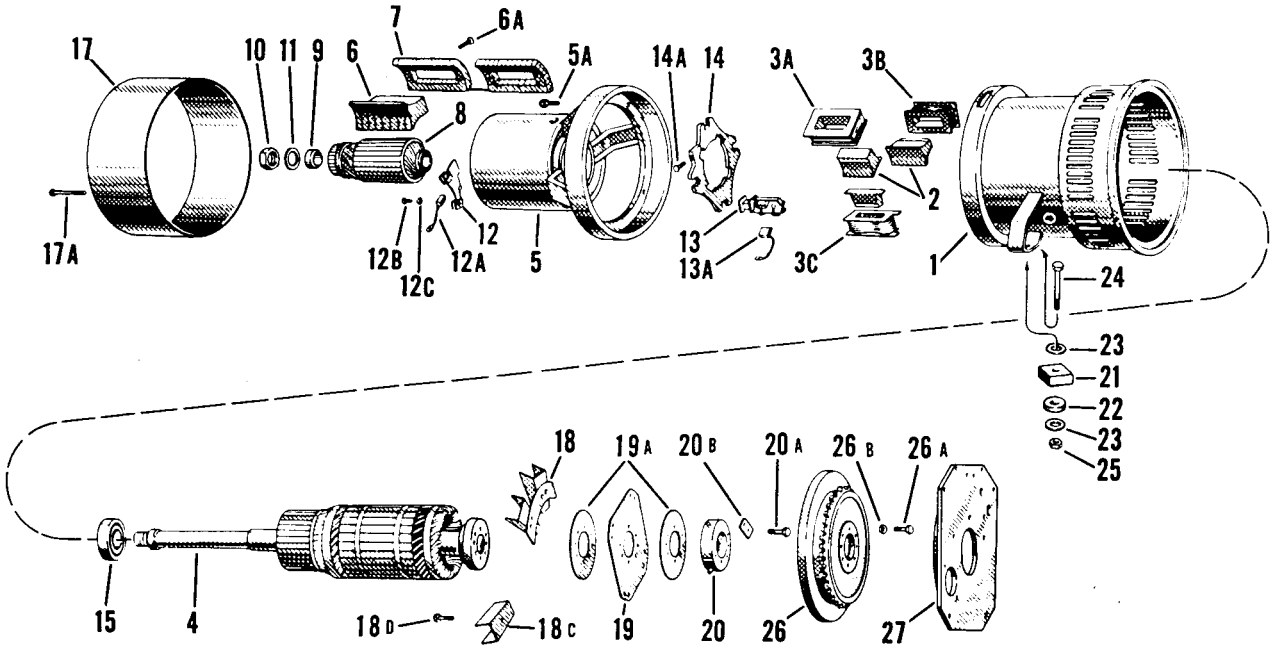
Parts List P-23-L		
ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
1	Camshaft	1
2	Camshaft Thrust Plate	2
3	Stud - Camshaft Thrust Plate to Block	2
4	Lockwasher - Camshaft Thrust Plate to Block	2
5	Hex Nut - Camshaft Thrust Plate to Block	2
6	Timing Gear Oiler Plate	1
7	Lockwasher - Oiler Plate and Thrust Plate to Block	1
8	Hex Head Bolt - Oiler Plate and Thrust Plate to Block	1
9	Camshaft Gear	1
10	Key - Camshaft Gear to Camshaft	1
11	Washer - To Lock Nut on Camshaft	1
12	Hex Nut - Camshaft Gear to Camshaft	1
13	Bushing - Camshaft Front	1
14	Bushing - Camshaft Center	1
15	Bushing - Camshaft Rear	1
	Valve Tappet Assembly - Includes:	8
16	Valve Tappet	8
17	Valve Tappet Locknut	8
18	Valve Tappet Screw	8
19	Valve Spring Seat	8
20	Valve Spring	8
21	Valve Stem Guide	8
22	Exhaust Valve Seat Insert	4
23	Valve Spring Lock	8
24	Intake Valve	4
24	Exhaust Valve	4
	Oil Pump Assembly - Includes	1
25	Drive Gear - Oil Pump	1
26	Pin - Oil Pump Drive Gear to Shaft	1
27	Body Assembly - Includes:	1
28	Bushing	1
29	Shaft	1
30	Key	1
31	Gear - Oil Pump Driver	1
32	Gear - Oil Pump Driven	1
33	Stud - Oil Pump Idler Gear	1
34	Snap Ring - Oil Pump Drive Shaft	1
35	Gasket - Oil Pump Cover	1
36	Cover - Oil Pump	1
37	Gasket - Strainer Screen	1
38	Strainer Frame	1
39	Strainer Spacer	1
40	Lockwasher	6
41	Hex Head Screw	6
42	Oil Strainer Screen	1
43	Stud - Oil Pump Body to Center Main Bearing Cap	1
44	Lockwasher - Oil Pump Body to Center Main Bearing Cap	1
45	Hex Nut - Oil Pump Body to Center Main Bearing Cap	1
46	Washer - Oil Pump Spacer	1
47	Oil Pump Drive Shaft Sleeve	1

EXCITER BRUSH HOLDER



Parts List P-25-M		
ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
	Exciter Brusholder Assembly Includes:	1
1	Spring	1
2	Brusholder	1
4	Hex Nut	1
5	Insulating Washer	2
6	Bushing	2

WELDING GENERATOR AND COUPLING



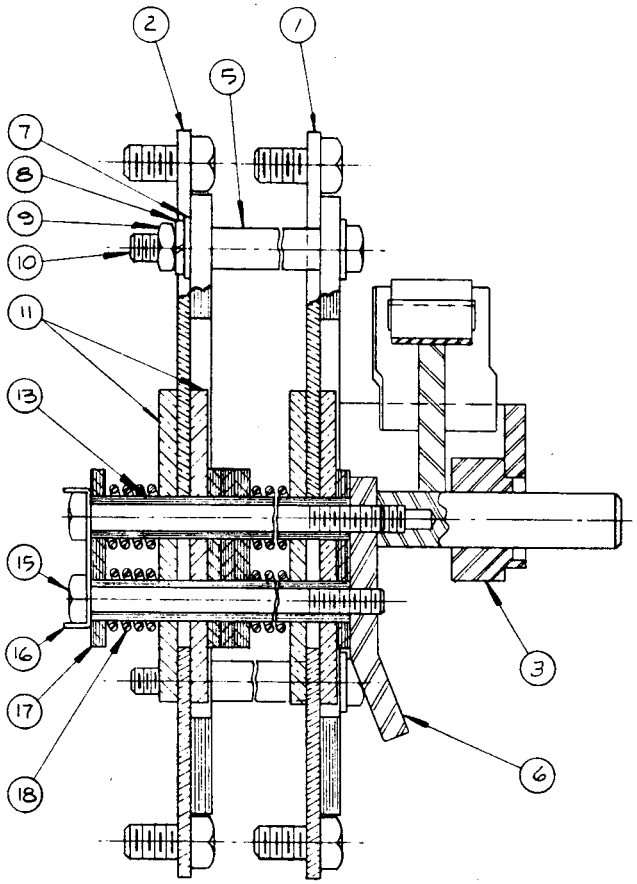
WHEN ORDERING GIVE: Item No., Part Name, Parts List No., and Welder Code.

Parts List P-76-H

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
1	Welder Frame	1
2	Main Pole Lamination Assembly	4
3	Main Pole Shunt Field Coil	2
3	Main Pole Series Field Coil	2
	Interpole Coil and Pole Includes:	4
2	Interpole Lamination Assembly	4
3	Interpole Field Coil	4
4	Welder Armature	1
5	Welder Bracket and Exciter Frame Includes:	1
	Baffle	1
	Thread Cutting Screw - Baffle to Bracket	4
6	Hex Head Screw - Bracket to Welder Frame	4
	Exciter Main Pole Lamination Assembly	2
	Hex Head Screw - Exciter Main Pole Lamination Assembly to Exciter Frame	8
7	Exciter Main Pole Field Coil	1
8	Exciter Armature	1
9	Exciter Armature Sleeve Collar - For Centering Armature On Shaft	1
10	Exciter Locknut	1
11	Exciter Locknut Locking Washer	1
12	Commutator Brushholder Assembly, Includes:	1
	Mounting Plate	1
	Brushholder	4
	Springs	4
	Brush, Commutator Brushholder	4
12	Slip Ring Brushholder Assembly, Includes:	1
	Brushholder - Left	1
	Brushholder - Right	1
	Mounting Bracket	1
	Insulator	2
	Insulating Tube	2
	Insulating Washer	2
	Spring	2

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
	Brush, Slip Ring Brushholder	2
12	Exciter Brushholder Assembly, Includes:	2
	Exciter Brushholder Parts	See P-25-M
12A	Exciter Brush	2
12B	Screw - Brushholder to Frame	4
12C	Washer - Brushholder to Frame	4
13	Brushholder Assembly	4
	Brushholder Parts	See P-25-L
13A	Brush	8
14	Rocker	1
15	Ball Bearing	1
	Pipe Plug - Mounts in Bearing Housing	1
	Lead Block - Mounts on Rear Ring of Welder Frame	1
	Drive Screw - For Mounting Lead Block	2
17	Bracket Cover	1
	Round Head Bolt	2
	Square Nut	2
18	Blower Segment	4
19	Coupling Disc	1
19A	Coupling Disc Backing Plate	2
20	Coupling Ring	1
20A	Bolt - Disc to Hub	8
20B	Bolt Locking Clip - Disc to Hub	4
	Bolt - Disc to Flywheel	8
	Lockwasher	8
26	Flywheel - Includes Ring Gear	1
26A	Bolt - Flywheel to Crankshaft	6
26B	Nut - Flywheel to Crankshaft	6
	Lockwasher - Flywheel to Crankshaft	6
27	Engine Adapter Plate Assembly, Includes:	1
	Engine Adapter Plate	1
	Timing Pin	1
	Hex Head Cap Screw - Welder to Engine Adapter Plate	6
	Lockwasher - Welder to Engine Adapter Plate	6

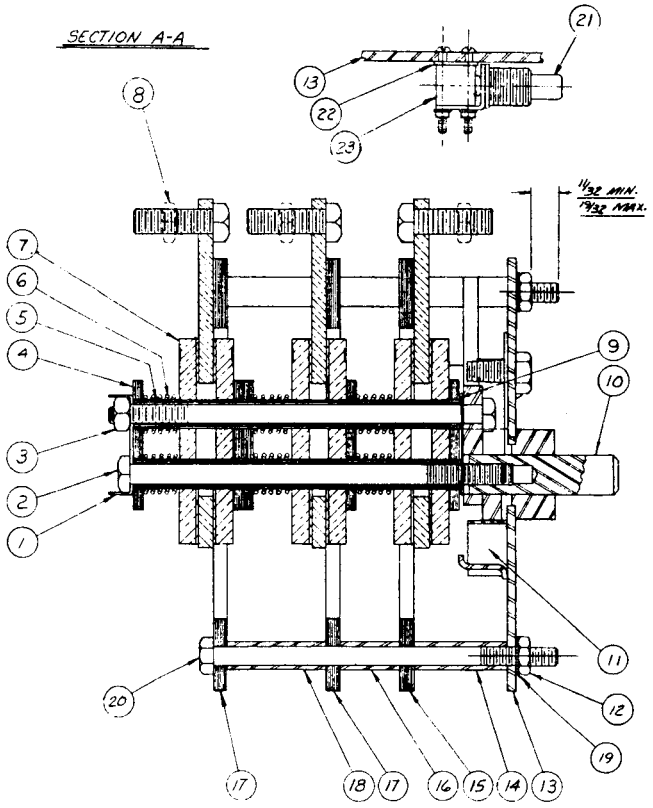
SELECTOR SWITCH



Parts List P-76-E		
ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
	Selector Switch, Includes:	
1	Contact Panel Assembly	1
2	Contact Panel Assembly	1
3	Bracket	1
4	Cam Spring	1
5	Spacer	3
6	Shaft & Arm Assembly	1
7	Flatwasher	6
8	Lockwasher	3
9	Hex Nut	3
10	Hex Head Screw	3
11	Moving Contact	4
13	Insulating Tube	2
14	Rivet	4
15	Hex Head Screw	2
16	Locking Clip	1
17	Insulating Washer	5
18	Spring	4

WHEN ORDERING GIVE: Item No., Part Name, Parts List No., and Welder Code.

SLOPE SELECTOR SWITCH



Parts List P-76-F		
ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
	Slope Selector Switch, Includes	1
1	Locking Clip	1
2	Hex Head Bolt	1
3	Hex Nut	1
4	Insulating Washer	5
5	Insulating Tube	2
6	Spring	6
7	Moving Contact	6
8	Hex Jam Nut	8
9	Spring	1
10	Rotor Arm	1
11	Switch Spring	1
12	Hex Jam Nut	3
13	Mounting Bracket	1
14	Spacer	3
15	Contact Panel	1
16	Spacer	3
17	Contact Panel	2
18	Spacer	3
19	Lockwasher	3
20	Hex Head Bolt	3
21	Actuator	2
22	Insulation	2
23	Micro Switch	2
28	Thread Cutting Screw	2

SAFETY PRECAUTIONS

For your own protection read and observe all instructions and specific safety precautions included in this manual as well as the following general safety precautions.

Arc Welding Safety

1. Protect yourself from electrical shock:
   a. The electrode and work (or ground) circuits are electrically "hot" when the welder is on. Avoid contact between "hot" parts of the circuits and bare skin or wet clothing. Wear dry, hole-free gloves to insulate hands.
   b. Take special care to insulate yourself from ground using dry insulation when welding in damp locations, on metal floors or gratings, and in positions (such as sitting or lying) where large areas of your body can be in contact with possible grounds.
   c. Maintain the electrode holder, ground clamp, welding cable and welding machine in good, safe operating condition.
   d. Never dip the electrode holder in water for cooling.
   e. Don't 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.
   f. If using the welder as a power source for mechanized welding, these precautions for the electrode holder also apply for the automatic nozzle or semiautomatic welding gun.
2. When working above floor level, protect yourself from a fall should you get a shock. Never wrap the electrode cable around any part of your body.
3. Arcburn may be more severe than sunburn. Therefore:
   a. Use a good shield fitted 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.
   b. Use suitable clothing to protect your skin and that of your helpers from the arc rays.
   c. Protect other nearby personnel with suitable non-flammable screening.
4. Droplets of molten slag and metal are thrown or fall from the welding arc. Protect yourself with oil free protective garments such as leather gloves, heavy shirt, cuffless trousers and high shoes.
5. Always wear safety glasses when in a welding area. Use glasses with side shields when near slag chipping operations.
6. Remove flammable material from the area or cover it to prevent the welding sparks from starting a fire.
7. When not welding, place the holder where it is insulated from the ground system. Accidental grounding can cause overheating and create a fire hazard.
8. Be sure the work cable is connected to the work as close to the welding area as practical. Work cables connected to the building framework or other locations some distance 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.
9. Provide adequate ventilation in the welding area. This is particularly important when welding on galvanized, lead or cadmium plated steel and other metals which produce toxic fumes.
10. Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat or the rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.
11. For more detailed safety information, purchase a copy of "Safety in Welding & Cutting – ANSI Standard Z49.1" for $5.00 from the American Welding Society.

Engine Welder Operation and Maintenance Safety

1. Ground the frame of the welder in accordance with the National Electric Code and the manufacturer's recommendations. The fixture or metal building welded to must also be connected to a good electrical ground.
2. Whenever possible, turn the machine off before doing trouble shooting and maintenance work.
3. Keep safety guards, covers and devices in position and good repair.
4. Keep hands, hair, clothing and tools away from V-belts, gears, fans and all other moving parts when starting, operating or repairing equipment.
5. Operate internal combustion engines in open, well ventilated areas or vent the engine exhaust fumes to the outside.
6. Do not add fuel near an open flame or when the engine is running. Stop the engine, and if possible, allow it to cool to prevent spilled fuel from igniting on contact with hot engine parts or electrical sparks.
7. 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.
8. To avoid scalding, do not remove the radiator pressure cap when the engine is hot.
9. Observe special precaution mentioned in the specific operating manual for the engine.

HOW TO ORDER REPLACEMENT PARTS

Order parts only from Lincoln offices or from the Authorized Field Service Shops listed in the "Service Directory". Give the following information:

(a) From the nameplate – machine model, code and serial numbers.
(b) From this manual – part name, item number, quantity required and the number of the list used to get this information.

Any items indented in the "Parts Name" column are included in the assembly under which they are listed. The indented items may be ordered separately. If the entire assembly is needed, do *not* order the indented parts.

GUARANTEE

The Lincoln Electric Company, the Seller, warrants all new equipment except engines and accessories thereof against defects in workmanship and material for a period of one year from date of shipment, provided the equipment has been properly cared for, and operated under normal conditions. Engines and engine accessories are warranted free from defects for a period of ninety days from the date of shipment.

If the Buyer gives the Seller written notice of any defects in equipment, electrode or flux within any period of warranty and the Seller's inspection confirms the existence of such defects, then the Seller shall correct the defect or defects at its option, either by repair or replacement F.O.B. its own factory or other place as designated by the Seller. The remedy provided Buyer herein for breach of Seller's warranty shall be exclusive.

No expense, liability or responsibility will be assumed by the Seller for repairs made outside of the Seller's factory without written authority from the Seller.

The Seller shall not be liable for any consequential damages in case of any failure to meet the conditions of any warranty. The liability of the Seller arising out of the supplying of said equipment or electrode or its use by the Buyer, whether on warranties or otherwise, shall not in any case exceed the cost of correcting defects in the equipment or replacing defective electrode in accordance with the above guarantee. Upon the expiration of any period of warranty, all such liability shall terminate.

The foregoing guarantees and remedies are exclusive and except as above set forth there are no guarantees or warranties with respect to engines, accessories, equipment or electrodes, either express or arising by operation of law or trade usage or otherwise implied, including without limitation the warranty of merchantability, all such warranties being waived by the Buyer.

LINCOLN ELECTRIC

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Printed Nov. '73 1M

EN-S 9-73

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