TM 11-939

WAR DEPARTMENT TECHNICAL MANUAL

POWER UNIT PE-182

Unclassified, AG 300.7 (22 Dec 44)
W. D. Circular 5, 1945

RESTRICTED. DISSEMINATION OF RESTRICTED MATTER. The information contained in restricted documents and the essential characteristics of restricted materiel may be given to any person known to be in the service of the United States and to persons of undoubted loyalty and discretion who are cooperating in Government work, but will not be communicated to the public or to the press except by authorized military public relations agencies. (See also par. 28, AR 380-5, 15 Mar. 1944.)

WAR DEPARTMENT *4 OCTOBER 1944*

WAR DEPARTMENT TECHNICAL MANUAL

TM 11-939

This manual supersedes TM 11-939, 1 December 1943

POWER UNIT PE-182

WAR DEPARTMENT *4 OCTOBER 1944*

RESTRICTED. *DISSEMINATION OF RESTRICTED MATTER.* The information contained in restricted documents and the essential characteristics of restricted materiel may be given to any person known to be in the service of the United States and to persons of undoubted loyalty and discretion who are cooperating in Government work, but will not be communicated to the public or to the press except by authorized military public relations agencies. (See also par. 28, AR 380-5, 15 Mar. 1944.)

WAR DEPARTMENT,
WASHINGTON 25, D. C., 4 October 1944.

TM 11-939, Power Unit PE-182, is published for the information and guidance of all concerned.

[A. G. 300.7 (21 December 43).]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:
J. A. ULIO,
Major General,
The Adjutant General.

DISTRIBUTION:
As prescribed in paragraph 9a, FM 21$\frac{1}{N}$6:
Armies (5); Sv C (5); Def C (2); Dept (5); I Bn 11 (2); IC 4 (5), IC 11 (2); Arm & Sv Board (2); AF Dep (Sig Sec) (5); Sig C Repr Shs (2); ASF Dep (Sig Sec) (5); Sig C Insp Z (2); Sig C Proc Dist (2);

I Bn 11	T/O & E	11$\frac{1}{N}$400 Sig AW Orgn (A) Bn Hq;
IC 4	T/O & E	4$\frac{1}{N}$260$\frac{1}{N}$1 Hq & Hq Btry (HD), 4$\frac{1}{N}$37;
IC 11	T/O	11$\frac{1}{N}$107, 11$\frac{1}{N}$237, 11$\frac{1}{N}$592, 11$\frac{1}{N}$587, 11$\frac{1}{N}$597, 11$\frac{1}{N}$617, 11$\frac{1}{N}$287, 11$\frac{1}{N}$400 Sig AW Orgn (C) and U Radar Rep Plat, 11$\frac{1}{N}$500 Radar Maint Team (EC).

For explanation of symbols, see FM 21$\frac{1}{N}$6.

TABLE OF CONTENTS

	Paragraph	Page
SECTION I. Description.		
General	1	1
Engine	2	1
Generator	3	2
Control panels	4	3
Cable connections	5	6
Weights and dimensions	6	6
II. Installation and operation.		
Initial procedure	7	7
Installation	8	7
Preparation for use	9	7
Operation	10	9
Storing	11	12
III Functioning of parts.		
Automatic voltage regulator	12	13
Field rheostat	13	14
Frequency meter	14	14
Governor	15	14
IV. Maintenance.		
Routine service	16	15
Fuel	17	21
Carburetor	18	22
Governor	19	26
Valve adjustment	20	29
Servicing the air cleaner	21	29
Servicing the fuel strainer	22	31
Replacing carburetor	23	32
Servicing the oil filter	24	32
Oil pressure adjustment	25	33

TABLE OF CONTENTS

SECTION IV. Maintenance (Contd)	Paragraph	Page
Starting motor replacement	26	33
Servicing the magneto	27	34
Spark plug service	28	39
Commutator and slip ring service	29	39
Replacing brushes	30	41
Removal of generator	31	41
Cylinder head removal	32	43
Carbon removal	33	43
Valve grinding	34	45
Clearances	35	46
Removal of engine	36	47
Water pump removal	37	47
Oil pump removal and replacement	38	49
Connecting rod bearings	39	49
Piston removal	40	50
Fitting piston pin and rings	41	50
Installing piston assembly	42	51
Camshaft removal	43	52
Crankshaft removal	44	52
Assembly of valve timing gears	45	53
Valve timing	46	53
Armature removal	47	56
Removing and replacing brushholders	48	56
Generator bearing replacement	49	57
Automatic voltage regulator maintenance	50	57
Trouble chart	51	59
Illustrated parts list	52	70
V Supplementary data.		
Maintenance parts list	53	162

LIST OF ILLUSTRATIONS

Fig. No.	*Title*	*Page*
1	Power Unit PE-182, left-hand side	XI
2	Power Unit PE-182, right-hand side	XII
3	Control panel	4
4	Control panel wiring diagram	5
5	Link position diagram	11
6	Lubrication—right side	16
7	Lubrication—left side	17
8	Governor adjustment instructions	28
9	Valve adjustment	30
10	Brush and commutator maintenance	40
11	Fitting brushes to commutator	42
12	Undercutting and testing commutator	44
13	Piston and connecting rod assembly	48
14	Valve timing	54
15	Timing sprockets	54
16	Timing marks (flywheel)	55
17	Power Unit PE-182, left-hand side	69
18	Power Unit PE-182, right-hand side	75
19	Control panel, front view	77
20	Engine—front sectional view	79
21	Engine—side sectional view	82
22	Cylinder head, manifold and valve cover	85
23	Timing chain cover, and cylinder block	87
24	Crankshaft, connecting rods and pistons	89
25	Camshaft	97

TABLE OF ILLUSTRATIONS

Fig. No.	*Title*	*Page*
26	Valve	99
27	Brushholder for 9.4 kva generating unit	102
27a	Bendix drive	104
28	Starting motor and Bendix drive	106
29	Wico magneto assembly	110
30	Wico magneto parts	112
31	Wico magneto parts	116
32	Conduit and shield assembly	118
33	Voltage regulator	120
34	Oil pump	123
35	Oil Filter	126
36	Oil filter brackets, tubes and connectors	128
37	Water pump	130
38	Radiator	131
39	Fan and coupling group	132
40	Carburetor, perspective view	134
41	Carburetor	136
42	Carburetor	137
43	Carburetor	139
44	Carburetor	140
45	Fuel pump	142
46	Gas tank safety cap	144
47	Air cleaner	146
48	Servo precision governor	148
49	Penn electric switch group	150
50	Tools	153

DESTRUCTION NOTICE

WHY —

To prevent the enemy from using or salvaging this equipment for his benefit.

WHEN—

When ordered by your commander.

HOW —

1. Smash—Use sledges, axes, handaxes, pickaxes, hammers, crowbars, heavy tools, etc.
2. Cut —Use axes, handaxes, machetes, etc.
3. Burn —Use gasoline, kerosene, oil, flame throwers, incendiary grenades, etc.
4. Explosives—Use firearms, grenades, TNT, etc.
5. Disposal —Bury in slit trenches, fox holes, other holes. Throw in streams. Scatter.

USE ANYTHING IMMEDIATELY AVAILABLE FOR DESTRUCTION OF THIS EQUIPMENT.

WHAT—

1. Smash—Radiator, fuel tank, generator and exciter frame, oil filter, magneto, fuel pump, water pump, cylinder head, cylinder block, air cleaner, muffler, carburetor, fuel strainer, governor, manifolds, blower fan, control panel instruments, voltage regulator, and terminal panel.
2. Cut —All cables, control panel wiring, ignition wires, fuel pipes, generator windings, exhaust tube, radiator hose, and all other wires or cables used in or on the unit.
3. Bend and/or break—Unit housing, control cabinet, cable, reels, tool and spare parts box and contents, and unit base.
4. Burn —Instruction books, other papers or documents, wire and cable, fuel, and oil.
5. Bury or scatter—Any or all of the above pieces after breaking.

DESTROY EVERYTHING

WARNING

HIGH VOLTAGE

is used in the operation
of this equipment.

DEATH ON CONTACT

may result if personnel fail
to observe safety precautions.

This unit generates voltage which may cause severe and possibly fatal shock.

Always open the circuit breaker before changing load connections.

CAUTION

EXHAUST GASES CONTAIN CARBON MONOXIDE

Provide ample ventilation when operating the unit in a confined space. Make sure all exhaust connections are gas tight. When operating out-of-doors locate the exhaust so the wind will carry the exhaust gases away from personnel.

FIRST AID TREATMENT FOR ELECTRIC SHOCK

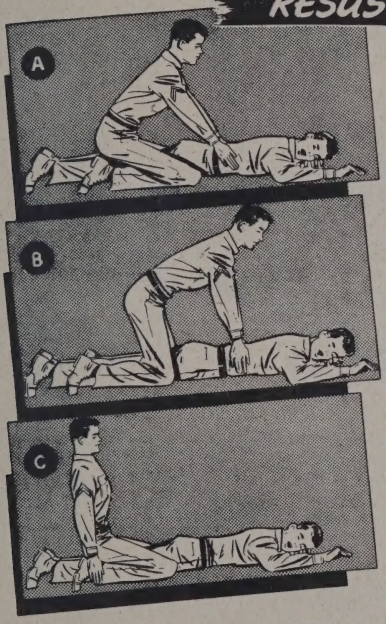
I. FREE THE VICTIM FROM THE CIRCUIT IMMEDIATELY.

Shut off the current. If this is not **immediately** possible, use a dry nonconductor (rubber gloves, rope, board) to move either the victim or the wire. Avoid contact with the victim. If necessary to cut a live wire, use an axe with a dry wooden handle. Beware of the resulting flash.

II. ATTEND INSTANTLY TO THE VICTIM'S BREATHING.

Begin resuscitation at once on the spot. Do not stop to loosen the victim's clothing. Every moment counts. Keep the patient warm. Wrap him in any covering available. Send for a doctor. Remove false teeth or other obstructions from the victim's mouth.

RESUSCITATION



POSITION

1. Lay the victim on his belly, one arm extended directly overhead, the other arm bent at the elbow, the face turned outward and resting on hand or forearm, so that the nose and mouth are free for breathing (fig. A).

2. Straddle the patient's thighs, or one leg, with your knees placed far enough from his hip bones to allow you to assume the position shown in figure A.

3. Place your hands, with thumbs and fingers in a natural position, so that your palms are on the small of his back, and your little fingers just touch his lowest ribs (fig. A).

FIRST MOVEMENT

4. With arms held straight, swing forward slowly, so that the weight of your body is gradually brought to bear upon the victim. Your shoulders should be directly over the heels of your hands at the end of the forward swing (fig. B). Do not bend your elbows. The first movement should take about 2 seconds.

SECOND MOVEMENT

5. Now immediately swing backward, to remove the pressure completely (fig. C).

6. After 2 seconds, swing forward again. Repeat this pressure-and-release cycle 12 to 15 times a minute. A complete cycle should require 4 or 5 seconds.

CONTINUED TREATMENT

7. Continue treatment until breathing is restored or until there is no hope of the victim's recovery. Do not give up easily. Remember that at times the process must be kept up **for hours.**

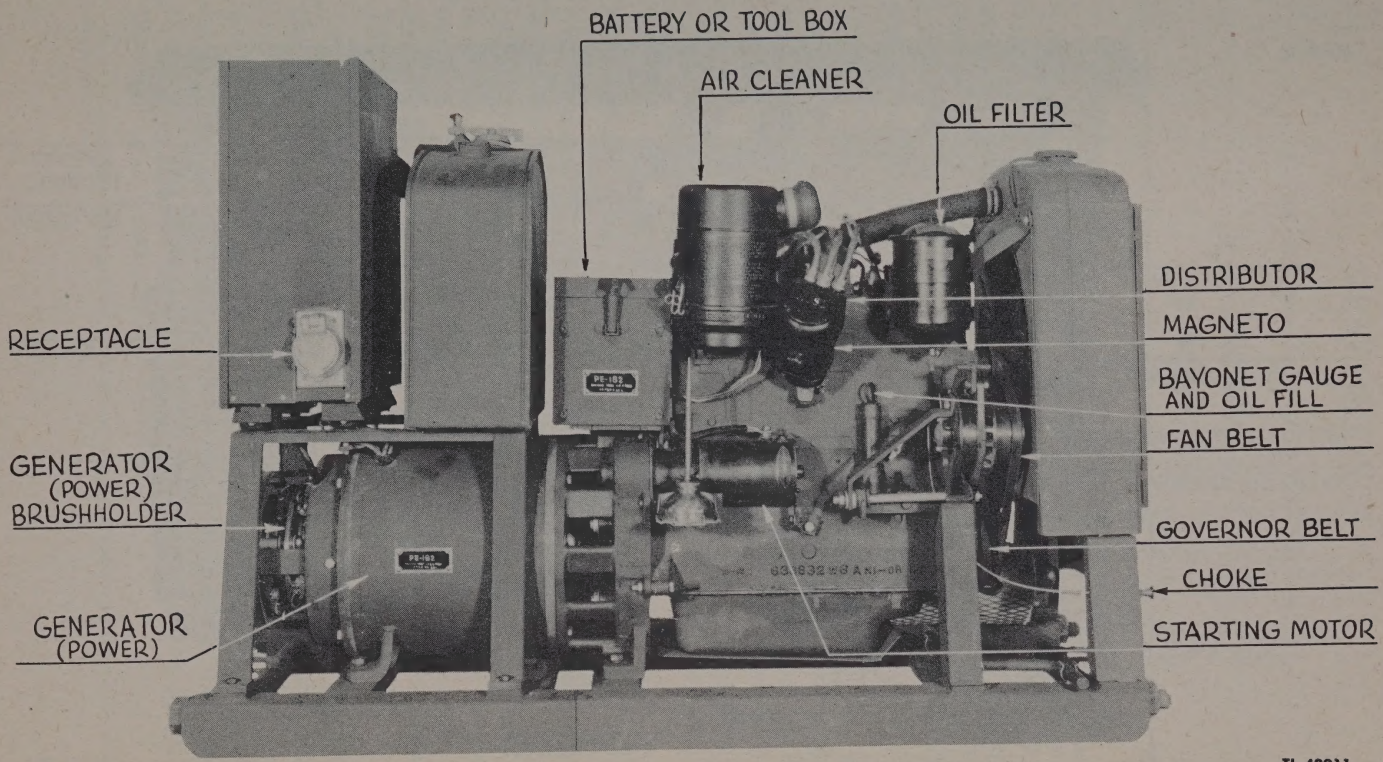
8. During artificial respiration, have someone loosen the victim's clothing. Wrap the victim warmly; apply hot bricks, stones, etc. Do not give the victim liquids until he is fully conscious. If the victim must be moved, keep up treatment while he is being moved.

9. At the first sign of breathing, withhold artificial respiration. If natural breathing does not continue, immediately resume artificial respiration.

10. If operators must be changed, the relief operator kneels behind the person giving artificial respiration. The relief takes the operator's place as the original operator releases the pressure.

11. Do not allow the revived patient to sit or stand. Keep him quiet. Give hot coffee or tea, or other internal stimulants.

HOLD RESUSCITATION DRILLS REGULARLY



TL-42911

Figure 1. Power unit PE-182, left-hand side.

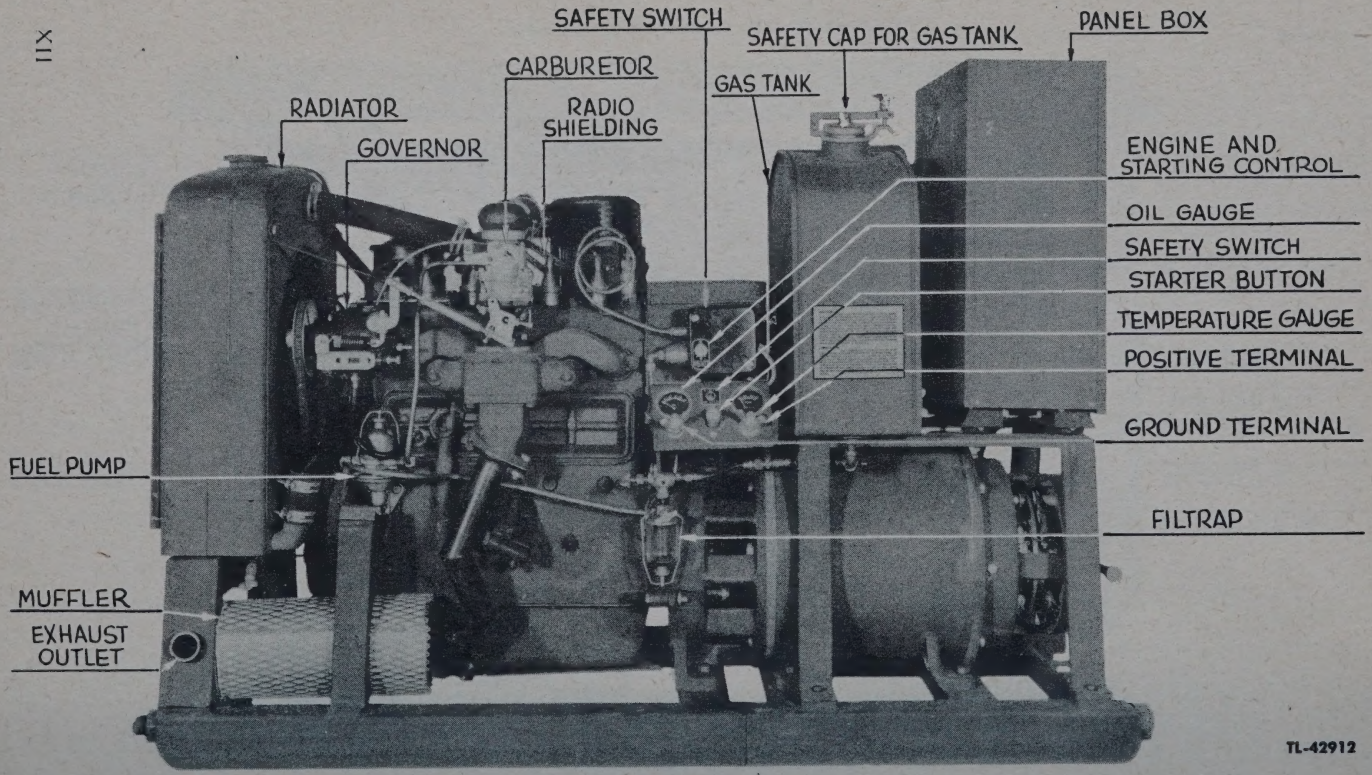


Figure 2. Power unit PE-182, right-hand side.

This manual supersedes TM 11-939, 1 December 1943

SECTION I
DESCRIPTION

1. GENERAL.

a. Power Unit PE-182 is a self-contained power plant consisting of three main components: gasoline engine, power generator, and control panel. The entire assembly is mounted on a welded steel skid base. The PE-182 is a 9.4 kva, 0.8 power factor, 7.5 kw, 120/208-volt, three phase 26-ampere unit. It consists of a gasoline engine and miscellaneous engine auxiliaries directly connected to an alternator with built-in exciter.

b. The speed of the power unit is controlled by a precision governor. At no load, the speed is approximately 1,805 rpm. At 9.4 kva, 0.8-power factor, 26-amperes, 120/208 volts, the speed is approximately 1,800 rpm. With a load as above, and the RHEOSTAT set for 208 volts, the no-load voltage will be approximately 215 volts.

2. ENGINE.

a. Rating. The engine is a vertical, L-head, 4 cylinder, 4-cycle liquid-cooled unit. It has a 3⅛-inch bore, a 4⅜-inch stroke, 134.2 cubic inches piston displacement, and a compression ratio of 6.48 to 1. The horse power maximum brake is 60 at 3,600; the compression 111 at 185 rpm; the SAE horse power is 15.63; the maximum torque is 105 lbs.-ft. at 2,000 rpm, and the firing order is 1-3-4-2. The engine speed is maintained by a mechanical governor.

b. Cooling. The engine is cooled by a liquid cooling system of the forced circulating type. The cooling liquid is circulated through a radiator of the tubular copper-fin type by a centrifugal water pump mounted on the front[1] end of the engine. The radiator in turn is cooled by a blower-type fan, built within the flywheel at the opposite end of the engine, that draws air through the generator, thus cooling the armature and windings.

[1]Front is assumed to be the radiator end of the unit, and right and left are determined by facing the radiator end.

c. Ignition. Ignition is provided by a high-tension magneto mounted on the left side of the engine. The entire ignition system is shielded to reduce radio interference.

d. Fuel System. The fuel system consists of a fixed-jet, float-feed carburetor, fuel pump, fuel strainer, and three-way fuel valve. This valve permits drawing fuel from either the built-in fuel tank or remote fuel tank.

> NOTE: Twenty feet of flexible fuel line is provided, together with a half-inch, round, plated steel pipe of sufficient length to reach the bottom of a 50-gallon drum. The flexible fuel line is equipped with an identical fitting at each end. A vented adapter and packing nut are provided for fitting the half-inch pipe through the large hole of a standard fuel drum.

The gasoline fuel tank, above the main generator, is provided with an indicating fuel gauge and a hinged filler cap. The carburetor is provided with an air filter of the oil-bath type to prevent the entry of dust and dirt.

e. Lubricating System. Positive lubrication for the engine is provided by a gear-type pump mounted in the oil pan. This pump circulates lubricating oil under pressure to all main and connecting rod bearings. All other bearing surfaces and moving parts within the engine are spray-lubricated. The oil is circulated through an oil filter, mounted at the left side of the cylinder head, which prevents the circulation of any foreign matter that may be picked up by the lubricating oil.

f. Starting System. The unit may be started either by means of a hand crank or an automotive type electric starter with bendix drive.

3. GENERATOR.

a. Main Generator. The main generator, shown in figure 6, is a 9.4 kva, three-phase a-c, separate inbuilt exciter, of the revolving field type. It is designed to generate 60 cycles, 120/208 volts when driven at 1,800 rpm. The d-c generator for separate excitation is mounted on the same shaft as the main generator rotor, between the generator bearing and flywheel. Voltage is controlled by a hand-operated rheostat on the control panel. The generator is designed to give good regulation and overload capacity. It is so constructed that it will not be harmed if operated as long as two hours at 25 percent overload.

b. Generator Exciter Field. The exciter field is built in the front bearing bracket of the main generator. The brush holders for the exciter commutator and the collector rings which supply the current to the revolving field of the main generator are of the radial-box type with adjustable spring tension. They require very little attention but are readily accessible upon removal of the front generator cover.

c. Generator Armature Shaft. The armature shaft is mounted on two oversize ball bearings with sufficient movement of the bearings allowed for thermal expansion of the shaft. A screw type grease cup is provided to lubricate the rear main bearing and a zerk fitting is provided to grease the bearing at the other end of the armature shaft. A large-diameter fan cools the generator by propelling cool air past the winding.

4. CONTROL PANELS.

NOTE: The control equipment necessary for the operation and control of the generating unit is mounted on two panels. This equipment is indicated by lettering engraved on the panels.

a. Control Cabinet and Panel Assembly. A self contained control cabinet is mounted on the generator assembly. The panel (fig. 3) is made up of the following:

1	Voltmeter, 0.300 a-c
3	Ammeter, 0-30 a-c
1	Frequency meter, 58-62 cycles
1	Elapsed time meter
2	Panel lights
1	Circuit breaker, single pole, 25 ampere thermal overload
1	Field rheostat
1 set	Terminals (3 phase and 1 neutral)
1	Duplex convenience receptacle
1	Power receptacle (Hubbell 3-pole, 250-volt, 3-phase receptacle)
1	Voltage regulator
1	Selector switch for phase voltage
1	Toggle light switch
1	Toggle switch (regulator switch)

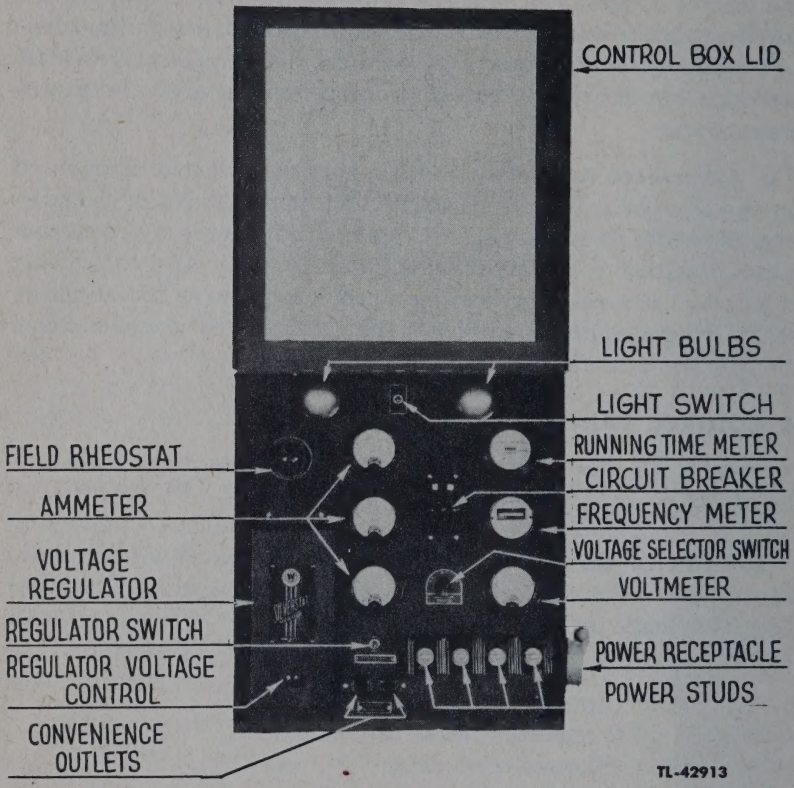
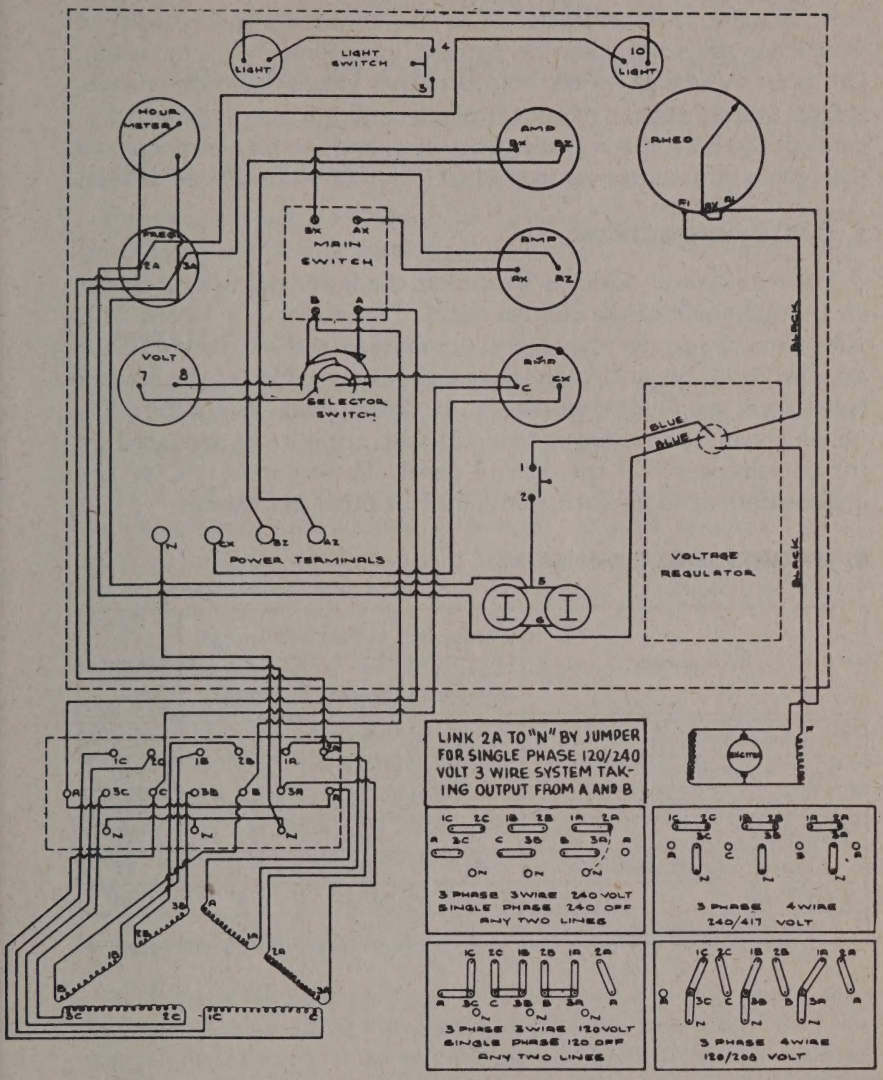


Figure 3. Control panel.



TL-42914

Figure 4. Control panel wiring diagram.

b. Engine Control Panel. The power unit is provided with an engine control panel, shown in figure 2, incorporating the following: Oil pressure gauge, water temperature gauge, ignition switch, starter switch, starter motor terminals, and a toggle switch to disconnect the low-pressure emergency stop and the high-temperature emergency stop during periods when loss of power might be serious.

5. CABLE CONNECTIONS.

The main power outlet is located at the lower right-hand corner on the right side of the control panel. This outlet is a 3-pole, 250-volt, three phase receptacle, and is provided with a cover which is attached by a hinge. In the lower right-hand corner of the control panel there are four terminals. All of these terminals are for additional power connections. Two 125-volt outlets are mounted at the bottom center of the control panel. These outlets are for the attachments of tools, extension lights, or other appliances.

6. WEIGHTS AND DIMENSIONS.

Component	Dimensions in Feet and Inches			Weight (lb.)
	Length	Width	Height	
Complete unit (dry)	4′ 11″	2′	3′ 4½″	1035
Engine assembly	2′ 6½″	1′ 10½″	2′ 7″	546
Generator assembly	2′ 4″	1′ 2½″	1′ 2½″	281
Radiator	9″	1′ 8″	2′	35
Control Cabinet Assembly	9¾″	1′ 8½″	1′ 9¾″	53
Fuel Tank	1′ 8¼″	8½″	1′ 8″	18
Skid Base and welded mounts	4′ 11″	2″	1′ 1¾″	102

SECTION II

INSTALLATION AND OPERATION

7. INITIAL PROCEDURE.

Before attempting to install Power Unit PE-182 inspect the unit for possible damage or missing parts. Report any damage or shortage immediately.

8. INSTALLATION.

a. Choose a location that will be consistent with the assignment to be carried out and the length of the attaching cables. The unit may be operated either indoors or out-of-doors.

b. If the unit is to be operated out-of-doors with its skid base on the ground, select a dry, level spot. Avoid low ground which may be flooded by sudden rain. Always locate the unit so that exhaust gases are carried away from the operating personnel by the wind.

c. If the unit is to be operated within a building, be sure to provide adequate ventilation to carry off escaping exhaust fumes and provide an ample supply of oxygen. Locate the unit so that the exhaust may be carried out of the building with the fewest number of bends in the exhaust line. Make sure that all exhaust connections are gas tight. Provide at least two feet of space on all sides of the unit. These instructions also apply when the unit is installed in a trailer or other vehicle.

9. PREPARATION FOR USE.

a. Inspect the unit thoroughly to see that it is in proper working order. Check all fuel and wire connections to see that they are secure. Tighten any loose screws, nuts or bolts. With the ignition OFF, turn the engine a few times with the hand crank to make sure that all parts move freely. If the unit is new, or has just been taken from storage, remove all seals from the carburetor air intake, exhaust outlet, crankcase breather, etc.

b. Before filling the fuel tank, make the following preparations: (1) Withdraw the bayonet oil gauge and check the oil supply. If

the oil is not up to the FULL mark, replenish it; or, if empty, fill the base with five quarts of oil according to the following:

Temperature	*Oil*
Above 32° F.	OE30
32° F to 0° F.	OE10
Below 0° F.	See Note

NOTE: When the temperature is below zero degrees Fahrenheit fill the crankcase with 75% OE10 and 25% gasoline thoroughly mixed in a separate container before placing in the crankcase.

(2) Be sure that the oil pan drain plug is closed.

(3) Lubricate the starting motor by placing six drops of engine oil in the oil cup on the front end. Lubricate all exposed moving control parts with light engine oil.

(4) Wipe off the entire unit and make sure that all radiator air passages and cooling fins are free from foreign matter.

(5) Remove the base of the air cleaner and make sure that it is clean. Fill the air cleaner bowl to the indicated level and replace it on the unit.

(6) Blow out any dust and dirt from the inside of the control cabinet and the back of the control panel.

(7) Fill the fuel tank with 10 gallons of clean gasoline. Make sure that the gasoline used is free from water and other foreign matter. Check the air vent in the fuel tank cap and make sure that it is clear.

(8) Fill the radiator with 13 quarts of clean water. Make sure that the water used is free from any foreign matter that might clog the cooling system. If the unit is to be operated in freezing temperatures, protect the cooling system by adding anti-freeze according to the following table:

	10° F.		0° F.		—10° F.		—20° F.		—30° F.	
	pt.	oz.	pt.	oz.	pt.	oz.	pt.	oz.	pt.	oz.
Alcohol	4	6	5	4	6	2	7	0	8	12
Water	9	10	8	12	7	14	7	0	5	4
Prestone	3	8	4	6	5	4	6	2	7	0
Water	10	8	9	10	8	12	7	14	7	0

(9) The operating temperature of the unit depends upon a number of conditions. Special attention should be made to maintain the proper operating temperature between 140° F. and 180° F.

10. OPERATION.

Start the engine with either a crank or a battery. Recheck the operations previously outlined (par. 9) and make sure that all of the instructions have been followed.

a. Manual Starting. To crank the unit by hand, proceed as follows: (1) Turn the small knob of the low-pressure high-temperature emergency stop to the ON position. This knob, shown in figure 2, is located on the engine control panel at the right-hand side of the motor.

(2) Be sure that the toggle switch on the engine control panel is in the SAFETY position.

(3) Remove the hand crank from the left-hand side of the skid beneath the motor. Insert it in the hole in the center of the radiator mount on the front end of the unit and rotate it until it engages the starting pin in the end of the crankshaft.

(4) Pull up quickly on the starting crank. The unit should start. If the unit does not start on the first or second attempt, push the choke about half way in and try again. NEVER push down on the crank as serious injury to the operator may result if the engine should backfire. If the unit fails to start after several attempts, refer to the trouble chart (par. 51) for the possible cause.

> **CAUTION:** When cranking, do not place fingers around the radiator. The radiator fan may cause serious injury.

b. Battery Starting. If the engine is to be started with a battery, proceed as follows: (1) Remove the eight-foot battery terminals from the spare parts box and attach them to a standard six-volt battery. Attach the negative lead to the ground terminals on the engine control panel, shown in figure 2, at the right-hand side of the motor. Attach the positive side of the battery to the positive terminal.

(2) Connect the load to the HUBBELL receptacle on the right-hand side of the generator control cabinet (fig. 3).

(3) See that the circuit breaker is in the OFF position.

(4) Turn the small knob of the low-pressure high temperature emergency stop to the ON position.

(5) Place the toggle switch on the control panel in the SAFETY position.

(6) Push the starter switch to start the engine.

(7) Choke the carburetor if necessary. Very little choking is needed. If the engine fails to start in 15 to 20 seconds of cranking, or if it should suddenly stop, shut off the switches and look for the cause. (Trouble and Remedy Chart, par. 51.)

c. Operating Under load. (1) MAIN SWITCH. After the engine has been started and is operating satisfactorily, throw the load across the generator by turning the main switch to ON. As this switch is a circuit-breaker, it automatically disconnects the generator from the load if any trouble (generally a short-circuit) develops. It resets immediately when thrown to the ON position again and throws out if the trouble has not yet been cleared. Clear any trouble that develops before further use.

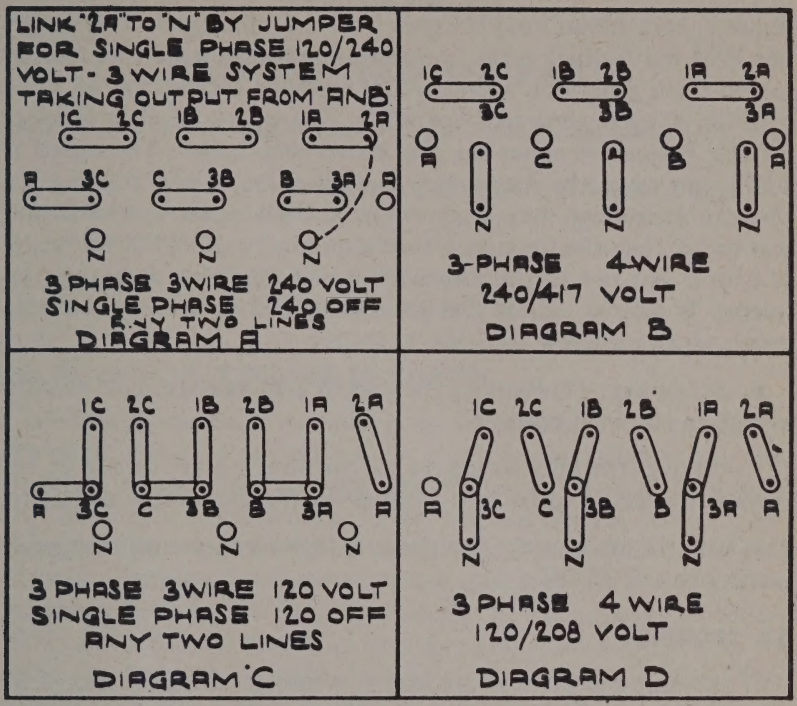
(2) VOLTMETER. The voltmeter is connected in the circuit ahead of the main switch and reads the line voltage at all times. By turning the SELECTOR switch on the panel, voltage may be read on any phase. If the machine is running and the voltmeter does not register, check your machine before proceeding further.

(3) AMMETER. The ammeter is placed in each phase of the load circuit and gives a direct indication of the load of that phase.

(4) LOAD. Normal load or rating for a balanced load is 26 amperes for 120/208 volts on three-phase, 60-cycle operation. The generator will not be harmed, though, even if it is operated for as long as two hours at 25% overload or at 25% more current in either case.

> **NOTE:** Link position diagrams for sub-panel link connections (located at the rear of the main panel) are shown on figure 5. Possible voltages are shown in the accompanying table.

d. Changing Frequency. Change the speed of the engine to conform to the speed necessary to give the frequency desired. The engine speed is controlled by a mechanical governor, shown in



TL-42915

Phase	*Wire*	*Volts*	*Max. I*	*Link Diagram*
3	3	240	V3 x 13	A
3	4	240/417	13	B
3	3	120	V3 x 26	C
3	4	120/208	26	D Normal
1	2	120/120	13/13	A
1	2	120	26	D
1	2	208	26	D
1	2	417	13	B
1	2	120	V3 x 26	C

Figure 5. Link position diagram and values.

figure 2, belt-driven from the pulley on the crankshaft. This governor is of the fly-ball type, operating in oil, and is adjusted easily for 60-cycle generator operation. The engine should run at 1,800 rpm for 60-cycle generator operation. The engine speed is checked by the frequency meter on the instrument panel. The speed is 1,800 rpm when the meter indicates 60 cycles. Upon starting the unit the frequency may read as low as 58.0 cycles until the unit warms up, then the frequency climbs gradually to 59.5 or 60 cycles. If it does not rise to the proper 60 cycles, and this operating frequency is desired, adjust the governor speed by turning the governor adjusting screw (ref. No. 1, fig. 8.)

e. Stopping. (1) Remove the load by pulling the circuit-breaker switch to the OFF position.

(2) Pull over the idler spring on the carburetor and catch it on the hook provided. The hook is located on the carburetor assembly.

(3) Turn the knob on the low-pressure high-temperature emergency control box to STOP.

11. STORING.

If the unit has been in use and it is desired to store it for a six month period or less, the procedure is as follows: (1) Remove the spark plugs and place approximately two tablespoonfuls of heavy engine oil in the top of each cylinder. Crank the engine over by hand a few times to distribute the oil. Replace the spark plugs.

(2) Lubricate the entire unit in accordance with the lubricating instructions in paragraph 16**d** and refer to figures 6 and 7.

(3) Drain the fuel tank, radiator, engine block, fuel strainer, and carburetor.

(4) Store in a closed building or shed whenever possible.

SECTION III

FUNCTIONING OF PARTS

NOTE: Complete information on the functioning of internal engines, carburetion, and ignition systems will be found in the following technical manuals:

TM 10-550, Fuels and Carburetion.
TM 10-580, Automotive Electricity.

12. AUTOMATIC VOLTAGE REGULATOR.

a. Performance. The voltage regulator performs automatically the same operation as obtained by hand manipulation of the field rheostat. In the usual arrangement, an exciter is used to energize the field of the a-c generator. Under manual control, the a-c generator voltage is determined by the setting of the exciter shunt-field rheostat. Turning the rheostat in one direction, IN lowers the a-c generator voltage. Turning the rheostat in the opposite direction, OUT raises the a-c generator voltage. The regulator achieves the same results automatically by varying a REGULATING RESISTANCE which is connected in the exciter shunt field circuit, in series with the exciter field rheostat. This regulating resistance becomes effective when the exciter field rheostat is turned towards or near the RESISTANCE ALL-OUT position.

b. To Place the Regulator in Service. (1) The exciter field rheostat should be turned to the ALL-IN position (turn in direction to LOWER voltage).

(2) Turn the voltage rheostat on the regulator to the end of its travel in the RAISE direction.

(3) Open the a-c potential circuit to the regulator by flipping toggle switch (fig. 3) down to OFF position.

(4) See that no load is connected to the a-c generator and then bring the a-c generator up to operating voltage.

(5) To give control of the a-c voltage to the regulator, reconnect the a-c potential circuit to the regulator by flipping toggle switch (fig. 3) up to ON position.

(6) Turn the voltage adjusting rheostat in the regulator in direction to lower or raise the a-c voltage to normal value.

c. To Remove Regulator from Service and Place on Manual Control. (1) Turn exciter field rheostat in the direction to lower the voltage until the a-c generator voltage begins to drop.

(2) Flip regulator potential toggle switch to OFF position.

(3) Normal values of a-c voltage may then be controlled by turning the exciter field rheostat by hand.

(4) If it is desired to have manual control above normal voltage it is only necessary to turn the voltage adjusting rheostat slightly in the RAISE direction until the desired voltage range can be obtained.

13. FIELD RHEOSTAT.

The field rheostat is connected in the exciter field circuit. It varies the voltage of the exciter, which in turn varies the excitation of the a-c generator and controls the voltage of the entire unit. It is usually advisable to adjust the voltage to the rated or desired value after the machine reaches a steady operation condition at its normal load. If this adjustment is made in the first few minutes of operation it may be necessary to increase the rheostat setting slightly to compensate for normal rise in temperature.

14. FREQUENCY METER.

When the unit is started, the frequency will be approximately 58.5 to 59 cycles, and the maximum voltage approximately 210 volts. It is not necessary to adjust the governor to bring the frequency to 60 cycles. When the engine is warm, the speed will increase 30 to 45 rpm and the frequency will read approximately 60 cycles and the voltage reading will be approximately 215 volts. The speed of the engine is indicated by the frequency meter which, when registering a frequency of 60 cycles, indicates that the engine is operating at the correct speed.

15. GOVERNOR.

A precision governor regulates the voltage and the frequency so that from full-load to no-load the voltage will be 208 volts to 215 volts, and the frequency will be from 60 to 60.2 cycles.

SECTION IV

MAINTENANCE

Unsatisfactory performance of this equipment will be reported immediately on W. D., A. G. O. Form No. 468. If form is not available, see TM 38-250.

---

16. ROUTINE SERVICE.

a. General. Keep the unit clean and free from sand, dust, and water. Dirt, sand, or water in any part of the unit will cause trouble and often serious damage. Keep the cooling air and water passages free from foreign matter, and keep the entire unit free from grease and dirt. In reassembling any part or parts of the unit, always be sure to replace all star washers, bonding, shielding, and capacitors. This is necessary in order to cut down possible interference with nearby radio equipment.

b. Daily Service Checks. (1) Open the hinged cover over the fuel gauge and check the fuel supply. Keep the fuel tank full when the unit is shut down, and refill as often as necessary to maintain operation. If possible, stop the unit while filling the fuel tank. Avoid spilling gasoline on the outside of the tank at all times.

(2) Check the level of the cooling liquid and replenish as necessary. Always allow enough air space so that the cooling liquid will not overflow when it becomes hot. In temperatures below 32° F., check the anti-freeze as needed, according to the table in paragraph 9. When operating in a hot climate, it may be necessary to check the radiator twice daily

(3) Withdraw the bayonet-type oil gauge and check the oil level. The bayonet gauge is on the left side of engine between the idler pulley cylinder and the starting motor. The rod is marked FULL, and EMPTY. Never allow the oil to drop below a level about half way between the FULL and EMPTY mark.

(4) Check the entire unit for loose screws, nuts, bolts, or fastenings of any kind, and tighten as needed. Wipe off any dirt, oil, or grease, and make sure that the radiator air passages are unobstructed.

(5) As soon as the unit is started, check all the meters and gauges

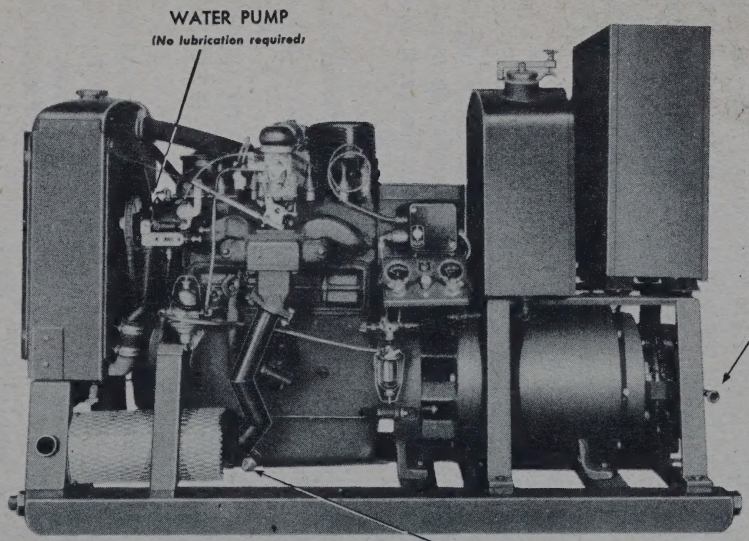
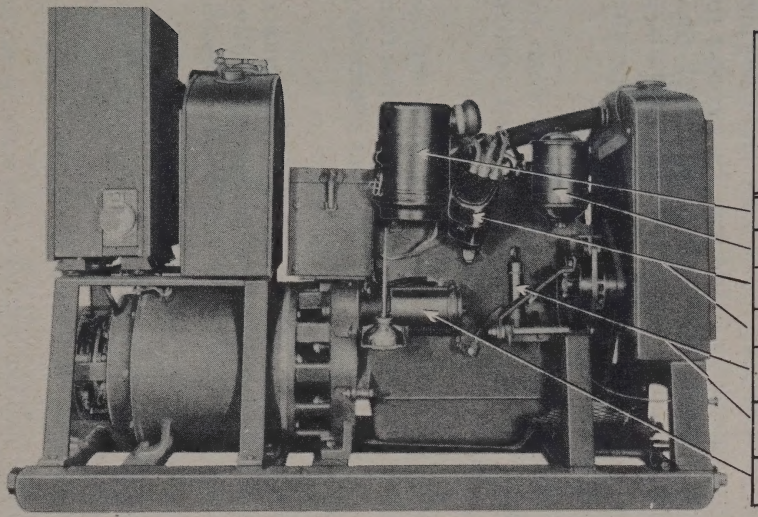


TABLE (CAPACITY AND LUBRICANTS TO BE USED)

UNIT	CAPACITY (Approx.)	LOWEST EXPECTED AIR TEMPERATURE		
		Above +32°F.	+32°F. to 0°F.	Below 0°F.
Engine Crankcase	5	OE SAE 30	OE SAE 10	See Para 9b(1)

TL-42916

Figure 6. Lubrication—right side.



LUBRICANT CODE LETTERS (See Key)	HOURS	NOTE	NOMENCLATURE
OE	8	2	AIR CLEANER
	256	4	OIL FILTER
WB	64	5 8	DISTRIBUTOR
OE	512	5	WICK UNDER ROTOR
OE	64	3	CRANKCASE (See Table, para 9b(1))
	8		BAYONET OIL GAUGE (Check Level)
128	64		STARTER (para 16d(2)(c)1)

NOTES

1. FITTINGS—Clean before applying the lubricant gun.
2. AIR CLEANERS—Every 8 hours, check level, and refill oil cup to circular level mark with OE. Every 64 hours or as often as 32 hours if operating in extreme dust conditions, remove entire assembly and clean. Clean air intake pipes and reassemble. Keep all connections tight.
3. CRANKCASE—Every 8 hours, check and fill to level. Drain only when engine is thoroughly warm. Refill to FULL mark on gauge.
4. OIL FILTER—Every 256 hours or more often if necessary, clean housing and renew element. After renewing element, refill crankcase to FULL mark on gauge. CAUTION: When running engine, be sure pressure gauge indicates oil is circulating.
5. DISTRIBUTOR — Every 512 hours wipe distributor See Table. CAUTION: When running engine be sure pressure gauge indicates oil is circulating. (Crankcase Breather Cap) Every 64 hours, remove breather cap. Wash and oil with OE.
5. DISTRIBUTOR—Every 512 hours lubricate the wicks with 5 or 6 drops of OE.
6. GENERATOR BEARING—At disassembly clean and repack bearing with WB. Examine bearing and bearing seal. Replace if worn or damaged.
7. OIL CAN POINTS—Every 64 hours, oil throttle and governor linkage with OE, and distributor shaft with OE.

TL-42917

Figure 7. Lubrication—left side.

on the control panel, and take any necessary steps to correct any faults that may be indicated.

c. Monthly or 150-hour Check. (1) Make all the checks as instructed under Routine Service (sub-par. **d** (2) (**b**)).

(2) Remove, clean, adjust, and replace all spark plugs. Adjust the point gaps to 0.030 inch. Discard all plugs that are not in good condition and replace with new ones.

(3) Check the magneto breaker points with a feeler gauge and adjust them to 0.015 inch. If the points appear burned or pitted, dress them with an ignition point file. Replace both points if one of them appears unserviceable. Adjustment must be made with the points open to their widest gaps.

(4) Remove the valve cover plate on the side of the cylinder block and check the valve tappet clearance with a 0.006 and 0.008 inch feeler gauge. The clearance should be 0.0014 inch. Be sure that the tappets are at their lowest point when checking and check them when the engine is cold. If the clearance is less than 0.0014 inch, adjust the tappets to this clearance. Recheck the clearance after tightening the locknut to be sure that it has not changed.

(5) Shut off the fuel supply. Remove and thoroughly clean the fuel strainer. Reassemble the strainer, and check after opening the fuel valve, to be sure there is no leakage.

(6) Inspect the generator and exciter. The commutator and slip rings should have a smooth mahogany appearance and be free from burns and pits. Clean the commutator and slip rings if necessary according to the instructions in paragraph 29.

(7) Check the brushes for good commutator or slip ring contact, free fit in their holders, and uniform spring tension. If the brushes are worn to the extent that the brushholder fails to exert pressure on brushes, replace them.

(8) Check the cooling system for leaks and faulty hose connections. Drain the system and flush it out with clear water. Be sure that the drain cocks are closed, and refill the radiator.

(9) Inspect the commutator and the brushes of the starting motor and give them any attention indicated.

(10) Check all connections and wiring in back of the control panel, and make sure that all connections are clean and secure.

d. Lubrication. (1) NOMENCLATURE. The following list gives the standard nomenclature for the lubricants used in Power Unit PE-182:

Symbol	*Standard Nomenclature*	*Specification*
OE10	Oil, engine	U. S. Army 2-104B
OE30	Oil, Engine	U. S. Army 2-104B
PS	Oil, lubricating, preservative, special	U. S. Army 2-120
WB2	Grease, general purpose No. 2	U. S. Army 2-108
SD	Solvent, dry cleaning	Federal P-S-661a
CG-O	Grease, general purpose No. 0	U. S. Army 2-106

(2) HOURLY MAINTENANCE CHECKS.

(*a*) *Every 8 Hours.*

1. Air Cleaner. Check the oil level and refill to the NORMAL level mark. Use the same grade of oil as used in the crankcase for temperatures above zero degrees fahrenheit. Below zero degrees fahrenheit use PS.

2. Crankcase. Check the oil level on the bayonet gauge. Refill if necessary according to the schedule in paragraph 9b (1).

(*b*) *Every 64 Hours.*

1. Air Cleaner. Remove, drain, clean, and refill with OE of the same grade as used in the crankcase for temperatures above zero degrees fahrenheit. Below zero degrees fahrenheit use PS.

2. Oil Filter. Remove the drain plug and drain off the sludge.

3. Generator. The front bearing of the generator is equipped with a zerk fitting that may be reached through the cooling vents. Lubricate this bearing sparingly with WB2. Turn the grease cup on the rear generator bearing 1 full turn and refill with WB2 when necessary.

4. Fuel Strainer. Remove and clean the sediment bowl and screen. Open the fuel strainer shut-off valve to drain the water and sediment.

5. Crankcase. Drain and refill with lubricant according to the table in paragraph 9**b** (1). The crankcase should only be drained when the engine is hot. The capacity is approximately five quarts. After refilling, run the engine for a few minutes and recheck the level which should be at the FULL mark on the bayonet gauge, and at the same time the pressure gauge will indicate if the oil is circulating.

6. Miscellaneous. The following places should be oiled with OE: Tool box hinge and fastener, control panel box hinge and fastener, fuel cap hinge and lock, fuel tank gauge cover and governor and throttle control linkage.

(*c*) *Every 128 Hours.*

Starter. Apply five or six drops of OE in the oil hole on the commutator end of the starter and also apply five or six drops of OE to the exposed portion of the front bearing.

(*d*) *Every 256 Hours.*

1. Oil Filter. Drain and clean the inside of the filter body and renew the filter element. After the filter has been reassembled run the engine for a few minutes and check the oil level in the crankcase, filling if necessary

2. Air Cleaner. Remove the air cleaner and wash all parts with SD or Diesel fuel oil. Refill to the NORMAL mark with the correct lubricant according to the temperature.

CAUTION: Use only SD, or Deisel fuel oil to clean greasy parts. AR-850-20 prohibits the use of leaded gasoline for cleaning purposes under any circumstances.

(*e*) *Every 512 Hours.*

Magneto Bearings. Remove the plugs on the upper side of the housing and lubricate the wicks with 5 or 6 drops of OE.

(3) COLD WEATHER OPERATION. When the temperature is below zero degrees fahrenheit use PS in every case except for the crank case. When the temperature is below zero degrees fahrenheit fill the crankcase with 75% OE10 and 25% gasoline thoroughly mixed. The level should be checked more often than when using OE10 or OE30. The level should be maintained at the FULL mark by adding gasoline only and the interval between draining should be reduced by one half.

(4) LUBRICATION DURING MAINTENANCE. The following components should be lubricated during the period of maintenance:

(*a*) *Starting Motor.* When the starting motor is disassembled for service, the intermediate or center bearing should be lubricated with five or six drops of OE.

(*b*) *Bendix Drive.* During maintenance apply OE sparingly to the Bendix drive assembly.

(*c*) *Crankcase Ventilator Baffle.* When repairs are being made, the bolt holding the crankcase ventilator pipe and baffle should be removed. Wash the ventilator pipe and baffle with SD. Dry and replace.

(*d*) *Magneto.* When repairs are being made on the magneto, apply two or three drops of OE to the breaker cam pad and the impulse mechanism.

> **NOTE:** Do not lubricate the fan idler pulley, engine governor or water pump bearings. The engine governor is lubricated by the engine lubricating system and the water pump and fan idler have sealed life type bearings.

17. FUEL.

a. Always make sure that the gasoline used is free from water and other foreign matter. Keep the air vent in the gasoline tank filler cap clear, as failure of air to enter the tank will prevent the flow of gasoline to the carburetor.

b. Except when the unit is to be out of use for prolonged periods, always fill the fuel tank after shutting down the unit. This will prevent condensation in cold climates, and the formation of gummy deposits which will result from the evaporation of gasoline in hot climates. If the unit is to remain idle for a period of several days,

stop it by shutting off the gasoline supply instead of using the STOP switch, and drain the fuel tank. Remove, clean, and replace the fuel filter when the unit has stopped.

18. CARBURETOR.

As the speed of the unit is governor-controlled, the speed is normally maintained at 1,800 rpm and no idling speed adjustment should be needed. After checking spark plug gap, compression, breaker points, valves (intake and exhaust), it has been determined that trouble with the unit is due to faulty carburetion make the following minor adjustments before completely disassembling the carburetor.

a. Carburetor Loads Up. If the carburetor loads up after considerable service, float level should be checked. Wear on lip of float lever will raise float level. Float level may be reset by bending lip of float lever down to raise float level or bending lever up to lower float level. Only a slight bend is needed.

b. Motor Stalls While Idling. If the motor stalls while idling, reset throttle adjusting screw and idle adjusting screw to specifications. If these adjustments do not correct the trouble: (1) Remove idle well plug and gasket assembly, allowing gasoline from the bowl to flush out idle well jet. Remove idle well jet and blow out with compressed air.

(2) Remove low speed jet and clean thoroughly with compressed air. Examine and see that jet seats gasoline tight at shoulder. If not, replace with a new jet of identical specifications.

(3) Examine bore of carburetor around throttle valve for carbon accumulation.

c. Clogged Pump Jet. A clogged pump jet should be removed and cleaned with compressed air, which in many cases, will remove the dirt or lint. It is usually advisable to replace the pump jet if one is available. All jets must be seated gasoline tight.

d. Poor Acceleration. Poor acceleration may be due to damaged or worn plunger leather in accelerating pump, loose plunger, corrosion or sediment in pump cylinder or bent pump arm.

e. To Disassemble Carburetor. Remove carburetor from motor, then proceed as follows: (1) Remove choke link pin spring, choke connector link and spring.

(2) Remove air horn assembly with all parts attached.

(3) Remove low speed jet plug and gasket assembly.

(4) Remove low speed jet.

(5) Remove idle well plug and gasket assembly.

(6) Remove idle well jet.

(7) Remove throttle shaft arm and screw assembly and throttle connector rod.

(8) Remove bowl cover with all parts attached.

(9) Remove pump spring from cylinder in body.

(10) Remove idle adjusting screw and spring.

(11) Remove metering rod jet and gasket assembly.

(12) Remove nozzle passage plug and gasket assembly.

(13) Remove nozzle retainer plug.

(14) Remove nozzle and nozzle gasket.

(15) Remove body flange attaching screws and then remove flange from body.

(16) Remove strainer passage plug and gasket assembly and strainer.

(17) Remove intake ball check assembly.

(18) Remove discharge disk check assembly.

(19) Remove pump jet passage plug and gasket assembly.

(20) Remove pump jet.

(21) Remove throttle valve screws, choke valve, choker shaft, and lever assembly.

(22) Remove idle port rivet plug.

(23) Remove choke tube bracket assembly.

(24) Remove choke valve screws, choke valve and choker shaft and lever assembly.

(25) Disassemble all parts from bowl cover.

f. Cleaning and Grouping. (1) Clean all castings thoroughly inside and out with a small brush and clean gasoline, or suitable solvent cleaner. Blow all passages out with compressed air.

(2) Group all parts as follows:

Group A. Parts controlling the gasoline level.

Group B. Low speed circuit parts.

Group C. High speed circuit parts.

Group D. Pump circuit parts.

Group E. Choke system parts.

Examine each part in each group and replace those parts that show signs of wear or damage. Clean all parts in gasoline and blow off with compressed air. If any carbon is in the bore of the flange, remove it by scraping or with sandpaper. Do not use emery cloth. Install all parts tightly.

g. To Reassemble Carburetor. Assemble parts in Group A above and proceed as follows: (1) Install needle seat in bowl cover. Install bowl cover gasket. Then put pin and spring into needle and install float and lever assembly.

(2) Set float lever. Turn gasket around so gauge can be placed on machined surface of casting. Correct setting is $\frac{3}{8}$-inch. Do not depress float lip against spring in needle, but let float rest on its own weight. Gauge should then be placed between free end of float and machined surface of bowl cover. Float should be set so it barely touches gauge. Adjustment is obtained by bending the lip on the float which contacts pin in needle. Do not bend on front of float in adjusting, as damage will result.

Continue by assembling parts in Group D above.

(3) Install pump jet and pump jet plug and gasket assembly.

(4) Install discharge disk check assembly.

(5) Install intake ball check assembly.

(6) Install pump check strainer and strainer plug and gasket assembly.

(7) Install pump spring.

(8) Install pump plunger and rod assembly.

(9) Install throttle shaft and lever assembly, back out throttle lever adjusting screw, then install throttle valve and throttle valve screw (be sure trade-mark on valve is toward the idle port side of carburetor when viewed from manifold side). With valve screws loose, tap throttle valve lightly to centralize it in bore of carburetor. Hold valve in place with fingers and securely tighten screws. (New screws are recommended.)

(10) Install idle adjustment screw and idle adjustment screw spring.

(11) Install idle port rivet plug.

(12) Install insulator and new gaskets, then install body on flange. Tighten screws evenly and securely.

(13) Install idle well jet and idle well jet plug and gasket assembly.

(14) Install low speed jet. Work jet into seat by moving back and forth, then install low speed jet plug and gasket assembly.

Assemble parts in Group C.

(15) Install metering rod jet and gasket assembly.

(16) Install bowl cover as assembled, tightening screws down evenly and securely.

(17) Install pump arm and collar and pump operation lever assembly and spring on pin in bowl cover.

(18) Install pump connector link (ends away from bore and pin spring at top).

(19) Install throttle shaft arm and screw assembly on throttle shaft.

(20) Install throttle connector rod in throttle shaft arm, using spring and retainer at lower ends and pin spring at top end.

(21) To adjust the pump, back throttle lever set screw. With throttle valve seated, pump should travel 17/64-inch from closed to wide open throttle. Adjustment can be made by bending throttle connector rod at lower angle. Pump travel can be measured by using universal pump stroke gauge (T109-117S) by placing base of gauge on raised portion of bowl cover so that projection ear of pump gauge rests on top of pump shaft. Hold gauge vertical. The difference between the number shown by index mark on gauge, at wide open and closed throttle positions, should be 17.

(22) Correct setting of metering rod is important and must be made after pump adjustment. To adjust the metering rod, install metering pin and spring assembly, washer, and nut loosely on pump operating lever. Insert gauge (tool T109-26) in place of metering rod, seating tapered end in metering rod jet. Hold gauge vertical to insure seating. With throttle valve seated, push metering rod downward until pin rests on shoulder of notch in gauge and tighten nut (tool T109-76). Remove gauge and install metering rod, disk, and pin spring. Connect metering rod spring.

(23) Install nozzle and nozzle gasket, using tool No. T109-55.

(24) Be sure that flat side of nozzle faces up.

(25) Install nozzle retainer plug, nozzle plug, and gasket assembly.

(26) Install air horn on body

(27) Install choker shaft and lever assembly and choker pull back spring.

(28) Install choker valve, choker valve screw, centralizing the valve in the air horn, then tighten valve screws.

(29) Install choke operating lever assembly and hook pull back spring in place.

(30) Install choke connector link, connector link spring, and pin spring.

NOTE: The repair tools required in paragraphs **g** (21), **g** (22), and **g** (23) above are not furnished with this unit. Any necessary adjustments as outlined above will be performed by an Ordnance Maintenance Unit.

19. GOVERNOR.

a. Governor Adjustments (fig. 8). Make the rod adjustment first. There are three adjustments possible. The governor, as manufactured, is calibrated for the desired full load engine speed and regulation range specified. If finer adjustment, or a different speed and regulation is desired, the following adjustments may be made, but before making speed or regulation adjustments, be sure bumper spring is backed out of contact with operation fork (that is; extends at least ⅞-inch out of body): (1) SPEED ADJUSTMENT. To increase governed speed, turn adjusting screw clockwise (to the right); to decrease, turn counter-clockwise (to the left); if possible, make adjustment with engine fully loaded. Be sure to tighten adjusting screw lock nut securely after completing adjustment to prevent change due to vibration.

(2) REGULATION ADJUSTMENT. If regulation (that is; difference in engine speed between full load and no load) is too broad (flat) or too close (sharp), it can be regulated by adjustment of the spring eye bolt. Shortening (taking up the length of the eye bolt with the adjusting lock nuts) sharpens regulation; lengthening

broadens (flattens) regulation. Be sure that the flattened part of the eye bolt lines up parallel to the spring slide spring and that both eye bolt lock nuts are tight. If this eye bolt adjustment is used, it may be necessary to reset the speed adjustment.

(3) SURGE CORRECTION ADJUSTMENT. Surge (unstable governing, hunting) under full, or partial, load should be corrected with the eye bolt regulation adjustment described above. Surge is the result of too sharp regulation. Surge, under no load, may be eliminated by use of the bumper spring. This adjustment is used *only* when surge is evident. With the engine surging at the governed no load speed, screw in the bumper spring screw carefully, a little at a time, until the surge is gradually eliminated. Do not screw it in any farther than is necessary to eliminate surge.

b. Specific Instructions. If it is necessary, for any reason, to disassemble the governor spring, spring slide, adjusting screw, or spring eye bolt, the following calibration dimensions must be carefully reset: (1) EYE BOLT SETTING. From center of operation shaft—shaft on which governor lever is assembled—to center of eye bolt hole 1-3/32-inch.

(2) SPRING SETTING. Measured from inside or spring loops 2-29/32-inch. In assembling the governor spring, the painted end must be in the spring slide, not in the eye bolt.

c. To Check Governor Operation. (1) The voltage of a generator depends upon speed, as well as upon field strength; keep that in mind when changing the speed adjustment. At no load, the cycles are approximately 61, and at full load approximately 60.

(2) To determine engine speed, check the frequency meter. Sixty cycles in the equivalent of 1,800 rpm. Each cycle equals 30 rpm.

(3) Surging, or uneven engine operation without the load change, is often caused by a lean mixture in the carburetor, or by dirt or water in the carburetor. Be sure that is not the case before working on the governor.

(4) To check for governor fault, touch the governor arm near the end of its travel while surging. If the surging stops, and the governor operates smoothly, the fault is probably in the governor adjustment. If surging occurs at light loads, the anti-surge screw (No. 4, fig. 8) should be screwed in until it touches a lever inside

GOVERNOR AND CARBURETOR LINKAGE ASSEMBLY

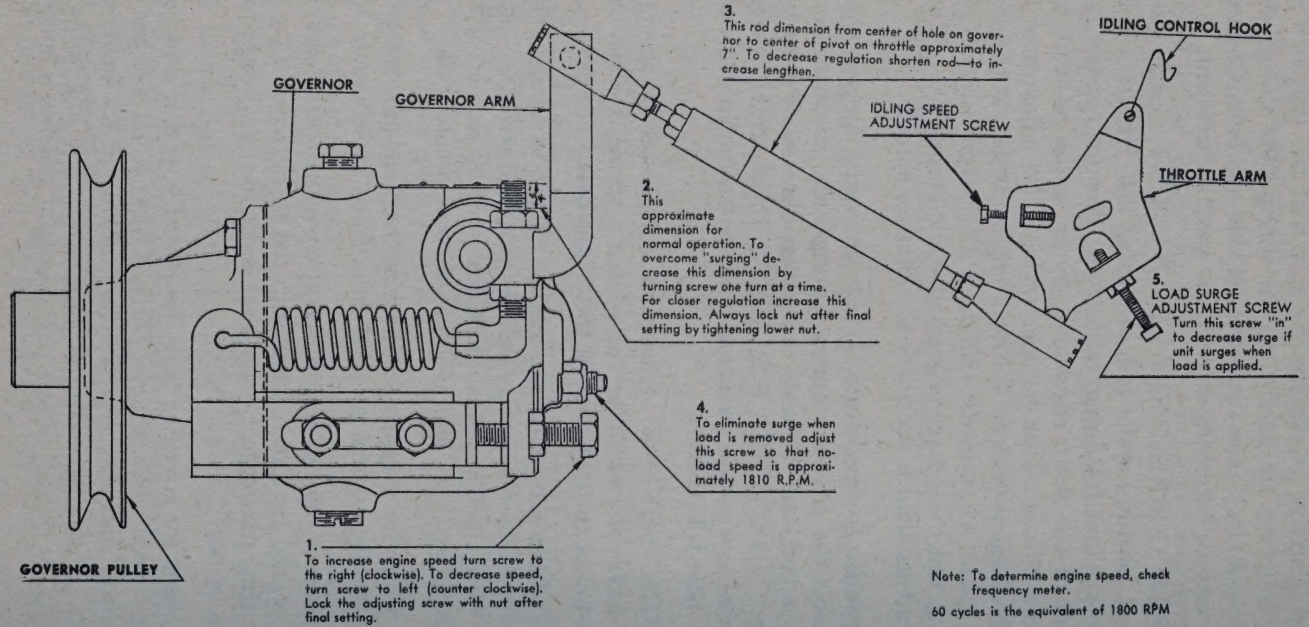


Figure 8. Governor adjustment instructions.

and damps the governor movement. Do not turn the screw in so far that it speeds up the unit. Be sure to tighten the locknut.

(5) If surging occurs under half to full-load conditions, lengthen the adjusting screw (No. 2, fig. 8) by screwing it out a few turns. Tighten the locknut and readjust the speed by screwing out the adjusting screw (No. 1, fig. 8) to obtain correct spring tension. Close speed regulation from no load to full load is obtained by having the screw (No. 2, fig. 8) as short as possible without causing surging.

(6) The linkage, or rod, connecting the governor arm to the throttle arm must be of the correct length and the throttle arm must be set so that it is in the middle of its travel, thus giving free movement from an open to a closed position. Also the throttle and joints of the rod must be absolutely free during the full travel of the parts. The rods are adjustable as to length and must be set so that with the unit at rest and with the governor and throttle in their normal wide open positions, the connections will hold the throttle arm about 1/64-inch away from its wide open position. There is some tension on the governor spring when the unit is at rest.

20. VALVE ADJUSTMENT.

The intake and exhaust valves are provided with adjustable tappets to enable proper valve adjustment. These tappets are reached by removing the valve cover plate on the side of the cylinder block (fig. 9). The tappets should be checked every 150 operating hours and readjusted to 0.0014 inch clearance when the clearance is found to exceed this figure. Adjust the tappets when the engine is cold and make sure that they are at their lowest point to avoid incorrect adjustment. One 7/16-inch open-end wrench and one 3/8-inch open-end wrench will be required. Always recheck the adjustments after tightening the locknuts to make sure that the adjustment has not shifted. Inspect the valve springs and other visible valve parts while the cover is off, and take any necessary steps indicated.

21. SERVICING THE AIR CLEANER.

a. The air cleaner on the carburetor air intake must be serviced at least once a week, or daily when operating in very dusty locations.

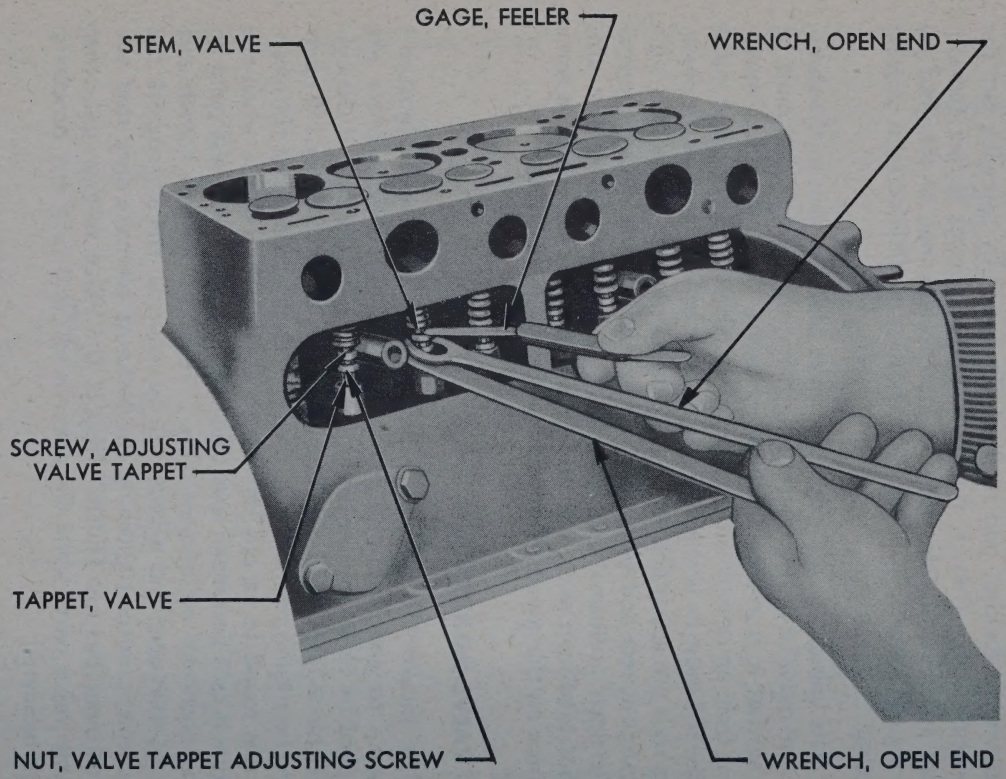


Figure 9. Valve adjustment.

b. Remove the bowl at the bottom of the cleaner. Empty the bowl and refill it to the indicated level with the same oil as used in the crankcase. Do not use oil that has been diluted with gasoline, but use the lightest undiluted engine oil available.

c. At least once a month, or weekly if operating in very dusty locations, remove the entire air cleaner unit and wash it thoroughly in Diesel oil or solvent. To remove the air cleaner, proceed as follows: (1) Loosen the two wire clamps located on opposite sides of cleaner, and remove the bowl.

(2) Turn wing-nut at bottom of cleaner counter-clockwise unti loosened sufficiently.

(3) Slide the air cleaner assembly out of the air cleaner housing.

(4) Disassemble the unit and thoroughly wash all parts in Diesel oil or solvent.

(5) Reassemble the unit and replace it on the engine. Make sure that all connections are tight to prevent the entrance of dust. Replace any gaskets that appear to be in poor condition.

(6) Do not forget to refill the oil reservoir to required level before replacing it on the unit.

22. SERVICING THE FUEL STRAINER.

a. Look at the fuel strainer daily to see if any dirt or water has collected in the glass bowl. If there is foreign matter present, close the fuel valve and remove the bowl by loosening the thumbscrew at the top of the strainer. Wipe the bowl thoroughly, both inside and out, with a cloth dampened with Diesel oil or solvent. Reassemble the strainer. Open the fuel valve, and check for leakage at the top of the glass bowl. If there is leakage, tighten the thumbscrew; if leakage continues, replace the cork gasket.

b. If necessary, remove and replace the fuel strainer as follows:

(1) Close the fuel valve.

(2) Remove the gasoline pipe from the strainer body.

(3) Remove the glass bowl and clamp.

(4) Unscrew the strainer body from the carburetor fuel intake.

(5) Blow out all passages and the strainer with a tire pump or compressed air.

(6) Reassemble in the reverse order of disassembly.

23. REPLACING CARBURETOR.

If trouble is experienced with the carburetor (par. 18), and it is necessary to replace the complete unit, proceed as follows: (1) Disconnect choke wire.

(2) Disconnect the governor rod from the throttle arm.

(3) Disconnect the fuel line leading to fuel pump.

(4) Remove the air filter coupling from the carburetor air intake.

(5) Using a 9/16-inch open-end wrench, remove the two nuts that fasten the carburetor to the flange of the intake manifold.

(6) Using a new gasket between the intake manifold and carburetor flanges, reinstall the carburetor by reversing the above procedure.

24. SERVICING THE OIL FILTER.

a. The oil filter must be serviced at least every 256 hours or more often if the condition of the drained crankcase oil indicates the need. Servicing may be necessary more often when operating under very low temperature conditions.

b. To service the oil filter, proceed as follows: (1) Using a 7/16-inch open-end wrench, or crescent wrench, remove the oil inlet bushing and using a 3/8-inch open-end wrench remove the oil outlet elbow.

(2) Remove the screws that hold the oil filter to its mounting bracket.

(3) Using a crescent wrench, or a one-inch wrench, remove the oil filter cover.

(4) Remove the filter element and the oil remaining in the filter.

(5) Wash all parts thoroughly in Diesel oil or 5 D.

(6) Install a new filter element.

(7) Reassemble the unit to the engine and reconnect all connections.

(8) Start the unit and, after letting it run for a few minutes, stop it. Check the oil supply by means of the bayonet gauge. Add enough oil to bring it up to the FULL mark.

25. OIL PRESSURE ADJUSTMENT.

a. The oil pressure gauge on the control panel should normally show a pressure of 15 pounds after the engine has warmed up. This pressure may be regulated by removing the hex. head cap screw from the side of the oil pump, directly below the carburetor, and proceeding as follows: (1) IF THE OIL PRESSURE IS LOW: Add one or two $\frac{3}{8}$-inch by $\frac{1}{32}$-inch shims in the cylindrical container found on the cap screw. Place over spring and tighten.

(2) IF THE OIL PRESSURE IS HIGH. Remove one or two $\frac{3}{8}$-inch by $\frac{1}{32}$-inch shims from the cylindrical container found on the cap screw. Place over spring and tighten.

b. As the bearings become worn, additional oil will pass through and reduce the oil pressure. This is a normal drop. If a sudden or excessive drop in oil pressure is noticed stop the unit at once and investigate the cause.

26. STARTING MOTOR REPLACEMENT.

a. Aside from the replacement of the brushes, cleaning the commutator, and possible replacement of the Bendix spring, no service of the starting motor should be attempted in the field. Except in cases where the above troubles are the obvious cause of the difficulty, replace the complete starting motor unit.

b. When it is necessary to remove and replace the starting motor, proceed as follows: (1) Using a $\frac{9}{16}$-inch open-end wrench, remove the terminal nut and the battery cable from the starting motor.

(2) Using the same wrench, remove the three cap screws that hold the starting motor to the bell housing. The starting motor may now be removed by sliding it toward the front of the unit.

(3) With the starting motor removed, check the Bendix spring and replace it if necessary.

(4) Before replacing the starting motor on the engine, clean the

pinion shaft thoroughly with Diesel oil or 5 D and give the worm a light application of light engine oil.

(5) Reassemble the starting motor to the unit by reversing the above procedure.

27. SERVICING THE MAGNETO.

The radio-shielding of the Wico type JEM magneto is accomplished by inclosing the distributor cap unit with a cast metal housing. In order to get at the distributor cap and breaker points of the unit it will be necessary to remove this radio shielding. This is accomplished in the following manner: (1) REMOVAL OF RADIO SHIELDING. Remove the terminal shield cover screws (ref. 303, fig. 29) which will allow the terminal shield to be free of the unit. Take out the four distributor shield cover screws and lift off the distributor shield cover (ref. No. 301, fig. 29). This will permit access to the distributor cap. The four lead wires should then be removed from the distributor cap terminals. The location of the lead wires with respect to their proper terminals should be noticed so that they can be replaced in the same position on assembly. The distributor shield clamp screw (ref. No. 298, fig. 29) should be loosened sufficiently to free the shield on the main body of the magneto. This part can then be removed, exposing the distributor end of the unit.

(2) REPLACEMENT OF RADIO SHIELDING. To replace the distributor shield after service adjustments have been made, set the shield on the main body of the magneto with the clamp screw on the vented side of the unit and positioned firmly on the locating bases on the inside of the shield. Tighten the clamp screw until the shield is locked securely in place. Place the lead wires in their original terminals and assemble the distributor shield and terminal covers.

(3) DISTRIBUTOR CAP AND ARM. After removing the distributor cap by loosening the four screws which hold it in place, the distributor arm may be pulled off the breaker cam. Before replacing the distributor arm, line up the key inside the breaker arm with the slot in the cam and press the breaker arm down. When replacing the distributor cap make certain the gasket is in place.

(4) BREAKER POINTS. (*a*) To reach the breaker compartment, it is first necessary to remove the distributor cap, distributor arm, sealing washer, and breaker cover.

(*b*) The breaker points should be adjusted to 0.015 inches when fully opened. Adjustment is made by shifting the fixed contact (ref. No. 327, fig. 30), by means of the small, eccentric screw. After adjustment, tighten the fixed contact screw (ref. No. 332, fig. 30).

(*c*) The breaker points should be free of foreign matter. Lacquer thinner is an ideal cleaner for this purpose. Adjust the alignment of the points so that the full surfaces of both contacts meet squarely.

(*d*) To remove the breaker arm (ref. No. 322, fig. 30), take out the breaker clamp screw (ref. No. 325, fig. 30), lockwasher and breaker arm clamp washer. Then the breaker arm may be pulled off the pivot. When replacing the breaker arm, make certain that the coil leads and ground lead are placed under the breaker arm spring screw washer.

(*e*) To remove the fixed contact (ref. No. 327, fig. 30), the breaker arm must first be removed as outlined above Then pull off the breaker arm spacer (ref. No. 321, fig. 30), and spacing washer (ref. No. 326, fig. 30). After removing the fixed contact screw (ref. No. 332, fig. 30), lockwasher, and washer, the fixed contact may be pulled off the breaker pivot.

(*f*) If the points need replacing, it is recommended that both the fixed contact and breaker arm be replaced at the same time. After assembly the points should be adjusted as described in the beginning of this section.

(*g*) If it is desired to remove the breaker assembly as a complete unit, disconnect the ground lead and insulated primary lead coil from the breaker spring screw. Remove the two breaker assembly screws (ref. No. 329, fig. 30), lockwashers, and plain washers, which hold the breaker plate to the housing and lift out the complete breaker assembly.

(5) CAPACITOR. (*a*) The capacitor (ref. No. 337, fig. 30), should have a capacitance of 16 to 18 microfarad. If, when tested, the capacitor shows to be below capacitance it should be replaced.

(*b*) To remove the capacitor, remove the breaker arm spring screw (ref. No. 325, fig. 30), and the two leads under it. Then take

out the two capacitor screws (ref. No. 335, fig. 30), and lockwashers, after which the capacitor may be lifted off the breaker plate. When replacing the capacitor, make certain that the capacitor case gasket (ref. No. 334, fig. 30) is in place.

(6) CAM. (*a*) The cam is held to the end of the rotor shaft by a cam screw (ref. No. 329, fig. 30), lockwasher, and cam screw lock plate (ref. No. 330, fig. 30). In removing the cam, it may be necessary to tap the top of the rotor shaft very lightly with a piece of brass rod while pulling on the cam.

(*b*) To replace the cam, line up the key on the rotor shaft with the slot in the cam. Press the cam down firmly.

(7) REMOVAL OF DRIVE AND IMPULSE MECHANISM. First remove the distributor cap, distributor arm, breaker cover and breaker cam. Then remove the two bearing plate clamp screws (ref. No. 364, fig. 31), and lockwashers, and pull the rotor, end plate, bearing plate and impulse parts off the main housing as a unit. When replacing, make certain the oil plug in the bearing plate is on the same side of the main housing as the nameplate and that the bearing plate gasket (ref. No. 348, fig. 31), is in place.

(8) INNER CORE. To remove the inner core, it is first necessary to remove all parts mentioned previously, then proceed as follows:

(*a*) Pry out the inner core snap ring, and then press the coil down a little to give some clearance between the coil and the inner core.

(*b*) Place two screw drivers 180° apart under the inner core and pry it out, being careful not to damage the coil or the inner core. When the inner core is replaced, press it down as far as it will go and insert a new snap ring so that the split of the snap ring is over the split of the inner core.

(9) COIL. (*a*) To test the coil, it is not necessary to remove it from the magneto. Remove the distributor cap, distributor arm and breaker cover. When using an Eiseman coil tester, connect the ground lead of the tester to the high tension spring on the magneto secondary pencil, turn the cam until the breaker points are open. The coil must be replaced if it requires more than 1.5 amp. to give a steady spark on a 5mm. gap.

(*b*) If the coil is to be replaced, first remove the inner core, the

breaker plate and disconnect all coil leads. Turn the coil leads up so that when the coil is removed the lead terminals will not catch on the housing.

(*c*) To replace the coil proceed in the following manner: Place two cambric coil shields (ref. No. 343, fig. 30), over the coil lead wire and insert the coil and shields so that the secondary contact spring on the side of the coil makes contact with the seeondary pencil. Press the coil down firmly and insert the two coil edges so that they are on the same sides of the core as the split in the core.

(10) SECONDARY PENCIL. (*a*) The secondary pencil serves the purpose of conducting high-tension current from the secondary terminal on the coil to the center terminal of the distributor cap, from which point the current is distributed in succession to each of the towers in the distributor cap.

(*b*) In order to replace the secondary pencil, it is necessary to remove the distributor cap, distributor arm breaker cover, cam, breaker plate from the distributor end of the magneto. From the drive end of the magnetos it is necessary to remove the drive shaft, rotor and impulse parts as a unit, inner core and coil. After these parts have been removed, the secondary pencil may be removed from the main housing by taking out the two secondary pencil screws (ref. No. 329, fig. 30), and lockwashers.

(11) END PLATE AND IMPULSE MECHANISM. (*a*) After removing the two end plate clamp screws (ref. No. 364, fig. 31), and the end plate clamp screw lock (ref. No. 363, fig. 31), the end plate may be pulled off the drive shaft and free from the bearing plate by holding down the drive shaft while pulling upward on the end plate group. It may be necessary to strike the side of the end plate with an instrument such as the handle of a screw driver, to free it from the bearing plate, before it can be pulled off.

(*b*) The drive shaft with the cam and impulse springs may now be pulled off.

(*c*) To remove the cam plate from the drive shaft, clamp the cam plate in a vise and remove the cam plate clamp nut (ref. No. 355, fig. 31), and washer (ref. No. 368, fig. 31). After the clamp nut has been removed, the cam plate may be taken off the drive shaft by gently tapping the nut of the shaft.

(*d*) When reassembling, first, place the cam plate on the drive shaft, gently tapping into place if necessary. Then replace the cam plate clamp nut (ref. No. 355, fig. 31), and washer (ref. No. 368, fig. 31). After the clamp nut has been removed, the cam plate may be taken off. After this the two impulse springs (ref. No. 357, fig. 31), and the four impulse spring guides (ref. No. 358, fig. 31), should be assembled to the pins on the cam plate.

(*e*) If it is necessary to replace the impulse springs or guides it is recommended that the impulse spring group X4600 be ordered (manufactured by the Wico Electric Company, Springfield, Mass.) as the use of this group greatly facilitates the assembly of the springs to the pivots on the cam plate and support plate. It is only necessary to push the two retaining cups together with the fingers and place the protruding loop over the pin, thus dispensing with the use of the crochet hook as mentioned previously.

(*f*) Make certain that the end plate gasket (ref. No. 362, fig. 31), is placed between the end plate and bearing plate.

(12) ROTOR, BEARING PLATE, AND SUPPORT PLATE

(*a*) Remove the support plate from the drive shaft. Using a socket wrench and being extremely careful not to twist the rotor shaft, loosen the support plate clamp nut (ref. No. 355, fig. 31). If necessary, the support plate may be pried off by placing two screw drivers 180° apart beneath it. After the support plate assembly has been removed, the rotor may be pulled off the bearing plate.

(*b*) The support plate assembly may be disassembled by removing the cotter pins from the trip arm pivot pins (ref. No. 353, fig. 31). After pulling out the pivot pin the trip arm pivot pins (ref. No. 352, fig. 31) may be removed.

(13) TIMING TO ENGINE. (*a*) Rotate the flywheel and bring piston of No. 1 cylinder into firing position of compression stroke. The flywheel is marked to identify firing position.

(*b*) With the distributor cap removed, turn the magneto shaft in a direction opposite to its ordinary rotation until the monel metal segment of the distributor arm is opposite the No. 1 terminal of the distributor cap and the breaker points just begin to open. Clamp the magneto to the engine in that position. Complete

the installation by replacing the distributor cap and connecting the remaining leads in their correct firing order.

(*c*) It is a good practice to recheck the timing under actual running conditions and make final adjustments by slightly advancing or retarding the magneto (slightly turning the housing), as may be required to obtain best engine performance.

(14) LUBRICATION. The magneto requires a small amount of oil after each 512 hours of operation. (See lubrication charts, figures 6 and 8.)

28. SPARK PLUG SERVICE.

The spark plugs must be removed, cleaned and adjusted at least once each month, or every 150 hours of operation. Scrape the carbon from both inside and outside of the body and wash the plugs in solvent. Adjust the point gaps to 0.030 inch by the aid of a feeler electrode as this will not damage the plug. Always adjust by bending the outer electrode or the one attached to the outer shell of the plug. When reassembling the spark plugs to the cylinder head, make sure that the gasket is replaced. Use a new gasket if possible, and be sure that the plug is screwed securely into the cylinder head.

29. COMMUTATOR AND SLIP RING SERVICE.

a. Remove the generator end-cover once each month and inspect the commutator, slip rings and brushes (fig. 10). If the commutator or slip rings appear in need of cleaning, use a flat, dry stick and a piece of cloth. Place the cloth over the end of the stick, and dampen the cloth with cleaning solvent. Hold the flat side of the stick so that the cloth will come in contact with the surface of the commutator or slip rings while the unit is running at idle speed. This will remove any normal accumulation of dirt. If the commutator or slip rings are badly in need of cleaning, follow the same procedure but substitute a piece of #00 sandpaper in place of the solvent moistened cloth. NEVER USE EMERY.

b. After a short period of use, the commutator and slip rings will take on a smooth mahogany color which is a natural condition and not an indication of need of cleaning. A bright, highly polished surface is not necessary.

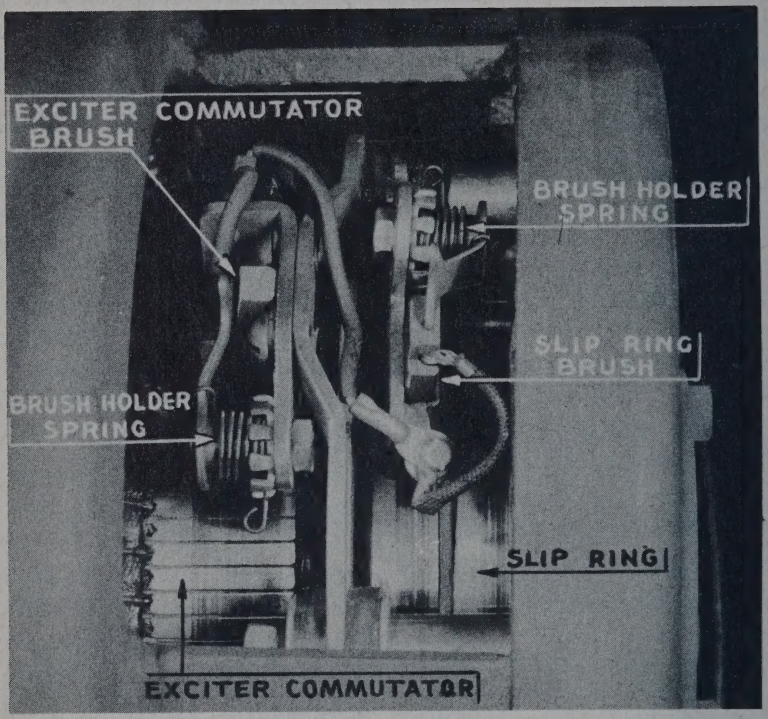


Figure 10. Brush and commutator maintenance.

30. REPLACING BRUSHES.

a. Proceed as follows: (1) Remove the exciter bearing bracket cover. Remove the machine screws, nuts and lockwashers holding the louvered, sheet-metal cover on the exciter-bearing bracket.

(2) Disconnect the pigtail connection. Loosen the connection screw on the bracket holding the brush to the commutator, and slide out the pigtail connection lug.

(3) Lift the brushholder arm, and remove the brush.

b. Brush Installation. (1) Install pigtail connection. Slide the brush pigtail connection lug under the connection screw on the brushholder bracket. Tighten the screw.

(2) Install the brush. Lift the brushholder arm, slide in the brush, and drop the arm to the brush securely in place.

(3) Install the cover. Place the cover in position, securing with screws, lockwashers, and nuts.

31. REMOVAL OF GENERATOR.

When it is necessary to remove the generator, proceed as follows:

(1) Disconnect all leads from the generator to the control panel box.

(2) Disconnect gas line leading from gas tank to filtrap.

(3) Disconnect and remove gas tank, and control panel box mount from skid (leave gas tank and control box intact).

(4) Disconnect generator from skid. Use a $\frac{1}{2}$-inch open-end wrench.

(5) Disconnect generator from fan and coupling housing.

(6) Loosen the two screws that hold flange key to the driving axle. Use a $\frac{3}{8}$-inch open-end wrench.

(7) Loosen the two screws that hold the flange assembly to the generator axle. Use a $\frac{5}{16}$-inch open-end wrench.

(8) Reinstall the generator by using the reverse order of the above procedure.

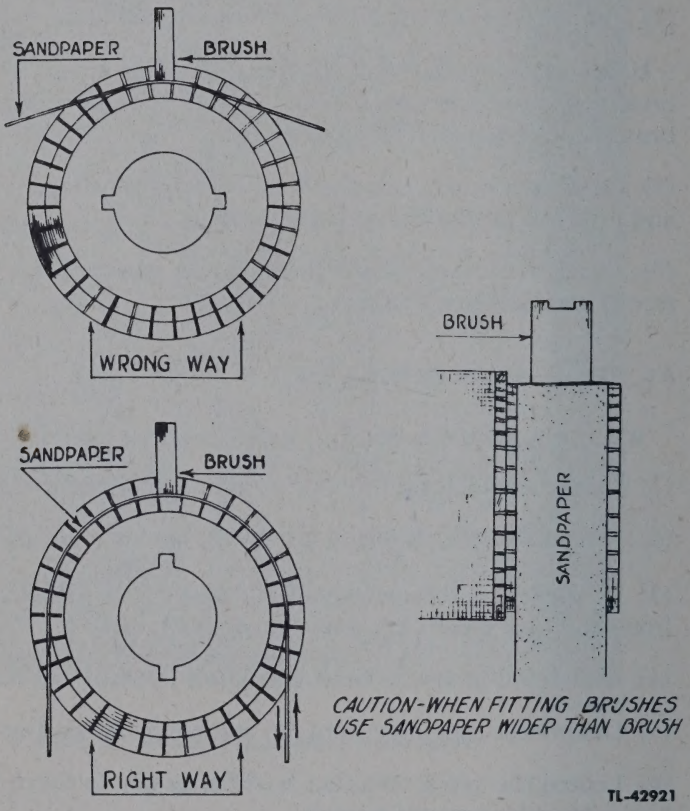


Figure 11. Fitting brushes to commutator.

32. CYLINDER HEAD REMOVAL.

When it is necessary to remove the cylinder head for removing carbon, grinding valves, or other operations, proceed as follows:

(1) Disconnect radiator hose, air cleaner hose, spark plug wires, etc. Using a 7/16-inch hexagon socket wrench, remove the cap screws that fasten the cylinder head to the cylinder block.

(2) Lift the head from the block, being careful not to damage the gasket. If the cylinder head does not come away freely, do not attempt to pry off. Replace a few of the cap screws loosely, and with the ignition off, crank the engine. The force of compression should loosen the head so that it can be lifted off.

(3) When replacing the head, coat both sides of the gasket with cup grease and place it on the cylinder head. Use a new gasket if the old one is damaged or otherwise unfit for use.

(4) Line up the holes in the gasket with those in the top of the cylinder block, and lower the cylinder head into place.

(5) Replace the cylinder head cap screws, and screw them down as far as possible by hand.

(6) Using a 7/16-inch hexagon socket and torque wrench, tighten the cap screws. Do not pull any one screw down all the way, but tighten first one screw and then another, a little at a time. Take up on them gradually until all of the screws show a tension of 42 foot-pounds or 504 inch-pounds on the torque wrench. If no torque wrench is available, follow the same procedure until all of the screws are moderately tight. Do not use too much force on the wrench as this might result in stripping the threads in the cylinder block or twisting off the head of the screw.

(7) Run the engine for a few minutes after replacing the head, and then take up any slack by taking another turn or two on each of the cap screws.

33. CARBON REMOVAL.

a. Carbon deposits must be removed from the cylinder head, the piston heads, the tops of the cylinder walls and from around the intake and exhaust valves about every 300 operating hours. Follow the instructions for removing the cylinder head (par. 32).

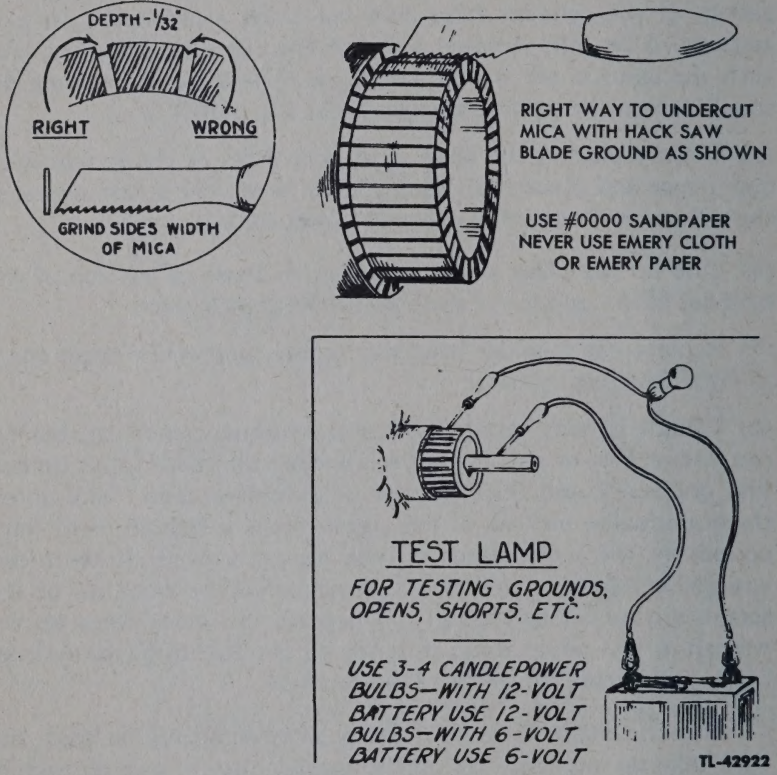


Figure 12. Undercutting and testing commutator.

b. Scrape the carbon from the cylinder head, pistons, cylinder walls, and from around the valves with a carbon scraping tool. If such a tool is not available, the end of a file or similar instrument may be used. Be careful not to scar the heads of the pistons or the cylinder walls or allow carbon to fall underneath the valves.

c. Check the condition of the valves while the head is off and give them any attention necessary. If it is found that the valves are in need of grinding, proceed as follows: (1) Remove the valve cover plate from the side of the cylinder block.

(2) Insert the valve lifter between the valve tappet boss and the valve spring seat. Compress the valve lifter and, using a pair of long-nosed pliers, remove the valve spring retainer pin from the valve stem.

(3) Release the valve lifter, remove it, and then lift the valve from its seat. Mark the valve so that you may be sure that it is returned to the same seat from which it was removed.

(4) Remove the valve spring and spring seat, and repeat the same operation for each valve until they have all been removed. Do not forget to mark each valve as it is removed from the cylinder block.

34. VALVE GRINDING.

Remove the valves (par. 33**c.**) and proceed as follows: (1) Select the valve from either end of the cylinder block. It is best to proceed from one end to the other instead of selecting valves at random.

(2) Place a light, even coating of fine valve-grinding compound on the face of the valve.

(3) Slip a light coil spring over the valve stem. This spring must be long enough to lift the valve from its seat when there is no pressure on it.

(4) Place the valve in position in the seat from which it was removed. The light spring on the valve stem should be below the head of the valve and resting on the valve stem guide boss. Be sure that the valve is in the correct seat.

(5) Using a valve grinding tool or screwdriver, rotate the valve back and forth while pressing it lightly on its seat. Lift the valve by means of the spring every few rotations and give it a half turn while clear of the seat. Bear down again and continue the rotating action. Keep this up until a satisfactory seat has been ground. It may be necessary to renew the grinding compound from time to time.

(6) The valve may be assumed to be properly ground when both the valve face and valve seat present a smooth, silvery color. A bright, polished surface is not desirable.

(7) Remove the valve; remove the spring from its stem, and wipe off both the valve face and valve seat with a cloth dampened with Diesel oil or solvent.

(8) Check the seat by placing pencil marks at close intervals around the face of the valve and then rotating it a half turn on its seat. If the pencil marks are evenly smudged all around the valve, it may be assumed to be properly ground.

(9) Follow the same procedure (subpar. [2] to [8] above), until all of the valves have been properly ground.

(10) Be sure to remove any valve-grinding compound that may have found its way into the valve pockets below the valve seats or other parts of the engine.

(11) Reassemble the valves in their seats by reversing the operations for removal. Be sure that each valve is returned to the seat from which it was removed and to which it has been ground.

(12) Replace the cylinder head (par. 32).

35. CLEARANCES.

	Minimum	Maximum
Between valve tappets and valve stem	0.014 (cold)	
Between intake valve stem and guide	0.0015	0.00325
Between exhaust valve stem and guide	0.002	0.00375
Between valve tappet and guide	0.0005	0.002
Crankshaft end play (governed by front main bearing)	0.004	0.006
Connecting rod clearance on crankshaft	0.0008	0.0023
Connecting rod side clearance	0.005	0.009
Between piston and cylinder wall	0.003	0.0025
Piston rings to piston grooves		
(1) Compression rings	0.0005	0.001
(2) Oil rings	0.001	0.0015
Piston ring end gap	0.008	0.013
Piston pin	0.0001	0.0009
Main bearings (crankshaft)	0.001	
Spark plug gap	0.030	
Magneto breaker point gap	0.015	

36. REMOVAL OF ENGINE.

When it is found necessary to remove the engine from the unit, proceed as follows: (1) Drain the oil from the base of the engine.

(2) Drain all liquid from the radiator and water jacket.

(3) Remove all connections between the engine and radiator.

(4) Remove the fuel pipe between the filtrap and fuel pump.

(5) Disconnect all wires between the engine and other parts of the unit. Tag the wires as they are removed so as to be sure they are returned to their proper places.

(6) Remove the radiator, and radiator mount.

(7) Disconnect the engine from the generator.

(8) Check to make sure that there are no remaining connections of any kind between the engine and other parts of the unit.

(9) Remove the fastenings that secure the engine to the base, then slide the engine forward to disengage it from the generator, and lift it from the base.

(10) For convenience in handling the engine, remove all piping and accessories. These include the air filter, carburetor, fuel strainer, oil drain cock, muffler, oil and water fillers, oil filter, fuel pump, starting motor assembly, and spark plugs and wiring.

(11) Tag any wires to return them to their proper place, and plug the spark plug holes to prevent dirt from getting into the cylinders.

37. WATER PUMP REMOVAL.

When it is found necessary to remove the water pump from the engine, proceed as follows: (1) Before attempting to disassemble the water pump from the engine, drain the radiator.

(2) Loosen the fan belt by loosening the idler pulley cylinder.

(3) Remove the fan.

(4) Disconnect the lower radiator hose.

(5) Remove the three bolts that mount water pump to engine.

(6) Slip the water pump forward, and remove from the engine.

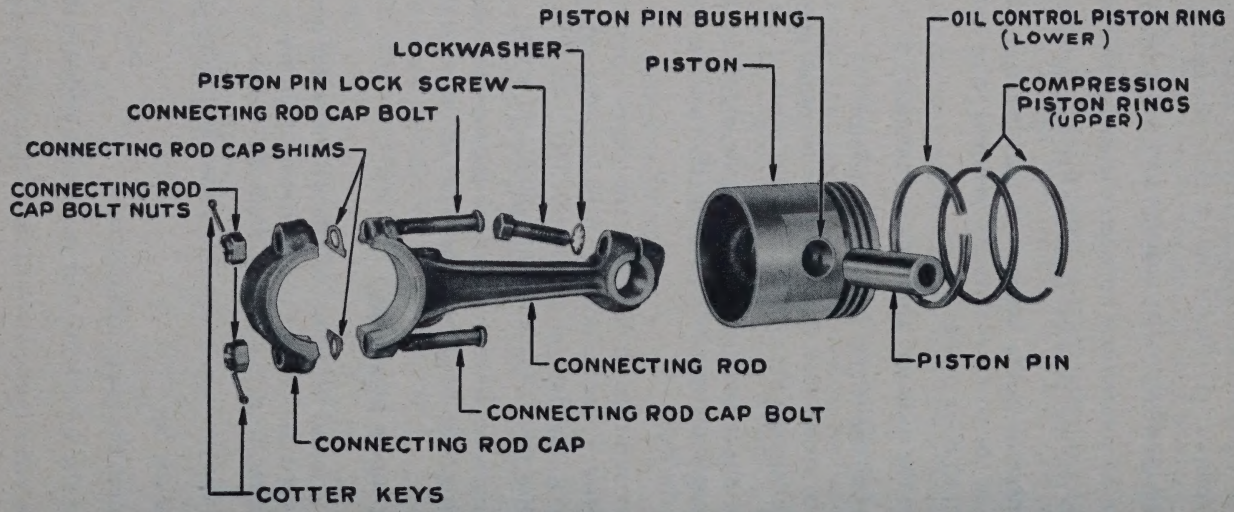


Figure 13. Piston and connecting rod assembly.

38. OIL PUMP REMOVAL AND REPLACEMENT.

a. When it is found necessary to remove the oil pump from the engine, proceed as follows: (1) Remove the three nuts on studs holding oil pump to crankcase.

(2) Slide oil pump from studs.

(3) Remove screw (ref. No. 412, fig. 34), in oil pump cover plate which will allow cover to be removed from housing.

(4) To remove driven gear (ref. No. 422, fig. 34), file off one end of straight pin (ref. No. 423, fig. 34), and drive pin through the shaft.

(5) The oil shaft and rotor (ref. No. 417, fig. 34), can be removed from the body in an assembly.

(6) When removing spring retainer (ref. No. 407, fig. 34), care must be taken not to lose the small washers (ref. No. 409, fig. 34).

(7) Adding shims will increase the oil pressure; removing shims will decrease it.

b. When replacing the oil pump on engine the following procedure should be followed in order to have correct timing for the ignition: (1) Set No. 1 piston coming up on the compression stroke, then turn the flywheel so that the timing mark IGN appears on the flywheel in the center of the hole in the flywheel housing on the right-hand side.

(2) Set the distributor rotor at No. 1 terminal tower in distributor cap and with the points just breaking.

(3) Hold the oil pump in one hand with the oil relief valve retainer in the same position as it would be when installed in the engine; turn the shaft so that the narrow side of the slot in driven gear end is toward you, then line up the pin holding driven gear to shaft so that it will fall in line with the right-hand side of the slot in the pump body. Slide the assembly on studs in the crankcase: feed gear slowly into camshaft gear, noting when fully set if the rotor on distributor has moved from its original setting. If so, remove oil pump and turn one tooth to obtain the correct setting.

39. CONNECTING ROD BEARINGS.

a. Remove the base and oil pan. The crankshaft ends of the connecting rods are fitted with bearing caps and adjusted by means

of shims. The correct clearance between the bearing and the crankshaft is between 0.0008 and 0.0023 inch. The end play should be between 0.005 and 0.009 inch.

b. Adjust the bearing clearance by removing or adding shims until the correct clearance is attained. Check this by moving the bearing from end to end on the bearing journal. Adjust until a definite drag developes, and then add one additional shim and secure the bearing cap. Be sure to replace all locks and washers. Repeat the above steps for each bearing.

40. PISTON REMOVAL.

To remove the piston, proceed as follows: (1) Remove the base or oil pan.

(2) Remove the bearing caps from the crankshaft ends of the connecting rods.

(3) Remove the cylinder head (par. 32).

(4) Push the piston out of the cylinder by pushing on the connecting rod and withdrawing it from the cylinder. Be careful not to scar the cylinder walls with the end of the connecting rod. Be sure to mark each piston and connecting rod assembly so that it may be returned to its original location.

41. FITTING PISTON PINS AND RINGS.

a. Remove piston and connecting rod assemblies (par. 40).

b. Check the piston pin clearance. If it is over 0.0009 inch it will be necessary to replace the piston pin bushings in the piston. This can be accomplished only where suitable equipment is available. It may be possible to take up play by fitting an oversize piston pin.

c. The piston pin may be removed from the piston by loosening the piston pin lockscrew on the inside of the piston. A hexagonal socket wrench is required for this operation. With this screw removed, the pin may be driven from the piston.

d. When reassembling, be sure to replace the lockwasher that secures the piston pin lockscrew.

e. With the pistons removed from their cylinder, the piston rings may be replaced. Each piston is fitted with one oil and two compression rings.

f. Before installing new piston rings, inspect the condition of the cylinder walls and check the piston clearance within the cylinders. The correct piston clearance is 0.003 inch to 0.0025 inch. If the clearance of the piston within the cylinder is over 0.003 inch, oversize rings will be required.

g. To fit new rings, slip the ring down into the cylinder bore. The gap between the ends of the ring should not be more than 0.013 inch and not less than 0.008 inch. If the gap is less than 0.008 inch, file the ends of the ring with a fine file until the correct clearance is attained. Be sure to fit the rings in the cylinders in which they are to be used.

h. Before fitting new rings to a piston or replacing old rings, clean the ring grooves carefully and be sure that all carbon has been removed. The compression rings should have a side clearance when in their grooves, of 0.0005 to 0.001 inch. The oil rings should have a clearance of 0.001 to 0.0015 inch. If a ring fits too tightly in its groove, lap it on a piece of crocus cloth resting on a surface known to be perfectly flat and smooth.

42. INSTALLING PISTON ASSEMBLY.

a. When all necessary work on the piston assembly has been completed the pistons may be installed in their respective cylinders.

b. Insert the piston assembly in the cylinder from which it was removed and to which the piston rings were fitted. Use a ring compressor to compress the rings. If a ring compressor is not available, tie each ring so that it is fully compressed with a piece of string.

c. Press the piston assembly down into the cylinder and as each ring enters the cylinder bore, cut the string on that ring. If a ring compressor is being used, the piston and ring assembly will slide out of the compressor into the cylinder. Tap the top of the piston lightly with a hammer handle to drive it down into the bore of the cylinder.

d. Rotate the piston within its cylinder until the piston pin lockscrew is on the side toward the camshaft, and lower the assem-

bly into position on the crankshaft. Insert the connecting rod bearing cap bolts in the holes in the base of the connecting rod. Place three 0.003 inch shims on the bolts and slip the bearing cap in place.

e. Adjust the connecting rod bearing as instructed in paragraph 39.

43. CAMSHAFT REMOVAL.

a. If it should be necessary to remove or replace the camshaft, the following operations will be necessary: (1) Remove the base, or oil pan.

(2) Remove the capscrews that hold the gear cover to the cylinder block. This cover may now be removed.

(3) Remove the valves (pars. 33 and 34).

(4) Lift all eight valve tappets clear of the camshaft and fasten them so that they will not drop back on the camshaft while it is being removed.

(5) The camshaft may now be pulled out through the gear case end of the engine.

b. Reassemble the camshaft by reversing the procedure for disassembly. Be sure to replace all gaskets and washers when reassembling. Use new gaskets when the old ones are unfit for use, and be sure to clean thoroughly all surfaces before reassembling so that the gaskets will make good contact.

44. CRANKSHAFT REMOVAL.

a. Refer to paragraph 36 for details concerning the removal of the engine from the unit.

b. Before removing the crankshaft, it is advisable to first remove the flywheel.

c. Refer to paragraph 38 for the removal of the oil pump. Remove the oil pump.

d. Remove the connecting rod caps and keep them in the correct relationship with the connecting rods.

e. Remove the main bearing caps and this will enable you to remove the crankshaft.

45. ASSEMBLY OF VALVE TIMING CHAIN AND SPROCKETS.

a. The silent type timing chain is non-adjustable. The lubrication is positive through drilled passages in the crankshaft and sprocket from the front main bearing.

b. To replace timing chain, it is necessary to remove fan blades, radiator, fan belt, crankshaft pulley, and timing case cover. Remove bolts holding camshaft sprocket to camshaft and remove chain.

c. When chain has been removed, for any purpose, it will be necessary to set the valve timing when chain is replaced.

46. VALVE TIMING.

a. To set the valve timing turn the crankshaft so No. 1 and No. 4 pistons are at top dead center.

b. Place camshaft sprocket on camshaft, turn camshaft so punch mark on gear faces punch mark on crankshaft sprocket.

c. Remove sprocket and place the timing chain on, then place timing chain over crankshaft sprocket changing position of camshaft sprocket in chain until the cap screw holes in sprocket and camshaft are in line.

d. Timing is correct when a line drawn between sprocket centers cuts through timing marks on both sprockets (fig. 15).

e. Inlet opens 9° before top center measured on flywheel, or 0.039 inch piston travel from top center.

f. To check valve timing (fig. 14), adjust inlet valve tappet No. 1 cylinder to 0.020 inches. Rotate crankshaft clockwise until piston in No. 1 cylinder just starts on the intake stroke, at which time the tappet should just be tight against end of valve stem and mark on flywheel 10 is in center of timing hole in flywheel housing (fig. 16).

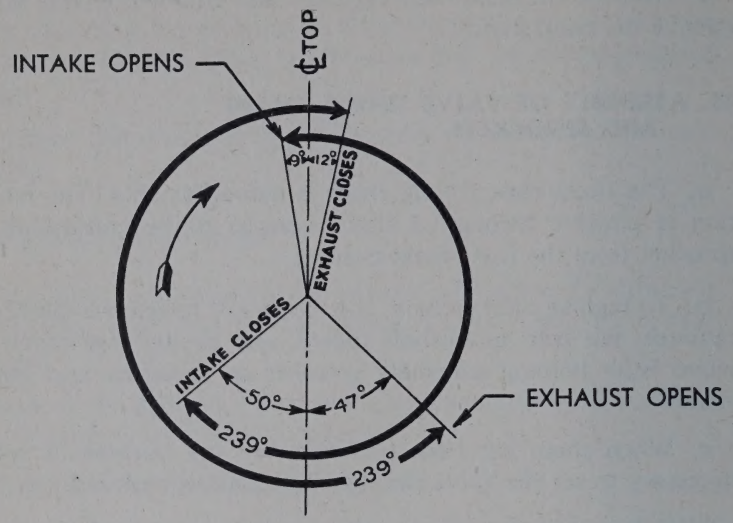


Figure 14. Valve timing.

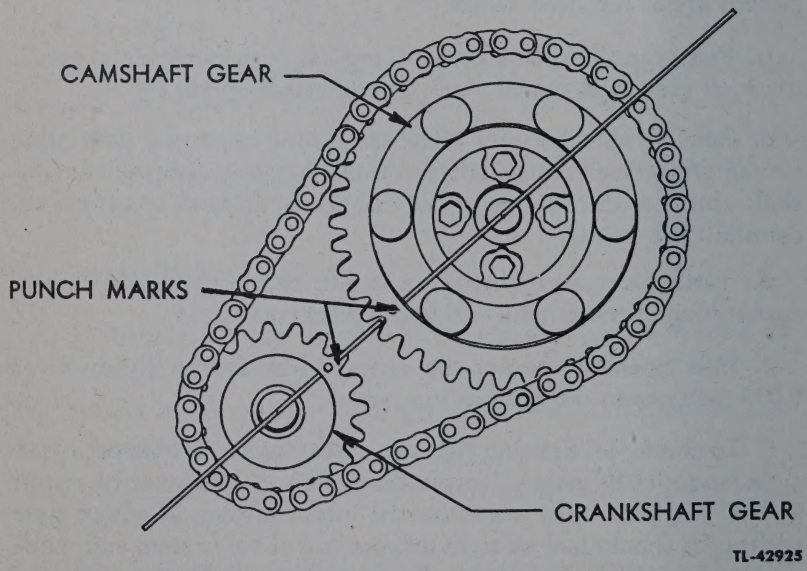


Figure 15. Timing sprockets.

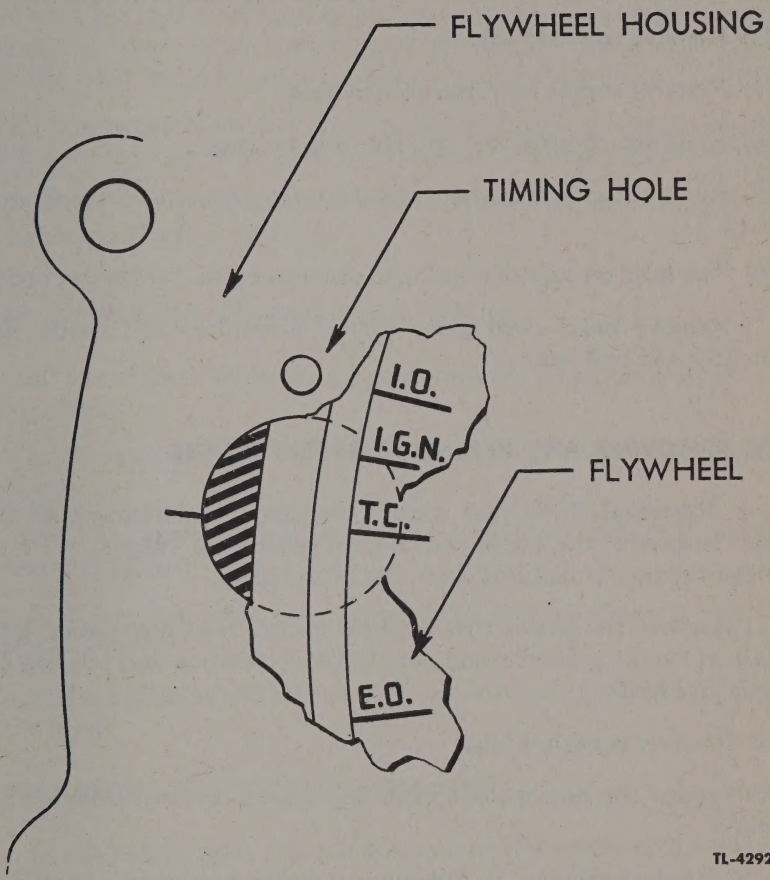


Figure 16. Timing marks (flywheel).

47. ARMATURE REMOVAL.

To remove the armature, proceed as follows: (1) Remove the exciter lead from the rheostat by means of a ¼-inch end wrench.

(2) Remove the field lead.

(3) Remove corner from the exciter head.

(4) Raise the commutator and slip ring brushes.

(5) Remove cap screws that hold the exciter head to the generator body.

(6) Tap head on edge of housing to disengage seat from stator body.

(7) Remove head, then grasp exciter armature with hands, lift slightly and pull out.

48. REMOVING AND REPLACING BRUSHHOLDERS.

a. Removal. First; use steps 1 through 7 of paragraph 47 for the removal of the exciter head; then proceed as follows: (1) Remove the exciter coil lead from the brushholder.

(2) Remove the screws that hold the exciter field pole pieces. Use care in handling of coils and note EXACT position and relation of coils and leads.

(3) Remove capacitor lead.

(4) Loosen the brushholder mounting screws on both sides of the head.

b. Replacement. (1) The outer slip ring brushholder is placed at the bottom of the exciter head.

(2) See that the commutator brush sockets with brushes are in a position half way between adjacent exciter field poles.

(3) Tighten setscrews on sides of head.

(4) Reconnect the capacitor. The capacitor mounts on the exciter head just to the right of the hole in the head through which the exciter leads come out.

(5) The short lead of the exciter coil connects to the lower left-hand commutator brush when facing the large opening of the housing.

(6) Set the coils so their connections are towards the operator and with the first coil connected to the brushholder set at the bottom of the head, progress counter clockwise around the head.

(7) Wrap the pole pieces with insulation board. Insulate the coils from the flux ring and insulate between the pole piece ear and coil.

(8) Bring the long lead of the last coil over the last coil and out through the hole in the head.

49. GENERATOR BEARING REPLACEMENT.

a. Use steps 1 through 7 of paragraph 47 for removal of the exciter head.

b. Remove bearing from armature shaft by means of a bearing puller.

c. When replacing the bearing, be sure sealed side of bearing is next to slip ring.

d. Use a soft hammer or brass punch and tap bearing onto the armature shaft.

e. Pack the bearing with a good grade of cup grease and replace the head.

50. AUTOMATIC VOLTAGE REGULATOR.

a. Maintenance. No maintenance of the regulator is required under normal atmospheric conditions. In case of unusual concentration of dirt or dust in the atmosphere, the regulator cover should be removed at regular intervals and any dust carefully blown out.

> **CAUTION:** At No Time Should The D-C Coil Circuit Of The Regulator Be Opened Without First Disconnecting The D-C Potential Wires.

b. What to Do in Case of Trouble. In case of difficulty, refer to the following chart:

WHAT TO DO IN CASE OF TROUBLE

(1) Regulator not working. Look for	Open circuit. Exciter Field Rheostat not on the marked position (At or near ALL-OUT). A-c. Generator Field rheostat not on the marked position. Short Circuit across regulating resistance of regulator. Obstruction in air gap of regulator magnetic circuit. No a-c voltage on a-c. leads of regulator. Circuit open between exciter field and regulating resistance.
(2) A-c. voltage erratic or swings violently. Look for	Loose or poor connections.
(3) A-c. voltage droops badly when generator is loaded. Look for	Exciter speed below normal. Exciter field rheostat not on marked position. Generator field rheostat not on marked position.
(4) Sparking at silver buttons. Look for	Excessive dust or dirt between buttons. Open circuit or poor connections between silver buttons and regulating resistance. Open circuit in regulating resistance.

51. TROUBLE AND REMEDY CHART.

Symptom	*Possible cause*	*Check*	*Remedy*
a. Engine.			
Fails to start or hard to start.	3-way fuel valve in wrong position.	Valve.	Place correctly.
	Oil pressure cut-off, relay not working.	Relay.	Replace.
	Stop switch shorted.	Magneto shorting contacts.	Remove short.
	Water in fuel.	Fuel strainer.	Remove water from fuel system.
	Faulty ignition.	Spark plug.	See paragraph 27.
	Lack of fuel.	Fuel supply.	Replenish fuel supply.
	Fuel not getting to carburetor.	Valve below gas tank.	Open valve.
	Small knob of low-pressure high-temperature Emergency stop on RUN position.	Knob position.	Replace knob to ON position.
	No spark of cylinders.	Check for spark by removing wire from plug and turning over engine a few times.	Test spark plugs, magneto, capacitor, timing.
	Carburetor clogged or defective.	Carburetor.	Prime engine by removing spark plugs and injecting gas in cylinders. Change carburetor.

51. TROUBLE AND REMEDY CHART—Continued.

Symptom	*Possible cause*	*Check*	*Remedy*
	Carburetor or intake manifold loose.	Nuts and cap screws.	Tighten, or if necessary, replace gasket.
	Defective wiring.	Ignition wires.	Correct faults.
	Air filter clogged.	Filter.	Clean filter.
	Valves incorrectly adjusted.	Valve clearance.	Readjust valves.
Engine misfiring.			
	Loose connections in ignition system.	All ignition connections.	Correct fault.
	Dirty or defective spark plug or plugs.	Spark plugs.	Clean or replace faulty plugs.
	Breaker points out of adjustment.	Breaker points.	See paragraph 27.
	Breaker points pitted.	Breaker points.	Replace points.
	One or more valves not closing properly.	Valve adjustment. Valve springs. Sticking valves.	Correct fault or report to higher echelon of repair.
	Loose spark plug wire or wires.	Spark plug wires.	Tighten spark plug terminal nuts.
	Faulty carburetion.	Carburetor.	See paragraph 18.

	Air leaks in intake system.	Carburetor flange manifold gaskets and fastenings. Cracks in intake manifold.	Correct fault.
Engine overheating.	Water passage clogged.	Water passage.	Drain and flush cooling system.
	Radiator frozen.	Radiator.	Thaw out. Open radiator drain cock to see if liquid flows.
	Lack of lubrication.	Crankcase OIL LEVEL with bayonet gauge.	Replenish oil.
	Muffler clogged.	Muffler.	Replace muffler.
	Incorrect valve adjustment.	Valve adjustment.	Readjust valves.
	Carburetor float valve set too high.	Float valve.	Correct adjustment.
	Automatic choke not functioning properly.	Choke operation.	Correct fault, or disconnect.
	Air cleaner dirty.	Air cleaner.	Clean.
	Generator overload.	Load.	Correct load.
	Lack of cooling liquid in radiator.	Radiator.	Replenish liquid.
Engine heats and automatic cut-off shuts off engine.	Little, or no water in radiator.	Water level in radiator.	Replenish.
	Loose fan belt.	Fan belt.	See that it shows a one-inch deflection when snapped with fingers.

51. TROUBLE AND REMEDY CHART—Continued.

Symptom	*Possible cause*	*Check*	*Remedy*
	Low oil pressure.	Oil level and bearings.	Replenish oil in crankcase. Check for loose or tight bearings.
Engine runs irregularly.	Over-rich gasoline mixture.	Check by trial.	Adjust lean-rich mixture on carburetor.
	Cylinders firing irregularly.	Plugs by grounding out with screwdriver.	Defective cylinder will not cause change in speed or sound of exhaust. Check timing.
Engine knocks.	Excessive carbon on head.	Head for carbon deposit.	Send back for removal of carbon.
	Loose bearings.	Stop engine, rock by using hand crank.	If bearing is defective, send to repair depot.
	Excessive carbon.	Cylinder head.	Clean cylinder head and piston head.
	Fuel mixture too lean.	Close choke part way and note any improvement.	Correct float valve adjustment, or clean carburetor.
	Lack of lubrication.	Crankcase OIL LEVEL.	Replenish oil.
	Loose flywheel.	Flywheel.	Report to higher echelon.
	Engine overheated.	Condition of cooling system, air intake, and ventilation.	Correct fault.

	Loose connecting rod or piston pin bearings.	Rock against compression with hand crank and feel for play.	Report to higher echelon of repair.
	Broken valve.	Compression. Remove cylinder head and check valves.	Report to higher echelon of repair.
	Incorrect timing.	Timing.	See paragraph 27, and 46.
	Worn piston and/or cylinders.	Compression.	Return to depot.
Engine backfires.	Incorrect timing.	Timing.	See paragraph 27.
	Fuel mixture lead.	Carburetor.	Correct adjustment of float. See paragraph 18.
	Intake valves not seating.	Compression.	Correct fault. See paragraph 34.
	Air leaks in intake manifold.	Leaks.	Correct fault.
	Intake valve springs weak.	Valve springs.	Replace springs.
	Intake valve warped, or broken.	Compression, and valves.	Replace faulty valves.
	Intake tappets set too close.	Valve adjustment.	Readjust valves.
	Intake valves sticking.	Compression. Valve stems for excessive carbon.	Clean valve stems.
Excessive smoking.	Upon first starting, protective oil from cylinders not burned out.	Check further if excess continues after four or five minutes.	Allow to burn out.
	Too much oil.	Oil level with bayonet gauge.	Drain off any excess.

51. TROUBLE AND REMEDY CHART—Continued.

Symptom	*Possible cause*	*Check*	*Remedy*
	Fuel mixture too rich.	Carburetor float level.	Readjust float level.
	Oil too light.	Body of oil.	Refill with oil of correct viscosity.
	Worn piston, rings, or cylinder wall.	Compression.	Return to depot.
	Worn connecting rod.	Refer to engine knocks.	Return to depot.
Weak compression.	Cylinder head gasket leaking.	Cylinder head cap screws.	Tighten cylinder head cap screws. If necessary, install a new gasket.
	Valves not seating properly.	Valves.	Correct fault. See paragraph 34.
	Valves sticking.	Valve action.	Clean valve stem.
	Valve tappets set too close.	Valve adjustment.	Readjust valves.
	Piston rings and/or cylinder worn.	Rings and cylinder wall.	Return to depot.
Surging or uneven operation.	Lean mixture in carburetor.	Gradually close the choke. If mixture is lean, unit will speed up slightly and run more smoothly at a certain choke position.	Clean out fuel line. Remove carburetor and blow out dirt.

	Air leak in manifold.	Check exhaust noise at manifold.	Replace manifold gasket.
	At no load.	Check anti-surge screw position on governor.	Screw in anti-surge screw on governor.
	Piston rings and/or cylinder worn.	Rings, and cylinder wall.	Return to depot.
b. Fuel Pump.			
(1) Fuel leaks.	Loose sediment cup.	Sediment cup.	Tighten cup bracket nut.
	Faulty sediment cup gasket.	Gasket.	Replace gasket.
	Loose fuel line fittings.	Fittings.	Tighten fuel pump inlet and outlet fittings. Replace, if threads are stripped.
	Broken fuel pump diaphragm.	Diaphragm.	Replace diaphragm.
	Stuck valve.	Valve.	Free, or replace valve assembly.
(2) Low fuel pressure.	Air leaks in system.	Connections.	Tighten connections.
	Pull rod assembly out of order (fig. 45, ref. No. 506).	Pull rod assembly.	Replace pull rod assembly.
	Stuck valve.	Valve.	Free, or replace valve assembly.
	Broken lever or diaphragm spring.	Lever and spring.	Replace spring.
c. Generator.			
(1) Sparking at brushes.	Excessive load.	Load.	Reduce load.

51. TROUBLE AND REMEDY CHART—Continued.

Symptom	*Possible cause*	*Check*	*Remedy*
	Brushes not seating properly. Dirty brushes and/or commutator.	Brushes, and commutator.	Replace and clean as necessary.
	Commutator pitted.	Commutator.	Clean as needed.
	High mica on commutator.	Commutator.	Return to depot.
	Open circuit in exciter armature.	Armature.	Replace armature.
	Open circuit in main generator field rheostat lead.	Lead.	Repair lead.
(2) A-C voltage low.	Engine not up to speed.	Frequency meter.	Check engine for cause.
	Voltage regulator not operating properly.	Switch to manual rheostat and check.	Operate on manual control until replacement can be made.
	Dirt on exciter slip.	Slip rings.	Clean.
	Worn exciter brushes.	Brushes.	Replace brushes.
	Short, ground or opening in field circuit.	Field circuit.	Report to depot.
(3) Frequency incorrect.	Engine speed is incorrect.	Governor.	Adjust engine governor (par. 19).

(4) Generator fails to deliver voltage or amperage.	No load on generator.		Apply load.
	Circuit breaker off.		Close circuit breaker.
	Dirt on exciter rings.	Exciter rings.	Clean rings.
	Exciter brushes sticking.	Exciter brushes.	Clean, or replace brushes.
	Exciter brushes worn.	Exciter brushes.	Replace brushes.
	Open circuit in field.	Field circuit.	Check and repair if possible; if not, return to depot.
(5) No voltage output.	Generator exciter or slip brushes not making contact wirh commutator and slip ring.	Check all brushes.	Push brushes down until they come in contact with commutator and slip ring.
	No residual magnetism in exciter field poles.	Check exciter voltage (should read about 65 volts).	Use a 6-volt storage battery and touch terminals to brushes on commutator.
	Excessive resistance in shunt field.	Check for breaks in wiring, open circuits and rheostat control.	Repair any breaks or opens, or change rheostats.
(6) Generator overheated.	Overload on generator.	Load.	Reduce load.
	Cooling fan obstructed.	Fan air passages.	Clean.

51. TROUBLE AND REMEDY CHART—Continued.

Symptom	*Possible cause*	*Check*	*Remedy*
d. Shocking.			
Shock upon touching unit.	Ground in shunt field.	By using 110-volt supply with a lamp of corresponding voltage in series and placing one terminal on shunt field lead and the other terminal on generator lead.	Replace field.
	Ground in stator.	Repeat the above, but place terminals to stator lead and frame.	Replace stator.

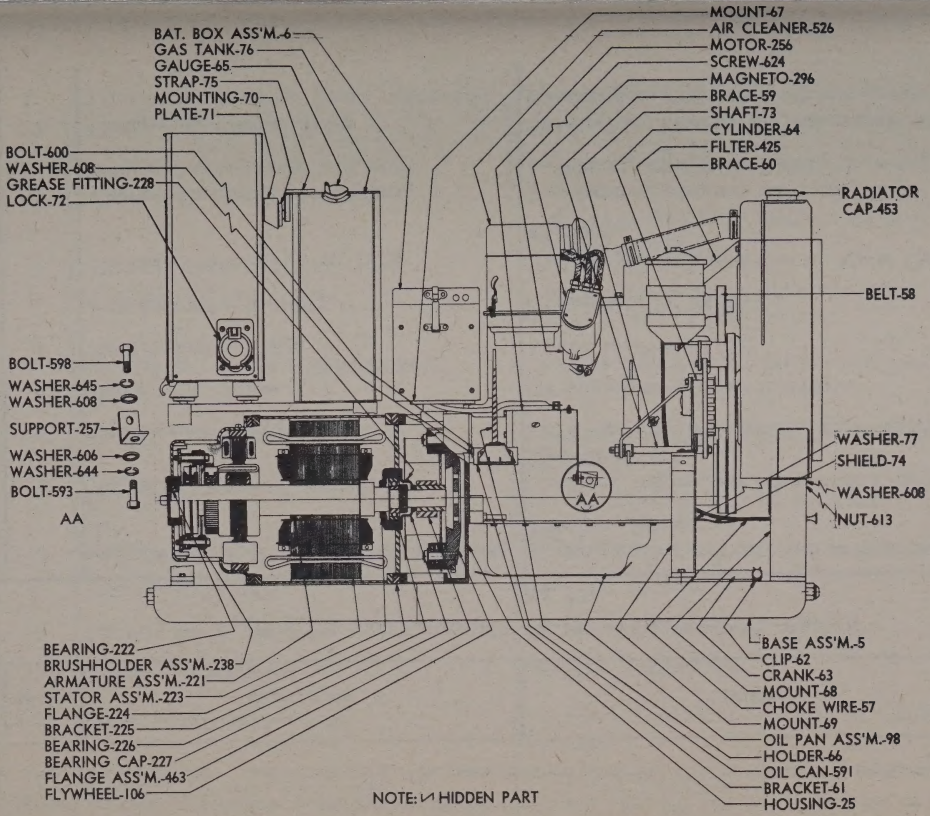


Figure 17. Power unit PE-182, left side.

52. ILLUSTRATED PARTS LIST.

This paragraph contains a complete illustrated parts list for Power Unit PE-182 including a list of tools and a tabular list of bolts, nuts, screws, washers. and cotter pins. The maintenance parts list will be found in Supplementary Data, section V.

Ref. No.	*Quan.*	*Description*	*Function*	*Mfg's Part No.*	*Mfg.*
		POWER UNIT GROUP PE-182—COMPONENT PARTS (fig. 17)			
1	2	Adapter—⅛ IMP x ½—20 thread—steel ZP.	Connecting Ends of Fuel Line Leading from Filtrap to Pump.	Order by size	14
2	1	Adapter—Therma Couple Tube.	Connects Temperature Element to Engine Cyl. Head.	10J2016	18
3	1	Brace—Left Radiator	Holds Radiator in Proper Vertical Position.	10J173	18
4	1	Brace—Air Cleaner.	To Mount Air Cleaner to Motor.	10J107	18
5	1	Base Assembly—Skid.	Mount for Power Unit.	10J14	18
6	1	Box Assembly—Battery.	Encasement for Battery.	10J65	18
7	6	Clamps—Hose—1½" No. 10½.	Fastens Water Inlet Hose to Water Outlet Hose.	3 ply-X	1
8	2	Clamp—Carburetor Air Cleaner.	1—Mounts Carburetor Air Horn. 1—Mounts Air Cleaner Horn.	A-281	46
9	2	Clamp—Air Cleaner Tube.	Mounts Flex. Hose to Air Cleaner and Carburetor Horn.	A-1515	46

10	2	Connector—5/16 (male flare) steel—zinc plated.	Connects Fuel Line to Filtrap and Pump.	137398	12
11	4	Connector—L—1/8 pipe x 1/4 brass.	2—Connects Oil Gauge Line to Engine and Oil Gauge. 2—Connects Oil Gauge Line to Oil Gauge and Safety Switch.	801	24
12	1	Coupling—1/4" steel pipe.	Connects Nipple to Flexible Pipe Assembly that Connects with Filtrap.	Order by size	14
13	3	Ell—Street—1/4" 90° malleable iron.	Connects Flexible Pipe Assembly from Gas Tank to Filtrap.	Order by size	14
14	2	Ell—5/16" flared tube.	Connects Pipe from Carburetor to Fuel Pump Assembly.	384549	46
15	1	Fan—Radiator.	Provides Cooling Draft for Radiator.	10J199	18
16	1	Filtrap.	Filters Fuel.	0W400	39
17	1	Gasket—Fuel Pump.	Used with ref. No. 502.	638737	46
18	1	Gauge—Oil (2" 0-50#).		Type C	11
19	1	Gauge—Temperature.	Indicates Temperature.	8585A	11
20	1	Hook—Carburetor Idling.	To Hold Carburetor Throttle in Idling Position.	10J193	18
21	1	Horn—Carburetor Air Cleaner.	Controls Direction of Air.	A-463	46
22	1	Hose—Air.	Transfer of Air from Air Cleaner to Carburetor.	10J221	18

52. ILLUSTRATED PARTS LIST—Continued.

Ref. No.	*Quan.*	*Description*	*Function*	*Mfg's Part No.*	*Mfg.*
23	2	Hos7—Water Inlet.	Connects Water Inlet Pipe to Radiator.	25J172	18
24	1	Hose—Water Outlet.	Conveyor for Water Between Radiator and Engine.	10J256	18
25	1	Housing—Bell.	To Hold and Protect Power Generator.	HJ-1	18
26	2	Latch—Door.	Fastens Control Panel Box Door.	J-453	18
27	1	Line—Fuel.	Transfer Fuel from Oil Gauge to Safety Switch.	10J190	18
28	1	Line—Fuel.	Transfer Fuel from Governor to Oil Filter.	10J229	18
29	1	Line—Fuel.	Transfer Fuel from Filtrap to Fuel Pump.	10J187	18
30	1	Line—Oil.	Transfer Fuel from Motor to Oil Gauge.	10J191	18
31	1	Muffler Assembly.	Deadening of Sound.	10J184	18
32	1	Mount—Left Motor.	Mounts Engine to Base.	10J140	18
33	1	Nipple—1¼" x 2½" long.	Exit for Exhaust from Muffler.	10J185	18
34	1	Nipple—Close—⅛" pipe thread—steel.	Connects Filtrap to T-Valve.	Order by size	14
35	1	Nipple—Close—½" x 1¼" long.	Connects ¼" Street Elbow with Gas Tank.	Order by size	18
36	1	Nipple—long ¼" x 3" BS pipe.	Convey Fuel from Connector to Flexible Tube.	Order by size	14
37	1	Pan—Control Panel Mounting.	Supports Control Panel.	10J260	18

38	1	Panel Assembly—Control.	Supports Instruments.	10J258	18
39	1	Panel Box—Control.	Encases Control Panel.	10J82	18
40	1	Panel Brace—Control.	Supports Panel and Gas Tank.	10J243	18
41	1	Panel—Engine.	Holds Instruments.	10J146	18
42	8	Pads—Gas Tank.	Cushion between Fuel Tank and Control Panel Brace.	DW1453	18
43	2	Pin—Brass Tubular Dowel.	Mounts Front Section of Base to Rear Section.	10J252	18
44	1	Pipe Assembly—Exhaust.	Conveys Exhaust from Engine to Muffler.	10J200	18
45	1	Pipe Assembly—Flexible 5/16" x 4½" (includes connectors).	Fuel Supply Line from Tank to Filtrap.	Order by size	12
46	1	Plate—Valve.	Encloses Valve Housing.	10J225	18
47	1	Pipe—Water Inlet.	Conveys Water between Radiator and Engine.	10J131	18
48	1	Ring—Air Cleaner Adapter.	Directs Flow of Clean Air from Air Cleaner through Hose leading to Carburetor.	10J150	18
49	1	Rod Assembly—Throttle.	Connects Precision Governor operating Lever with Carburetor Throttle.	10J213	18
50	1	Shield and Restrictor—Intake Manifold.	For Protection.	A-6531	46
51	1	Switch—Toggle.	Turns Electricity ON and OFF.	8963-7320	3
52	1	Switch—Starter.	Opens and Closes Circuit between Battery and Starter Motor.	SW-4001	11

52. ILLUSTRATED PARTS LIST—Continued.

Ref. No.	Quan.	Description	Function	Mfg's Part No.	Mfg.
53	1	Tube—Flexible (¼" x 10½" long), includes connectors.	Transfers Oil from Governor to Engine Valve Housing.	Order by size	12
54	1	Valve—Brass Needle.	Shuts Off Fuel Supply to Filtrap.	VAS-7	10
55	1	Valve—T (3 way ⅛" male thread).	Controls Fuel Distribution.	8L	24
56	2	Washer—Manifold Clamp.	Mounts Exhaust Pipe Assembly to Manifold.	344732	46
57	1	Wire—Choke. (fig. 18).	Holds Choke Shutter in Desired Position while Starting Motor.	PM-1110	35
58	1	Belt—Fan and Generator Drive.	Turns Generator and Fan.	A-1495	46
59	1	Brace—Idler Pulley.	Supports Idler Pulley.	10J205	18
60	1	Brace—Right Radiator.	Supports Radiator.	10J174	18
61	1	Bracket—Oil Can Holder.	Supports Oil Can Holder.	10J271	18
62	1	Clip—Crank.	Hold Crank Stationary.	10J273	18
63	1	Crank.	For Starting Engine.	10J133	18
64	1	Cylinder—Idler Pulley.	Houses Interior Idler Parts.	10J95	18
65	1	Gauge—Gas.	Resisters Fuel Supply.	3612	34
66	1	Holder—Oil Can.	Holds Oil Can.	10123	29

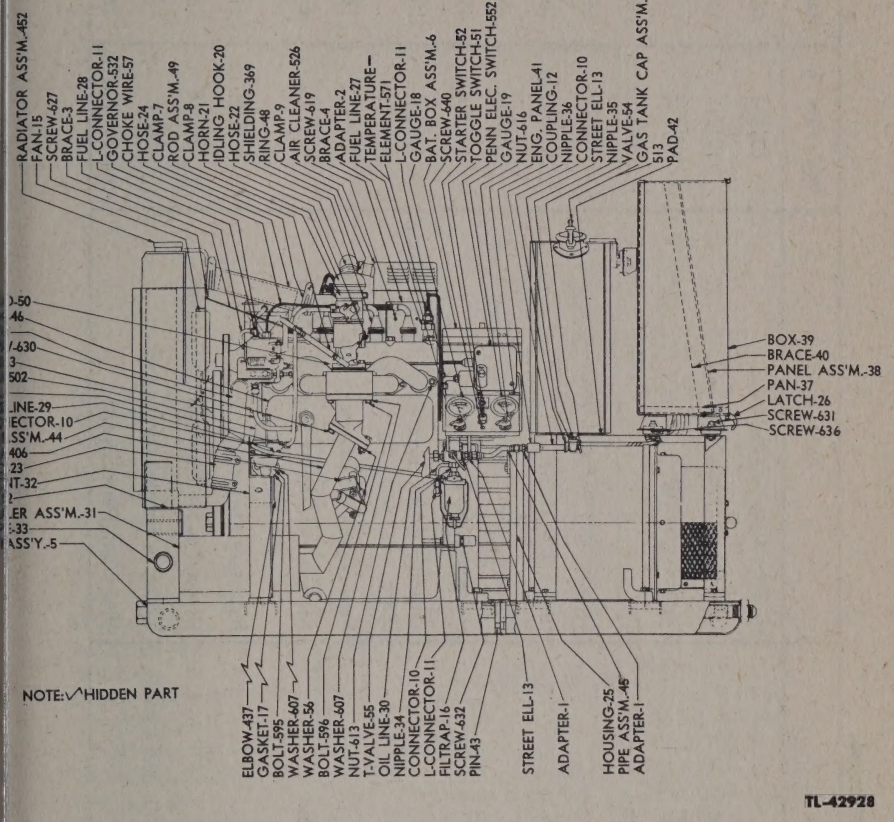


Figure 18. Power unit PE-182, right side.

52. ILLUSTRATED PARTS LIST—Continued.

Ref. No.	Quan.	Description	Function	Mfg's Part No.	Mfg.
67	1	Mount—Battery Box.	Base for Battery Box.	10J262	18
68	1	Mount—Radiator.	Mounts—Radiator to Base.	10J119	18
69	1	Mount—Right Motor.	Supports Motor.	10J101	18
70	5	Mounting—Shock Absorber.		200P-20	23
71	5	Plate—Mounting.	Mount Control Panel Box.	10J93	18
72	1	Receptacle—Twist Lock.	Convenient Outlet.	7380-7382	16
73	1	Shaft—Idler Pulley.	Supports Idler Pulley.	10J206	18
74	1	Shield—Fan Pulley.	Protection for Fan Belt.	A-1124	46
75	1	Strap—Gas Tank.	Provides Attachment Point for Mounting Plate.	10J232	18
76	1	Tank—Gas.	Fuel Supply for Engine.	10J13	18
77	6	Washer—Fan Pulley Shield. (fig. 19).	Mounts Fan Pulley Shield to Oil Pan.	A-1125	46
78	3	Ammeter (Triplett 0-50A).	Registers Amperes.	332JP	41
79	4	Block—Terminal.	Protection for Terminal Connection.	10J228	18
80	1	Breaker—Circuit 50-150 V., 50A 2 pole.	Make, or Break Load Circuit.	0322	17
81	2	Bulbs—Light (50W-120V).	Illuminate Panel Board.	Order by name	28

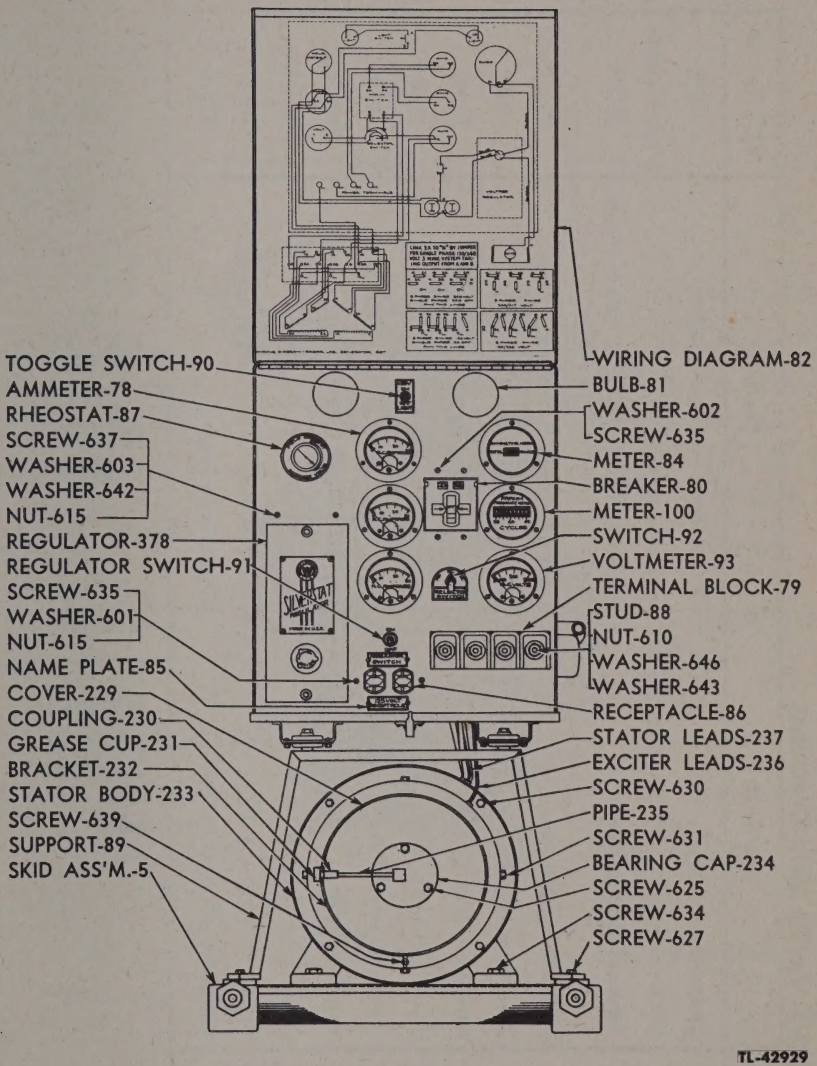


Figure 19. Control panel, front view.

52. ILLUSTRATED PARTS LIST—Continued.

Ref. No.	*Quan.*	*Description*	*Function*	*Mfg's Part No.*	*Mfg.*
82	1	Diagram—Wiring (fig. 4).	Shows Panel Instrument Wiring.	10J98	18
83	1	Meter—Frequency (58-62 cycles).	Registers cycles.	Order by name	20
84	1	Meter—Running Time.	Registers Motor's Running Time in Hours, and Tenths of Hours.	RT2H	7
85	1	Plate—Receptacle Name.	Identification of Receptacle Voltage.	35J228	18
86	1	Receptacle—Double.	Convenient Outlets.	1913	3
87	1	Rheostat—Type D.	Variation of Resistance in Circuit.	D-150	30
88	4	Stud—⅜"—16 x 2⅝".	Terminal Connecting Post.	10J219	18
89	1	Support-Control Panel		10J81	18
90	1	Switch—Toggle.	Control Electric Current.	8963-7320	3
91	1	Switch—Voltage Regulator.	Regulates Voltage.	8963-7320	3
92	1	Switch—Voltage Selector.	Selects Voltage.	1411	6
93	1	Voltmeter—Triplett (0-300V).	Registers Voltage.	332JP	41

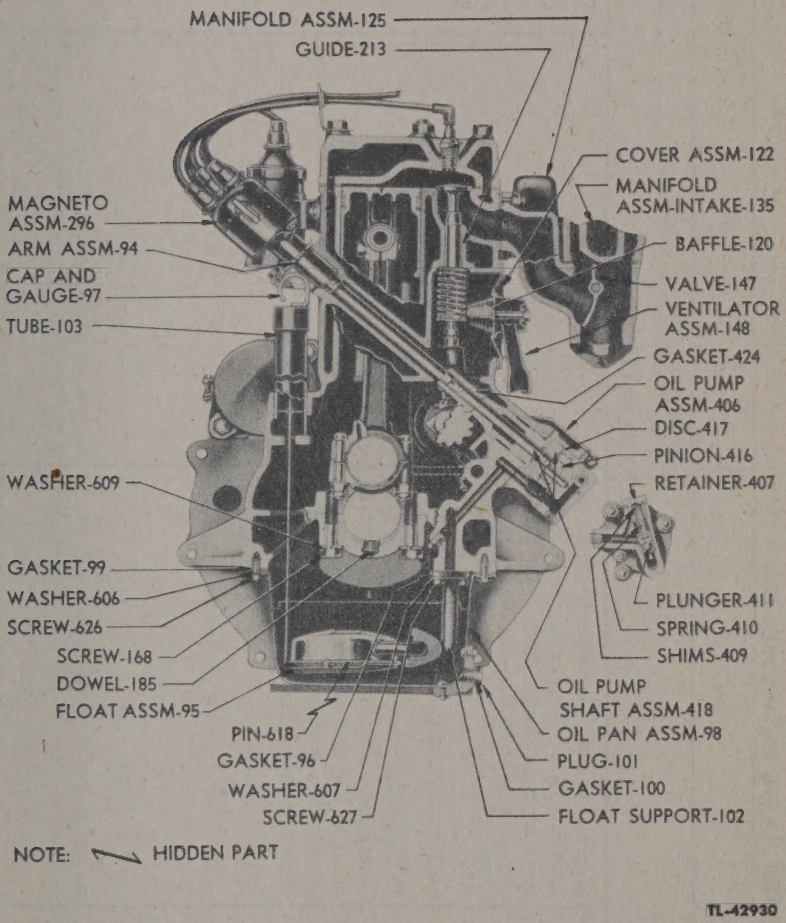


Figure 20. Engine, front sectional view.

52. ILLUSTRATED PARTS LIST—Continued.

Ref. No.	Quan.	Description	Function	Mfg's Part No.	Mfg.
		ENGINE			
		(figs. 20, 21, and 22)			
	1	Engine Assembly Complete (Includes all Electrical Units, Carburetor, Fan, Governor, Fan and Governor Belts, Fuel Pump and all Other Parts from Flywheel forward ready to run.		A-6411	46
	1	Engine Overhaul Gasket Set.		A-1536	46
	1	Cylinder Block and Bearings and Pistons Complete—Note: The Pistons after being fitted to the Cylinder Block will be removed; then wrapped in moisture proof paper and packaged with the Block.		A-6793	46

FRONT SECTIONAL VIEW—ENGINE GROUP

(fig. 20)

94	1	Arm Assembly—Advance Control.	Advance, or Retard Spark Control.	A-1674	46
95	1	Float Assembly—Oil.	Strains Oil that Enters Oil Pump.	630396	46
96	1	Gasket—Oil Float Support.	Mounts Oil Pump to Cankcase.	630398	46
97	1	Indicator—Oil Filler Cap and Level.		636322	46
98	1	Oil Pan Assembly.		A-1167	46
		Oil Pan Gasket Set (Includes one each of the following: 639980, 630398, and 314338).		A-1538	46
99	1	Gasket—Oil Pan.	Used with ref. No. 98.	639980	46
100	1	Gasket—Oil Pan Drain Plug.	Used with ref. No. 101.	314338	46
101	1	Plug—⅞" Oil Pan Drain.	Drains Oil Pan.	639979	46
102	1	Support—Oil Float.	Used with ref. No. 95.	630397	46
103	1	Tube—Oil Filter.	Entrance for Crankcase Oil.	636216	46

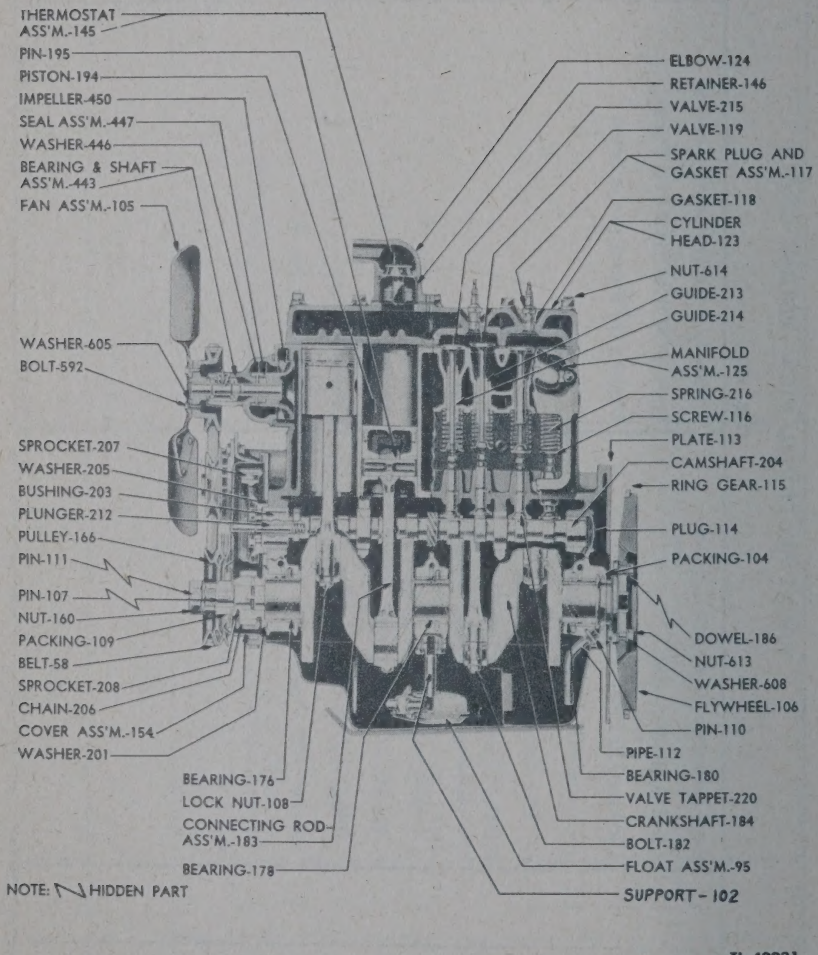


Figure 21. Engine, side sectional view.

52. ILLUSTRATED PARTS LIST—Continued.

Ref. No.	Quan.	Description	Function	Mfg's Part No.	Mfg
		SIDE SECTIONAL VIEW—ENGINE GROUP			
		(fig. 21)			
104	1	Bearing—Rear End Crankshaft.		637237	46
105	1	Fan Assembly.	Circulates Air.	A-447	46
106	1	Flywheel Assembly with Ring Gear.	Stabilizes Momentum.	A-1443	46
107	1	Key—No. 9 Woodruff.	Mounts Pulley to Crankshaft.	5036	46
108	8	Locknut—Connecting Rod Bolt.	Used with ref. No. 182.	52825	46
109	1	Packing—Front End Crankshaft.	Retains Lubricant.	637098	46
110	1	Pin—⅛" x ⅞".	Mounts Oil Drain Tube to Rear Bearing Cap.	337112	46
111	1	Pin—Starting Crank.	Locks Crank in Position to Start Motor.	28023	46
112	1	Pipe—Drain.	Drains Oil from Bearing.	630294	46
113	1	Plate—Rear Engine.	Cover for Rear End of Cylinder Block.	A-5121	46
114	1	Plug—1¾" Expansion.	For Rear Camshaft Bearing.	51460	46
115	1	Ring Gear—Flywheel (97 teeth).	To Facilitate Starter Motor Function.	635394	46
116	8	Screw—Valve Tappet Adjusting.		637048	46
117	4	Spark Plug and Gasket Assembly.	Provides Spark for Engine.	QM-2	8

52. ILLUSTRATED PARTS LIST—Continued.

Ref. No.	Quan.	Description	Function	Mfg's Part No.	Mfg.
118	4	Gasket—Spark Plug:	Used with ref. No. 117.	637863	46
119	8	Valve—Inlet.		637182	46
		CYLINDER HEAD, MANIFOLD AND VALVE COVER (fig. 22)			
120	1	Baffle—Crankcase Ventilator.		630298	46
121	2	Bearing—Heat Control Valve Shaft.	Mounts Heat Control Shaft.	637206	46
122	1	Cover Assembly—Valve Spring.	Encloses Valve Spring.	656554	46
123	1	Cylinder Head.	Encloses Compression.	A-1534	46
124	1	Elbow—Water Outlet.	Directs Water from Engine to Radiator.	639649	46
125	1	Exhaust Manifold Assembly.		A-912	46
126	1	Gasket—Cover.	Crankcase Ventilator to Valve Cover Gasket.	630299	46
127	1	Gasket—Cylinder Head.	Used with ref. No. 123.	638678	46
128	1	Gasket—Intake and Exhaust Manifold.	Used with ref. No. 136.	638640	46
129	1	Gasket—Intake to Exhaust Manifold.	Used with ref. No. 135.	634811	46
130	1	Gasket—Valve Spring Cover.	Used with ref. No. 122.	630305	46
131	1	Gasket—Valve Spring Cover Screw.	Used with ref. No. 140.	51875	46
132	1	Gasket—Water Outlet Elbow.	Used with ref. No. 124.	639650	46

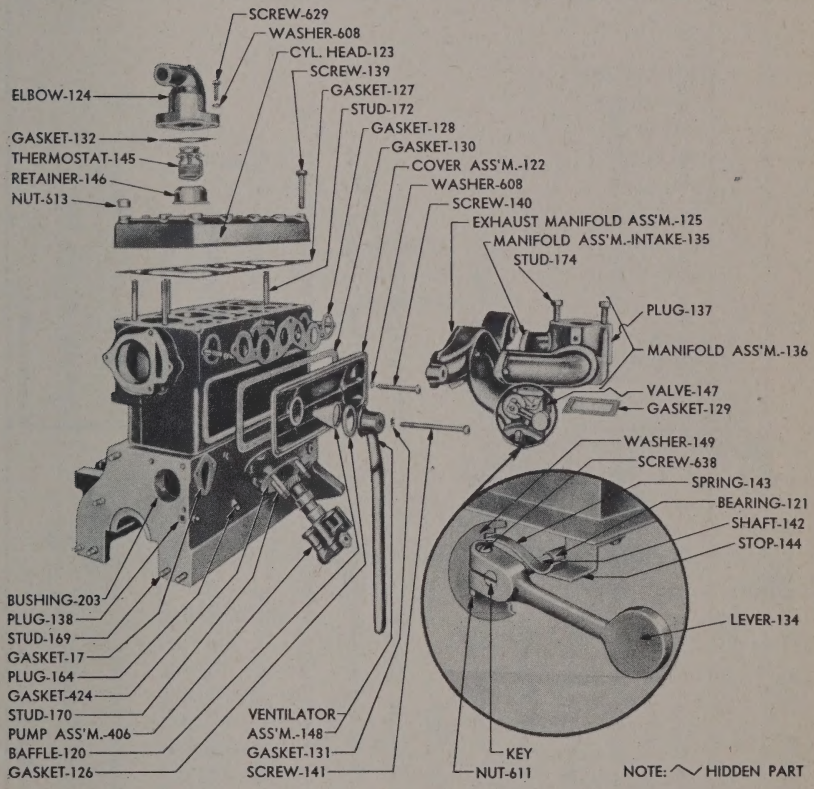


Figure 22. Cylinder head, manifold and valve cover.

52. ILLUSTRATED PARTS LIST—Continued.

Ref. No.	*Quan.*	*Description*	*Function*	*Mfg's Part No.*	*Mfg.*
133	1	Key—Heat Control Lever.	Mounts Heat Control Lever to Heat Control Shaft.	637211	46
134	1	Lever—Heat Control Valve Counterweight.	Causes Tension on Valve Spring.	637210	46
135	1	Manifold Assembly—Intake.		A-1166	46
136	1	Manifold Assembly—Intake and Exhaust.		A-1165	46
137	2	Plug—¼" Manifold Pipe.	For Intake Manifold.	5138	46
138	2	Plug—⅜" Pipe.		376373	46
139	7	Screw—Cylinder Head.	Mounts Cylinder Head.	638635	46
140	1	Screw—Rear Valve Spring Cover.	Mounts Valve Spring Cover.	639052	46
141	1	Screw—Valve Spring Cover Cap (Front).	Mounts Valve Spring Cover Cap.	632158	46
142	1	Shaft—Heat Control Valve.	Mounts Heat Control Valve.	637206	46
143	1	Spring—Heat Control Valve.	Controls Lever Action.	637208	46
144	1	Stop—Heat Control Valve Bi-Metal.	Stops Valve Spring.	639743	46
145	1	Thermostat Assembly.	Controls Water Circulation.	3108628	15
146	1	Thermostat Retainer.	Used with ref. No. 145.	639651	46
147	1	Valve—Heat Control.	Controls Heat.	636439	46

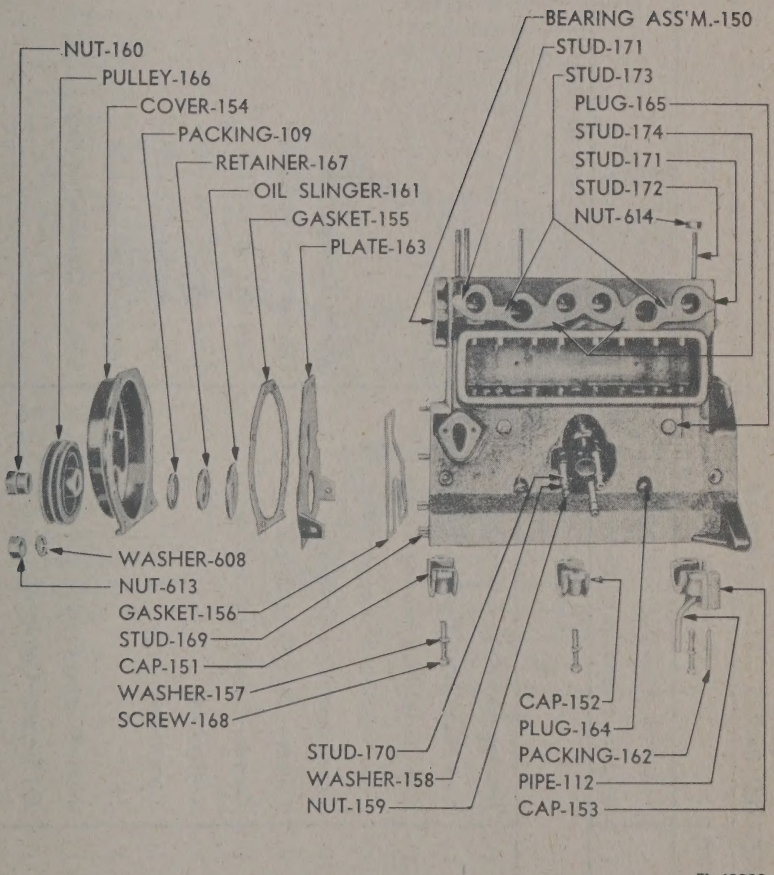


Figure 23. Timing chain cover, cylinder block.

52. ILLUSTRATED PARTS LIST—Continued.

Ref. No.	*Quan.*	*Description*	*Function*	*Mfg's Part No.*	*Mfg.*
148	1	Ventilator Assembly—Crankcase.		A-1061	46
149	1	Washer—Heat Control Bi-Metal Spring.	Shields Valve Spring.	637209	46

TIMING CHAIN COVER, AND CYLINDER BLOCK

(fig. 23)

150	1	Bearing Assembly—Cylinder Block.		A-1272	46
151	1	Cap—Crankshaft Bearing (Front).		630285	46
152	1	Cap—Crankshaft Bearing (Center).		630288	46
153	1	Cap—Crankshaft Bearing (Rear).		637236	46
154	1	Cover Assembly—Chain.	Shields Timing Chain.	A-1190	46
155	1	Gasket—Chain Cover.	Used with ref. No. 154.	630365	46
156	1	Gasket—Cylinder Block (Front).	Used with ref. No. 163.	630359	46
157	6	Lockwasher.	Used with ref. No. 168.	5009	46
158	2	Lockwasher.	Used with ref. No. 170.	51833	46
159	2	Nut.	Used with ref. No. 170.	5910	46
160	1	Nut—Starting Crank.	Mounts Crankshaft Pulley.	387633	46
161	1	Oil Slinger—Crankshaft.		375877	46
162	1	Packing—Crankshaft Bearing Cap (Rear).	Retains Lubricant.	637790	46

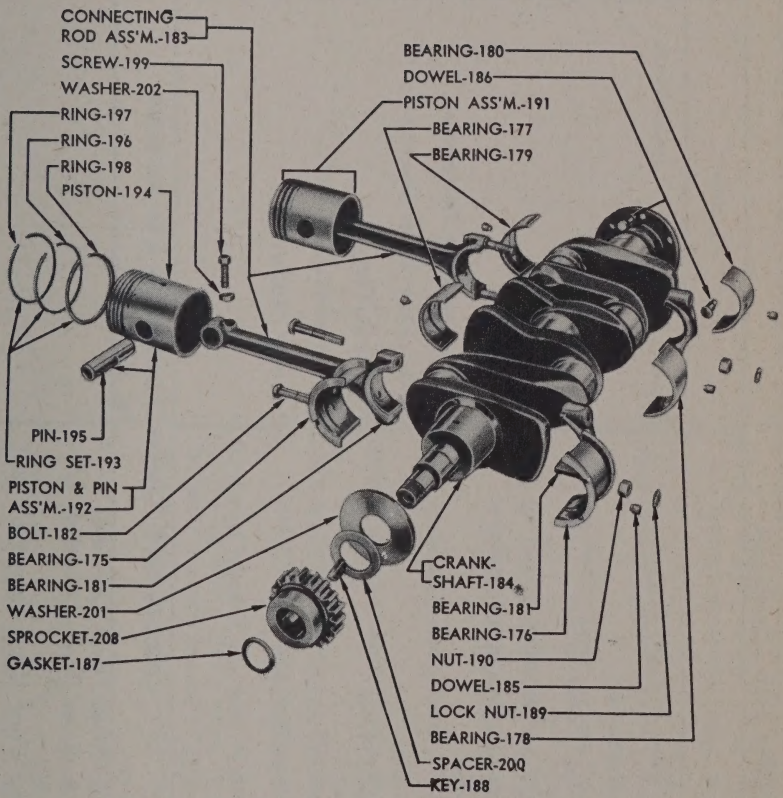


Figure 24. Crankshaft, connecting rods and pistons.

52. ILLUSTRATED PARTS LIST—Continued.

Ref. No.	*Quan.*	*Description*	*Function*	*Mfg's Part No.*	*Mfg.*
163	1	Plate—Front Assembly Engine.	Encloses Front End of Cylinder Block.	A-1463	46
164	2	Plug—Expansion.		5085	46
165	5	Plug—1¼" Expansion.		51091	46
166	1	Pulley—Crankshaft Fan.		638113	46
167	1	Retainer—Crankshaft Packing.		375920	46
168	6	Screw.	Mounts Crankshaft Bearing Cap.	381519	46
169	1	Stud.	Mounts Chain Cover Assembly.	384958	46
170	2	Stud—Oil Pump.	Mounts Oil Pump.	375981	46
171	2	Stud—1 15/16".	Mounts Manifold Assembly.	349712	46
172	4	Stud—Cylinder Head.	Mounts Cylinder Head.	349368	46
173	2	Stud—1½" Inlet and Exhaust Manifold.		300143	46
174	2	Stud—1 11/16" Inlet and Exhaust Manifold.		632159	46

CRANKSHAFT, CONNECTING RODS AND PISTONS
(fig. 24)

175	1	Bearing—Front Upper Crankshaft.		637007	46
	1	Bearing—Front Upper Crankshaft 0.010 Undersize.		637724	46
	1	Bearing—Front Upper Crankshaft 0.020 Undersize.		116522	46

	1	Bearing—Front Upper Crankshaft 0.030 Undersize.		116523	46
176	1	Bearing—Front Lower Crankshaft.		637008	46
	1	Bearing—Front Lower Crankshaft 0.010 Undersize.		637725	46
	1	Bearing—Front Lower Crankshaft 0.020 Undersize.		116524	46
	1	Bearing—Front Lower Crankshaft 0.030 Undersize.		116525	46
177	1	Bearing—Center Upper Crankshaft.		638730	46
	1	Bearing—Center Upper Crankshaft 0.010 Undersize.		639237	46
	1	Bearing—Center Upper Crankshaft 0.020 Undersize.		116526	46
	1	Bearing—Center Upper Crankshaft 0.030 Undersize.		116527	46
178	1	Bearing—Center Lower Crankshaft.		638731	46
	1	Bearing—Center Lower Crankshaft 0.010 Undersize.		639238	46
	1	Bearing—Center Lower Crankshaft 0.020 Undersize.		116528	46
	1	Bearing—Center Lower Crankshaft 0.030 Undersize.		116529	46
179	1	Bearing—Rear Upper Crankshaft.		638732	46
	1	Bearing—Rear Upper Crankshaft 0.010 Undersize.		639239	46

52. ILLUSTRATED PARTS LIST—Continued.

Ref. No.	*Quan.*	*Description*	*Function*	*Mfg's Part No.*	*Mfg.*
	1	Bearing—Rear Upper Crankshaft 0.020 Undersize.		116530	46
	1	Bearing—Rear Upper Crankshaft 0.030 Undersize.		116536	46
180	1	Bearing—Rear Lower Crankshaft.		638733	46
	1	Bearing—Rear Lower Crankshaft 0.010 Undersize.		639240	46
	1	Bearing—Rear Lower Crankshaft 0.020 Undersize.		116532	46
	1	Bearing—Rear Lower Crankshaft 0.030 Undersize.		116533	46
181	8	Bearing—Connecting Rod (½) Standard.		639862	46
	8	Bearing—Connecting Rod 0.010 Undersize.		116534	46
	8	Bearing—Connecting Rod 0.020 Undersize.		116535	46
	8	Bearing—Connecting Rod 0.030 Undersize.		116536	46
182	4	Bolt—Connecting Rod Cap.	Mounts Connecting Rod Cap.	637020	46
183	2	Connecting Rod Assembly—No. 1 and No. 3 Cylinder (Interchangeable with Model MA) (in sets only).		639858	46

	2	Connecting Rod Assembly—No. 2 and No. 4 Cylinder (Interchangeable with Model MA) (in sets only).		639859	46
184	1	Crankshaft.		638121	46
185	4	Dowel—Crankshaft Bearing.		635377	46
186	2	Dowel—Flywheel Crankshaft.		632156	46
187	1	Gasket—Crankshaft Oil Slinger.		334103	46
188	1	Key—Crankshaft Sprocket.		50917	46
	1	Kit—Crankshaft Bearing Service—Stol Size (Includes one each of the following: 637007, 637008, 638730, 638731, 638732, and 638733).		A-6798	46
	1	Kit—Crankshaft Bearing Service—0.010 Undersize (Includes one each of the following: 637724, 637725, 639237, 639238, 639239, and 639240).		A-6746	46
	1	Kit—Crankshaft Bearing Service—0.020 Undersize (Includes one each of the following: 116522, 116524, 116526, 116528, 116530, and 116532).		A-6747	46
	1	Kit—Crankshaft Bearing Service—0.030 Undersize (Includes one each of the following: 116523, 116525, 116527, 116529, 116531, and 116533).		A-6748	46
189	8	Lock Nut—Connecting Rod Bolt (Stamped Nut 7/16"-20).	Used with ref. No. 182.	52825	46

52. ILLUSTRATED PARTS LIST—Continued.

Ref. No.	*Quan.*	*Description*	*Function*	*Mfg's Part No.*	*Mfg.*
190	8	Nut—Connecting Rod Cap Bolt.		636962	46
191	4	Piston Assembly Complete, Standard Size	Compresses Gas Vapor.	637037	46
	4	Piston Assembly Complete, 0.010 Oversize.		115994	46
	4	Piston Assembly Complete, 0.020 Oversize.		116017	46
	4	Piston Assembly Complete, 0.030 Oversize.		116018	46
192	4	Piston and Pin Assembly, Standard Size.	Compresses Gas Vapor.	637041	46
	4	Piston and Pin Assembly, 0.010 Oversize.		115996	46
	4	Piston and Pin Assembly, 0.020 Oversize.		116019	46
	4	Piston and Pin Assembly, 0.030 Oversize.		116020	46
193	1	Piston Ring Set, Standard (Conventional Type).	Seals Gas Vapor.	A-6794	46
	1	Piston Ring Set, 0.010 O. S. (Conventional Type).		A-6795	46
	1	Piston Ring Set, 0.020 O. S. (Conventional Type).		A-6796	46
	1	Piston Ring Set, 0.030 O. S. (Conventional Type).		A-6797	46
	1	Piston Ring Set, Standard (Re-ring Type).		116110	46
	1	Piston Ring Set, 0.010 (Re-ring Type).		116111	46
	1	Piston Ring Set, 0.020 (Re-ring Type).		116112	46
	1	Piston Ring Set, 0.030 (Re-ring Type).		116113	46

194	4	Piston—Grade D.		636957	46
195	4	Pin—Piston.		636961	46
196	4	Ring—Piston—Second Groove (Std. Size).	Seals Gas Vapor.	637042	46
	4	Ring—Piston—Second Groove 0.010 Oversize.		116000	46
	4	Ring—Piston—Second Groove 0.020 Oversize.		116023	46
	4	Ring—Piston—Second Groove 0.030 Oversize.		116024	46
197	4	Ring—Piston—Compression Top Groove—Std. Size.	Seals Gas Vapor.	639864	46
	4	Ring—Piston—Compression Top Groove—0.010 Oversize.		116501	46
	4	Ring—Piston—Compression Top Groove—0.020 Oversize.		116502	46
	4	Ring—Piston—Compression Top Groove—0.030 Oversize.		116503	46
198	4	Ring—Oil Regulating Piston—Bottom Groove Std. Size.	Seals Gas Vapor.	116566	46
	4	Ring—Piston—Bottom Groove Std. Size.		638242	46
	4	Ring—Piston—Bottom Groove 0.010 Oversize.		116115	46
	4	Ring—Piston—Bottom Groove 0.020 Oversize.		116116	46
	4	Ring—Piston—Bottom Groove 0.030 Oversize.		116117	46

52. ILLUSTRATED PARTS LIST—Continued.

Ref. No.	Quan.	Description	Function	Mfg's Part No.	Mfg.
199	4	Screw—Piston Pin Lock.		632157	46
	As req.	Shim—Crankcase (0.002 thick).	Mounts Crankshaft Cap.	6320262	46
200	1	Spacer—Crankshaft Sprocket.		630727	46
201	1	Washer—Crankshaft Thrust.		634796	46
202	4	Washer—Piston Pin Lock Screw.		5010	46

CAMSHAFT
(fig. 25)

203	1	Camshaft Bushing—Front.		639051	46
204	1	Camshaft.		637065	46
205	1	Camshaft Thrust Washer.		375900	46
206	1	Camshaft Drive Chain.		638457	46
207	1	Camshaft Sprocket.		638458	46
208	1	Crankshaft Sprocket.		638459	46
209	4	Camshaft Sprocket Cap Screw Lockwasher.		315932	46
210	4	Camshaft Sprocket Cap Screw.		634850	46
211	1	Camshaft and Thrust Plunger Spring.		375908	46
212	1	Camshaft Thrust Plunger.		375907	46

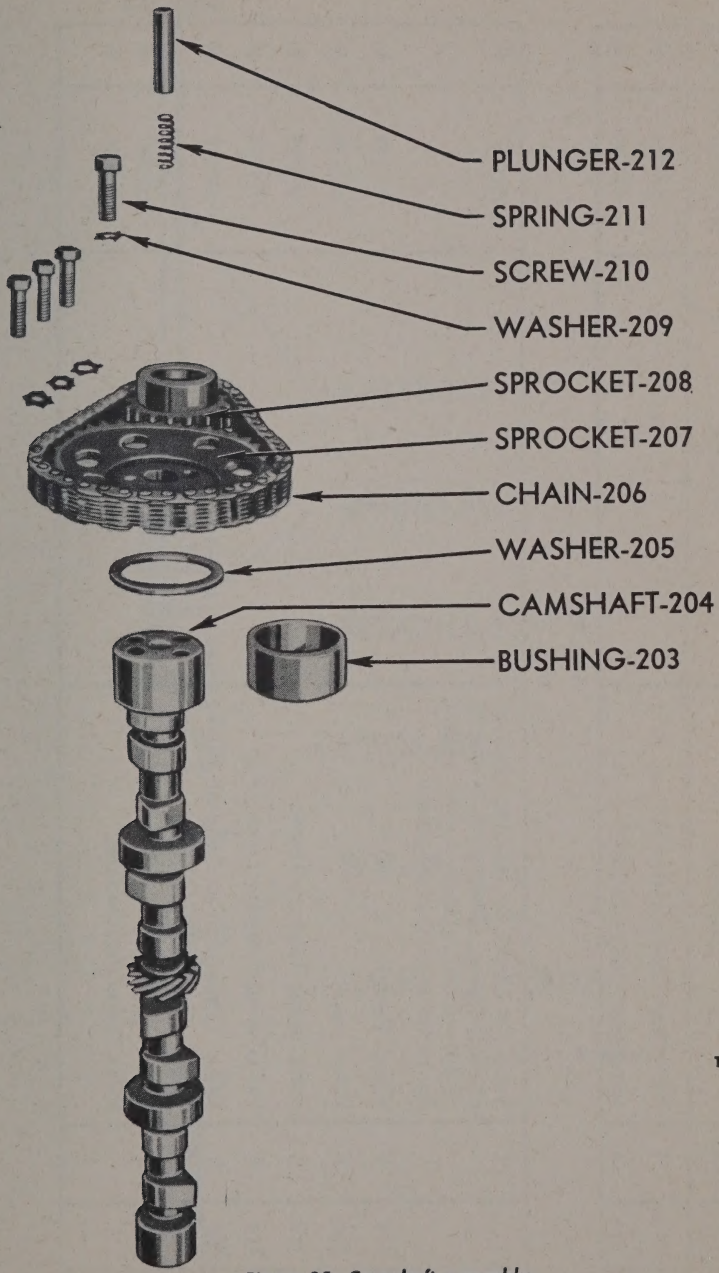


Figure 25. Camshaft assembly.

52. ILLUSTRATED PARTS LIST—Continued.

Ref. No.	*Quan.*	*Description*	*Function*	*Mfg's Part No.*	*Mfg.*
213	4	Valve Stem Guide—Exhaust.		375811	46
214	4	Valve Stem Guide—Intake.		637045	46

VALVE
(fig. 26)

	1	Valve Job Gasket Set (Includes one each of the following: 639650, 638678, 630299, 630305, 634811, 638640, A-6357, 634814, two of 51875 and four of 637863).		A-1537	46
215	4	Valve—Exhaust.		637183	46
216	8	Valve—Spring.		638636	46
217	8	Valve Spring Retainer—Lower.		637044	46
218	8	Valve Spring Retainer—Lower Lock.		375994	46
219	8	Valve Tappet Self-Locking Adjusting Screw.		640020	46
220	8	Valve Tappet.		637047	46
		Valve Tappet .004 Oversize.		115948	46

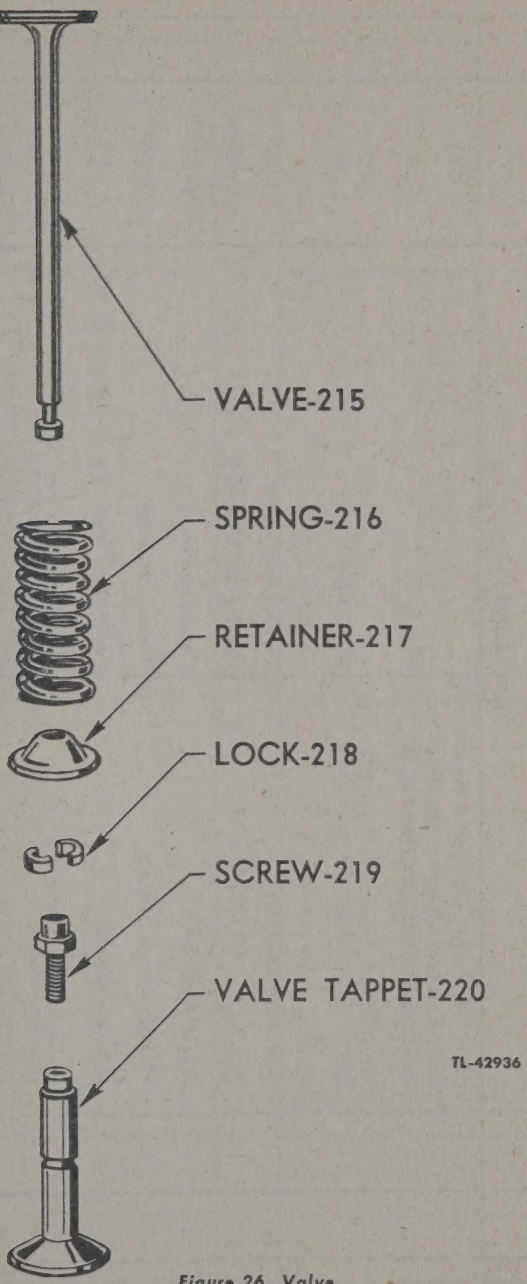


Figure 26. Valve.

52. ILLUSTRATED PARTS LIST—Continued.

Ref. No.	Quan.	Description	Function	Mfg's Part No.	Mfg.
		POWER GENERATOR (figs. 18 and 19)			
		Power Generator Complete Ready to Mount Fan and Coupling (fig. 39). Does not include Bell Housing (ref. No. 25).		10J1	18
	1	Brushholder Assembly Complete (fig. 27). (fig. 18).		J-320	18
221	1	Armature Assembly.	To Generate Power.	10J33	18
222	1	Bearing.	Bearing for Armature.	WC8507X	26
223	1	Stator Assembly.	Generates Power.	HJ-57	18
224	1	Flange—Inside Bearing.	Encases Bearings.	M-1516	18
225	1	Bracket—Spacer.	Facilitate Connection of Generator with engine.	10J3	18
226	1	Bearing—Ball.	Bearing for Armature.	308	26
227	1	Cap—Bearing.	Retains Grease for Bearings.	AW-458	18
228	1	Fitting—⅛" Zerk. (fig. 19).		Order by name	18
229	1	Cover—Bearing Bracket.		J-249	18

230	1	Coupling—⅛" Steel Pipe.	Connects Grease Cup to Pipe.	Order by name	14
231	1	Cup—Grease.	Supply Generator Bearing with Lubricant.	000	1
232	1	Bracket—Exciter Bearing.	Housing for Bearing and Stator Assembly.	J-2A	18
233	1	Body—Stator.	Houses Main Generator Assembly.	10J149	18
234	1	Cap—Bearing (Type M).	Encases Generator Bearing.	J-6	18
235	1	Pipe—⅛" x 5" BS.	Conveys Lubricant from Grease Cup to Generator.	Order by name	14
236	2	Leads—Exciter (order in sets).		Order by name	18
237	4	Leads—Exciter (order in sets).		Order by name	18

BRUSHHOLDER FOR 9.4 KVA GENERATING UNIT
(fig. 27)

238	1	Brushholder Assembly.	Generates Current.	J-320	18
239	1	Exciter Brushholder—Outer Ring—brass.	Holds Brushes.	AW-10	18
240	1	Exciter Brushholder—Inner Ring—brass.	Holds Brushes.	AW-9	18
241	8	Fibre Washer.	Mounts Exciter Brushholder Rings—Inner and Outer.	A-25	18
242	2	Brushholder Spacer—Steel.	Mounts Exciter Brushholder Rings—Inner and Outer.	J-346	18
243	1	Brushholder Mount—Steel.	Mounts Exciter Brushholder Rings—Inner and Outer.	J-144A	18

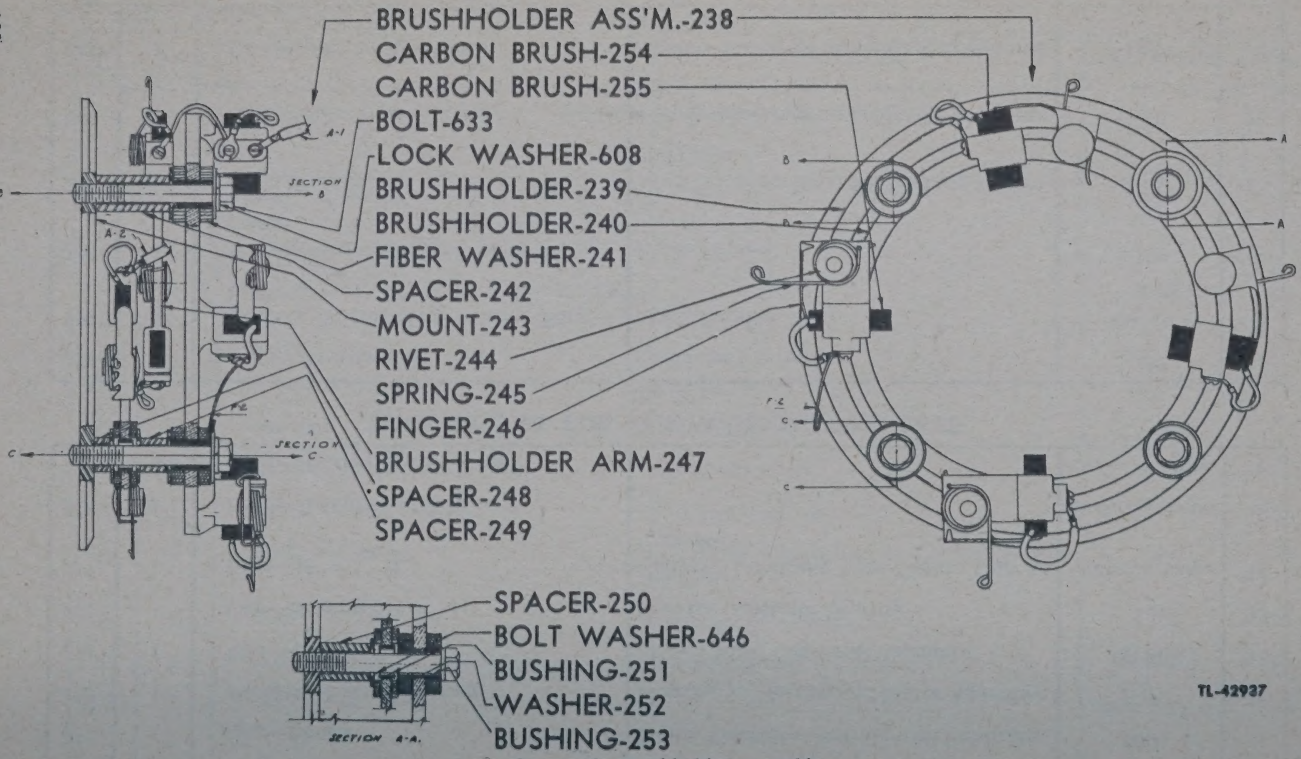


Figure 27. Brushholder assembly.

52. ILLUSTRATED PARTS LIST—Continued.

Ref. No.	*Quan.*	*Description*	*Function*	*Mfg's Part No.*	*Mfg.*
244	8	Tension Spring Rivet—Steel.	Mounts Tension Spring.	B-233	18
245	8	Tension Spring—Steel.	Maintains Pressure on Brushholder Finger.	W-799-6	18
246	8	Brushholder Finger—Steel.	Holds Brush in Contact with Armature.	B-1203	18
247	2	Slip Ring Brushholder Arm—Brass.	Holds Carbon Brushes.	DW-450	18
248	1	Brushholder Spacer—Steel.	Mounts Exciter Outer, and Inner Brushholder.	J-317	18
249	1	Brushholder Spacer—Steel.	Mounts Exciter Outer, and Inner Brushholders.	J-345	18
250	1	Brushholder Spacer—Steel.	Mounts Exciter Outer, and Inner Brushholders.	J-347	18
251	2	Brushholder—Slip Ring. Brushholder Arm—Fibre.	Mounts Exciter Outer, and Inner Brushholders.	10J231	18
252	4	Washer—Bakelite.	Mounts Exciter Outer, and Inner Brushholders.	OW-232	18
253	4	Bushing—Vulcoid.	For Exciter Brushholder Rings.	BW-107	18
254	4	Slip Ring Brushes-Carbon 1½" x ⅝" x ¼"	Generates Current.	DW-825	38
255	4	Exciter Brushes —Carbon 1½" x ⅝" x ⅜"	Generates Current.	AAP-16A	38

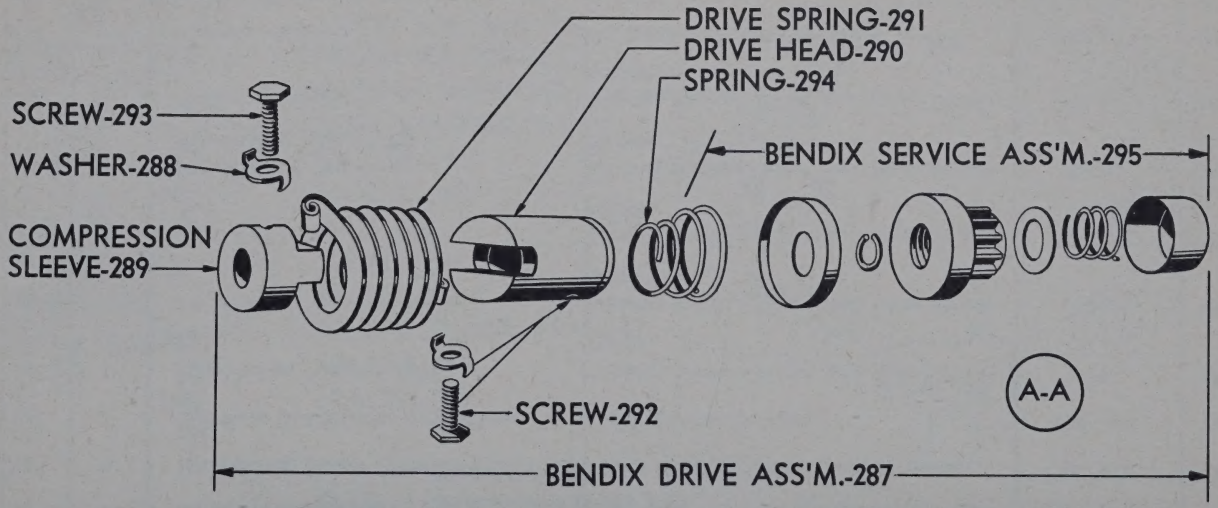


Figure 27a. Bendix drive assembly.

52. ILLUSTRATED PARTS LIST—Continued.

Ref. No.	Quan.	Description	Function	Mfg's Part No.	Mfg.
		STARTING MOTOR (fig. 28)			
256	1	Starting Motor Assembly.	Starts Engine.	MZ-4113	11
	1	Service Kit—Starting Motor—Consists of one each of the following: A-1553, A-1554, 109433, 109436, A-1554, 109437, A-1569, two each of 109455, A-1574 and four each of A-1559 and 109445.		A-6756	46
	2	Bolt—hex. Head Cap.	Ref. No. 600.	51406	46
	2	Lockwashers—Steel.	Ref. No. 608.	5010	46
257	1	*Starting Motor Support.	Braces Front End of Starting Motor.	638646	46
	1	Washer—Steel Lock.	Ref. No. 608.	5010	46
	1	Bolt—hex. Head Cap.	Ref. No. 593.	52132	46
	1	Washer—Plain Steel.	Ref. No. 644.	5437	46
	1	Washer—Steel Lock.	Ref. No. 606.	51833	46
258	1	Commutator End Plate Assembly.		MZ-2156	11
259	2	Brush Assembly—Grounded.		MZ-19	11
260	2	Brush.		MZ-12	11
	1	Brush Set Service.		MZ-20126	11

*Not included with Starting Motor Assembly.

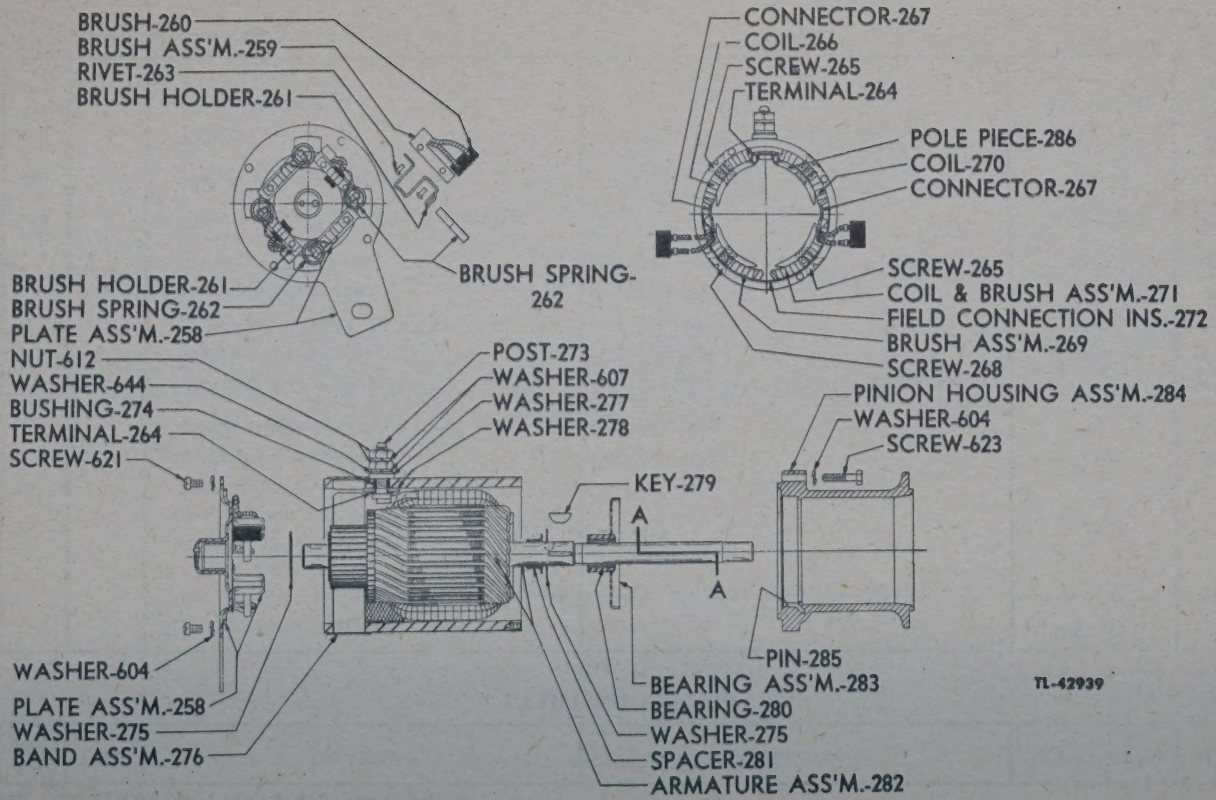


Figure 28. Starting motor.

52. ILLUSTRATED PARTS LIST—Continued.

Ref. No.	*Quan.*	*Description*	*Function*	*Mfg's Part No.*	*Mfg.*
261	2	Brushholder.		MZ-16	11
262	4	Brush Spring.		MZ-19	11
263	4	Rivet—⅛" x ¼" Oval Head Tubular.		X-532	11
264	1	Terminal.		A-1554	46
265	4	Pole Piece Screw.		A-1559	46
266	1	Field Coil U. L.		MZ-1007	11
267	1	Field Coil Connector.		A-1558	46
268	4	Pole Piece Screw.		MZ-38A	11
269	2	Field Coil and Brush Assembly L. L.		MZ-10098	11
270	1	Field Coil U. R.		MZ-1010	11
271	1	Field Coil and Brush Assembly.		MZ-1008A	11
272	1	Field Connection Ins.		MZ-30A	11
	4	Screw—Fillister Head.	Ref. No. 621.	X-902	11
	4	Washer—Lock No 10.	Ref. No. 604.	X-544	11
273	1	Terminal Post.		MU-28	11
	2	Nut—hex. Head 5/16"-24.	Ref. No. 612.	5X-1376	11
	1	Washer—Plain 5/16".	Ref. No. 644.	X-1014	11
	2	Washer—5/16" Lock.	Ref. No. 607.	X-1014	11

52. ILLUSTRATED PARTS LIST—Continued.

Ref. No.	*Quan.*	*Description*	*Function*	*Mfg's Part No.*	*Mfg.*
274	1	Bushing—Insulating.	Mounts Starting Motor Terminal Plate.	MU-31	11
275	1	Washer—1/32" thick Thrust	Mounts Starting Motor Armature Assembly Shaft.	MU-54	11
276	1	Head Band Assembly.	Mounts Starting Motor Armature Assembly Housing.	MZ-1024	11
277	1	Washer—Insulating.	Mounts Starting Motor Terminal Pole.	MAB-31	11
278	1	Washer—Insulating.	Mounts Starting Motor Terminal Pole.	MU-39	11
279	1	Key—No. 6 Woodruff.	Mounts Bendix Drive Compression Sleeve to Starting Motor Armature Assembly Shaft.	X-261	11
280	1	Bearing—Absorbent Bronze.	Reduces Friction.	MB-77A	11
281	1	Spacer—Bearing Thrust.	Mounts Starting Motor Armature Assembly Shaft.	MZ-51	11
282	1	Armature Assembly.	Furnishes Electrical Power.	MZ-2089	11
283	1	Bearing Assembly—Intermediate.	Reduces Friction.	MB2040A	11
284	1	Pinion Housing Assembly.	Houses Bendix Drive Assembly.	PS1079A	11
	4	Screw—No. 10-32" x 3 1/32".	ref. No. 623.	MZ-52	11
	4	Washer—No. 10 Steel Lock.	ref. No. 604.	X-544	11

285	1	Pin—Dowel.	Locks Intermediate Bearing Assembly in Position.	NAB-88	11
286	4	Pole Piece.		MZ-29	11

BENDIX DRIVE

(fig. 28)

287	1	Bendix Drive Assembly.	Engages with Flywheel to Start Engine.	EBA-46	11
288	2	Lockwasher.	1—Locks Compression Sleeve Screw and Bendix Drive Spring. 1—Locks Driving Head Screw and Bendix Drive Spring.	EB-108	11
289	1	Compression Sleeve.	Engages Bendix Driving Head.	EB-7819S	11
290	1	Driving Head.	Engages Bendix Pinion.	EB-8503	11
291	1	Drive Spring.	Mounts Driving Head and Compression Sleeve.	EB-8505	11
292	1	Screw—Head Spring.	Mounts Drive Spring to Driving Head.	EB-8506	11
293	1	Screw—Shaft Spring.	Mounts Drive Spring to Compression Sleeve.	EB-8507	11
294	1	Spring—Take Up.	Eases in Compression.	EB-8734	11
295	1	Bendix Service Assembly.	Engages Flywheel.	EBA-4611	11

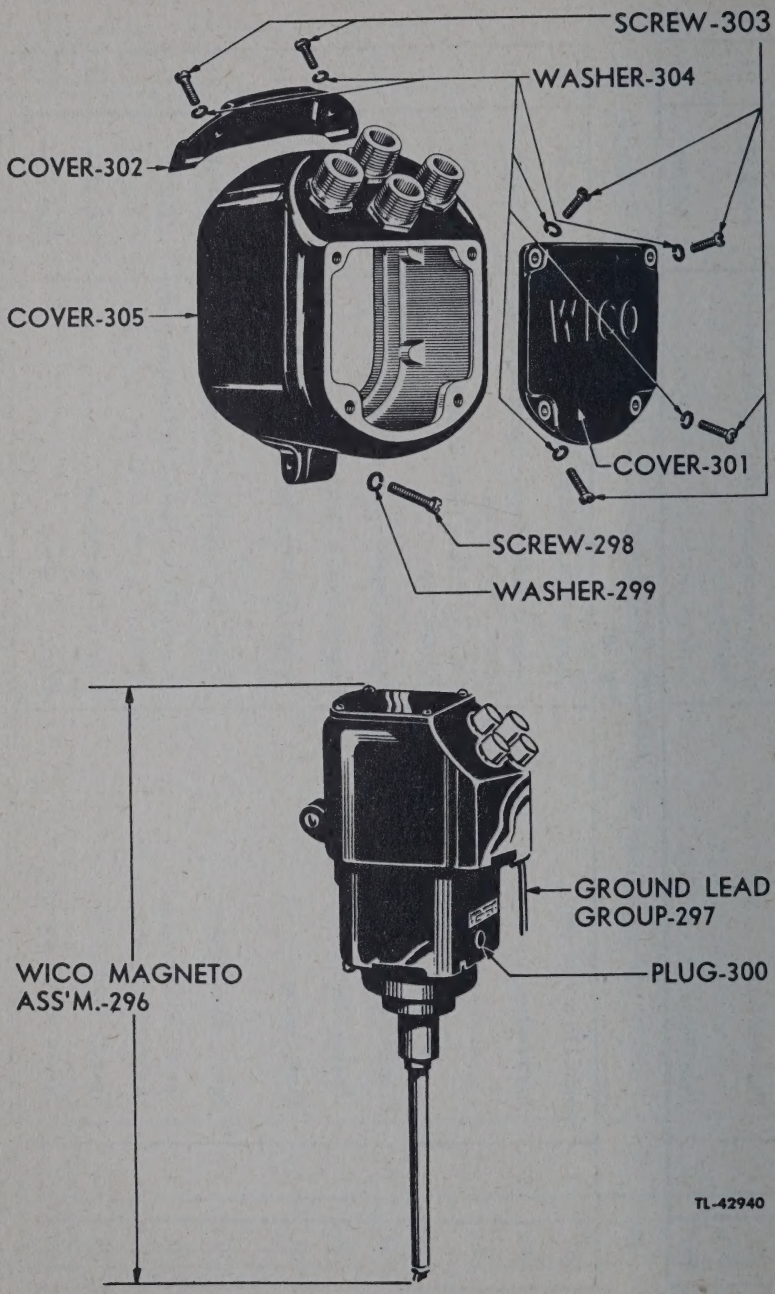
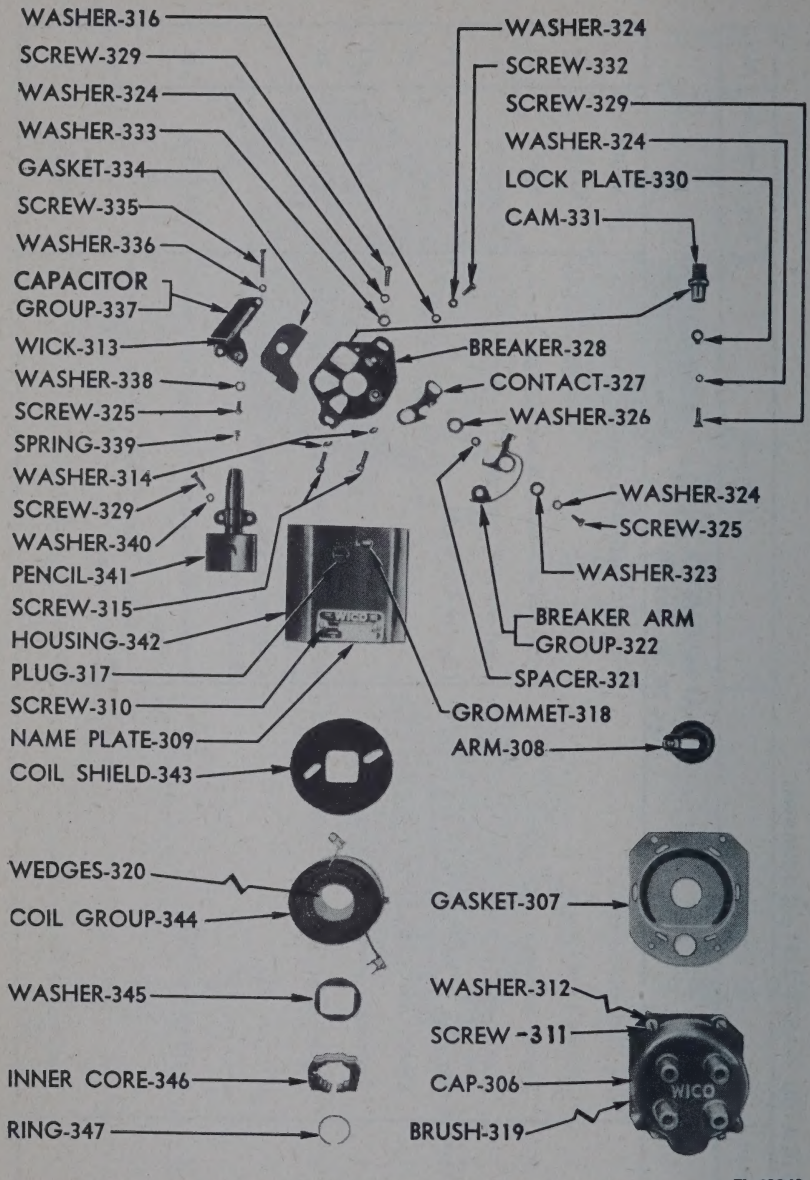


Figure 29. Wico magneto assembly.

52. ILLUSTRATED PARTS LIST—Continued.

Ref. No.	Quan.	Description	Function	Mfg's Part No.	Mfg.
		WICO MAGNETO (figs. 29, 30, and 31)			
296	1	Wico Magneto Assembly.	Provides Spark for Ignition.	JEM-1677	45
297	1	Ground Lead Group.		X-5142	45
298	1	Clamp Screw.	Mounts Distributor Shield Group.	5067	45
299	1	Lockwasher.	Used with ref. No. 298.	M-58X	45
300	1	Oil Plug.	Cap for Oil Wick.	IXA-345	45
301	1	Distributor Shield Cover.		5055	45
302	1	Terminal Cover.		5103	45
303	6	Screw—Dist. Shield and Terminal Cover.	2—Mounts Terminal Cover to Dist. Shield group. 4—Mounts Dist. Shield Cover to Dist. Shield Group.	4376	45
304	6	Lockwasher, Dist.	2—Mounts Terminal Cover to Dist. Shield Group. 4—Mounts Dist. Shield Cover to Dist. Shield Group.	M-55XA	45
305	1	Distributor Shield Group. (fif. 30).	Houses Upper Portion of Dist.	X-5068	45



NOTE: ~~ HIDDEN PART

Figure 30. Wico magneto parts.

52. ILLUSTRATED PARTS LIST—Continued.

Ref. No.	*Quan.*	*Description*	*Function*	*Mfg's Part No.*	*Mfg.*
306	1	Distributor Cap Group.		X-3788	45
307	1	Distributor Cap Gasket.		4992	45
308	1	Distributor Arm Group.		X-3797	45
309	1	Name Plate.		3806	45
310	2	Name Plate Drive Screw.		1248	45
311	1	Distributor Cap Screw.	Mounts Distributor Cap.	3774	45
312	1	Lockwasher.	Used with ref. No. 311.	2205	45
313	1	Oil Wick.	Lubricates Rotor.	3934	45
314	2	Lockwasher.	Used with ref. No. 315.	4749	45
315	2	Bearing Plate Clamp Screw.	Mounts Bearing Plate.	1130	45
316	1	Fixed Contact Screw Washer.	Used with ref. No. 332.	IXA256	45
317	1	Oil Plug.	Cap for Oil Wick.	IXA345	45
318	1	Ground Lead Grommet.	Insulator for Ground Lead Group.	X3729	45
319	1	Secondary Contact Brush.		15-560	45
320	2	Coil Wedge.	Mounts Coil.	2264 A or B	45
321	1	Breaker Arm Spacer.		1418	45

52. ILLUSTRATED PARTS LIST—Continued.

Ref. No.	*Quan.*	*Description*	*Function*	*Mfg's Part No.*	*Mfg.*
322	1	Breaker Arm Group.		X-1408	45
323	1	Breaker Arm Clamp Screw Washer.		1207	45
324	5	Lockwasher.	1—Mounts Coil Ground Connection Lock. 1—Mounts Breaker Arm Screw. 1—Mounts Breaker Arm Clamp. 1—Mounts Fixed Contact Screw. 1—Mounts Cam Screw.	M55XA	45
325	2	Breaker Arm Spring Screw.	1—Mounts Breaker Arm Clamp. 1—Mounts Breaker Arm Spring.	16-738	45
326	1	Breaker Arm Spacing Washer.	Mounts Breaker Arm Group.	1197	45
327	1	Fixed Contact.		1196	45
328	1	Breaker Plate Group.		X3976	45
329	5	Secondary Terminal Screw.	1—Mounts Cam. 2—Mounts Secondary Pencil. 2—Mounts Breaker.	1902	45
330	1	Cam Screw Lock Plate.	Mounts Cam.	3806	45
331	1	Cam.	Mounts Breaker.	3902	45
332	1	Fixed Contact Screw.	Locks Fixed Contact.	M-31X	45

333	2	Lockwasher.	Mounts Breaker Screw.	M-36X	45
334	1	Capacitor Case Gasket.	Mounts Breaker.	1533	45
335	2	Capacitor Screw.	Mounts Capacitor.	1383	45
336	2	Lockwasher.	Mounts Capacitor Screw.	M-90X	45
337	1	Capacitor Group.		X1413	45
338	1	Lockwasher.	Mounts Breaker Arm Spring Screw.	2573	45
339	1	Secondary Terminal Contact Spring.	Mounts Secondary Pencil.	3810	45
340	2	Lockwasher.	Mounts Secondary Terminal Screw.	M54X	45
341	1	Secondary Pencil.		Y3684	45
342	1	Main Housing Repl. Group.		X5142	45
343	2	Coil Shield		4474	45
344	1	Coil Group.		X3682	45
345	2	Washer.	Spacing for Inner Core.	4299	45
346	1	Inner Core Group.		X3765	45
347	1	Inner Core Snap Ring. (fig. 31).		3783	45
348	1	Gasket.	Mounts Bearing Plate Housing.	3802	45
349	1	Rotor—4 cyl. CW.		X3910	45
350	1	Bearing Plate Group.		X3826	45

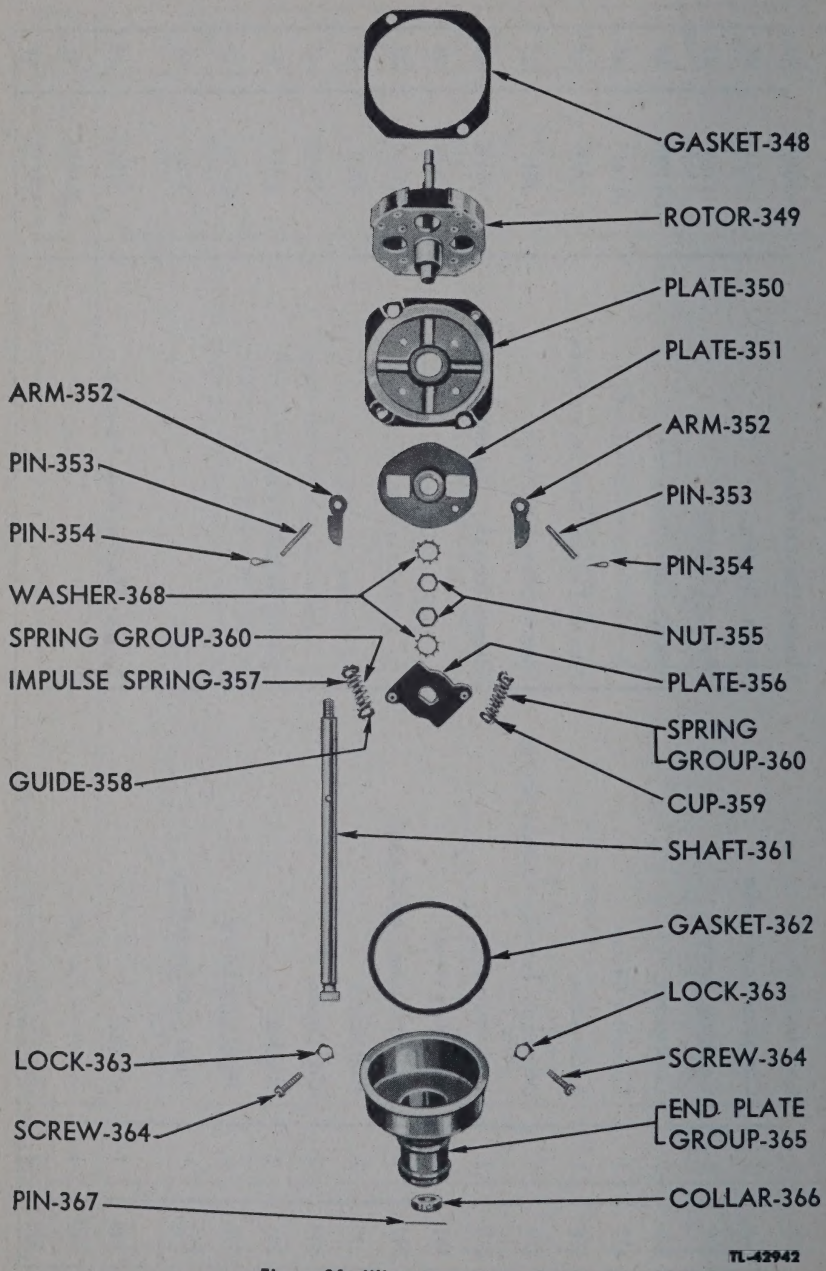


Figure 31. Wico magneto parts.

52. ILLUSTRATED PARTS LIST—Continued.

Ref. No.	*Quan.*	*Description*	*Function*	*Mfg's Part No.*	*Mfg.*
351	1	Support Plate Group.		X3960	45
352	2	Trip Arm.		3770	45
353	2	Trip Arm Pivot Pin.		3771	45
354	2	Trip Arm Pivot Cotter Pin.		M95X	45
355	2	Nut.	1—Mounts Cam Plate Clamp. 1—Mounts Support Plate Clamp.	4112	45
356	1	Cam Plate Group.		X3958	45
357	2	Impulse Spring.		3799	45
358	4	Impulse Spring Guide.		3800	45
359	4	Impulse Spring Cup.	Used with ref. No. 360.	4584	45
360	2	Impulse Spring Group.		X4600	45
361	1	Drive Shaft.		3904	45
362	1	End Plate Gasket.		3801	45
363	2	End Plate Screw—Clamp Lock.		1127	45
364	2	End Plate Clamp Screw.		1130	45
365	1	End Plate Group.		X4982	45
366	1	Thrust Collar.		3738	45

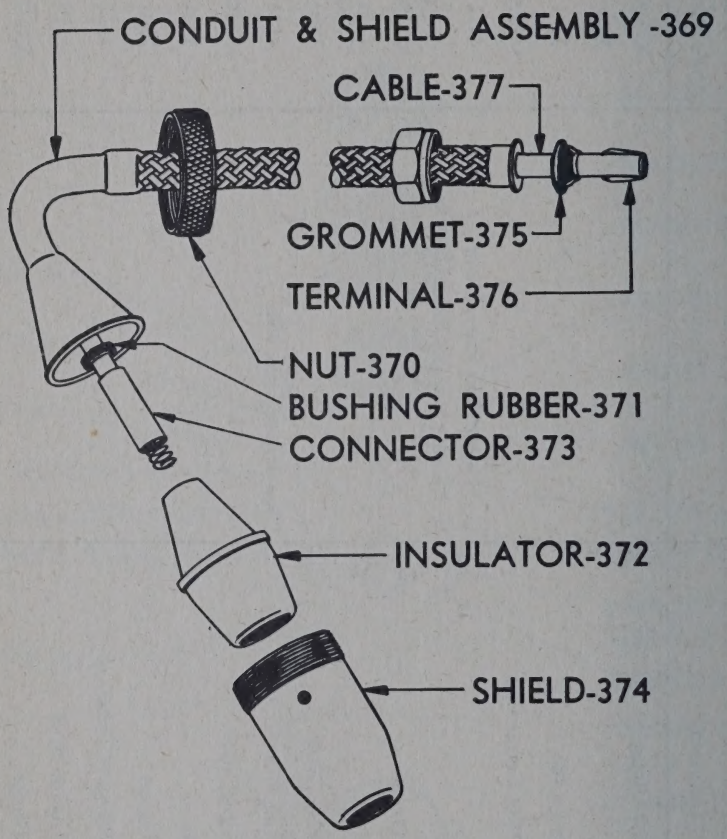


Figure 32. Conduit and shield assembly.

52. ILLUSTRATED PARTS LIST—Continued.

Ref. No.	*Quan.*	*Description*	*Function*	*Mfg's Part No.*	*Mfg.*
367	1	Thrust Collar Pin.		3739	45
368	2	Lockwasher.	1—Mounts Cam Plate Clamp. 1—Mounts Support Plate Clamp.	4113	45
	1	Oil Instruction Label.		5133	45

CONDUIT AND SHIELD ASSEMBLY

(fig. 32)

369	4	Conduit and Shield Assembly.	Conducts Electrical Energy to Spark Plug and Eliminates Radio Interference.	S213-1300	40
370	4	Nuts—Knurl.	Mounts Conduit Assembly to Shield.	A-21535	40
371	4	Bushing—Rubber.	To Insulate Cable from Shield.	A-20343	40
372	4	Insulator—Spark Plug Shield.	To Insulate Spark Plug Connection from Shield.	A-27487	40
373	4	Connectors—Spark Plug.	Contacts Cable with Spark Plug.	A-22706	40
374	4	Spark Plug Shield.	Shields Spark Plug.	A-20315	40
375	4	Grommet.	Insulates Terminal Connection.	A-25440	40
376	4	Distributor Terminal K39.	Connection of Cable with Distributor.	A-22639	40
377	4	Cable—23" long High Tension Ignition, 7M/M.	Conducts Electricity.	A-26692	40

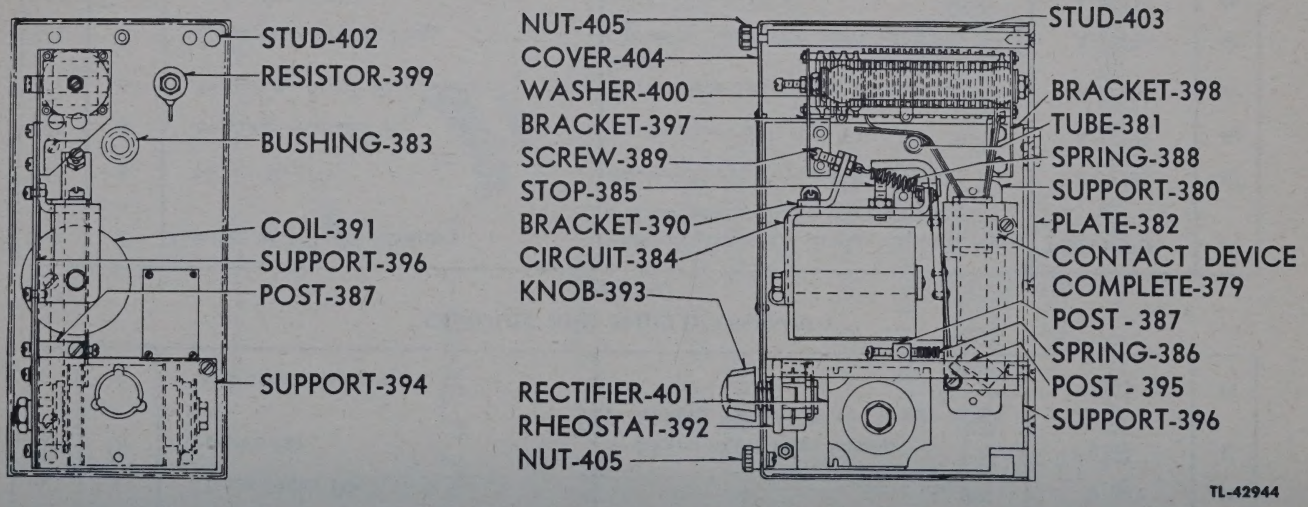


Figure 33. Voltage regulator.

52. ILLUSTRATED PARTS LIST—Continued.

Ref. No.	*Quan.*	*Description*	*Function*	*Mfg's Part No.*	*Mfg.*
		VOLTAGE REGULATOR (fig. 33)			
378	1	Voltage Regulator Complete.	Regulates Voltage.	Type SRA-JR	44
	1	Voltage Regulator (Without Carbon Resistor Plates).		1151-942	44
379	1	Contact Device Complete.		1227-025	44
380	1	Contact Device Support.		Order by name	44
381	1	Insulation Tube.		Item 14 3B4597	44
382	1	Mounting Base Plate.		Order by name	44
383	1	Rubber Bushing.		1152-955	44
384	1	Stationary Magnetic Circuit Complete with Armature and Core.		Items 1-3 to 8-10-18 dwg. 3B4597 and 5A7781	44
385	1	Stop for Moving Armature.		1252-657	44
386	1	Moving Armature Jumping Spring.		1227-023	44
387	1	Bumper Spring Stop Post.		Item 4 5A7939	44
388	1	Control Spring.		1227-024	44

52. ILLUSTRATED PARTS LIST—Continued.

Ref. No.	*Quan.*	*Description*	*Function*	*Mfg's Part No.*	*Mfg.*
389	1	Control Spring—Adjusting Screw.		Item 11 3B4597	44
390	1	Control Spring Bracket.		Item 9 3B4597	44
391	1	Stationary Operating Coil.		1151-941	44
392	1	Voltage Adjusting Rheostat.		1169-182	44
393	1	Rheostat Knob.		1087-334	44
394	1	Rheostat Support.		Item 3 5A7939	44
395	1	Rheostat Support Post.		Item 6 5A7939	44
396	1	Element Support.		Order by name	44
397	1	End Bracket—Front.		Item 11 5A7939	44
398	1	End Bracket—Rear.		Item 12 5A7939	44
399	1	Resistor—750 ohm.		1115-103	44
400	6	Mica Washer.		393-631	44
401	1	Rectox Rectifier.		1167-145	44

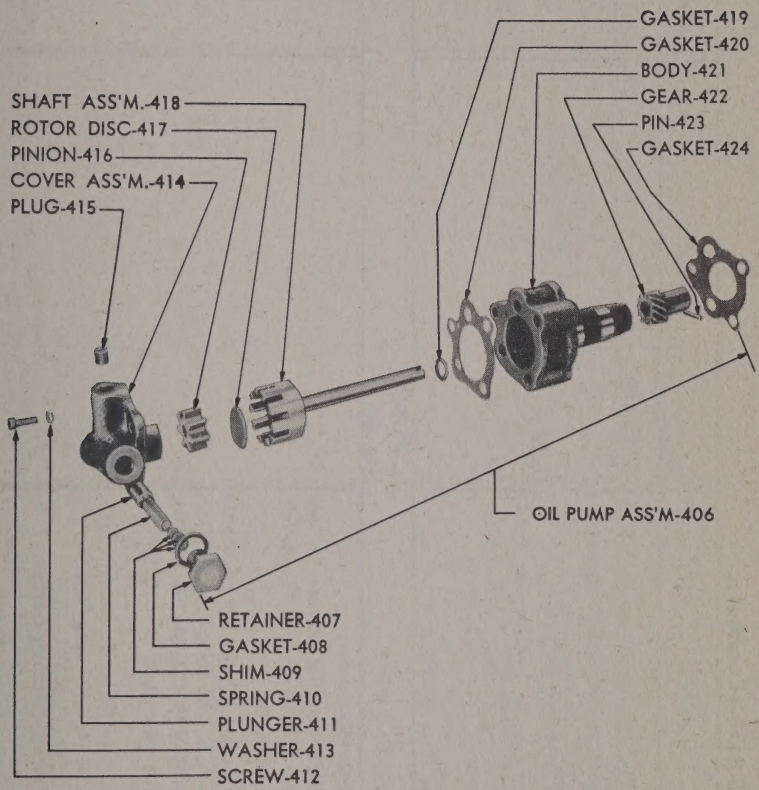


Figure 34. Oil pump.

52. ILLUSTRATED PARTS LIST—Continued.

Ref. No.	Quan.	Description	Function	Mfg's Part No	Mfg.
402	1	Guide Stud.		Item 5 5A7939	44
403	1	Cover Stud.		Item 7 5A7939	44
404	1	Cover.		Items 1 to 4 3B8476	44
405	2	Thumb Nut.		539599	44
		OIL PUMP (fig. 34)			
406	1	Oil Pump Assembly.		637636	46
	1	Oil Pump Service Kit consists of one each of the following: 636599, 343306, 637425, and 330964.		A-6749	46
	1	Oil Pump Gasket Service Kit—Consists of one each of the following: 375927, 634813, 639870, 380197, 630299, 630394, 630398 and two each of 630389 and 630392.		A-6750	46
407	1	Oil Pump Oil Relief Spring Retainer.		630390	46
408	1	Oil Pump Relief Retainer Gasket.		634813	46
409	As req.	Oil Pump Relief Spring Shim.		630389	46

410	1	Oil Pump Relief Plunger Spring.		356155	46
411	1	Oil Pump Oil Relief Plunger.		630518	46
412	1	Oil Pump Cover to Body Screw.		51819	46
413	1	Oil Pump Cover to Body Screw Lock-washer.		380197	46
414	1	Oil Pump Cover Assembly.		630387	46
415	1	Oil Pump Cover Plug.		52525	46
416	1	Oil Pump Pinion.		343306	46
417	1	Oil Pump Rotor Disc.		636600	46
418	1	Oil Pump Shaft Assembly.		636599	46
419	1	Oil Pump Shaft Gasket.		375927	46
420	1	Oil Pump Cover Gasket Vellumoid.		639870	46
421	1	Oil Pump Body.		630384	46
422	1	Oil Pump Driving Gear.		637425	46
423	1	Oil Pump Driving Gear Pin.		330964	46
424	1	Oil Pump to Cylinder Block Gasket.		630394	46

OIL FILTER

(fig. 35)

425	1	Oil Filter Assembly Type PD-51-04.		27078	33
426	1	Cover.		25791	33

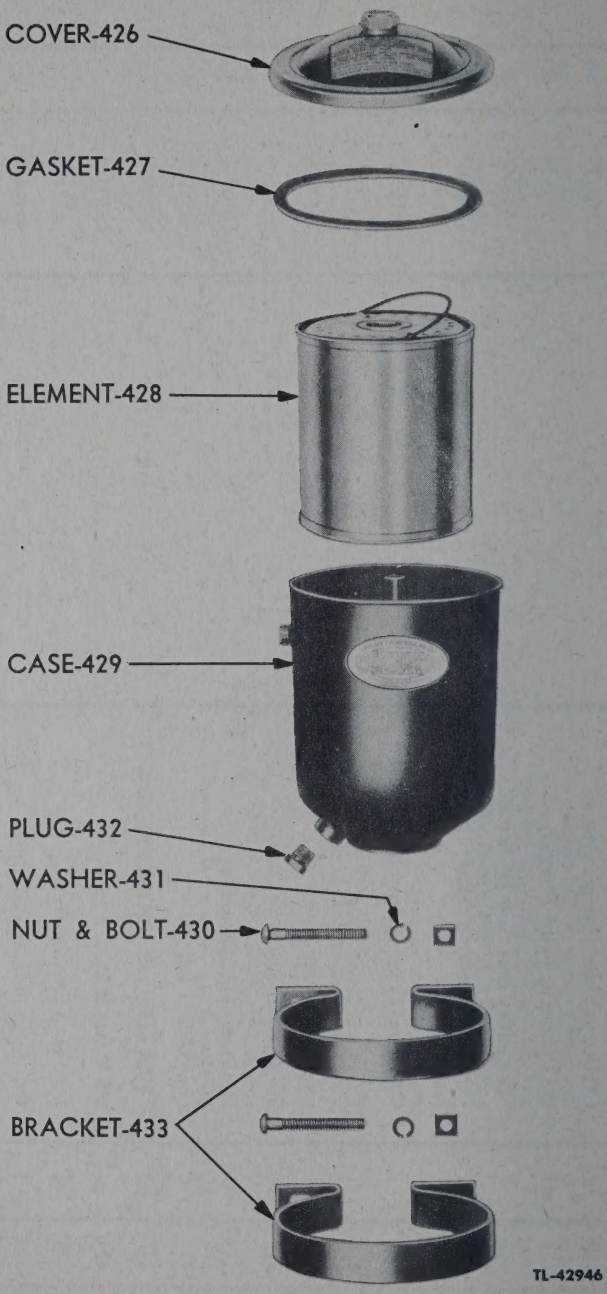


Figure 35. Oil filter.

52. ILLUSTRATED PARTS LIST—Continued.

Ref. No.	*Quan.*	*Description*	*Function*	*Mfg's Part No.*	*Mfg.*
427	1	Cover Gasket.		25802-2	33
428	1	Element Assembly.		26637-2	33
	1	Replacement Element.		Type PD-51	33
429	1	Case.		26708	33
430	2	Nut and Bolt.		19984	33
431	2	Lockwasher.		7963	33
432	1	Drain Plug.		25795	33
433	2	Bracket.		27075	33

OIL FILTER BRACKETS, TUBES AND CONNECTIONS

(fig. 36)

434	1	Bracket Assembly—Oil Filter.		A-1247	46
435	1	Clip—Inlet Tube.		A-1289	46
436	1	Connector—Inverted Flared Tube.		387891	46
437	2	Ell—Inverted Flared Tube.	1—Connects Oil Line from Governor to Oil Filter. 1—Connects Tube from Filter to Cylinder Block.	384569	46
438	1	Grommet—Rubber.		345961	46

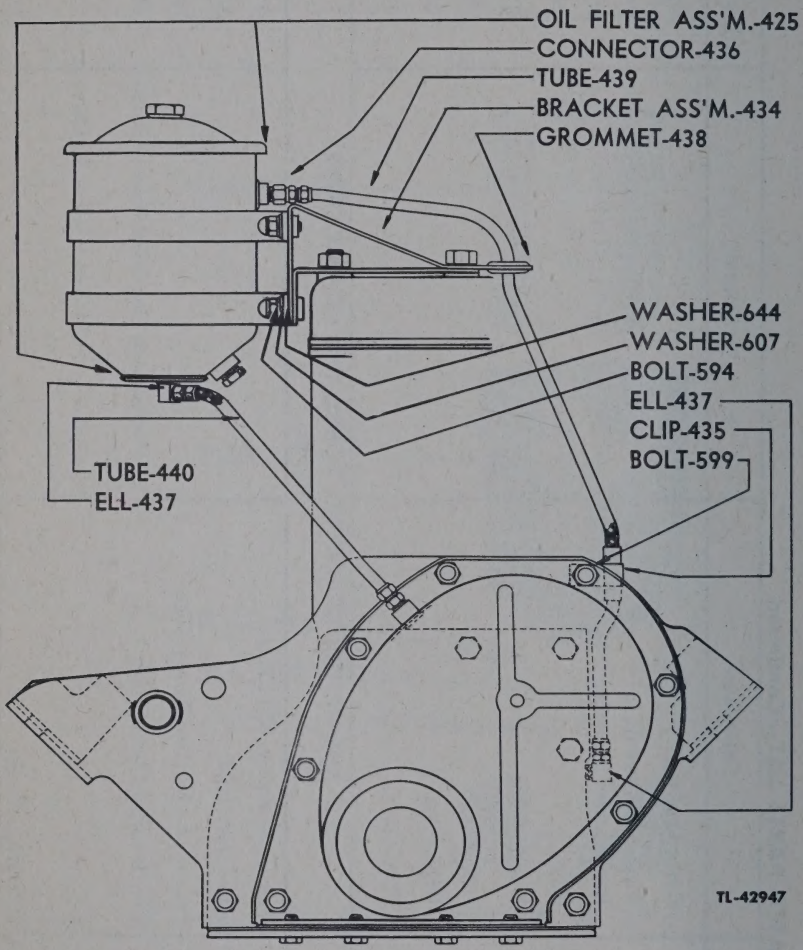


Figure 36. Oil filter brackets, tubes and connections.

52. ILLUSTRATED PARTS LIST—Continued.

Ref. No.	*Quan.*	*Description*	*Function*	*Mfg's Part No.*	*Mfg.*
439	1	Tube—Oil Filter Inlet.		A-1197	46
440	1	Tube—Oil Filter Outlet.		A-1198	46

WATER PUMP

(fig. 37)

441	1	Water Pump Assembly.	Circulation of Water.	639992	46
	1	Water Pump Service Kit—Consists of one each of the following: 636297, 636298, 640031, 640034, and 637053.		A-6839	46
442	1	Pulley—Fan and Water Pump.		636299	46
443	1	Bearing and Shaft Assembly—Water Pump.		636297	46
444	1	Body—Water Pump.		637052	46
445	1	Wire—Water Pump Bearing Retaining		636298	46
446	1	Washer—Water Pump Seal.		640034	46
447	1	Seal Assembly—Water Pump.		640031	46
448	1	Billows—Water Pump Seal.		640032	46
449	1	Spring—Water Pump Seal.		640033	46
450	1	Impeller—Water Pump.		639993	46

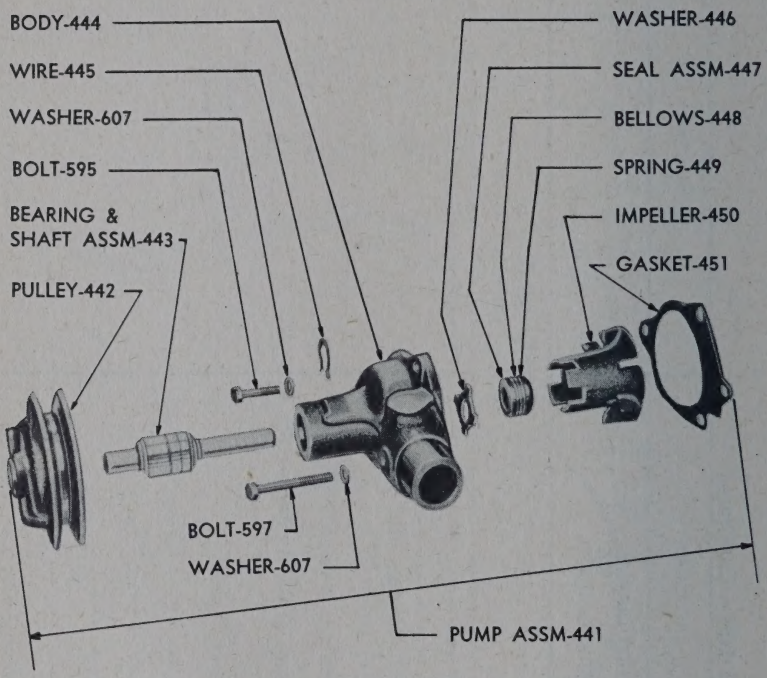


Figure 37. Water pump assembly.

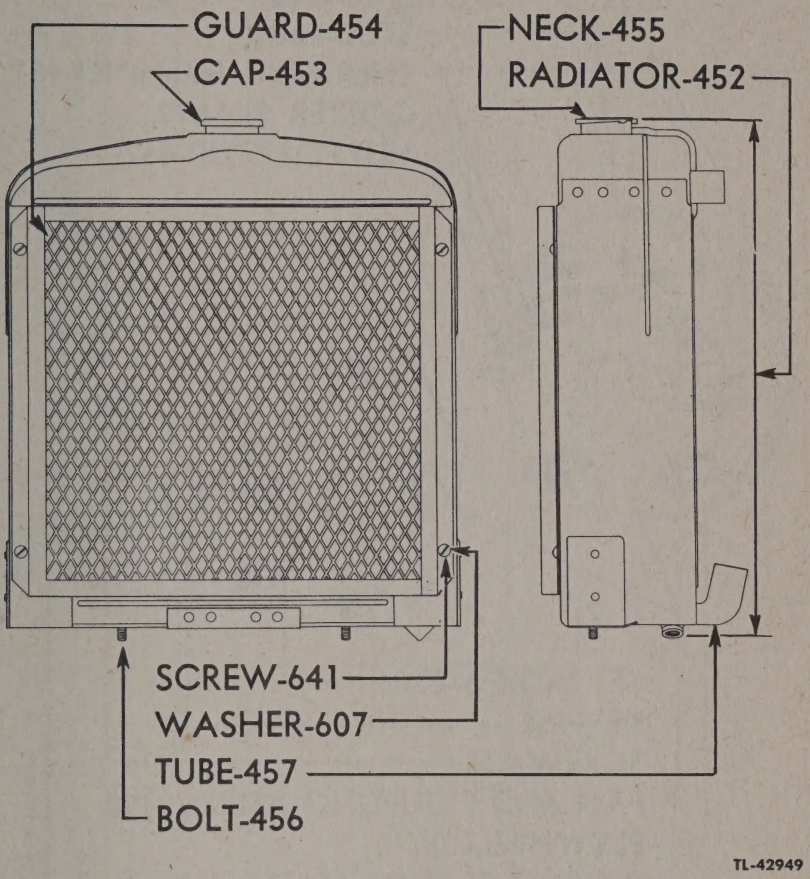


Figure 38. Perfex radiator—R2369D.

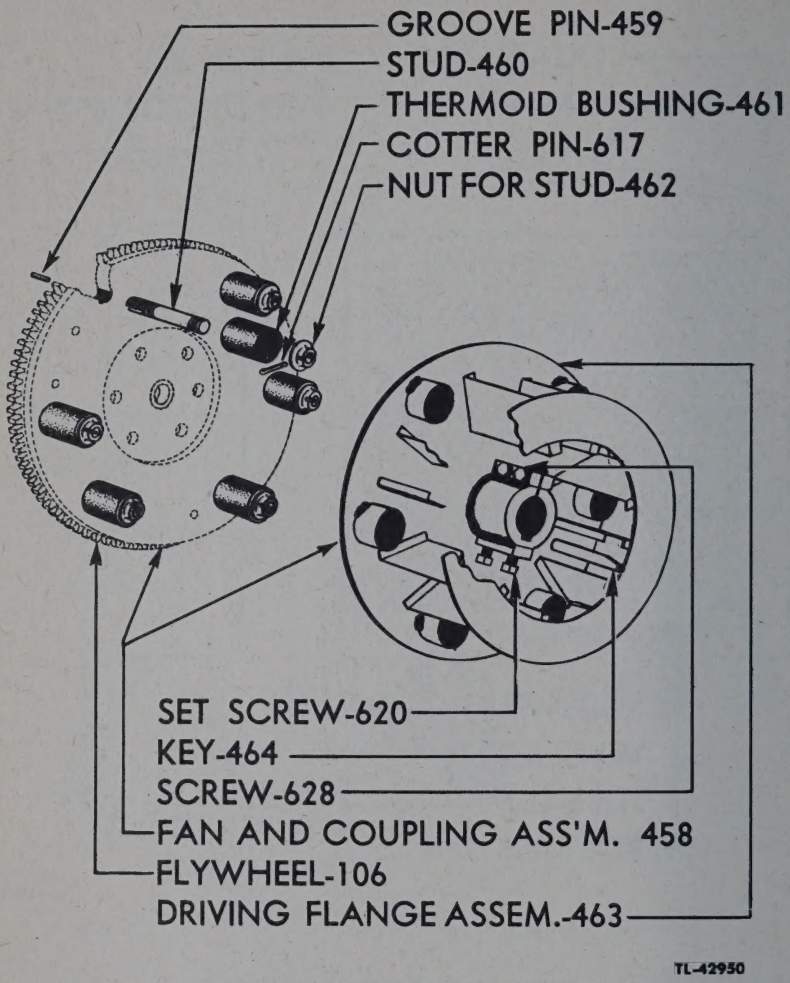


Figure 39. Fan and coupling.

52. ILLUSTRATED PARTS LIST—Continued.

Ref. No.	*Quan.*	*Description*	*Function*	*Mfg's Part No.*	*Mfg.*
451	1	Gasket—Water Pump.	Seal Between Water Pump and Cylinder Block.	637053	46

RADIATOR
(fig. 38)

452	1	Radiator Complete.	Cooling System.	R-2368D	32
453	1	Cap:		G-13540	32
454	1	Guard.		A-1268	32
455	1	Washer—Neck.		G-12581	32
456	2	Bolt—⅜"-16 thread.		G-24608	32
457	1	L-Tube.		G-3452	32

FAN AND COUPLING GROUP
(fig. 39)

458	1	Fan and Coupling Assembly.	Connects Generator to Engine.	10J270	18
459	6	Groove Pin—Steel.	To Hold Flywheel Stud.	J-505	18
460	6	Stud—Steel.	Driving Coupling Stud on Flywheel.	10J230	18
461	6	Thermoid Bushing.	Mounts Fan and Coupling to Flywheel.	J-250	18
462	6	Nut—Steel.	Mounts Fan and Coupling Assembly to Flywheel.	J-319	18

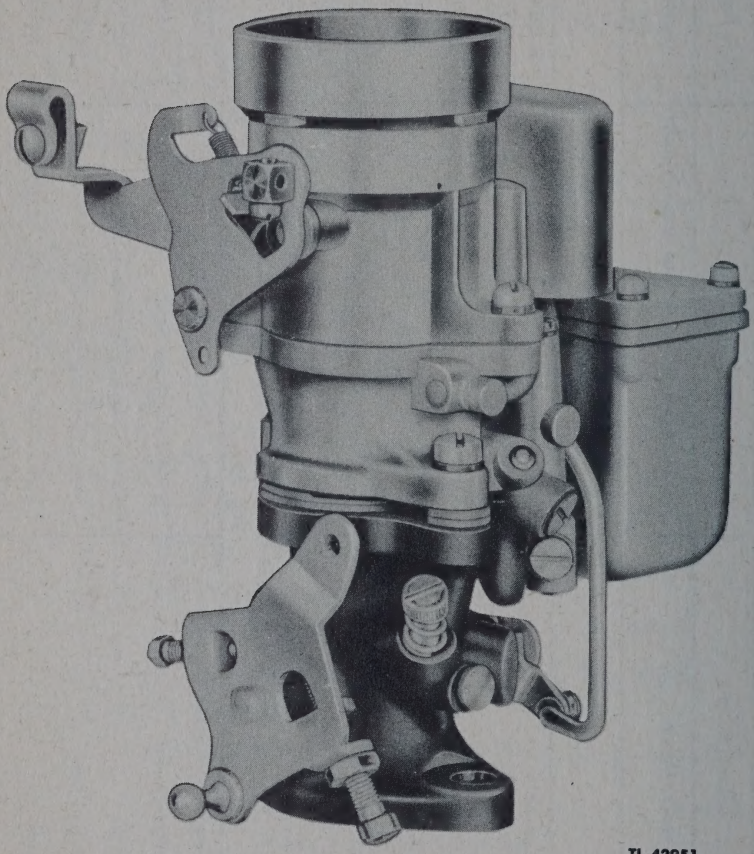


Figure 40. Carburetor.

52. ILLUSTRATED PARTS LIST—Continued.

Ref. No.	*Quan.*	*Description*	*Function*	*Mfg's Part No.*	*Mfg.*
463	1	Driving Flange Assembly.	To Drive Generator.	10J6	18
464	1	Key.	For Driving Flange.	10J257	18

CARBURETOR
(figs. 40, 41, 42, 43 and 44)

465	1	Carburetor—Model WO. Repair Package or Kit—Asterisk (*) Marks all Parts Included in this Kit. (fig. 41).		567S 1344	5 5
466	1	Checker Valve Assembly.		7-116S	5
467	2	*Air Horn Screw and Washer Assembly.		101-150S	5
468	2	*Low Speed Jet, Idle Passage Plug and Gasket Assembly.		11B-129S	5
469	1	*Bowl Cover Gasket.		121-73	5
470	2	*Body Flange Attaching Screw.		101-122	5
471	1	*Low Speed Jet Assembly.		11-180S	5
472	1	*Idle Well Jet.		43-67	5
473	1	Idle Adjustment Screw.		30A-39	5
474	1	Idle Port Rivet Plug.		11B-108	5

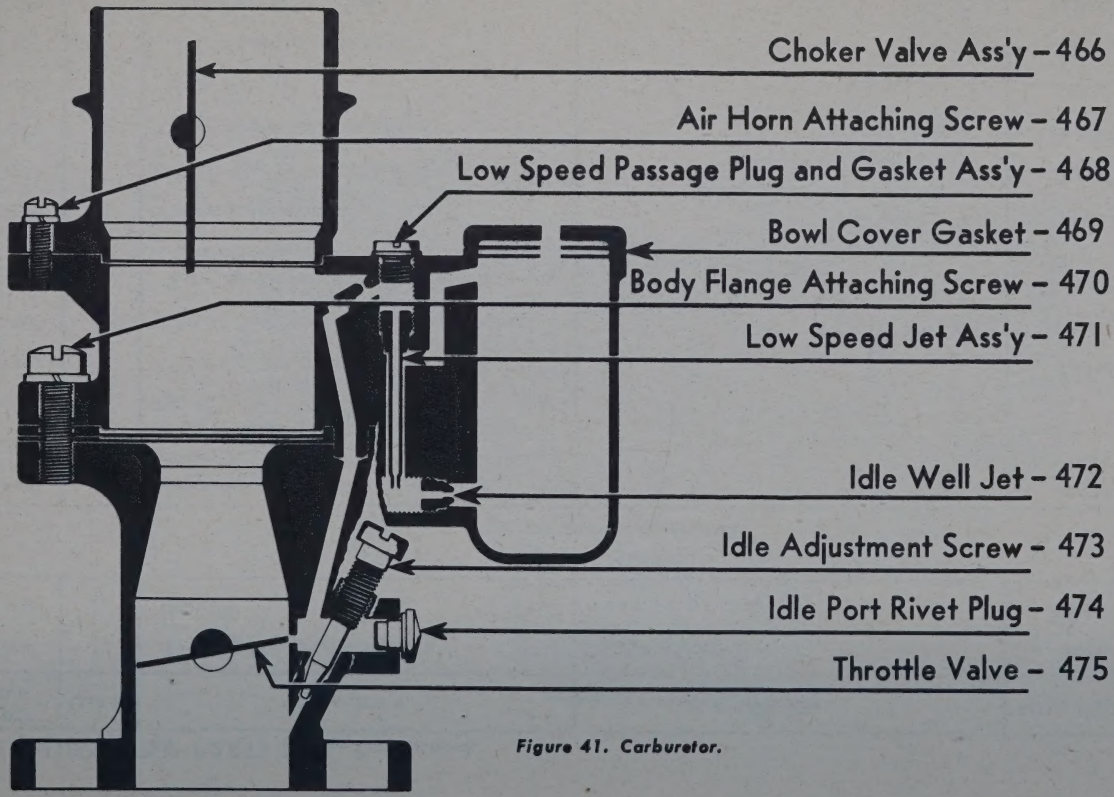


Figure 41. Carburetor.

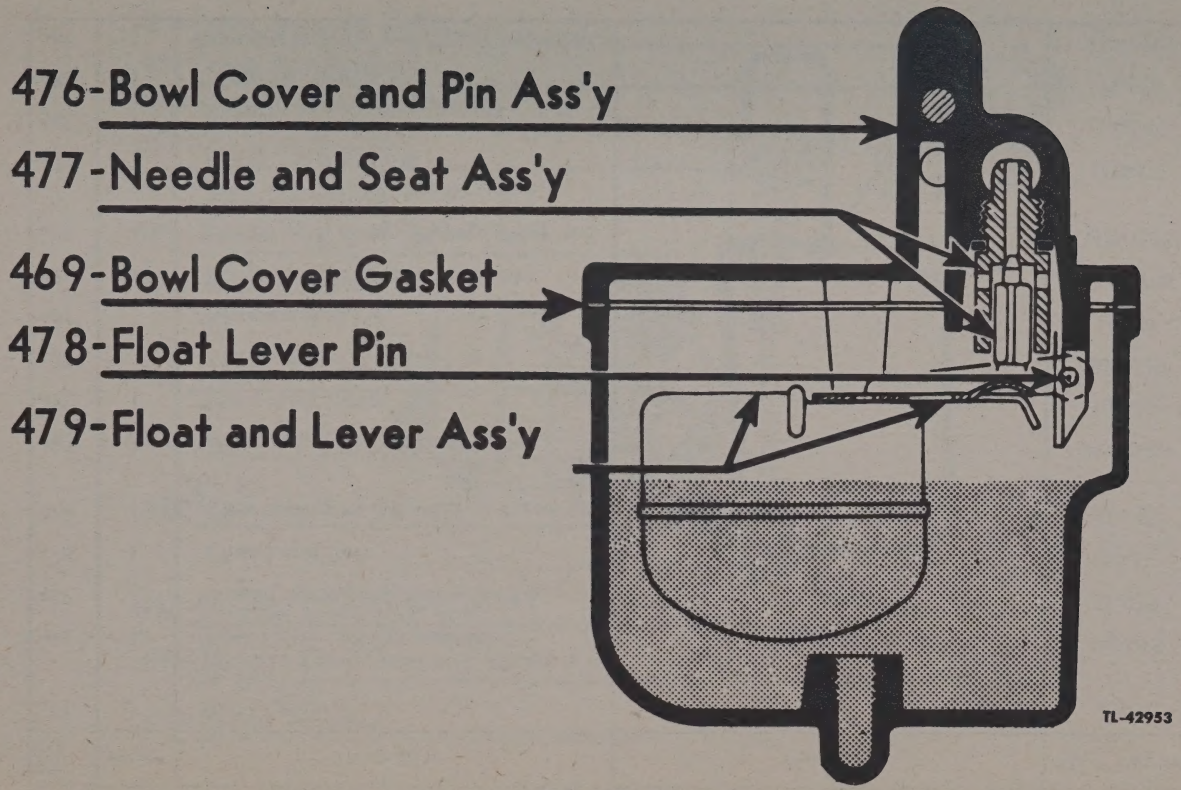


Figure 42. Carburetor.

52. ILLUSTRATED PARTS LIST—Continued.

Ref. No.	Quan.	Description	Function	Mfg's Part No.	Mfg.
475	1	Throttle Valve. (fig. 42).		2-116	5
476	1	Bowl Cover and Pin Assembly.		146-95S	5
477	1	*Needle, Spring and Seat Assembly.		25-93S	5
478	1	Float Level Pin.		24-23	5
479	1	Float and Lever Assembly. (fig. 43).		21-74S	5
480	1	Pump Arm and Collar Assembly.		53A-168S	5
481	1	*Pump Arm Spring.		61-169	5
482	1	*Metering Rod Pin Hex. Nut		105A-19	5
483	1	*Metering Rod Pin.		150-97	5
484	1	Pump Operating Lever Assembly.		53A-170S	5
485	2	*Nozzle and Pump Passage Plug and Gasket Assembly.		11B-127S	5
486	1	*Nozzle Retainer Plug.		11B-171	5
487	1	*Nozzle.		12-255	5
488	1	*Metering Rod (Std.)		75-570	5
489	1	*Metering Rod Jet and Gasket Assembly.		120-135S	5

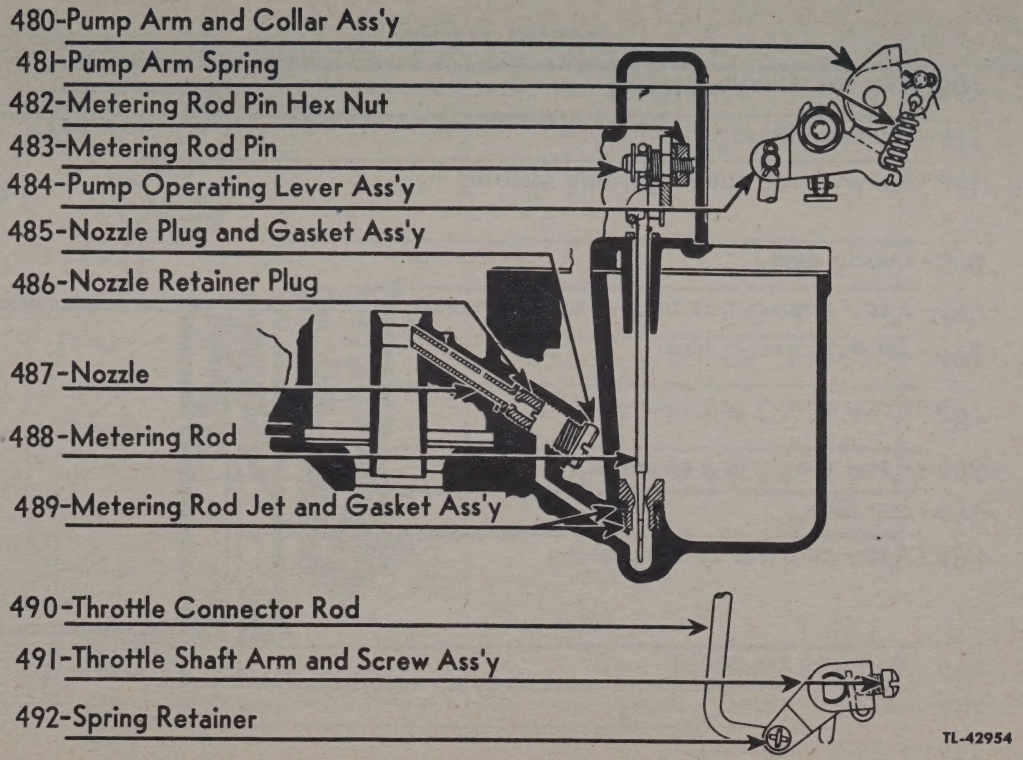


Figure 43. Carburetor.

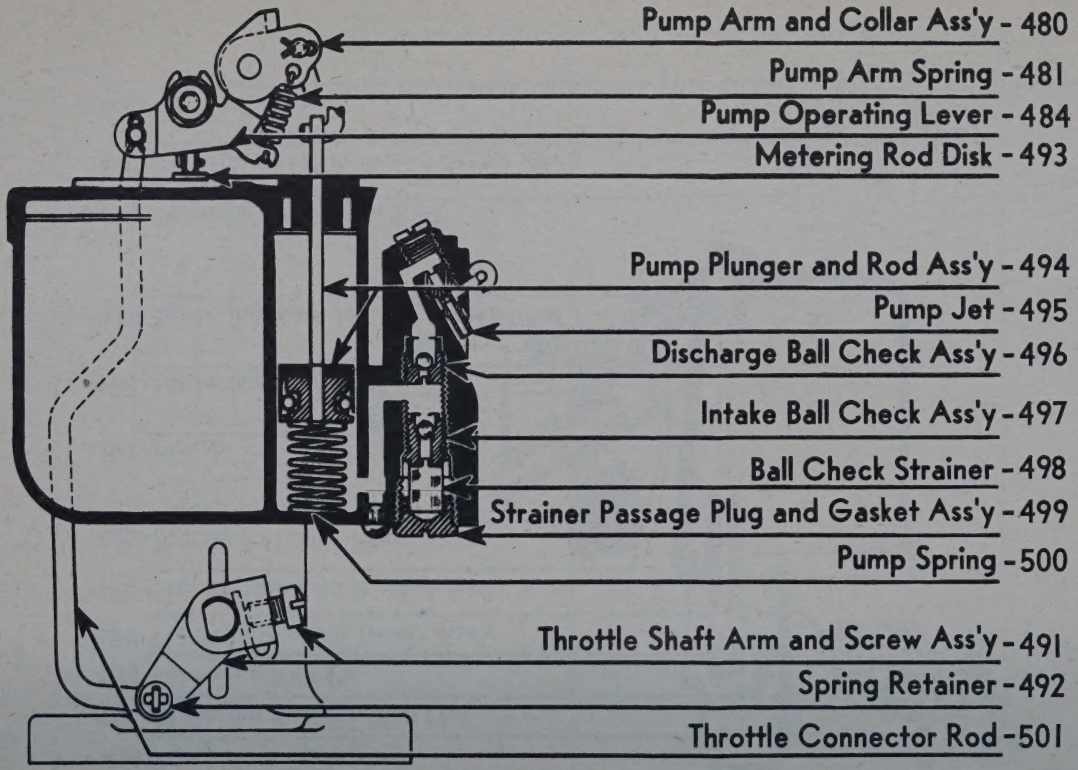


Figure 44. Carburetor.

52. ILLUSTRATED PARTS LIST—Continued.

Ref. No.	Quan.	Description	Function	Mfg's Part No.	Mfg.
490	1	*Throttle Connector Rod.		115-59	5
491	1	*Throttle Shaft Arm and Screw Assembly.		114-21S	5
492	1	*Spring Retainer. (fig. 44).		63-35	5
493	1	*Metering Rod Disk.		129-15	5
494	1	*Plunger and Rod Assembly.		64-62S	5
495	1	*Pump Jet.		48-84	5
496	1	*Discharge Disk Check Plug Assembly.		122-47S	5
497	1	*Intake Ball Check Plug Assembly.		122-64S	5
498	1	*Strainer—Ball Check.		30-20	5
499	1	*Strainer Passage Plug and Gasket Assembly.		11B-125S	5
500	1	Pump Spring Plunger.		61-143	5
501	1	Throttle Shaft and Lever Assembly.		3-497S	5

FUEL PUMP

(fig. 45)

502	1	Fuel Pump Assembly.		A-1220	46

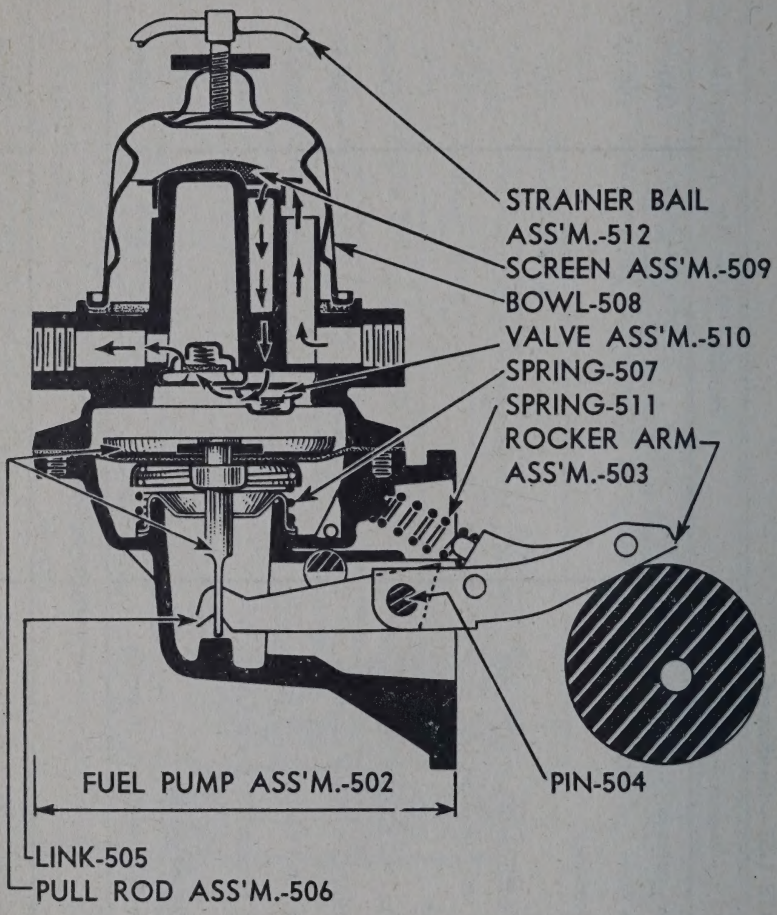


Figure 45. Fuel pump.

52. ILLUSTRATED PARTS LIST—Continued.

Ref. No.	Quan.	Description	Function	Mfg's Part No.	Mfg.
	1	Fuel Pump Service Kit—(Internal) (No. 1537904)—Includes one each of the following: 638737, 115641, 115880, A-1046, A-1047, 115643, 115654, 115644, 115653, 115868, 115869, 115870, 115656, two each 115651, 115652, 51546, and six of 113439.		A-1540	46
	1	Fuel Pump Service Kit—(External)—Consists of one each of the following: A-1494, 115656, 115657, and 113460.		A-6754	46
503	1	Fuel Pump Rocker Arm Assembly.		115641	13
504	1	Fuel Pump Rocker Arm Pin.		A-1046	13
505	1	Fuel Pump Rocker Arm Link.		115880	13
506	1	Fuel Pump Diaphragm and Pull Rod Assembly.		115644	13
507	1	Fuel Pump Diaphragm Spring.		115868	13
508	1	Fuel Pump Bowl.		A-1494	13
509	1	Fuel Pump Filtering Screen Assembly.		115654	13
510	1	Fuel Pump Inlet and Outlet Valve Assembly.		115651	13
511	1	Fuel Pump Rocker Arm Spring.		115643	13
512	1	Gasoline Strainer Bail Assembly.		115657	13

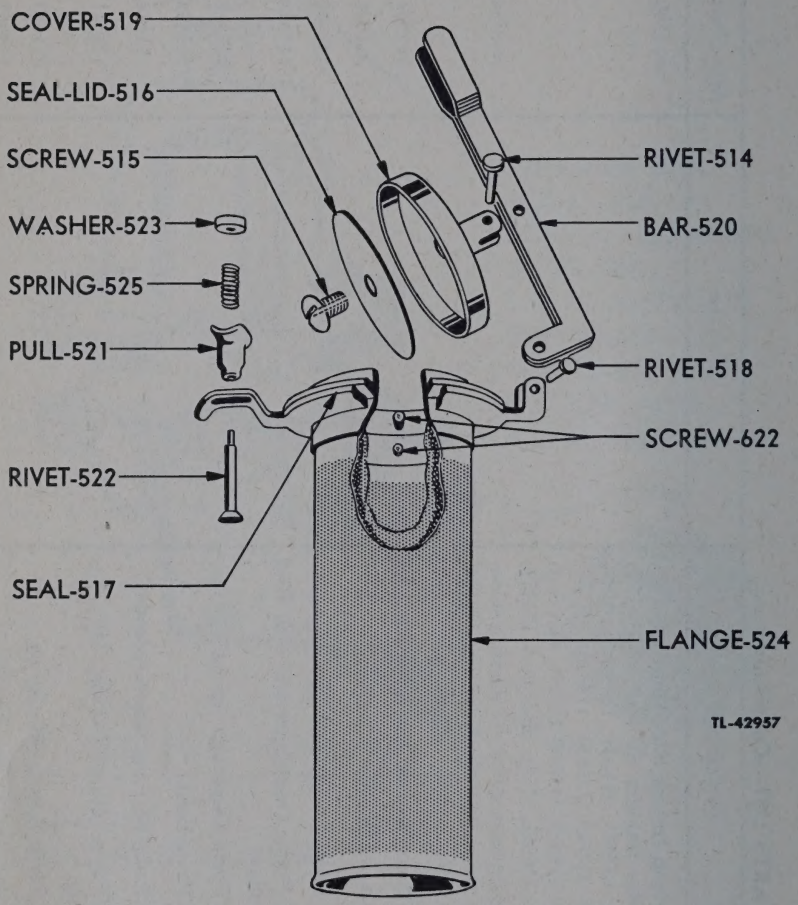


Figure 46. Gas tank safety cap assembly.

52. ILLUSTRATED PARTS LIST—Continued.

Ref. No.	Quan.	Description	Function	Mfg's Part No.	Mfg.
		GAS TANK SAFETY CAP (fig. 46)			
513	1	Gas Tank Safety Cap Assembly.		DW2086	18
514	1	Rivet.		50MS286	18
515	1	Screw—(Drilled for Vent).		DW1440	18
516	1	Seal—Lid to Cap Leather.		DW1453	18
517	1	Seal for Cap—Leather.		DW1454	18
518	1	Rivet.		DW1727	18
519	1	Cap Cover.		DW3008	18
520	1	Holddown Bar (SA).		DW1313A	18
521	1	Pull for Cap.		DW3020	18
522	1	Rivet.		DW3025	18
523	1	Rivet Washer for Hold Down.		DW3033	18
524	1	Protecto Seal Assembly and Body Flange (SA).		DW3085	18
525	1	Holddown Spring.		94W799D	18

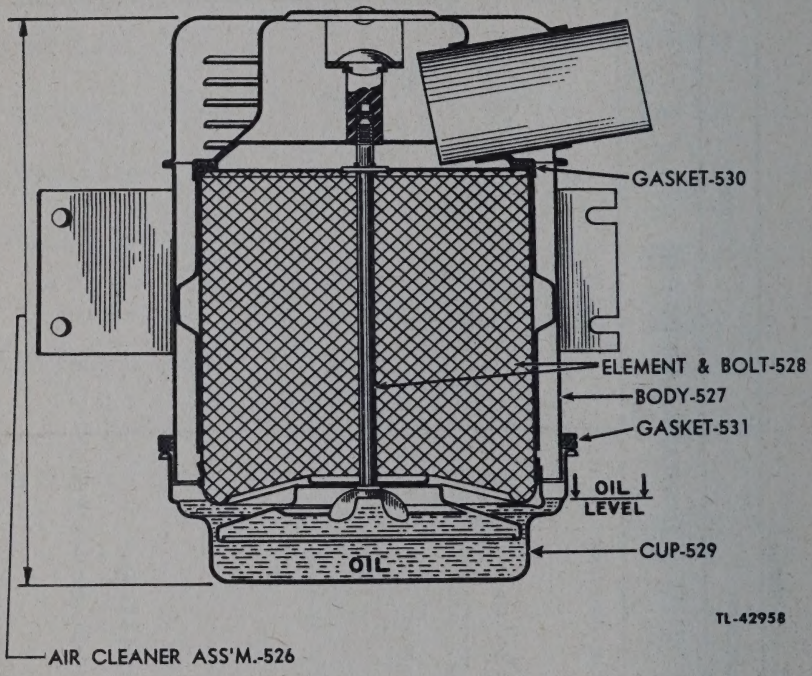


Figure 47. Air cleaner (heavy duty, oil type).

52. ILLUSTRATED PARTS LIST—Continued.

Ref. No.	*Quan.*	*Description*	*Function*	*Mfg's Part No.*	*Mfg.*
		AIR CLEANER			
		(fig. 47)			
526	1	Air Cleaner Assembly.	Filters Air to Carburetor.	613300	19
527	1	Body—Air Cleaner.		A-5629	46
528	1	Element and Wing Bolt—Air Cleaner.		A-5630	46
529	1	Cup—Air Cleaner Oil.		A-5631	46
530	1	Gasket—Air Cleaner Body (Upper).		A-5632	46
531	1	Gasket—Air Cleaner Oil Cup (Lower).		A-5633	46
		SERVO PRECISION GOVERNOR			
		(fig. 48)			
532	1	Precision Governor Assembly.	Maintains Predetermined Engine Speed.	26710-326	21
533	1	Spring Slide.		26618	21
534	2	Shoulder Screw.		26619	21
535	1	Adjusting Screw.		21535	21
536	1	Locknut.		46202	21
537	1	Oil Level Plug.		25368	21
538	1	Oil Filler Plug.		25369	21

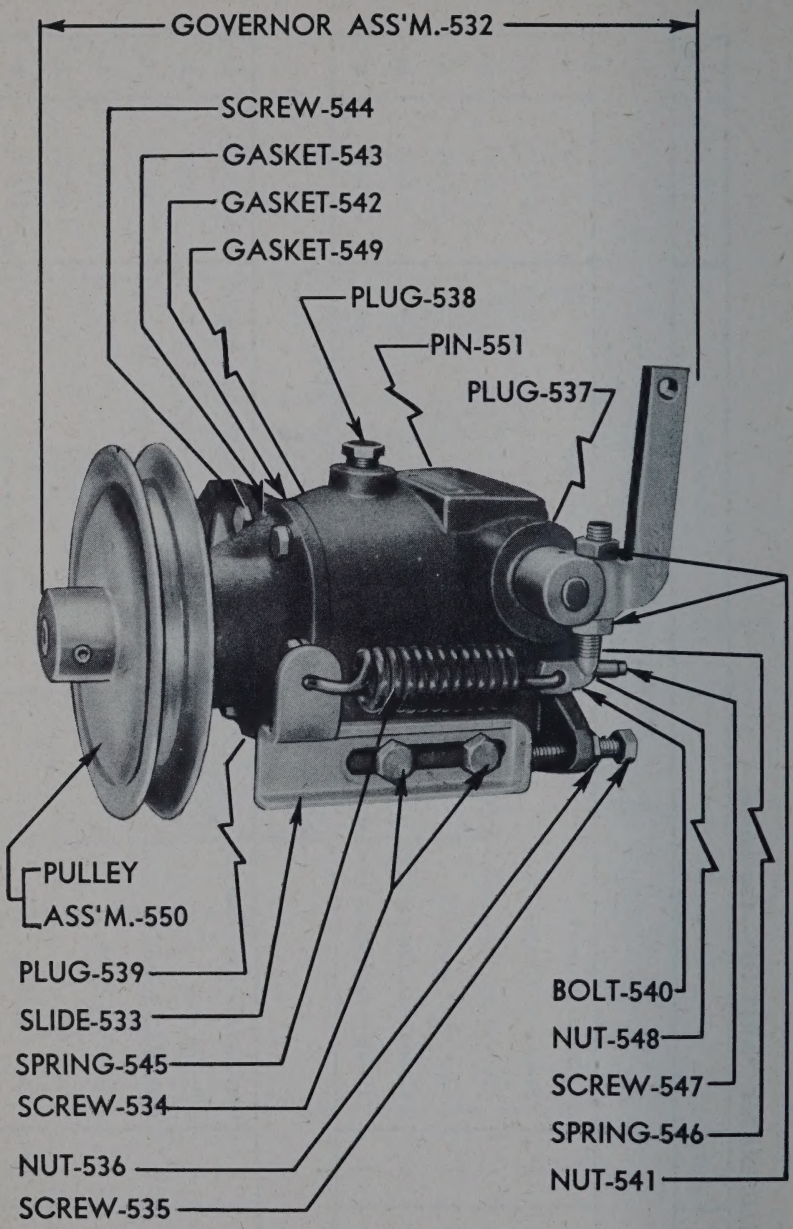


Figure 48. Servo precision governor.

52. ILLUSTRATED PARTS LIST—Continued.

Ref. No.	*Quan.*	*Description*	*Function*	*Mfg's Part No.*	*Mfg*
539	1	Pipe Plug.		20285	21
540	1	Spring Eyebolt.		26628	21
541	2	Locknut.		A-7434	21
542	1	Gasket.		26646	21
543	6	Gasket.		25230	21
544	6	Body Screw.		26648	21
545	1	Governor Spring.		23491	21
546	1	Bumper Spring.		H-9367	21
547	1	Bumper Spring Screw.		26649	21
548	1	Bumper Screw Lock Nut.		26706	21
549	1	Gasket.		26773	21
550	1	Pulley Assembly.		26641	21
551	1	Taper Pin.		20251	21

PENN ELECTRIC SWITCH GROUP
(fig. 49)

552	1	Penn Electrical Switch—Model 2200.	Protects Engine Against Oil Pressure Failure and Overheating.	261AP 14X	31
553	1	Connector Rod Pivot Screw.	Mounts Pivot Rod to Main Arm Assembly.	260-17	31

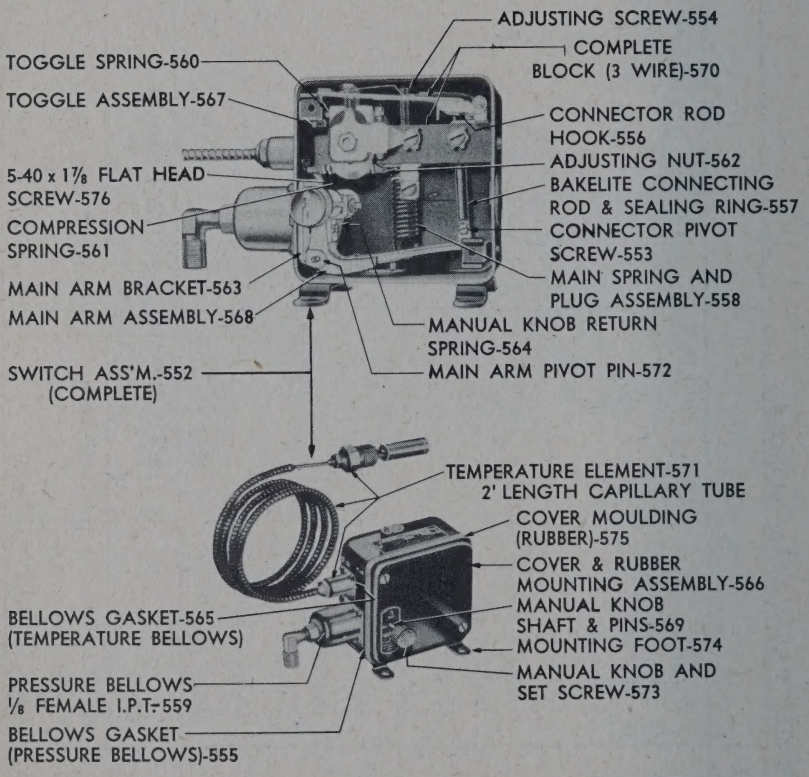


Figure 49. Penn electric switch.

52. ILLUSTRATED PARTS LIST—Continued.

Ref. No.	*Quan.*	*Description*	*Function*	*Mfg's Part No.*	*Mfg.*
554	1	Adjusting Screw.	To Adjust Contact.	260-221	31
555	1	Bellows Gasket (Pressure Bellows).	For Mounting Pressure Bellows.	260-266	31
556	1	Connector Rod Hook.	Stop to Relieve Pressure on Switch when Closed.	260-802	31
557	1	Bakelite Connector Rod and Sealing Ring.	Connects Main Arm Assembly with Contact Block to Operate Switch.	260-808	31
558	1	Main Spring and Plug Assembly.	Holds Main Arm Assembly Intact.	260N894	31
559	1	Pressure Bellows (⅛" Female I.P.T.)	Housing for Pressure Element that Operates Switch.	260N919	31
560	1	Toggle Spring.	Holds Heat Toggle Assembly Switch in Required Position.	261-22	31
561	1	Compression Spring.	To Hold Adjusting Nut Secure.	261-23	31
562	1	Adjusting Nut.	To Adjust.	261-25	31
563	1	Main Arm Bracket.	Holds Main Arm.	261-73	31
564	1	Manual Knob Return Spring.	Returns Manual Knob to Proper Position.	261-94	31
565	1	Bellows Gasket (Temperature Bellows).	Prevents Leakage from Bellows.	261-105	31
566	1	Cover and Rubber Moulding Assembly.	To Enclose Unit.	261-897	31
567	1	Toggle Assembly.	Switches Unit ON and OFF.	261-899	31

52. ILLUSTRATED PARTS LIST—Continued.

Ref. No.	*Quan.*	*Description*	*Function*	*Mfg's Part No.*	*Mfg.*
568	1	Main Arm Assembly.	To Throw Switch.	261-901	31
569	1	Manual Knob Shaft and Pins.	Controls Setting of Unit.	261-902	31
570	1	Complete Contact Block (3-wire).	Controls Contact.	261-907	31
571	1	Temperature Element (2′ length—Capillary Tube).	Transfers Heat from Engine to Switch Unit.	261-9242	31
572	1	Main Arm Pivot Pin.	Pivots Main Arm.	299-9	31
573	1	Manual Knob and Setscrew.	For Turning Manual Knob Shaft.	299-812	31
574	2	Mounting Foot.	For Mounting Switch Assembly.	L-347	31
575	1	Cover Moulding—Rubber.	For Mounting Cover to Switch.	LN-47	31
576	1	Flat Head Screw, 5-40-1⅞″.	For Mounting Compression Spring.	Z-651	31

TOOLS
(fig. 50)

577	1	Pressure Grease Gun.		5903	22
578	1	Gas Pliers.		2247-BP	4
579	2	Tappet Wrench.		XU90	42
580	1	Feeler Gauge.		67B	43
581	1	Screw Driver (Large).		1516P	9

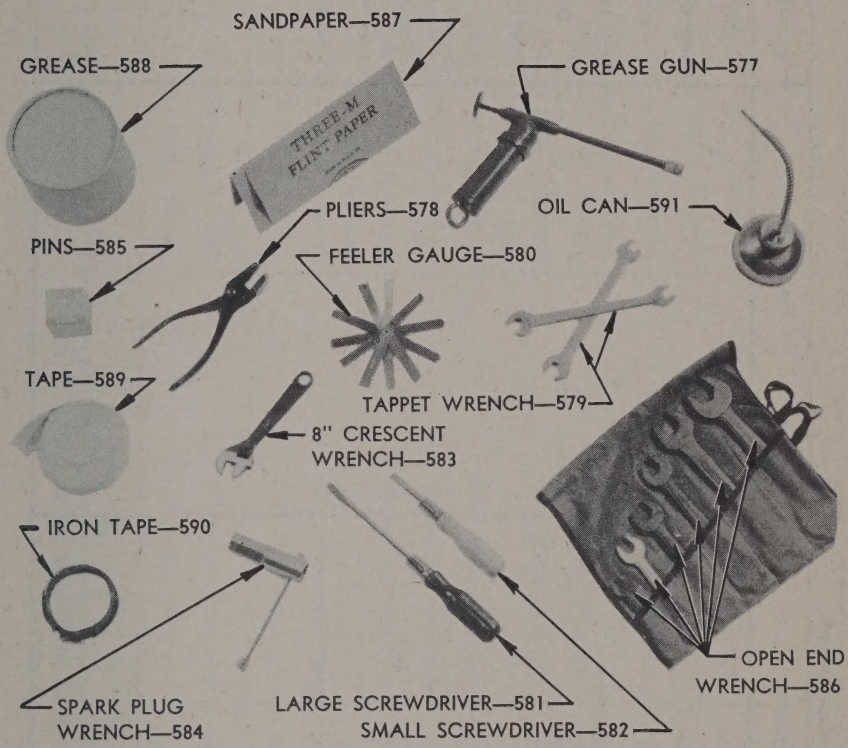


Figure 50. Tools.

52. ILLUSTRATED PARTS LIST—Continued.

Ref. No.	Quan.	Description	Function	Mfg's Part No.	Mfg.
582	1	Screw Driver (Small).		1516P	9
583	1	Crescent Wrench—8"		Order by name	4
584	1	Spark Plug Wrench.		6302	27
585	1	Cotter Pins—Small Assorted.		Order by name	37
586	1 set	Wrenches—Open End.		4746	4
587	2 sheets	Sandpaper #00.		Order by name	25
588	1	Grease—2-lb. Can.		Order by name	18
589	1	Asbestos Tape—1¼" x 25' roll.		Order by name	36
590	1	Tape—Soft Iron 25'.		Order by name	2
591	1	Oil Can with Flexible Spout.		#76	29

52. ILLUSTRATED PARTS LIST—Continued.
TABLE OF BOLTS, NUTS, SCREWS, WASHERS AND COTTER PINS

Ref. No.	*Quan.*	*Size*	*Length*	*Thread*	*Description*	*Function*
592	4	1/4	5/8	20	Bolt, Hex. Head Cap.	Mounts Fan to Pulley.
593	1	5/16	5/8	24	Bolt, Hex. Head Cap.	Mounts Starting Motor Support to Starting Motor.
594	4	5/16	3/4	24	Bolt, Hex. Head Cap.	Mounts Filter to Bracket.
595	5	5/16	7/8	18	Bolt, Hex. Head Cap.	2—Mounts Fuel Pump to Cylinder Block. 3—Mounts Water Pump to Cylinder Block.
596	4	5/16	1	18	Bolt, Hex. Head Cap.	Mounts Exhaust to Intake Manifold.
597	1	5/16	2 1/2	18	Bolt, Hex. Head Cap.	Mounts Water Pump to Cylinder Block.
598	1	3/8	7/8	16	Bolt, Hex. Head Cap.	Mounts Starting Motor Support to Crankcase.
599	12	3/8	1	24	Bolt, Hex. Head Cap.	Mounts Timing Chain Cover to Engine.
600	2	3/8	1 1/4	16	Bolt, Hex. Head Cap.	Mounts Starting Motor to Rear Engine Plate and Bell Housing.
601	2	#8			Lockwasher, Std.	Mounts Receptacle to Control Panel.
602		#10			Lockwasher, Std.	Mounts Circuit Breaker to Control Panel.
603	4	3/16			Lockwasher, Std.	2—Mounts Voltage Regulator Bracket to Control Panel.
	4					2—Mounts Voltage Regulator to Central Panel Mounting Pan.

52. ILLUSTRATED PARTS LIST—Continued.
TABLE OF BOLTS, NUTS, SCREWS, WASHERS AND COTTER PINS

Ref. No.	*Quan.*	*Size*	*Length*	*Thread*	*Description*	*Function*
604		10			Lockwasher, Steel.	4—Mounts Commutator End Plate Assembly to Starting Motor Armature Housing.
	8					4—Mounts Pinion Housing to Starting Motor Housing.
605	4	1/4			Lockwasher, Steel.	Mounts Fan to Pulley.
606	21	5/16			Lockwasher, Steel.	1—Mounts Starting Motor Support to Starting Motor.
						6—Mounts Fan Pulley Shield and Oil Pan to Cylinder Block.
						14—Mounts Oil Pan to Cylinder Block and Front Engine Cover.
607	22	5/16			Lockwasher, Steel.	4—Mounts Oil Filter Clamp Assembly to Bracket.
						2—Mounts Oil Float Support to Crankcase.
						4—Mounts Exhaust to Intake Manifold.
						2—Mounts Fuel Pump to Cylinder Block.
						4—Mounts Water Pump to Cylinder Block.
						2—Mounts Starting Motor's Terminal Post.
						4—Mounts Radiator Guard.
608	28	3/8			Lockwasher, Steel.	4—Mounts Exciter Brushholder Ring—Inner and Outer.
						3—Mounts Water Outlet Elbow.

						4—Mounts Cover to Engine Plate. 6—Mounts Engine Plate and Chain Cover to Cylinder Block. 6—Mounts Flywheel Bolt. 2—Mounts Starting Motor to Rear Engine Plate and Bell Housing. 1—Mounts Starting Motor Support to Crankcase. 2—Mounts Radiator to Radiator Mount.
609	6	½			Lockwasher.	Mounts Bearing Cap and Crankcase Screw
610	16	⅜		16	Nut, Hex. Head Jam.	8—Mounts Terminal Block Stud to Control Panel. 4—Mounts Lugs to Terminal Block Stud. 4—Mounting External Electrical Equipment.
611	1	10		24	Nut, Hex. Head Cap.	Mounts Heat Control Crank Lever to Heat Control Shaft.
612	2	5/16		24	Nut, Hex. Head Cap.	Mounts Starting Motor Terminal Post.
613	25	⅜		24	Nut, Hex. Head Cap.	4—Mounts Cover to Engine Plate. 6—Mounts Engine Plate and Chain Cover to Cylinder Block. 7—Mounts Intake and Exhaust Manifolds to Engine Block. 2—Mounts Flywheel Dowel. 4—Mounts Flywheel Bolt. 2—Mounts Radiator to Radiator Mount.

52. ILLUSTRATED PARTS LIST—Continued.

TABLE OF BOLTS, NUTS, SCREWS, WASHERS AND COTTER PINS

Ref. No.	Quan.	Size	Length	Thread	Description	Function
614	8	7/16		20	Nut, Hex. Head Cap.	6—Mounts Cylinder Head. 1—Mounts Cylinder Head Stud No. 12 Hole. 1—Mounts Cylinder Head Stud No. 10 Hole.
615	6	#8	1/8	32	Nut, Hex. Head Brass.	2—Mounts Receptacle to Control Panel. 2—Mounts Voltage Regulator Bracket to Control Panel. 2—Mounts Voltage Regulator Bracket to Control Panel Mounting Pan.
616	2	1/2		13	Nut, Standard Wing.	Mounting Terminal of Battery Cable.
617	6	1/8	1		Pin, Steel-Cotter.	Locks Stud Nut.
618	1	1/8	1 1/4		Pin—Cotter.	Mounts Oil Float to Support.
619	4	#8	1/2		Screw—Self Tapping.	Mounts Air Cleaner to Air Cleaner Brace
620	2	3/8	1	16	Screw, Sq. Hd. Cup Point Set.	Mounts Flange to Crankshaft.
621	4	10	3/8	32	Screw, Fillister Head.	Mounts Commutator End Plate Assembly to Starting Motor Armature Housing.
622	2	1/4	1/2	20	Screw, Allen Head Cap, Point Set.	Mounts Seal to Body Flange Gas Tank Safety Cap Assembly.
623	4	10	31/32	32	Screw, Hex. Head Cap.	Mounts Pinion Housing to Starting Motor Housing.

624	1	1/4	5/8	20	Screw, Hex. Head Cap.	Mounts Magneto Advance Control Arm Assembly.
625	3	5/16	1/2	18	Screw, Hex. Head Cap.	Mounts Bearing Cap to Exciter Bearing Bracket.
626	20	5/16	5/8	18	Screw, Hex. Head Cap.	4—Mounts Fan Pulley Shield and Oil Pan to Cylinder Block. 16—Mounts Oil Pan to Cylinder Block and Front Engine Cover.
627	8	5/16	3/4	18	Screw, Hex. Head Cap.	2—Mounts Right Radiator Brace. 4—Mounts Control Panel Support to Skid Assembly. 2—Mounts Oil Float Support to Crankcase.
628	2	5/16	1 1/4	24	Screw, Hex. Head Cap.	Mounts Flange to Crankshaft.
629	3	3/8	1 1/8	16	Screw, Hex. Head Cap.	Mounts Water Outlet Elbow.
630	6	3/8	1 1/4	16	Screw, Hex. Head Cap.	4—Mounts Exciter Bearing Bracket to Generator. 2—Mounts Exhaust Pipe Assembly to Manifold.
631	8	3/8	1 1/2	16	Screw, Hex. Head Cap.	4—Mounts Exciter Pole Piece to Exciter Bearing Bracket. 4—Mounts Shock Absorber between Control Panel Mounting Pan and Control Panel Support.
632	2	3/8	2	16	Screw, Hex. Head Cap.	Mounts Generator to Engine.

52. ILLUSTRATED PARTS LIST—Continued.

TABLE OF BOLTS, NUTS, SCREWS, WASHERS AND COTTER PINS

Ref. No.	*Quan.*	*Size*	*Length*	*Thread*	*Description*	*Function*
633	4	3/8	2 3/4	16	Screw, Hex. Head Cap.	Mounts Exciter Brushholders, Both Outer and Inner Rings.
634	4	1/2	1 1/2	13	Screw, Hex. Head Cap.	Mounts Generator to Skid Assembly.
635	6	#8	3/8	32	Screw, Rd. Hd. Machine.	4—Mounts Breaker Switch to Panel. 2—Mounts Receptacle to Control Panel.
636	10	#10	3/8	24	Screw, Rd. Hd. Machine.	Mounts Shock Absorber Plate to Control Panel Mounting Pan Bracket.
637	4	#10	5/8	24	Screw, Rd. Hd. Machine.	2—Mounts Voltage Regulator Bracket to Control Panel. 2—Mounts Voltage Regulator Bracket to Control Panel Mounting Pan.
638	1	10	3/4	24	Screw, Rd. Hd. Machine.	Mounts Heat Control Crank Lever to Heat Control Shaft.
639	2	1/4	3/4	20	Screw, Rd. Hd. Machine.	Mounts Brush Cover to Exciter Bearing Bracket.
640	2	1/4	1 1/2	20	Screw, Rd. Hd. Machine.	Mounts Starter Switch to Engine Panel.
641	4	5/16	5/8	24	Screw, Rd. Hd. Machine.	Mounts Radiator Guard.
642	2	3/16			Washer, Std. Wrot Iron.	Mounts Voltage Regulator Bracket to Control Panel Mounting Pan.

643	4	1/4			Washer, Vulcoid or Equivalent 1 1/8 OD	Mounts Studs to Control Panel.
644	6	5/16			Washer, Plain Steel.	4—Mounts Oil Filter Clamp Assembly to Bracket. 1—Mounts Starting Motor Support to Starting Motor. 1—Mounts Starting Motor Terminal Post.
645	1	3/8			Washer, Plain Steel.	Mounts Starting Motor Support to Crankcase.
646	26	3/8			Washer, Bolt Steel.	8—Mounts Terminal Block Stud to Control Panel. 8—Mounts Lugs to Terminal Block Stud. 10—Mounts Exciter Brushholder, both Outer and Inner Rings.

SECTION V. SUPPLEMENTARY DATA

53. MAINTENANCE PARTS LIST FOR POWER UNIT PE-182.

Ref. symbol	*Ordnance stock No.*	*Name of part and description*	*Quantity per unit*	*Running spares*	*Orgn. stock*	*3d ech*	*4th ech*	*5th ech*	*Depot stock*
		BATTERY AND BATTERY CABLE GROUP							
	HB No. 10J246	CABLE ASSEMBLY: starter; negative; 8′ long; Hobart Bros. Co., 10J246.	1	1					x
	HB No. 10J245	CABLE ASSEMBLY: starter; positive; 8′ long; Hobart Bros. Co., 10J245.	1	1					x
		CAMSHAFT GROUP							
114	WO No. 51460	PLUG: expansion; 1¾″; Willys 51460.	1	1					x
		CRANKSHAFT AND CONNECTING ROD GROUP							
181	WO No. A-7233	BEARING: set; connecting rod; for Willys MB engine; Willys A-7233. Consists of 2 Willys 639862 std. bearings (F. M.- GPW 6211A).	4	1					x
		CYLINDER BLOCK, CRANKCASE, AND GEAR COVER GROUP							
127	WO No. 638678	GASKET: cylinder head; for Willys MB engine; Willys 638678.	1	1					x
165	WO No. 51091	PLUG: expansion; 1¼″; Willys 51091.	5	5					x

		FUEL PUMP GROUP								
502	WO No. A-1220	PUMP: fuel; AC1537766; Willys A-1220.	1	1						x
		GOVERNOR AND GOVERNOR CONTROL GROUP								
532	KS No. 26710	GOVERNOR ASSEMBLY: centrifugal; King-Seeley 26710.	1	1						x
		IGNITION GROUP								
322	WCE No. 1408	ARM: breaker; Wico X-1408.	1	1						x
337	WCE No. 1413	CAPACITOR: magneto; Wico X-1413.	1	1						x
327	WCE No. 1196	POINT: magneto breaker; fixed contact; Wico 1196.	1	1						x
117	WO No. 538	SPARK PLUG: Champion QM2; Willys A-538.	4	4						x
		OIL FILTER AND OIL LINE GROUP								
428	WO No. A-1236	ELEMENT: oil filter; with gasket; for Purolator PD51; Willys A-1236; Ford motor, GPW18662B.	1	1						x
		RADIATOR GROUP								
7	AMC	CLAMP: hose; radiator; 1½"; 3-ply; No. 10½; American Stamping.	6	6						x
23	HB No. 25J172	HOSE: radiator; for inlet connections; 1½" I.D. x 3½" long; Hobart Bros. No. 25J172.	2	2						x

xTo be requisitioned from Ordnance Depots as per ASF directive dated 16 Sept. 1943, S. P. M. T. 400.4, serial No. 64.

53. MAINTENANCE PARTS LIST FOR POWER UNIT PE-182—Continued.

Ref. symbol	*Ordnance stock No.*	*Name of part and description*	*Quantity per unit*	*Running spares*	*Orgn. stock*	*3d ech*	*4th ech*	*5th ech*	*Depot stock*
24	HB No. HJ13	HOSE: radiator; for outlet connection; 1½" I.D. x 5" long; Hobart Bros. HJ13.	1	1					x
145	WO No. 637646	THERMOSTAT: water temperature; bellows type; Willys 637646.	1	1					x
		VALVE GROUP							
218	WO No. 375994	LOCK: retainer; valve spring; lower; Willys 375994.	16	8					x
217	WO No. 637044	RETAINER: valve spring; lower; Willys 637044.	8	4					x
216	WO No. 638636	SPRING: valve; Willys 638636.	8	4					x
215	WO No. 637183	VALVE: exhaust; Willys 637183.	4	4					x
		WATER PUMP AND FAN GROUP							
58	WO No. A-1495	BELT: fan and water pump drive; Willys A-1495.	1	1					x
443, 445, 447, 446, 451	WO No. A-6839	KIT: repair; water pump; Willys A-6839. Consists of 1 bearing and shaft assembly, Willys 636297; 1 bearing retainer wire, Willys 636298; 1 seal assembly, Willys 640031; 1 seal washer, Willys 640034; 1 water pump to cylinder block gasket, Willys 637053.	1	1					x

		MISCELLANEOUS GROUP								
	WO No. A-1536	GASKET: complete set; for Willys MB engone; Willys A-1536; F. M. GPW6051B; consists of the following:	1	1						x
155	WO No. 630365	GASKET: chain cover; Willys 630365; Ford GPW6288.	1							x
156	WO No. 630359	GASKET: cylinder block; front; Willys 630359; Ford GPW6020.	1							x
127	WO No. A-8558	GASKET: cylinder head; Willys A-8558; Ford GPW6051B.	1							x
	WO No. 634814	GASKET: exhaust pipe flange; Willys 634814; Ford GPW9450.	1							x
17	G-085-30-02240	GASKET: fuel pump; Willys 638737; Ford GPW9417.	1							x
	WO No. A-6357	GASKET: insulator and diffuser assembly; Willys A-6357; Ford GPW9445.	1							x
128	G-503-01-94021	GASKET: intake and exhaust manifold; Willys 638640; Ford GPW9448.	1							x
129	WO No. 634811	GASKET: intake to exhaust manifold; Willys 634811; Ford GPW9435.	1							x
	WO No. 630398	GASKET: intake to exhaust manifold; Willys 630398; Ford GPW6627.	1							x

xTo be requisitioned from Ordnance Depots as per ASF directive dated 16 Sept. 1943, S. P. M. T. 400.4, serial No. 64.

53. MAINTENANCE PARTS LIST FOR POWER UNIT PE-182—Continued.

Ref. symbol	*Ordnance stock No.*	*Name of part and description*	*Quantity per unit*	*Running spares*	*Orgn. stock*	*3d ech*	*4th ech*	*5th ech*	*Depot stock*
		MISCELLANEOUS GROUP (Contd.)							
96	WO No. 630398	GASKET: oil float support; Willys 630398; Ford GPW6627.	1						x
99	WO No. 639980	GASKET: oil pan; Willys 639980; Ford GPW6710.	1						x
420	WO No. 639870	GASKET: oil pump cover (Vellumoid); Willys 639870; Ford GPW6659.	1						x
	WO No. 630392	GASKET: oil pump cover; Willys 630392; Ford GPW6619.	2						x
100	3320-GFW-6734	GASKET: oil pan drain plug; Willys 314338; Ford B-12410.	1						x
419	WO No. 375927	GASKET: Oil pump shaft; Willys 375927; Ford GPW6625.	1						x
424	WO No. 630394	GASKET: oil pump to cylinder block; Willys 630394; Ford GPW6630.	1						x
408	WO No. 634813	GASKET: oil pump relief spring retainer; Willys 634813; Ford GPW6642.	1						x
187	WO No. 334103	GASKET: crankshaft oil slinger; Willys 334103; Ford GPW6353.	1						x

162	WO No. 637790	PACKING: crankshaft bearing cap; Willys 637790; Ford GPW6701.	2								x
118	WO No. 637863	GASKET: spark plug; Willys 637863; Ford 0IA-12410.	4								x
130	G-503-01-94022	GASKET: valve spring cover; Willys 630305; Ford GPW6521.	1								x
131	G-503-01-94032	GASKET: valve cover screw; Willys 51875; Ford GPW6555.	2								x
132	G-503-01-94030	GASKET: water outlet elbow; Willys 639650; Ford GPW8255.	1								x
451	G-503-01-94016	GASKET: water pump to cylinder block; Willys 637053; Ford GPW8543.	1								x
109	WO No. 637098	PACKING: crankshaft, front; Willys 637098; Ford GPW6700.	1								x
104	WO No. 637237	PACKING: crankshaft, rear; Willys 637237; Ford GPW6702.	2								x
126	WO No. 630299	GASKET: ventilator to valve spring cover; Willys 630299; Ford GPW6648.	1								x

xTo be requisitioned from Ordnance Depots as per ASF directive dated 16 Sept. 1943, S. P. M. T. 400.4, serial No. 64.

53. MAINTENANCE PARTS LIST FOR POWER UNIT PE-182—Continued.

Ref. symbol	*Signal Corps stock No.*	*Name of part and description*	*Quantity per unit*	*Running spares*	*Orgn. stock*	*3d ech*	*4th ech*	*5th ech*	*Depot stock*
		GENERATOR AND EXCITER GROUP							
222	3H304-27	BEARING: ball; for arm shaft; New Departure WC8507X; Fafnir 207T.	1	1		*	*		*
226	3H4540.1/7	BEARING: ball; engine end of generator; Fafnir 308.	1	1		*	*		*
254	3H106H-1/B5	BRUSH: A. C.; 0.245″ x 0.620″ x 1½″; S. A. E. 35 grade Nat'l Carbon Co; 472G grade Superior Carbon Co.; for alternator; Hobart Bros. DW825.	4	4	*	*	*	*	*
255	3H105-1/B6	BRUSH: D. C.; 0.370″ x 0.621″ x 1½″; 3A-35 or 259 grade, Nat'l Carbon Co; 472G grade, Superior Carbon Co.; for exciter; Hobart Bros. AAP-16A.	4	4	*	*	*	*	*
	3DA100-268	CAPACITOR: tubular; bearing bracket; 0.1 mf 400 vdcw; ¾″ diam. tinned case; capacitor body 2″ long with 2¾″ lead; soldered lug; 5/32″ hole in bracket.	2	0			*	*	*
230	6Z3429-5	COUPLING: pipe; steel; ⅛″.	1	0			*	*	*
231	6Z3460-1	CUP: grease; ⅛″; No. 000 male.	1	0			*	*	*
235	6Z7245-2.1	NIPPLE: pipe; steel; black; ⅛″; 5″ long.	1	0			*		

245	2C4923A/T6	SPRING: brush; No. 14; 0.064" dia.; phosphor bronze wire; Hobart Bros. No. W799-6.	8	0		*	*	*	*
		CONTROL GROUP							
83	3F2746	FREQUENCY METER: miniature type MF9; Frahm vibrating reed; 59 to 62 cps; 9 reeds; 125 v.; 2¾" dia. x 3" deep from back of flange; James Biddle Co., Philadelphia, Pa.	1	0			*	*	*
81	6Z6820-21	LAMP: 25w, 120 v.; silver bowl; A-19 rough service lamp.	2	0	*	*	*	*	*
72	6Z7778	RECEPTACLE: twist lock; Hubbell 7380.	1	0		*	*		*
87	3Z7032	RHEOSTAT: field; 32-ohm; wire-wound; Ohmite Model L, Ohmite spec. 10821 or Hardwick-Hindle type D-150.	1	0		*	*	*	*
84	3F3320-1	TIMEMETER: range 9,999.9 hours; 115 v., 60 cps; case dia. 2¾"; flange dia. 3½"; R. W. Cramer, RT2H.	1	0			*	*	*
	6Z8355-2	SOCKET: panel light; 125 v.; rubber insulated; Daniel Woodhead, 604 lamp holder.	2	0			*	*	*
51	3Z9859-35	SWITCH: light; toggle; with bussing back terminals; Cutler-Hammer, 7320.	1	0		*	*	*	*
	3H106H	ALTERNATOR: 9.4 kva; 120/208 vac, 3-phase; Hobart Bros. 10J1.	1	0					*

*Indicates Signal Corps stock available.

53. MAINTENANCE PARTS LIST FOR POWER UNIT PE-182—Continued.

Ref. symbol	Signal Corps stock No.	Name of part and description	Quantity per unit	Running spares	Orgn. stock	3d ech	4th ech	5th ech	Depot stock
		CONTROL GROUP (Contd.)							
78	3F8300-33	AMMETER: a-c; 0.50 amps; all bakelite case; white face; black lettering; mounts in 2½" dia. round window; flange dia. 3¼"; linear distance between mounting holes in flange, 2½"; 3-screw mounting; Triplett Model 332JP.	3	0			*	*	*
	3DA10-32	CAPACITOR: power studs to ground; 0.01 mf, 400 vdcw; ¾" diam. case with bracket soldered on; body 2" long with 1½" lead; tinned lug; 5/32" hole in bracket for mounting.	4	0			*	*	*
80	3H900-50-12	CIRCUIT BREAKER: thermal; 2-pole; 125 v., 50 amps.; molded black bakelite case, 5¼" x 3" x 2¾"; toggle action, manual reset; Heineman 0322.	1	0		*	*	*	*
	3H4109-4	CONTROL PANEL ASSEMBLY: complete with instruments; Hobart Bros., 10J293.	1	0			*	*	*
378	3H4959-7	REGULATOR: voltage; 100-125 v.; 25-125 cycles; 3-amps.; 46.5-ohms; exciter volts, 60; Westinghouse Silverstat Jr, SRA-JR; style 3-79Y712; diagram 4D5526.	1	0		*	*	*	*

91	3Z9859-35	SWITCH: toggle; voltage regulator; Cutler-Hammer No. 7320 as per print A-319-019.	1	0		*	*	*	*
92	3Z9825-58.6	SWITCH: voltage transverse; 2-sections; 2-pole, 6-positions; Centralab No. 1411 selector switch.	1	0		*	*	*	*
93	3F1050-33	VOLTMETER: a-c; 0-300 v.; bakelite case; white face; black lettering; 3-screw mounting; mounts in 2½" dia. round window; flange dia. 3¼"; linear distance between mounting holes in flange, 2½" Triplett 332JP.	1	0			*	*	*

*Indicates Signal Corps stock available.

NAMES AND ADDRESSES OF MANUFATURERS

1.	American Stamping Company	Cleveland, Ohio
2.	American Steel & Wire Company	Cleveland, Ohio
3.	Arrow-Hart & Hegeman Company	Hartford, Conn.
4.	Barcale Manufacturing Company	Buffalo, N. Y.
5.	Carter Carburetor Company	St. Louis, Missouri
6.	Central Laboratory	Milwaukee, Wis.
7.	Cramer, R. W.	Centerbrook, Conn.
8.	Champion Sparkplug Company	Toledo, Ohio
9.	Chicago Kit & Tool Company	Chicago, Ill.
10.	Dole Valve Company	Chicago, Ill.
11.	Electric Auto-Lite Company	Toledo, Ohio
12.	Flexotube Company	Detroit, Mich.
13.	General Motors A. C. Spark Plug Div.	Flint, Mich.
14.	Gibbons, M. J.	Dayton, Ohio
15.	Harrison Radiator Div.—General Motors Corp.	Detroit, Mich.
16.	Harvey-Hubble Company	Bridgeport, Conn.
17.	Heineman Circuit Breaker Company	Trenton, N. J.
18.	Hobart Brothers Company	Troy, Ohio
19.	Houdaille Hershey Corp.—Oaks Prod. Division	Trenton, N. J.
20.	James Riddle Company	Philadelphia, Pa.
21.	King-Seeley Corporation	Ann Arbor, Mich.
22.	Lincoln Engineering Company	St. Louis, Missouri
23.	Lord Manufacturing Company	Erie, Pa.
24.	Mansfield Brass Company	Chicago, Ill.
25.	Minnesota Mining & Mfg. Co.	Cincinnati, Ohio
26.	New Departure Ball Bearing Co.	Bristol, Conn.
27.	New England Pressed Steel Co.	Natick, Ohio
28.	Nichols Electric Company	Dayton, Ohio
29.	Noera Manufacturing Co.	Waterbury, Conn.
30.	Ohmite Manufacturing Co.	Chicago, Ill.
31.	Penn Electric Switch Co.	Goshen, Indiana
32.	Perfex Corporation	Milwaukee, Wis.
33.	Purolator Products, Inc.	Newark, N. J.
34.	Rochester Manufacturing Co.	Rochester, N. Y.
35.	Shakespeare Products Co.	Kalamazoo, Mich.
36.	Southern Asbestos Co.	Charlotte, N. C.
37.	Standard Lock Washer & Mfg. Co.	Worchester, Mass.
38.	Superior Carbon Company	Cleveland, Ohio
39.	Tillotson Manufacturing Co.	Toledo, Ohio
40.	Tite-Flex Metal Hose Co.	Newark, N. J.
41.	Triplett Electrical Instrument Co.	Bluffton, Ohio
42.	Vichek Manufacturing Company	Cleveland, Ohio
43.	Victor Institute & Mfg. Company	New York, N. Y.
44.	Westinghouse Elec. & Mfg. Co.	East Pittsburgh, Pa.
45.	Wico Electric Company	Springfield, Mass.
46	Willys-Overland Motor, Inc.	Toledo, Ohio

Order No. 530-MPD-43; 1512 copies; October 1944