

INSTRUCTION MANUAL AND PARTS LIST



(Price 78 cents)

READ THIS BOOK CAREFULLY AND
PRESERVE FOR FUTURE REFERENCE



GENERAL INFORMATION

THE PURPOSE OF THIS BOOK. This instruction book is furnished so that the operator may learn of the characteristics of the plant. A thorough study of the book will help the operator to keep the plant in good operating condition so that it will give efficient service. An understanding of the plant will also assist the operator in determining the cause of trouble if it occurs.

KEEP THIS BOOK HANDY. Such simple mistakes as the use of improper oil, improper fuel, or the neglect of routine servicing may result in failure of the plant at a time when it is urgently needed. It is suggested that this book be kept near the plant so that it may be referred to when necessary.

SERVICE. If trouble occurs and the operator is unable to determine the cause after a thorough study of this book, or if he is unable to determine what repair parts are required, needed information will be furnished upon request. When asking for information, be sure to state the Model, Serial, and Generator numbers of the plant. This information is absolutely necessary and may be obtained from name plates on the plant. Give all other available details.

MANUFACTURER'S WARRANTY

The manufacturer warrants each new engine or electric plant to be free from defects in material and workmanship. Under normal use and service our obligation under this warranty is limited to the replacing of any part without charge which, within ninety (90) days after delivery to the original user shall be returned to us or our authorized service station with transportation charges prepaid, and which our examination shall disclose to have been defective.

Our liability in case of defective workmanship, material or any costs incurred in remedying any claimed defective condition in any unit or such unit having been repaired, altered, or which installation and service recommendations have not been complied with, is limited strictly to the proper adjustment authorized by the factory.

This warranty does not include or cover standard accessories used, such as carburetors, magnetos, fuel pumps, etc., made by other manufacturers. Such accessories have separate warranties made by the respective manufacturers. Repair or exchange of such accessories will be made by us on the basis of such warranties.

This warranty is in lieu of all other warranties expressed or implied.

IMPORTANT--RETURN WARRANTY CARD ATTACHED TO PLANT.

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PLANT RUNNING HOURS COMPARED TO AUTOMOBILE RUNNING MILES

The engine of your generating plant makes as many revolutions in one hour, as the average automobile engine does when the car travels a distance of 41 miles.

100 running hours time on a generating plant engine is equivalent in total RPM's to approximately 4100 running miles on an automobile.

However, do not conclude that the wear on the generating plant engine and the wear on the automobile engine would be the same. The generating plant engine is built much more ruggedly, (having larger main bearings, bigger oil capacity and has a heavier crankshaft proportionately per horsepower) than most automobile engines. Given the proper care and periodic servicing the generating plant engine will continue to give many more hours of efficient service than an automobile engine will after having been run the equivalent number of running miles.

Compare the running time of your generating plant engine with the number of miles traveled by an automobile. The oil in an auto is checked every one or two hundred miles (3 to 5 hrs. running time) and changed every 1000 to 1500 miles (28 to 42 hrs.) Whereas in a generating plant or stationary power engine, the oil should be checked every 6 to 8 running hours (250 to 350 miles) and changed every 50 to 100 operating hours (2000 to 4000 miles) depending on operating conditions.

About every 5,000 to 10,000 miles (120 to 250 hours), services have to be performed on an auto, such as checking ignition points, replacing spark plugs, condensers, etc. Similarly on your generating plant engine, these same services have to be performed periodically except the change period is reckoned in hours. 10,000 miles on an auto is equivalent to about 250 running hours on your plant engine.

To arrive at an approximate figure of comparative generating plant running hours as against automobile engine running miles, multiply the total number of running hours by 41 to find the equivalent of running miles on an automobile.

Your generating plant engine can "take it" and will give many hours of efficient performance provided it is serviced regularly.

Below is a chart showing the comparison between a generating plant engine running hours and an automobile running miles.

GENERATING PLANT RUNNING HOURS		AUTOMOBILE RUNNING MILES	GENERATING PLANT RUNNING HOURS		AUTOMOBILE RUNNING MILES
DAILY AVERAGE	1 Hr.	41 Miles	MONTHLY AVERAGE	30 Hrs.	1,050 Miles
	4 Hrs.	164 "		120 "	4,200 "
	6 "	246 "		180 "	6,300 "
	8 "	328 "		240 "	8,400 "
WEEKLY AVERAGE	7 "	245 "	YEARLY AVERAGE	365 "	14,965 "
	28 "	980 "		1,460 "	59,860 "
	42 "	1,470 "		2,190 "	76,650 "
	56 "	1,960 "		2,920 "	102,200 "

NOTE: Electric generating plants do not operate economically when used to power electric refrigerators and will add from 4 to 8 operating hours per day in addition to the regular lighting load.

DESCRIPTION

This manual applies to alternating current (AC) generating plants as listed in the General Data Table below. This manual, when used in conjunction with the supplement beginning on page 57, also applies to direct current (DC) generating plants.

One copy of this manual is supplied with each plant of the basic models listed in the General Data Tables, and with other models which differ slightly from these basic models. The manual is supplied to assist the operator in the installation and operation of the plant, and in properly maintaining it so that it will provide long and satisfactory service. Each plant basically consists of an internal combustion engine and a self excited generator, enclosed in a steel housing. Accessories and controls applicable to the particular model are supplied for a normal installation. Read this manual thoroughly to become familiar with the details of installation and operation of the plant. A deviation from these instructions may lead to unnecessary trouble and expense.

Each electric generating plant is test run and carefully checked under various electrical load conditions before leaving the factory, to assure that it is free of defects and will produce its rated output. Before putting the plant into service, carefully inspect it for any damage which may have occurred in shipment. Damaged parts must be repaired or replaced.

GENERAL DATA

OUTPUT WATTS	OUTPUT VOLTS	CYCLES	PHASE	WIRES	CAPACITY IN QUARTS			† PARTS REF. SYMBOL
					COOLING SYSTEM	FUEL TANK	CRANK- CASE	
10000	115	*60	1	2	14	** 60	4	A
10000	230	*60	1	2	14	60	4	B
10000	115/230	*60	1	3	14	60	4	C
10000	120/208	*60	3	4	14	60	4	D
10000	230	*60	3	3	14	60	4	E

The Parts Reference Symbol in this column indicates the applicable column under "Quantity Used" in the Parts List - Generator Group, and Control Panel Group, beginning on page 52. Refer to the plant nameplate to obtain the correct data to use in the above table when ordering replacement parts. Unless otherwise specified in the parts description, engine and housing parts listed apply to all models to which this manual applies. Some parts numbers listed in the Generator Group do not apply to 50 cycle plants. When ordering Generator Group replacement parts for a 50 cycle plant, order by complete description, giving model and serial number of the plant, but not the part number. Refer to page 33 for more complete information on ordering replacement parts.

* 50 cycle plants run at 1500 R.P.M. and are rated at 9000 watts output.

** When fuel tank is mounted inside housing.

DESCRIPTION

ENGINE

The engine is a Ford Model 8NNN-6006 4 cylinder, L head, 4 stroke cycle, water cooled, internal combustion engine. The bore is 3.1875", the stroke is 3.75". The engine is rated 23 horsepower at 1800 R.P.M. The speed is controlled by a centrifugal flyweight type, gear driven governor. 12-volt starting and ignition current is supplied by two 6-volt batteries connected in series. The engine coolant is circulated through the water jackets and radiator by a belt driven water pump. Coolant temperature is controlled by a thermostat in the upper radiator hose. A fan mounted on the water pump shaft discharges cooling air forward through the radiator. Pressure lubrication to main, camshaft and connecting rod bearings is supplied by a gear type oil pump. Steel backed, babbitt lined main and connecting rod bearings are replaceable.

GENERATOR

The air cooled generator has two main components, the exciter, and the alternator. The alternator is a 4-pole revolving field type generator. The exciter supplies direct current for exciting the alternator field, and for charging the batteries. The generator is directly coupled to the engine, with the rotor turning at crankshaft speed. An exciter series field winding is used for electrically cranking the engine. The inner end of the rotor is supported by the rear main engine bearing, and the exciter end is supported by a large ball bearing. All generator windings are thoroughly impregnated with insulating varnish and baked.

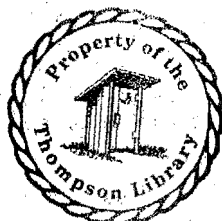
Voltage and frequency are proportional to engine speed, which is regulated by the engine governor. Speed is approximately 1800 r.p.m. for 60 cycle plants, and approximately 1500 r.p.m. for 50 cycle plants. The generator design assures close voltage regulation between full load and no load conditions. For a 115 volt plant, voltage at full load is 110 to 115 volts, and at no load condition, approximately 126 volts. Voltages will be proportionately higher for plants of higher voltage.

CONTROLS

The plant control panel, mounting the necessary meters, relays, switches etc., is located at the generator end of the plant housing. The plant may be started electrically or manually. Switches for remote control of starting and stopping, automatic controls, or line failure transfer controls may be connected to the plant.

ACCESSORIES

Accessories supplied with a standard plant include a hand crank, a remote control start-stop switch, batteries, battery hydrometer, ball bearing grease, and instruction manuals.



INSTALLATION

IMPORTANCE OF PROPER INSTALLATION.- Proper installation is essential to satisfactory and dependable performance. Location and ventilation are important factors to consider in installation.

LOCATION.- The plant should be centrally located in relation to the electrical load. If practicable, install the plant inside a building or covered vehicle for protection from extremes in weather conditions.

CAUTION

Exhaust gases are deadly poisonous, and must be piped outdoors whenever the plant is installed indoors. Excessive inhalation of exhaust gases will cause serious illness or death.

The site selected for the plant should be dry, clean, and well ventilated. Either a damp or a dusty location will require more frequent inspection and servicing of the plant. Allow at least 24" space on all sides of the plant for ease in servicing.

If the plant is mounted aboard a truck or trailer, see that it is fastened securely when in transit, and that it sets in an approximately level position when in operation.

VENTILATION.- The engine and generator generate a considerable amount of heat, which must be dissipated. If the plant is installed in a small room or compartment, provide separate air inlet and outlet openings of sufficient size to assure proper cooling of the plant. Locate the air outlet opening in front of the radiator end of the plant. A duct may be constructed between the radiator grille and the air outlet opening to prevent recirculation of the heated air.

EXHAUST.- The plant exhaust muffler is located at the lower front end of the plant. If the exhaust is to be piped outside an enclosure, use pipe at least as large as the muffler outlet. If the exhaust line must be pitched upward from the muffler, install a suitable condensation trap at the lowest point, draining the trap periodically. Proper shielding or insulation must be provided if the exhaust line passes through an inflammable wall or close to any other inflammable material.

An underground muffler may be constructed, if desired. Use a heavy 10 gallon or larger tank or drum, welding suitable pipe fittings to the drum. Perforate or remove the bottom of the drum, to permit moisture condensation to escape. Bury the underground muffler in loose gravel, extending the outlet pipe at least 24" above ground and fitting it with a pipe gooseneck.

FUEL, GASOLINE.- If a separate fuel tank is used, the total lift of the fuel to the fuel pump on the plant must not exceed 8 ft., and the total horizontal distance must not exceed 50 ft.

INSTALLATION

55 gallon and 110 gallon tanks suitable for underground installation are available through the dealer from whom the generating plant was purchased. Observe local underwriters codes regarding the installation of any separate tank.

FUEL, NATURAL OR "BOTTLED" GAS.— Some special model plants are equipped to burn natural gas or LPG (Liquid Petroleum Gas) fuel. The gas pressure regulator on the plant is designed to operate on a line pressure of 4 to 6 ounces. If the gas line pressure is more than 8 inches water column (approx. 6 oz.), a primary gas regulator must be installed to reduce the pressure. Comply with local gas codes in making the connection to the plant.

In some localities, presence of foreign matter in the gas supply may require installation of a fuel filter in the supply line. The fuel inlet on the plant gas regulator is threaded for 3/4" pipe.

BATTERIES.— Two 6 volt batteries are connected in series by a short jumper cable. Connect the battery cable which is connected to the start solenoid switch to the remaining positive (+) post of the two batteries. Connect the battery cable which is grounded on the cylinder head to the remaining negative (—) battery post. Batteries shipped "dry" must be prepared for operation as directed on the tags attached to the batteries.

CONNECTING THE LOAD WIRES.— The AC output terminal studs are located below the control panel, on the chassis. Remove the small grille from the right side (facing the radiator end of the plant) chassis side plate for access to the terminal posts. Solderless connectors are provided for connecting the load wires to the terminal studs. Be sure to use the proper size insulated wire, taking into consideration the distance between the plant and the load. Consult a competent electrician, and observe applicable electrical codes in making the installation. Refer to the plant wiring diagram when connecting the load line wires, the left hand output terminal on the wiring diagram corresponding to the topmost terminal on the plant. Follow the directions for connecting the load line wires as follows for the applicable plant.

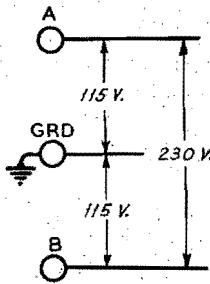
115 VOLT, SINGLE PHASE, 2 WIRE PLANT

230 VOLT, SINGLE PHASE, 2 WIRE PLANT

The topmost output terminal is grounded. Connect the ground (white) load line wire to the top (grounded) plant terminal. Connect the "hot" (black) load line wire to the lower plant terminal marked A. A load of not more than 15 amps., 115 volts, or 10 amps., 230 volts, may be connected to each outlet of the receptacle mounted on the control panel. Any load connected to the receptacle will not register on the panel ammeter.

INSTALLATION

115/230 VOLT, SINGLE PHASE, 3 WIRE PLANT

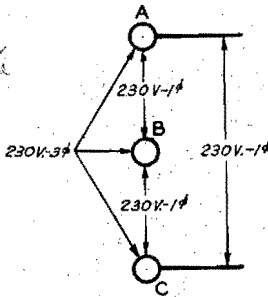


The center terminal post is grounded. For 115 volt current, connect the ground (white) load line wire to the center plant terminal, and the "hot" (black) load line wire to either of the two insulated ("hot") outer terminals A, or B. Two 115 volt circuits are thus available, but not more than $1/2$ the plant rating is available on each circuit. Balance the load as closely as possible between the two circuits. If part of the load will be 115 volt and the rest of the load 230 volt the amount of the 115 volt load must be subtracted from the amount of the plant capacity, to determine the amount of 230 volt load which may be available.

For 230 volt current, connect the load line wires to the upper and lower terminals, A and B, leaving the center grounded terminal unused.

A load not to exceed 15 amps, 115 volts, may be connected to each outlet of the control panel receptacle. Any load connected to this receptacle will not register on the panel ammeter.

230 VOLT, THREE PHASE, 3 WIRE PLANT



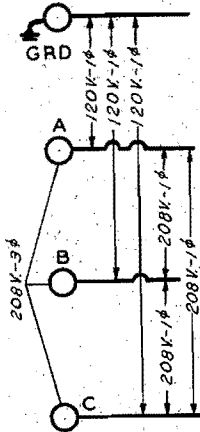
No terminal is grounded. For three phase current, connect a separate load wire to each plant terminal, A, B, and C, one wire to each terminal. Reversing the connections between any two terminals will reverse the direction of rotation of 3 phase motors. Use a phase sequence indicator to assure in-phase connection.

To obtain 230 volt, single phase current connect separate load wires to each of any two plant terminals, one wire to each terminal. Three 230 volt, single phase circuits are thus available, with $1/3$ the plant rating to each circuit. Balance the load as closely as possible between the circuits.

If both single and 3 phase current is to be used at the same time, use care not to overload any one circuit. Subtract the amount of the 3 phase load from the plant capacity. Divide the remainder by 3, and this is the load that may be taken from any one circuit for single phase current. For example, a 3 phase 4,000 watt load is used. This leaves 6,000 watts available for single phase, if the plant capacity is 10,000 watts. One third of this 6,000 watts is 2,000 watts, which is the amount that may be taken from each of the 3 single phase circuits. Do not attempt to take all 6,000 in this example off one circuit, as overloading of generator will result.

INSTALLATION

120 VOLT, SINGLE PHASE/208 VOLT, THREE PHASE, 4 WIRE PLANT



The topmost terminal is grounded. For 120 volt, single phase current, connect the grounded load wire to the grounded (top) plant terminal, and the other load wire to any one of the other three terminals A, B, or C. Three 120 volt, single phase circuits are thus available, with 1/3 the plant rating to each circuit. Balance the load as closely as possible between the circuits.

For 208 volt, three phase current, connect a load wire to each of the three insulated plant terminals, A, B, and C, leaving the grounded (topmost) terminal unused. Reversing the connections between any two insulated terminals will reverse the direction of rotation of 3 phase motors. Use a phase sequence indicator to assure in-phase connection.

For 208 volt, single phase current, connect separate load wires to each of any two insulated (three lower) terminals, one wire to each terminal. Three circuits are thus available, with 1/3 the plant rating to each circuit. Balance the load as closely as possible between the circuits. If both single and three phase current is used at the same time, see the directions for the three phase, three wire plant.

REMOTE CONTROL SWITCH

A small, four place terminal block is mounted above and to the left of the AC output terminals. This is the block marked "DC OUTPUT - REMOTE" on the wiring diagram. One or more remote control switches, in parallel connection, may be connected to this terminal block for remote control of starting and stopping. No. 19 wire, listed in the parts list, may be used for distances up to 250 feet. Use #16 wire up to 500 ft., or #14 wire up to 1000 ft. Be sure to connect switch terminal #1 to terminal #1 on the plant terminal block, switch terminal #2 to block terminal #2, etc. If automatic or line failure transfer equipment is to be connected, follow the directions supplied with the equipment.

PREPARATION

PREPARATION FOR OPERATION.— Before putting the plant in operation supply it with fuel, oil, and water (or anti-freeze liquid). Follow closely the instructions given below.

LUBRICATION.— Fill the crankcase with 4 quarts (U.S. Measure) of oil.

Use oil of the proper SAE number as indicated in the following table, according to the lowest temperature to which the plant will be exposed when standing idle. Do not use an oil heavier than SAE #20 in a plant being put into service the first time. After the first oil change period, use oil of the SAE number as indicated in the table.

TEMPERATURE	SAE NUMBER
Above 90° F. (32° C.)	40
32° F. to 90° F. (0° C. to 32° C.)	30
10° F. to 32° F. (-12° C. to 0° C.)	20
-10° F. to 10° F. (-23° C. to -12° C.)	10W
below -10° F (-23° C.)	* 10W diluted with 10% kerosene

* Do not put diluted oil into the engine until ready to start it. Mix well just before pouring it into the engine.

The use of a heavy duty (detergent) type of oil is recommended. If a change to a heavy duty type of oil is made after using non-detergent oil in this plant, allow not more than one third the usual operating hours between the next two oil changes. Thereafter, change the crankcase oil at the regular periods, as recommended under PERIODIC SERVICE.

Keep the crankcase oil level at or near the "FULL" mark on the bayonet type oil level gauge, but never above it. If the crankcase is over-filled, the connecting rods may strike the oil, and lead to improper lubrication and excessive oil consumption. Never operate the plant with the oil level at or below the "DANGER" mark on the oil level gauge.

Fill the air cleaner oil reservoir to the level indicated with oil of the same SAE number as that used in the crankcase, except as instructed under ABNORMAL OPERATING CONDITIONS.

Pour a few drops of oil into the oil cup on the side of the distributor.

Place a drop of oil on each ball joint of the governor to carburetor connecting link.

FUEL, GASOLINE.— Some plants are equipped with a mounted 15 gallon (U.S. Measure) fuel tank. Fill the tank nearly full with clean, fresh, regular gasoline of 68 to 74 octane rating. Do not use a highly leaded, premium type of gasoline. Its use will necessitate more frequent spark plug, valve, and carbon removal servicing. Unleaded gasoline of 68 to 74 octane rating is available in some communities. However, do not use gasoline manufactured for use in stoves, as its octane rating is too low, and its use will cause severe knocking

PREPARATION

in the engine. Do not fill the tank completely full of cold gasoline. Expansion of the fuel as the plant warms up, may cause the fuel to overflow and result in a fire. Check to see that all fuel connections are tight.

FUEL, GAS.— If the plant is equipped to burn a gas fuel, see that fuel line connections have been properly made, and that the regulator installation is correct for the existing line pressure. Turn on the fuel supply.

RADIATOR.— The capacity of the cooling system is approximately 14 quarts. Use clean, alkali-free water, such as rain water. The use of a rust and scale inhibitor is recommended. In freezing weather use a standard anti-freeze liquid in the proportion recommended by its manufacturer. To avoid loss of anti-freeze through the overflow pipe due to expansion as the plant warms up, fill the radiator to only approximately 1 to 2 inches below the bottom of the filler neck. Check the cooling system to see that there are no leaks.

After the foregoing instructions have been carefully complied with, the plant should be ready for operation. However, before starting the plant carefully study the instructions under the headings OPERATION and ABNORMAL OPERATING CONDITIONS immediately following.

OPERATION

PRELIMINARY.-- Be sure that the plant has been properly installed and prepared for operation before attempting to start it. See that the fuel supply is turned on, and that there are no fuel leaks. See that the circuit breaker on the control panel is at the OFF position, so that no electrical load is connected to the plant.

CAUTION

If the preparation has been made for extremely cold weather, the initial filling of the crankcase with diluted oil should have been left to be done immediately before starting the plant. Be sure the crankcase is filled to the high level mark on the bayonet gauge.

STARTING ELECTRICALLY.-- See that the ignition switch on the control panel is set at the ELECT. START position. Press the START button firmly. It will take several seconds of cranking for the fuel pump to become full and to pump enough gasoline to the carburetor, before the plant will start the first time. The carburetor is automatically choked, and the plant should start after a few seconds of cranking, once the carburetor has become filled with gasoline. If the plant does not start after a few attempts, do not continue cranking until the batteries are discharged. Check the fuel and ignition systems. As the plant starts, continue to hold the START button in until the engine has picked up running speed. Release of the START button too soon will cause the plant to stop.

If the plant is to be operated on gas fuel, see that the arm of the automatic choke, mounted atop the exhaust manifold, is locked in the horizontal position, so as to make the choke inoperative. No choking is necessary when using gas fuel. Be sure that there is no gasoline in the carburetor bowl, and that the gasoline supply is turned off. With the gas fuel supply turned on, press the regulator priming button for an instant. Do not overprime. Press the control panel START button and start as described above for gasoline fuel. After the carburetor has been properly adjusted to the fuel being used, it should be unnecessary to use the priming button.

STARTING THE PLANT MANUALLY.-- If the starting batteries have insufficient power to crank the engine, the plant may be started manually. The batteries must have sufficient power to provide ignition current however. If gasoline fuel is used, see that the carburetor bowl is filled with gasoline as described above under STARTING ELECTRICALLY. Throw the ignition switch to the HAND START position. With the hand crank, crank the engine, using a quick upward pull. Do not spin the crank or press down on it. Manual operation of the choke will be necessary on special magneto ignition model plants.

If gas fuel is used, the gas used should have a BTU rating above 800 BTU per cu. ft. The surrounding temperature should be above 30° F. (-1° C.). It may be necessary to press the regulator priming button for an instant to start the gas equipped plant the first time.

OPERATION

After the plant starts, BE SURE TO RETURN THE IGNITION SWITCH TO THE "ELECT. START" POSITION.

CAUTION

KEEP THE IGNITION SWITCH AT THE ELECT. START POSITION AT ALL TIMES EXCEPT WHILE ACTUALLY STARTING THE PLANT MANUALLY. THROW THE SWITCH TO THE HAND START POSITION WHILE CRANKING THE PLANT MANUALLY, BUT RETURN IT TO THE ELECT. START POSITION AS SOON AS THE PLANT STARTS. WHILE THIS SWITCH IS AT THE HAND START POSITION, THE HIGH WATER TEMPERATURE CUT-OFF SWITCH (AND LOW OIL PRESSURE CUT-OFF SWITCH, IF THE PLANT IS SO EQUIPPED) IS CUT OUT OF THE CIRCUIT AND THE PLANT IS NOT PROTECTED AGAINST OVERHEATING. IF THE SWITCH IS LEFT AT THE HAND START POSITION WHEN THE PLANT IS NOT RUNNING, THE BATTERY MAY BECOME DISCHARGED AND THE IGNITION COIL DAMAGED.

CHECKING THE OPERATION.- After the plant starts, allow the engine to reach operating temperature. Check the level of the coolant in the radiator, as the thermostat may have allowed an air pocket to form, thus preventing complete filling.

Check the control panel meters and gauges. The oil pressure should be between 25 and 35 pounds, the coolant temperature 150° to 180°, and the battery charging rate between 2 and 10 amperes, depending upon the charge condition of the batteries.

Throw the control panel circuit breaker handle to the ON position. Any load connected to the plant output terminals will register on the panel ammeter. Voltages, as registered on the panel voltmeter will vary inversely with the electrical load applied to the plant. With no load on the plant, the voltage for a 115 volt plant will be approximately 126 volts. With a full load on the plant, the voltage for a 115 volt plant will be approximately 110 volts. Voltage will, of course, be correspondingly higher for plants of higher rated voltage.

A selector switch is provided for checking the individual phases of the circuit on the three phase plants. Single phase plants having an output receptacle on the control panel will not register any load connected to the panel. The receptacle is provided for a trouble light or similar light load.

Continuous overloading of the generator will cause the generator temperature to rise to a dangerous point and may lead to early failure of the windings. The circuit breaker on the control panel will trip to the OFF position if the plant is severely overloaded. Remove the cause of the overload before again returning the circuit breaker handle

OPERATION

to the ON position. On the three phase plant, if part of the load is single phase, be sure the total load on any one "leg" does not exceed one third the total capacity of the generator. On the 115/230 volt single phase plant, be sure to confine the load on each 115 volt circuit to not more than one half the plant capacity.

If the engine water temperature should rise to a dangerous point, the cut-off switch operates to break the ignition circuit, causing the plant to stop. Determine the cause of the high temperature before again starting the plant. The engine must cool approximately 100° F. before it can be restarted, after the switch has operated.

Some special model plants are equipped with a low oil pressure cut-off switch. On these plants, if the engine oil pressure falls to approximately 6 lbs., the switch will open the ignition circuit, stopping the plant. Correct the cause of the low oil pressure before attempting to again start the plant.

STOPPING THE PLANT.— Before stopping the plant, disconnect the load from the plant by throwing the load line switch to the off position, or by throwing the plant circuit breaker handle to the OFF position. Press the STOP button to stop the plant. The ignition switch must be at the ELECT. START position, as pressing the STOP button will have no effect if the switch is at the HAND START position.

ABNORMAL OPERATING CONDITIONS

LOW TEMPERATURES

Lubrication, fuel, and the cooling system require special attention at temperatures below 32° F. (0° C.).

CRANKCASE LUBRICATION.— If the plant will be exposed to low temperature when not running, so that it becomes thoroughly chilled, and the crankcase oil congealed, follow the crankcase oil recommendations as given under PREPARATION, LUBRICATION.

If temperature conditions require the use of diluted oil proceed as follows. Run the engine until thoroughly warmed up, then stop and drain the crankcase oil. Thoroughly mix 5-1/2 quarts (U.S. Measure) of SAE #10 or #10W oil with one pint of kerosene. Use 4 quarts of this mixture to fill the crankcase to the "FULL" mark on the bayonet gauge. Start the plant and run for at least ten minutes to thoroughly circulate the mixture throughout the engine. Use the remainder of the mixture to add oil when necessary. When using diluted oil, change the oil every 25 operating hours, and check the level at least every 8 hours. Use oil which is not diluted as soon as temperature conditions permit.

AIR CLEANER.— If congealed oil or frost formation within the air cleaner restricts the air flow, remove and clean the air cleaner. Reassemble and use the air cleaner without oil until conditions permit the use of oil in the normal manner.

COOLING SYSTEM.— The coolant must be protected if there is any possibility of its freezing. Use any good anti-freeze, in the proportion recommended by the manufacturer for the lowest temperature to which the plant will be exposed. The capacity of the cooling system is approximately 14 quarts, U.S. Measure.

If using an anti-freeze which has a low boiling point, set the high water temperature cut-off switch at a temperature setting which will properly protect the plant if excessive evaporation occurs.

If the plant will be standing idle in freezing temperatures without adding anti-freeze, be sure to open the cylinder block drain cock to thoroughly drain all water from the block, after draining the radiator.

FUEL, GASOLINE.— The use of fresh, clean, high test (not highly-leaded premium) gasoline is an aid to easy starting in cold weather. If the plant has a fuel tank mounted in the housing, keep the tank nearly full to prevent moisture condensation inside the tank, which could cause considerable trouble from ice formation in the fuel system. Do not fill the tank entirely full of cold gasoline, for expansion as the plant warms up may cause the gasoline to overflow.

FUEL, GAS.— Some types of Liquid Petroleum Gas will not vaporize readily at low temperatures. Heat exchanger equipment can be installed at the factory.

ABNORMAL OPERATING CONDITIONS

BATTERIES.— Check the charge condition of the batteries to be sure that they are kept in a high state of charge. A discharged battery may freeze at approximately 20° F. (-7° C.) and be permanently damaged. A fully charged battery will not freeze at -90° F. (-67° C.). Run the plant for at least 20 minutes after adding water, to assure mixing the water with the electrolyte.

HIGH TEMPERATURES

If the plant is to be operated in unusually high temperatures, observe the following precautions.

1. Provide sufficient air circulation for proper cooling.
2. Keep the cooling system clean and free of rust and scale. Keep the radiator well filled.
3. See that the high water temperature cut-off switch is properly set.
4. Keep the fan belt tension adjusted properly.
5. Keep the ignition properly timed.
6. Keep the crankcase oil level at, but not above, the "FULL" mark on the oil level gauge. Use SAE #30 oil for temperatures up to 90° F. (32° C.) and SAE #40 for higher temperatures.
7. Keep the battery electrolyte level up to normal.

DUST AND DIRT

Keep the plant as clean as practicable. Clean the air cleaner as often as conditions require. Keep the radiator fins clean and free of foreign matter. Keep the generator, its commutator and slip rings, and brushes clean. See that all brushes are free in their holders. Keep supplies of fuel and oil in air tight containers. Change the oil filter element as frequently as conditions require.

PERIODIC SERVICE

GENERAL.— Follow a definite schedule of inspection and servicing. This will assure better performance and longer life of the plant at minimum expense. Service periods outlined below are for normal service and average operating conditions. For extreme load conditions, or abnormal operating conditions, service more often.

DAILY SERVICE

If the plant is operated more than 8 hours daily, perform the DAILY SERVICE operations every 8 hours.

FUEL.— If the plant is operated on gasoline fuel, check the fuel gauge often enough to assure a continuous fuel supply. Do not fill the tank while the plant is running.

RADIATOR.— Check the level of the coolant and, if necessary, add sufficient liquid to bring the level up to within 1" of the bottom of the filler neck. In freezing weather, if a non-permanent type anti-freeze is used, check the protective strength of the coolant.

CRANKCASE OIL LEVEL.— Check the oil level as indicated on the bayonet oil level gauge. Do not allow the engine to run with the oil level at or below the "DANGER" mark on the gauge. Add sufficient oil of the proper SAE number to bring the oil level to the "FULL" mark, but do not overfill the crankcase.

AIR CLEANER.— Check the oil level in the air cleaner cup and add enough oil to bring it to the indicated level.

CLEANING.— Keep all exposed surfaces of the plant clean and free of dust, dirt and oil. A clean plant will give longer and more satisfactory service.

WEEKLY SERVICE

If the plant is operated more than 50 hours a week, perform the WEEKLY SERVICE operations each 50 hours. The WEEKLY SERVICE should include the applicable DAILY SERVICE operations.

CRANKCASE OIL.— Add crankcase oil, or change the oil after 50 operating hours. If the plant has been operating with diluted oil, change the oil after 25 hours operation.

AIR CLEANER.— Clean the filter element and cup thoroughly in gasoline or other suitable solvent. Allow to dry, or use compressed air to dry. Refill the cup to the indicated level with clean oil of the same SAE number as that used in the crankcase, except as noted under ABNORMAL OPERATING CONDITIONS.

BATTERIES.— Check the level of the electrolyte. Keep the electrolyte level at the proper level above the plates by adding only clean distilled water. Do not overfill. In freezing weather add water just before running the plant. See that battery connections are clean and tight.

PERIODIC SERVICE

FAN BELT.— Check the fan belt tension. Adjust to permit about $\frac{3}{4}$ " play when pressure is applied midway between the fan and crankshaft pulleys. See the illustration. Install a new belt if the old one is badly worn.

GENERAL LUBRICATION.— Put a drop of light oil on each of the governor arm to carburetor link ball joints, and a few drops in the distributor oil cup. Do not oil the carburetor throttle or choke shaft bearings if dusty conditions prevail.

SPARK PLUGS.— Clean the spark plugs and check the electrodes gap. Keep the gap adjusted to .025". More frequent spark plug service may be required if leaded fuels are used.

DISTRIBUTOR.— Check the distributor contact points. If they are only slightly burned or pitted, resurface them with a fine stone. Install new points if the old ones are badly burned. After either resurfacing or replacing points adjust the gap to .020". Excessive arcing at the points indicates a faulty condenser, which should be replaced with a new one.

MONTHLY SERVICE

If the plant is operated more than 200 hours a month, service every 200 hours. THE MONTHLY SERVICE operations should include the applicable DAILY and WEEKLY SERVICE operations.

GASOLINE SUPPLY.— Close the gasoline shut-off valve and remove and clean the sediment bowl and screen. Be sure the bowl gasket is in good condition when reassembling. Inspect for leaks and correct any found.

Remove the pipe plug at the bottom of the carburetor and drain the bowl of any sediment which may have accumulated. Drain the fuel pump to remove the sediment.

DISTRIBUTOR.— Place one drop of light oil on the distributor breaker arm pivot pin, several drops on the felt pad under the rotor, and three or four drops on the flyweight mechanism, distributed where it will reach friction points. Place a light coating of grease on each cam lobe.

EXHAUST SYSTEM.— Inspect all exhaust connections carefully. Make any necessary repairs.

ENGINE COMPRESSION.— Check the compression of the cylinders, using a compression gauge. A difference of more than 10 lbs. pressure between cylinders indicates a compression loss which should be corrected. The compression should not be below 80 lbs. pressure at sea level. New engine compression is 103 lbs. at cranking speed.

PERIODIC SERVICE

OIL FILTER.— Replace the oil filter element with a new one. The new filter element will absorb approximately one quart of oil when the plant is started up. Check the oil level after a short running period, adding oil as necessary to bring the oil to the proper level.

CRANKCASE BREATHER VALVE.— Remove the breather valve from between the valve cover plate and the intake manifold. Soak the valve assembly in a good solvent, dry it and reinstall to the engine.

GENERATOR.— Check the condition of the commutator, collector rings and brushes. In service, the commutator and collector rings acquire a glossy brown color, which is a normal condition. Do not attempt to maintain a bright, metallic, newly machined finish. If the commutator or collector rings become heavily coated, clean with a good cleaning solvent and a lint free cloth. Replace with new ones any brushes worn so that the top of the brush is below a point midway between the top and bottom of the brush holder.

Check the brush rig for proper alignment of the witness marks on the brush rig and support.

GENERAL.— Thoroughly inspect the plant for oil or water leaks, loose electrical connections, and loose nuts or bolts. Make any necessary repairs.

SEMI-YEARLY SERVICE

Every six months or 1200 operating hours, whichever occurs first, service the generator bearing and the fan idler bearing as follows.

GENERATOR BEARING.— Thoroughly clean all dirt from around the bearing cover and remove the cover and gasket. Remove the old lubricant with a clean finger, and work about one tablespoon of new ball bearing lubricant well into the bearing and again remove the lubricant. Refill the bearing housing about 1/2 full of bearing lubricant, packing it well into the lower half of the bearing. Be sure that no dirt gets into the bearing. Install the bearing cover, using a new gasket if necessary.

FAN IDLER BEARING.— Remove the fan idler pulley and arm by disconnecting the arm at the pivot. Remove all dirt from the assembly. Remove the snap ring and pipe plug. Press the bearing from the pulley. Clean the pulley and bearing in solvent. Replace the plug. Be sure the bearing is completely dry, and pack the bearing well with clean ball bearing grease. Reassemble, taking care not to get any foreign matter into the bearing. Adjust the fan belt tension as directed under ADJUSTMENTS.

SPECIAL ADJUSTMENTS

CARBURETOR.— The carburetor should require no servicing other than keeping it clean and free of sediment. When cleaning jets and passages, use compressed air or a fine, soft, copper wire. Be sure all gaskets are in place when reassembling.

Changes in the type of fuel used, or in operating conditions may necessitate a readjustment of the carburetor. For gasoline operation, adjust as follows. See the carburetor illustration. With the plant operating at full load, and at operating temperature, turn the main jet adjusting screw in (clockwise) until the voltage, as shown by the AC VOLTMETER, drops noticeably. Then turn the screw out (counterclockwise) until the voltage rises to normal, and the engine runs smoothly. Check the operation under various load conditions. If it is necessary to open the adjustment more than 1/2 turn beyond the point where normal voltage is attained, in order to obtain smooth operation, a readjustment of the governor may be necessary.

After the plant has been adjusted for load operation, disconnect the load and adjust the idle adjustment screw in the same manner. This adjustment is usually not as critical as the main jet adjustment.

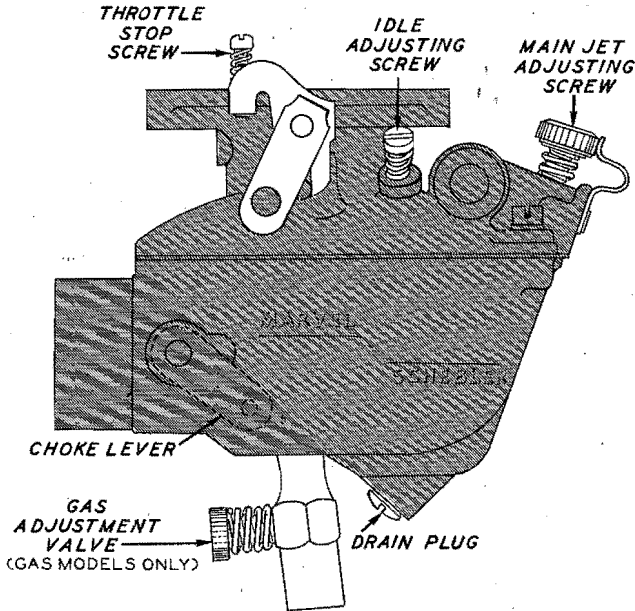
For natural gas, or Propane or Butane vapor operation, the only adjustment is the gas regulating valve at the bottom of the carburetor. Follow the principles as outlined above for gasoline operation.

AUTOMATIC CHOKE.— The choke control should not require seasonal readjustments, but may be adjusted in the following manner. Turn the shaft of the control to the position where a 3/32" diameter rod may be passed down through the hole in the end of the shaft opposite the lever. Engage the rod in the notch in the edge of the mounting flange. Loosen the lever clamp screw just enough to allow the lever to be turned slightly. To adjust the choke for a richer mixture, pull the lever upward. To adjust for a leaner mixture, push the lever downward. Retighten the lever clamp screw and remove the rod from the shaft hole. Check to see that when the lever is lifted up to the limit of its travel, the carburetor choke valve is completely closed, and when the lever is pushed down, the choke valve is wide open. For gas or vapor operation, the choke should be locked in the wide open position.

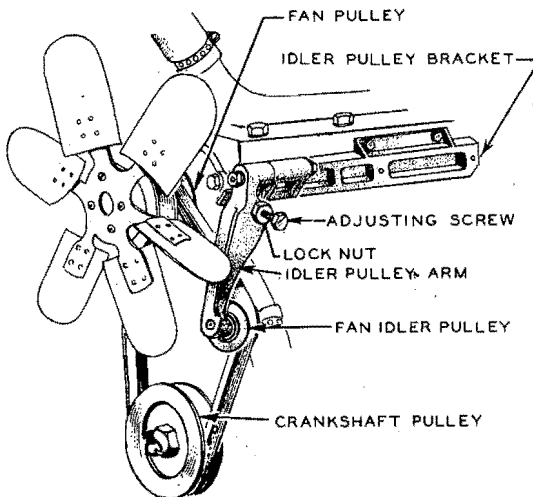
HIGH WATER TEMPERATURE SWITCH.— The high water temperature switch operates to stop the engine if the coolant temperature rises to a dangerous point, thus preventing overheating, which could cause serious damage to the engine parts. The engine may be started again when the coolant temperature drops approximately 10°F. The dial adjustment should be set to operate at a temperature several degrees below the boiling point of the coolant, taking into consideration the altitude at which the plant is operating. Lower the setting 3°F. for each 1000 feet above sea level. The dial was set at 205°F. at the factory. Do not set the switch to operate at too low a temperature, or the engine may be stopped before it reaches normal operating temperature.

SPECIAL ADJUSTMENTS

FAN BELT ADJUSTMENT.— The fan belt adjustment is made with an adjusting screw on the idler pulley arm. Loosen the lock nut on the adjusting screw. Turn the adjusting screw in (clockwise) to tighten the fan belt, and out (counterclockwise) to loosen. Be sure to tighten the lock nut after the adjustment is made. There should be approximately $\frac{3}{4}$ " play when pressure is applied at a point midway between the fan and crankshaft pulleys. Too tight a belt will have a short life, and will cause excessive strain and wear on the water pump bearing. A belt too loose will slip, wear out rapidly, and cause inefficient cooling.



CARBURETOR ADJUSTMENT



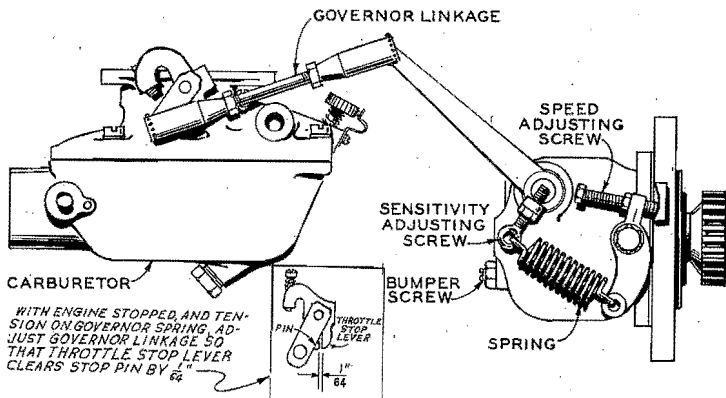
FAN BELT ADJUSTMENT

SPECIAL ADJUSTMENTS

GOVERNOR.— The governor controls the speed of the engine, and therefore the voltage and frequency of the current. Should resetting of the governor become necessary, proceed as follows, referring to the illustration GOVERNOR ADJUSTMENT.

1. With the engine stopped, and tension on the governor spring, adjust the governor linkage length so that the carburetor throttle stop lever clears the stop pin by not less than $\frac{1}{64}$ " as shown.
2. Start the plant and allow it to reach operating temperature.
3. With no electrical load connected, adjust the speed screw to the point where the panel voltmeter shows approximately 126 volts for a 115 volt A.C. plant. Apply a full load to the plant and again check the voltage, which should be approximately 110 volts for a 115 volt A.C. plant. Voltages will be proportionately higher for plants of other voltages. Engine speed, as checked with a tachometer, should be within the limits of 1890 r.p.m. at no load, to 1710 r.p.m. at full load, with the actual spread between no load and full load conditions not more than 100 r.p.m.
4. If the plant tends to hunt (alternately increase and decrease speed) under load conditions, increase very slightly the distance between the eye of the sensitivity screw and its support. For best regulation keep the sensitivity screw in as close as possible without causing hunting. Any change in the setting of the sensitivity screw will require correcting the speed screw adjustment.
5. If hunting occurs at NO LOAD, screw the small bumper screw in until the hunt is stopped, but not far enough to increase the engine speed. CAUTION: Be sure all load is removed when adjusting the bumper screw.

Be sure that all lock nuts are tightened as adjustments are completed. The governor can not operate properly if there is any binding, sticking, or excessive looseness in the connecting linkage or carburetor throttle assembly. A lean fuel mixture, or a cold engine may cause hunting. If the voltage drop is excessive when a full load is applied, and adjustments are correctly made, it is probable that the engine is low on power and should be repaired as necessary.



GOVERNOR ADJUSTMENT

MAINTENANCE AND REPAIRS

GENERAL.— Refer to the SERVICE DIAGNOSIS section for assistance in locating and correcting troubles which may occur. Should a major overhaul become necessary, the plant should be carefully checked and all necessary repairs should be made by a competent mechanic who is thoroughly familiar with modern internal combustion engines and revolving field generators.

ENGINE

IGNITION TIMING.— If a change is made to a lower octane fuel, a "pinging" condition may result which will require retarding the ignition timing. Loosen the distributor clamp bolt slightly, and turn the distributor body in a counterclockwise direction just enough to eliminate the "ping". Turning the distributor in a clockwise direction will advance the timing. Be sure to retighten the clamp bolt after the correct adjustment is made. If the distributor is removed from the engine, it will be necessary to retime the spark to the cylinders upon reinstalling the distributor. Be sure the contact point gap is set at .020" before retiming the ignition.

Remove the No. 1 spark plug and adapter. Insert a bent piece of stiff wire through the spark plug hole far enough into the cylinder to feel the near edge of the piston as it rises. Crank the engine slowly until the piston is exactly at top dead center on a compression stroke. Install the distributor so that the low tension terminal points approximately toward the water pump, and the distributor rotor points to a position corresponding to the No. 1 tower of the distributor cap. Press the rotor in a clockwise direction, to eliminate any backlash, and turn the distributor body counterclockwise to the point where the contact points just start to separate. Tighten the clamp bolt, and install the distributor cap. The correct firing order is 1-2-4-3, counterclockwise. Recheck the timing under running conditions.

VALVE SERVICE.— The tappets are not adjustable. The design of the engine makes frequent tappet adjustments unnecessary. When inspection shows one valve to be leaking, service all. Servicing will consist of grinding the valves to a good seat, and replacing with new parts any that are badly worn.

The valve assemblies may be removed for servicing in the following manner. Insert a small pry bar through the port at the side of the cylinder block and pry downward on the top of the guide, being sure that the valve is closed. Remove the valve guide retainer from the guide, and remove the pry bar. The valve, guide, and spring assembly can then be removed upward. If the assembly is difficult to remove, crank the engine until the valve is open and insert a piece of wood under the head to hold it open. Then crank the engine until the tappet is down and insert the flat end of a wrench or a similar metal block between tappet and valve end. Crank the engine and the valve will be pushed higher. By thus alternately increasing the blocking beneath the valve head and between valve and tappet, and cranking the engine to push the assembly up by easy stages, no damage will result to the valve. Do not try to raise a stuck assembly by prying under the valve head. Remove all valve assemblies and keep them in order so each may be reinstalled in its respective position.

MAINTENANCE AND REPAIRS

Remove springs and guides from valves. Keep the 2-piece guides in pairs, each with its proper valve.

Remove carbon and corrosion from valves and guides. Clearance of stem in guide should be between .0015" and .0035". If the inside of guide has worn larger than .314", discard it.

After grinding each valve to its seat, check the tappet clearance. The clearance must be between .014" and .016" for the exhaust valves, and between .010" and .012" for the intake valves. Adjust the clearance by grinding either the valve face, or the bottom of the valve stem, as required. If a face is ground, regrind the valve to its seat.

PISTON RING REPLACEMENT.—Pistons and connecting rods are removed from the top of the cylinder. Two compression and one oil control ring are used on each piston. Check the cylinders for out of round or taper, installing new sleeves if worn more than .005". Any ridge at the top of the cylinder bore should be removed. Fit each ring to its individual cylinder, being sure that the gap between the ends of the ring, when in the cylinder, is between .012" and .017". Fit the proper ring in each ring groove on the piston, with the ring gaps equally spaced around the piston, and with no gap directly in line with the piston pin. Be sure the ring grooves are clean, and oil return holes are open before installing the rings on the piston.

PISTONS AND PINS.—If a piston is worn or scored, install a new piston. Pistons which are to be reused must be reinstalled on their connecting rods so that they will face in the original direction. Fit piston pins to the piston with a maximum clearance of .0005", and to the connecting rod with a clearance of .0001". The piston pins are locked in place by retaining snap rings in the piston bosses at either end of the pin. When reassembling, make sure that both snap rings are tightly in place.

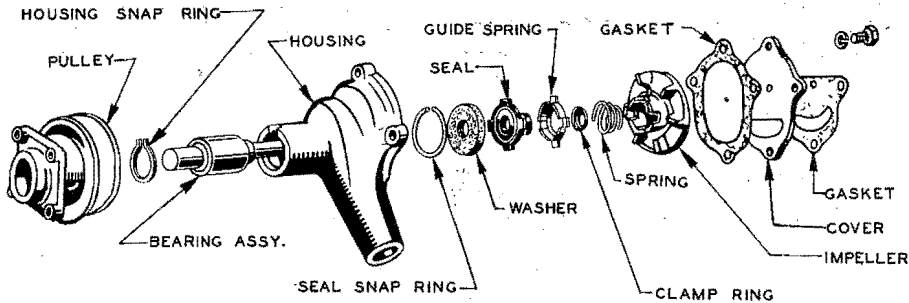
LUBRICATING SYSTEM.—A gear type oil pump delivers oil under pressure to the crankshaft main, camshaft, and connecting rod bearings. Spray holes in the upper halves of connecting rod bearings spray oil on the cylinder walls. Other internal parts are lubricated by oil spray from the bearings. A spring loaded oil relief valve at the front of the engine regulates the oil pressure. Whenever the engine is disassembled for servicing, make sure that all oil passages are unobstructed. Thoroughly clean the oil pan and the oil pump strainer screen.

CONNECTING RODS.—The connecting rod lower end bearing shells are steel backed, alloy lined, and are readily replaceable. Connecting rods are numbered on the camshaft side of the bearing end, and each connecting rod and piston assembly must be reinstalled in its original position. If one bearing shell becomes worn, both shells for that rod should be discarded, and new ones installed. The bearing shells are designed to give a clearance of .0004" to .0025" without any scraping or other fitting.

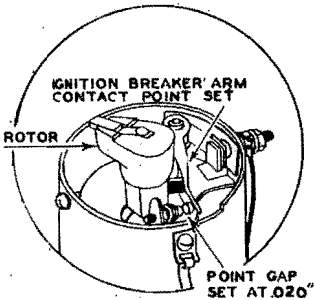
MAINTENANCE AND REPAIRS

Never attempt fitting a connecting rod by filing of either the cap or upper half of the rod. Be sure that no foreign material gets under the shell, and that each fits snugly when reassembling. Note that notches machined in the connecting rod halves receive matching ears stamped into the bearing shell. When installing pistons and connecting rod assemblies, be sure that they are properly aligned, and that connecting rod to crankshaft end play of .004" to .008" is maintained.

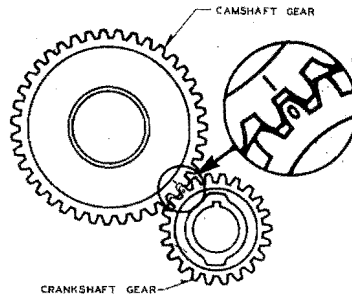
MAIN BEARINGS.— The crankshaft main bearings are of the same type as the connecting rod bearings. Front and rear bearing shells are interchangeable. The center bearing shells are flanged to take the crankshaft end play. The same general precautions given for fitting connecting rod bearings should be followed when fitting main bearings. The clearance, when installed should be .001" to .0025". A packing is fitted into grooves in the crankcase and the oil pan, to prevent the escape of oil at each end of the crankshaft. The packing is replaceable and should be renewed each time the oil pan is removed.



WATER PUMP



DISTRIBUTOR



TIMING GEAR MARKS

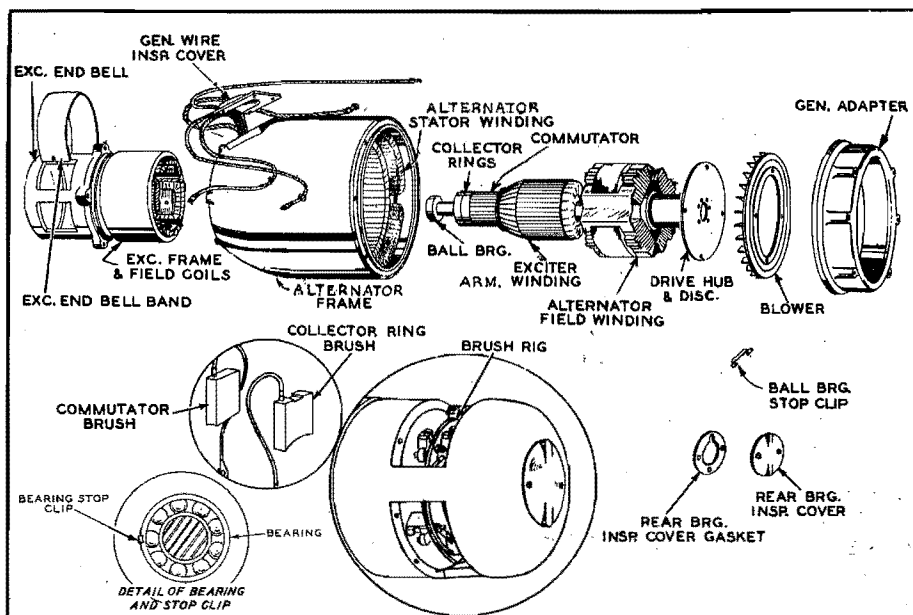
MAINTENANCE AND REPAIRS

TIMING GEARS.-- Should it become necessary to replace a worn camshaft timing gear, be sure that the marks stamped on the gears are properly aligned as shown in the illustration. The proper backlash is .003" to .004". Oversize camshaft timing gears are available in .006" and .010" oversizes. Some engines are equipped with an aluminum camshaft gear, others with a fibre gear. Either material may be used when replacing with a new gear. The cast iron crankshaft gear is pressed onto the crankshaft and may be removed with a gear puller.

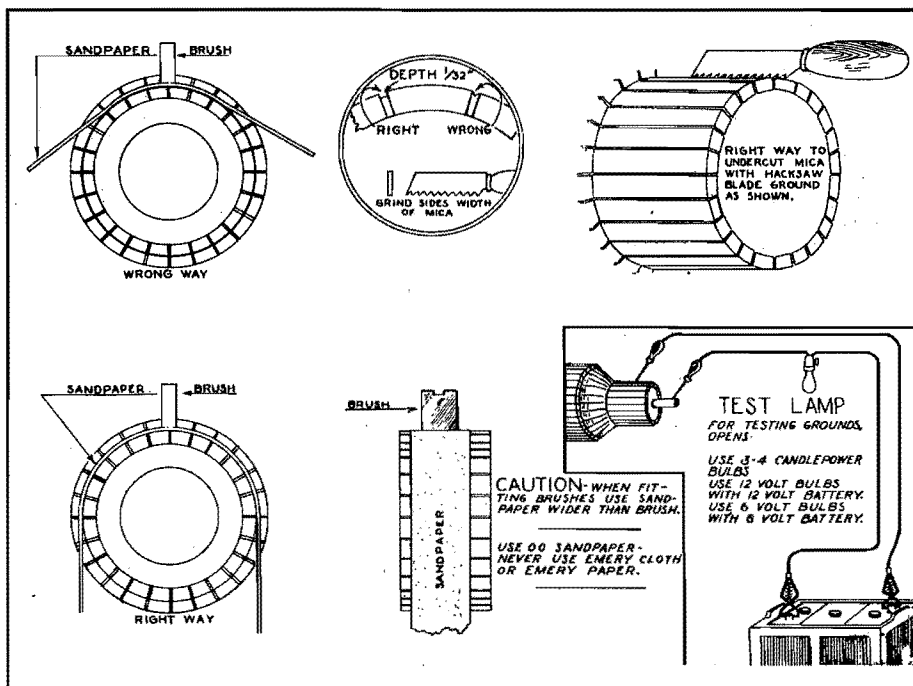
WATER PUMP.-- The water pump is pre-lubricated, and is not adjustable. If the water pump leaks, usually as a result of having the fan belt adjusted too tightly, install a new pump assembly, or replace worn parts. To disassemble the water pump, first remove it from the engine, and remove the fan from the pulley. See the illustration. Remove the rear cover and gasket. Press the pulley off the shaft in an arbor press, using a fixture which will hold the pulley at the belt groove. Remove the housing snap ring, and press the shaft from the impeller. Remove the seal snap ring and remove the various seal parts from the impeller. Replace with new, any worn parts, and reassemble, reversing the procedure of disassembly.

TABLE OF CLEARANCES

	MINIMUM	MAXIMUM
Valve Tappet Clearance (Intake) - - - - -	.010"	.012"
Valve Tappet Clearance (Exhaust) - - - - -	.014"	.016"
Valve Clearance In Guides - - - - -	.0015"	.0035"
Crankshaft Main Bearing - - - - -	.001"	.0025"
Connecting Rod Bearings - - - - -	.0004"	.0025"
Piston in Cylinder - - - - -		.003"
Piston Pin in Piston - - - - -		.0005"
Piston Pin in Connecting Rod - - - - -		.0001"
Piston Ring Gap - - - - -	.012"	.017"
Distributor Breaker Points Gap - - - - -		.020"
Spark Plug Gap - - - - -		.025"
Firing Order - - - - -		1-2-4-3
Distributor Rotation - - - - -		Counterclockwise



GENERATOR ASSEMBLY



CARE OF COMMUTATOR AND BRUSHES

MAINTENANCE AND REPAIRS

GENERATOR

GENERAL.— The generator normally requires little servicing other than periodic servicing to brushes, commutator, collector rings and ball bearing. Most generator troubles can be checked after removing the end bell band. With this band removed, there is ample room for servicing the brushes, commutator, or springs.

COMMUTATOR AND COLLECTOR RINGS.— Should the commutator or collector rings become grooved, out of round, or the surface become pitted or rough so that good brush contact cannot be maintained, it will be necessary to remove the rotor and turn the commutator or collector rings down in a lathe. It will be necessary to remove the generator frame before the rotor can be removed. Remove the ball bearing, to prevent any foreign material getting into it. After turning down the commutator, undercut the mica between bars about $1/32$ " deep, or to a depth equal to the distance between bars. See that no burrs are left along the edges of the bars and that spaces between bars are free of any metallic particles.

BRUSHES.— Install new brushes when the old ones are worn so that the top of the brush is below a point midway between the top and bottom of the brush holder. Sand new brushes to a good seating contact. See the illustration on sanding of brushes. See that brushes ride freely in their holders and spring tension is uniform. The correct tension is 30 oz. for the commutator brush springs and 16 oz. to 18 oz. for the collector ring brush springs, measured with the contact point of the spring level with the top of the holder.

GENERATOR WINDINGS.— Use a test lamp set to test for grounded or open circuits in the windings. Be sure that all brushes are lifted away from contact with the commutator and collector rings, and that leads are disconnected. When disconnecting leads, tag them to facilitate correct replacement. If a rotor winding tests open circuited, short circuited, or grounded install a new rotor. Use an armature growler to test the exciter armature for an internal short circuit.

The exciter field coil windings may be tested for an internal short by comparative ohmmeter readings. If one exciter field coil tests defective install a new set of field coils. If a stator winding tests defective, install a new stator assembly. If the trouble is in any lead outside a winding, repair the lead as necessary.

BRUSH RIG.— It is unnecessary to remove the brush rig when servicing the generator. If it has been removed, accidentally, line up the mark on the rig with the mark on the end bell when reinstalling it. Improper positioning of the brush rig will lead to excessive arcing of the brushes, heating of the windings and general low performance. Any defective condenser should be replaced with a new one of the same capacity.

CONTROLS

CONTROL PANEL EQUIPMENT.— If any of the control panel equipment fails to function properly, it should be replaced with a corresponding new unit rather than to attempt repairs on an old one. No attempt should be made to repair such units as meters, resistances, switches or receptacles.

SERVICE DIAGNOSIS

POSSIBLE CAUSE

REMEDY

ENGINE CRANKS TOO STIFFLY

Too heavy oil in crankcase.	Drain, refill with lighter oil.
Engine stuck.	Disassemble and repair.

ENGINE WILL NOT START WHEN CRANKED

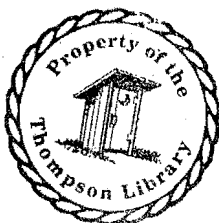
Faulty ignition.	Clean, adjust, or replace breaker points, plugs, condenser, coil, etc., or retime ignition.
Lack of fuel or faulty carburetion.	Refill the tank. Check the fuel system. Clean, adjust, or replace parts necessary.
Clogged fuel screen.	Clean.
Cylinders flooded.	Crank few times with spark plugs removed.
Poor fuel.	Drain, refill with good fuel.
Poor compression.	Tighten cylinder head and spark plugs. If still not corrected, grind the valves. Replace piston rings, if necessary.
Wrong timing.	Retime ignition.

ENGINE RUNS BUT CURRENT DOES NOT BUILD UP

Poor brush contact.	See that brushes seat well, are free in holders, are not worn too short, and have good spring tension.
Open circuit, short circuit, or ground in generator.	See GENERATOR, replace part necessary.

CURRENT UNSTEADY BUT ENGINE NOT MISFIRING

Speed too low.	Adjust governor to correct speed.
Poor commutation or brush contact.	See that brushes seat well on commutator, and collector rings, are free in holders, are not worn too short, and have good spring tension.
Loose connections.	Tighten connections.
Fluctuating load.	Correct any abnormal load condition causing trouble.



SERVICE DIAGNOSIS

POSSIBLE CAUSE

REMEDY

GENERATOR OVERHEATING

Overloaded.

Reduce load.

VOLTAGE DROPS UNDER HEAVY LOAD

Engine lacks power.

See remedies for engine missing under heavy load.

Poor compression.

Tighten cylinder head and spark plugs.
If still not corrected, grind the valves.
Replace piston rings, if necessary.

Faulty carburation.

Check the fuel system. Clean, adjust or replace parts necessary.

Restricted air cleaner.

Clean and refill.

Excessive choking.

See that choke opens properly.

Carbon in cylinders.

Remove carbon.

Restricted exhaust line.

Clean or increase the size.

ENGINE MISFIRES AT LIGHT LOAD

Carburetor idle adjustment set wrong or clogged.

Adjust, clean if needed.

Spark plug gaps too narrow.

Adjust to correct gap.

Intake air leak.

Tighten or replace gaskets.

Faulty ignition.

Clean, adjust, or replace breaker points, plugs, condenser, coils, etc., or retime ignition.

Uneven compression.

Tighten cylinder head and spark plugs.
If still not corrected, grind valves.
Replace piston rings, if necessary.

Worn intake valve stems.

Replace valves.

ENGINE MISFIRES AT HEAVY LOAD

Spark plugs defective.

Replace.

Faulty ignition.

Clean, adjust, or replace breaker points, plugs, condenser, coil, etc., or retime ignition.

SERVICE DIAGNOSIS

POSSIBLE CAUSE

REMEDY

ENGINE BACKFIRES AT CARBURETOR

Lean fuel mixture.	Clean carburetor.
Clogged fuel screen.	Clean screen.
Intake air leak.	Replace flange gaskets, tighten carburetor.
Poor fuel.	Refill with good, fresh fuel.
Spark too late.	Retime ignition.
Spark plug wires crossed.	Install wires correctly.
Intake valves leaking.	Grind or replace.

EXCESSIVE OIL CONSUMPTION, LIGHT BLUE SMOKY EXHAUST

Poor compression, usually due to leaking valves.	Tighten cylinder head and plugs. If still not corrected, grind or replace valves.
Oil leaks from engine or connections. This does not cause smoky exhaust.	Replace gaskets or leaking tubing. Tighten screws and connections.
Oil too light or diluted.	Drain, refill with correct oil.
Too large bearing clearance.	Replace.
Oil pressure too high.	Refer to symptoms of high oil pressure for remedies.
Engine misfires.	Refer to symptoms of engine misfires.
Faulty ignition.	Clean, adjust, or replace breaker points, plugs, condenser, coil, etc., or retime ignition.
Unit operated at light or no load for long periods.	No remedy needed.
Too much oil.	Drain excess oil.

BLACK, SMOKY EXHAUST, EXCESSIVE FUEL CONSUMPTION, FOULING OF SPARK PLUGS WITH BLACK SOOT, POSSIBLE LACK OF POWER UNDER HEAVY LOAD

Fuel mixture too rich.	Adjust choke. Install needed carburetor parts, adjust float level.
Choke not open.	See that choke opens properly.
Dirty air cleaner.	Clean, refill to proper level.

SERVICE DIAGNOSIS

POSSIBLE CAUSE

REMEDY

TAPPING SOUND

Tappet clearance too great. Adjust or replace tappets.

Broken valve spring. Install new spring.

HOLLOW CLICKING SOUND WITH COOL ENGINE UNDER LOAD

Loose pistons. If noise only slight and disappears when engine warms up, no immediate attention needed. Otherwise replace worn parts.

VOLTAGE LOW AT FAR END OF LINE BUT NORMAL NEAR POWER UNIT

Too small line wire for load and distance. Install larger or extra wires or reduce load.

MOTORS RUN TOO SLOWLY AND OVERHEAT AT FAR END OF LINE BUT OK NEAR POWER UNIT

Too small line wire for load and distance. Install larger or extra wires, or reduce load.

NOISY BRUSHES

High mica between bars of commutator. Undercut mica.

EXCESSIVE ARCING OF BRUSHES

Rough commutator or rings. Turn down.

Dirty commutator or rings. Clean.

Brushes not seating properly. Sand to a good seat.

Brush rig out of position. Line up marks on brush rig and support.

ENGINE OVERHEATING

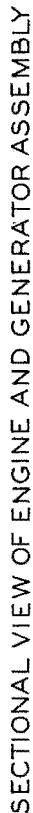
Low water in radiator. Refill radiator.

Overloaded. Remove part of load.

High water temperature switch set wrong. Correct setting of switch.

Radiator obstructed. Clean radiator.

Ignition timing late. Adjust ignition timing.



INSTRUCTIONS FOR ORDERING REPAIR PARTS

FOR SERVICE OR PARTS, CONTACT THE DEALER FROM WHOM YOU PURCHASED THIS EQUIPMENT, OR REFER TO THE COMPANY LISTED ON THE NAME-PLATE.

The Parts Reference Symbols in the right hand column of the General Data table on page 1 correspond with the same symbols at the tops of the Quantity Used column in the Parts List. They indicate which Quantity Used column to use when ordering parts for one of the plants listed in the General Data table. Compare the characteristics of the plant with the data in the General Data table to determine which Parts Reference Symbol applies. Order only parts which have a quantity listed in the applicable Quantity Used column in the Parts List.

Be sure to state on your order the Model Number, Serial Number, and Generator Number of the plant for which the parts are required. Obtain these numbers directly from the nameplates on the plant.

Order parts by part numbers and complete descriptions as listed herein. State the quantity of each part desired. Do not order parts as "sets" unless they are listed as "sets" in the parts list. If unable to identify the part required, return the old part to the address shown on the nameplate. Be sure to print your name and address plainly on the package. Regardless of any previous correspondence, write a letter to the same address describing the part and stating the reason for returning it.

Please do not order parts in a letter in which some other subject is treated. State definite shipping instructions when ordering parts.

All shipments are complete unless the packing list indicates items are back ordered. Shipments are properly packed and in good order when delivered to the transportation company. Any claim for loss or damage in transit should be filed promptly against the transportation company making the delivery.

Prices quoted herein are F.O.B. factory and are subject to change without notice.

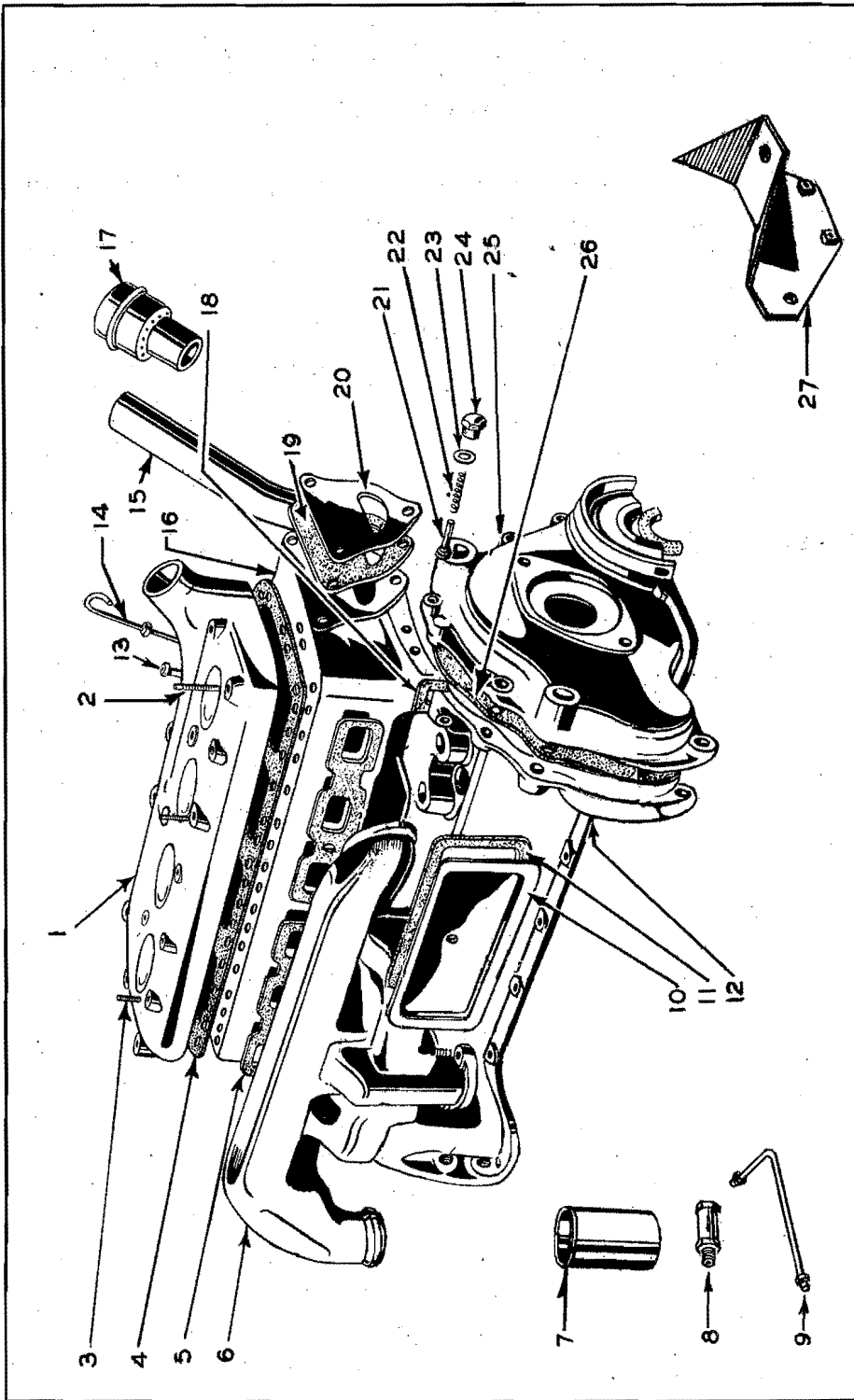


Fig. 1—ENGINE GROUP

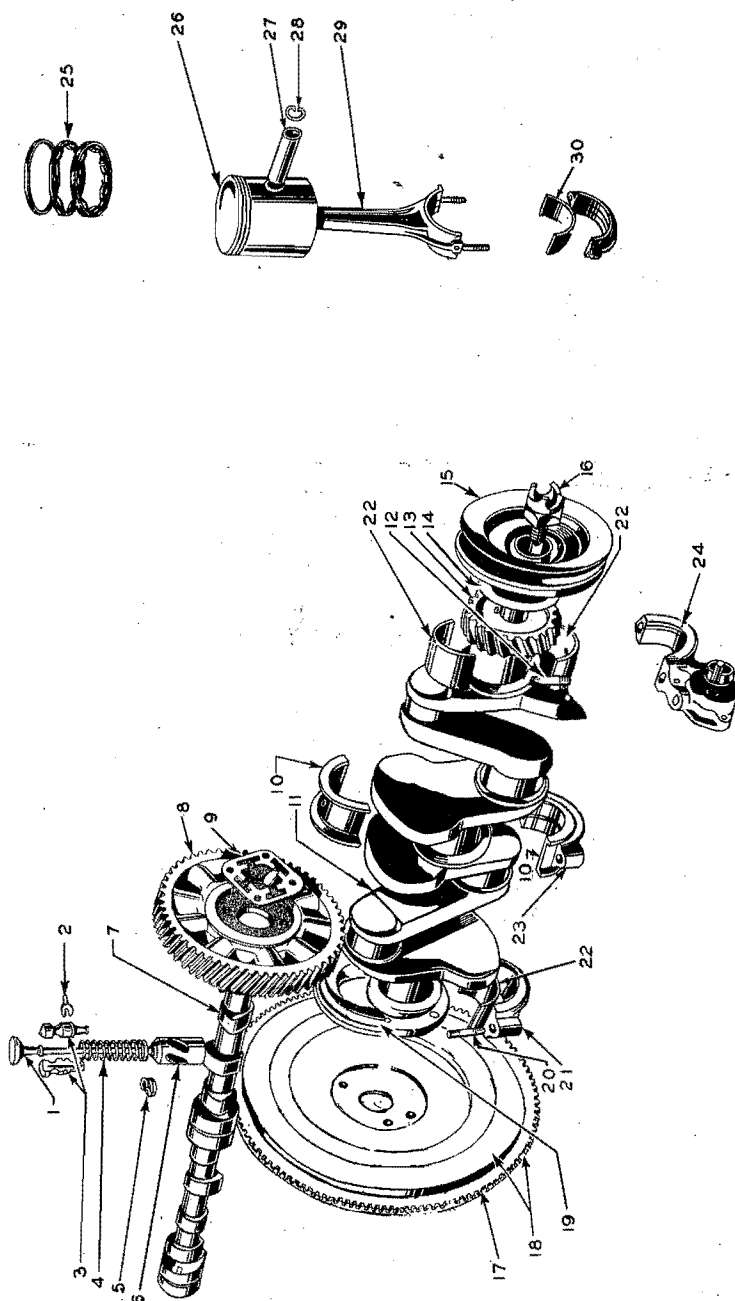


Fig. 2-ENGINE GROUP

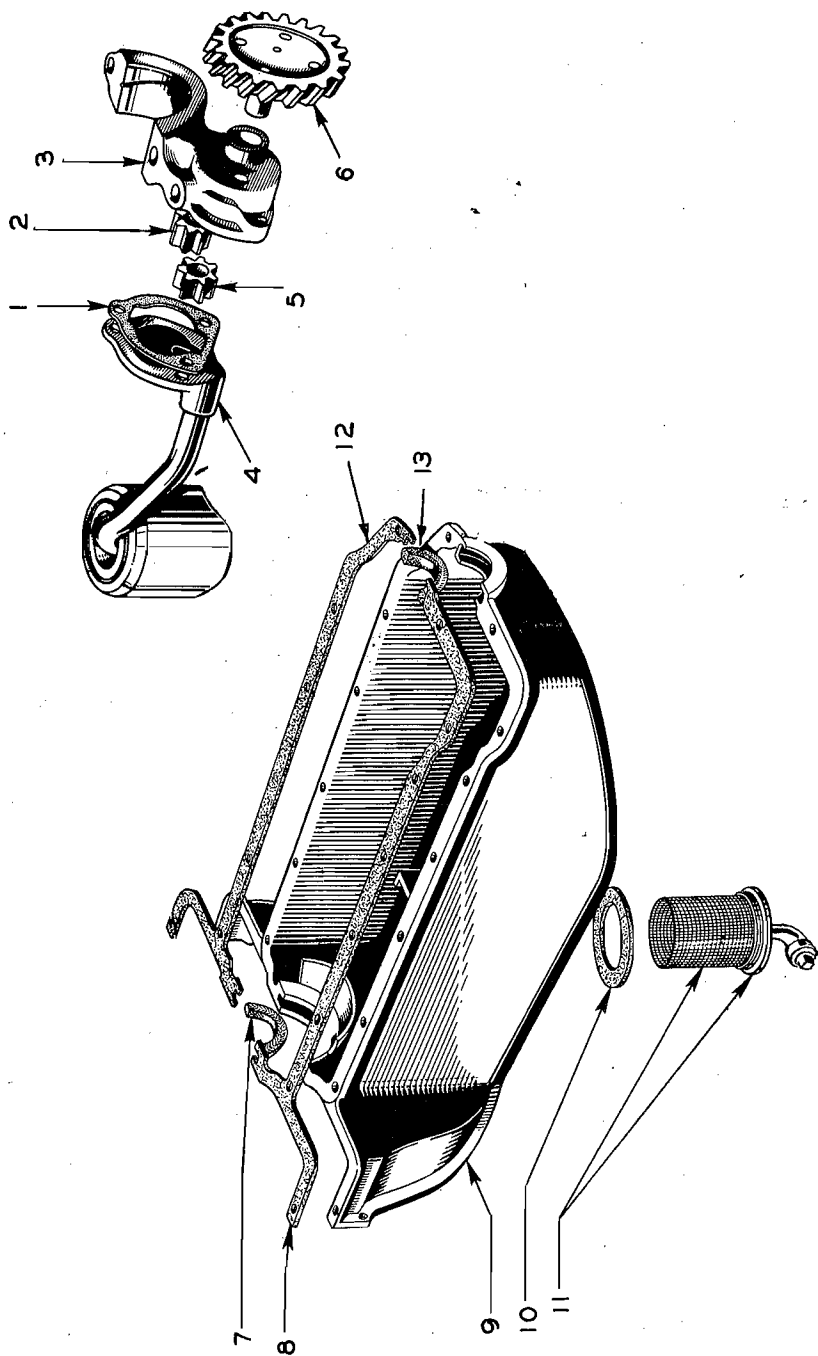
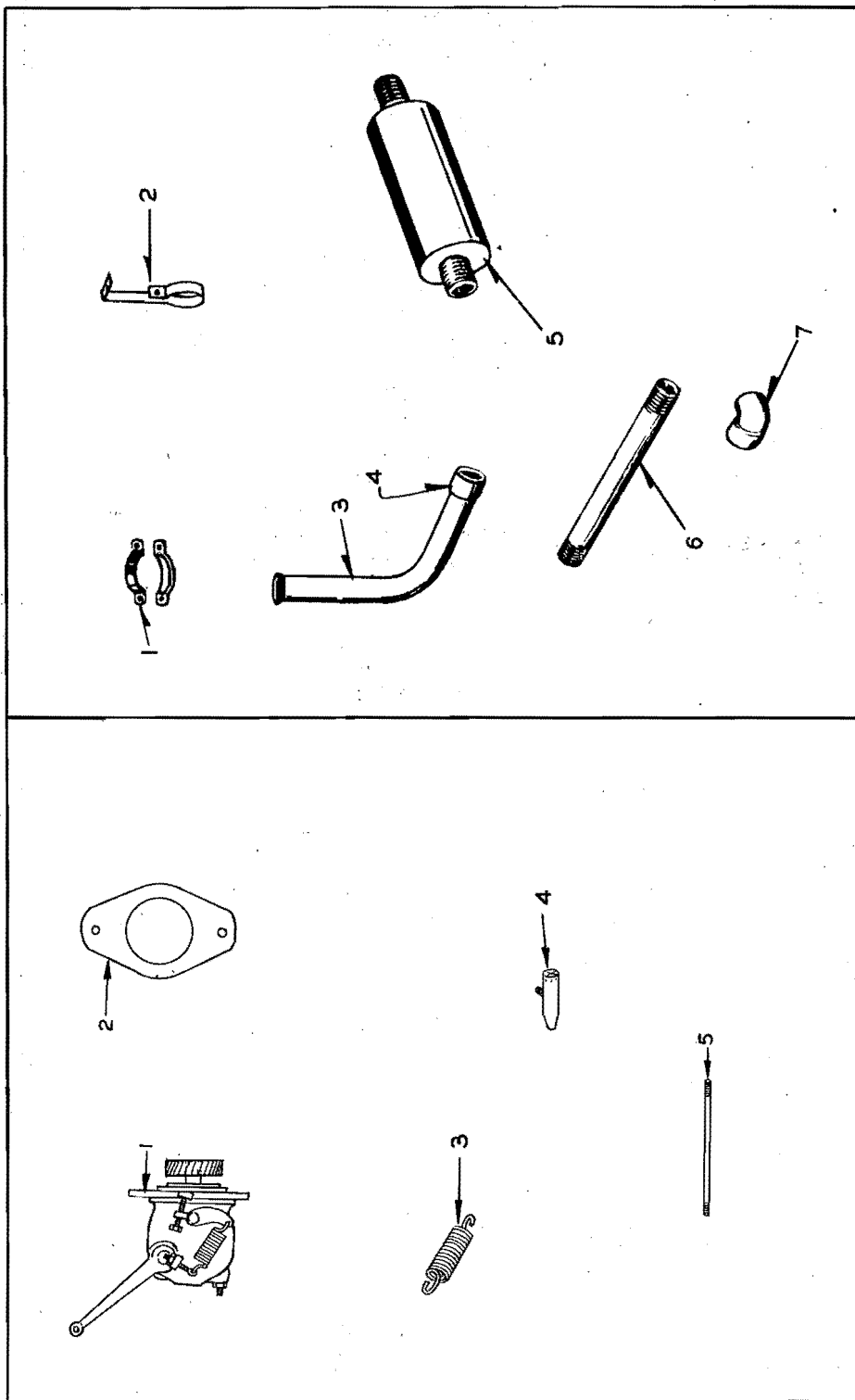


Fig. 3—OIL PUMP AND PAN GROUP

Fig. 5—MUFFLER GROUP

Fig. 4—GOVERNOR GROUP



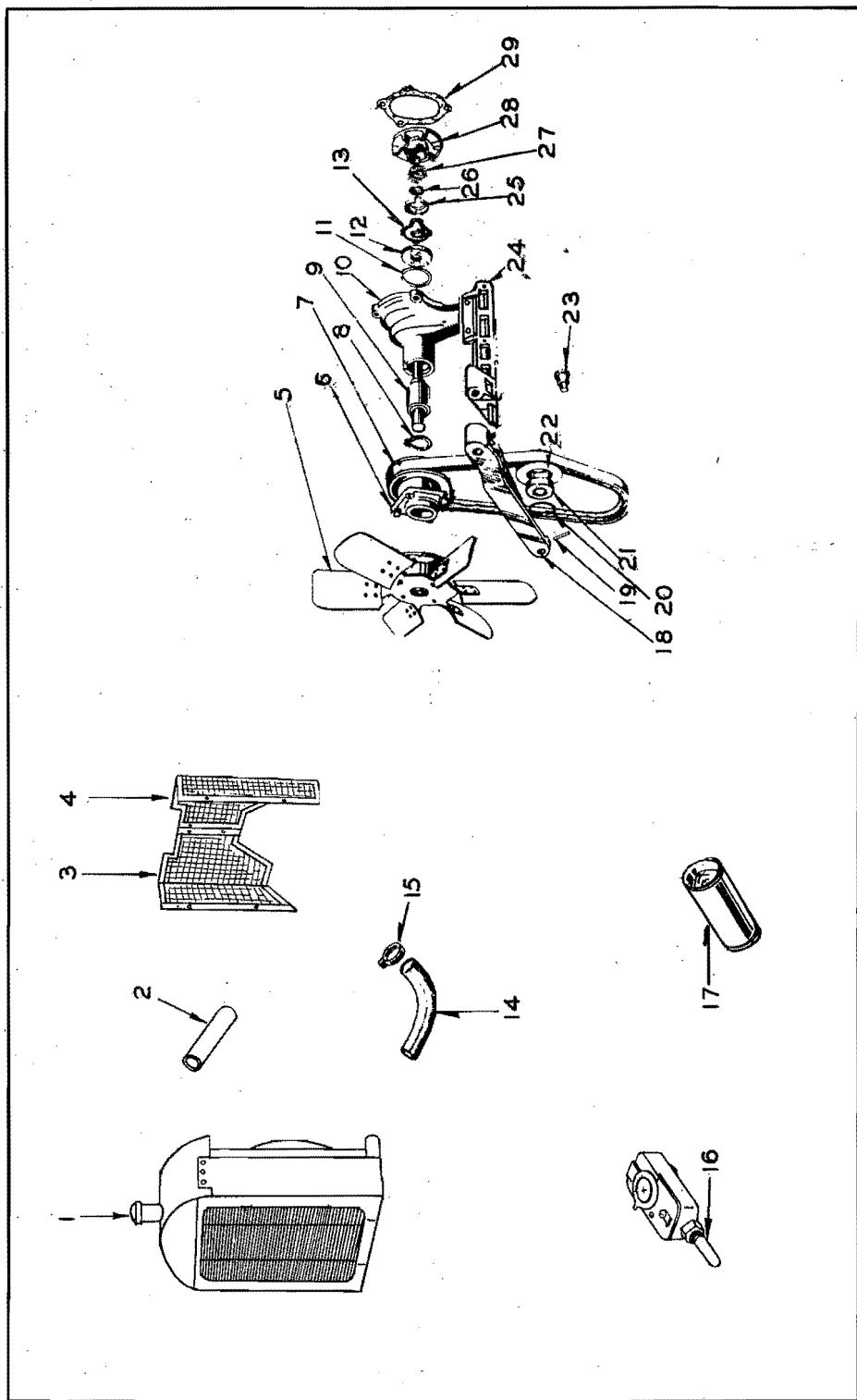


Fig. 6—RADIATOR AND WATER PUMP GROUP

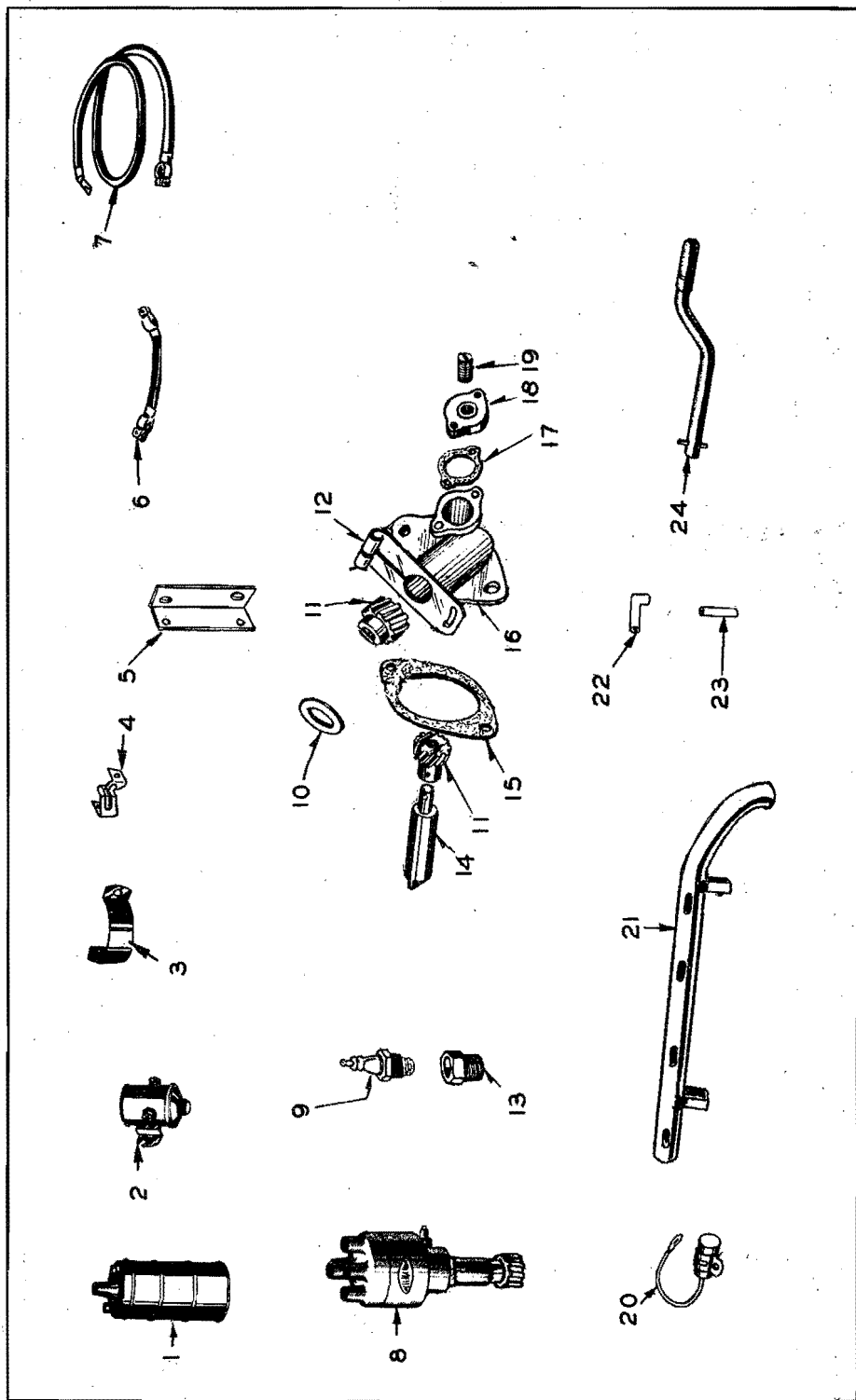


Fig. 7—IGNITION GROUP

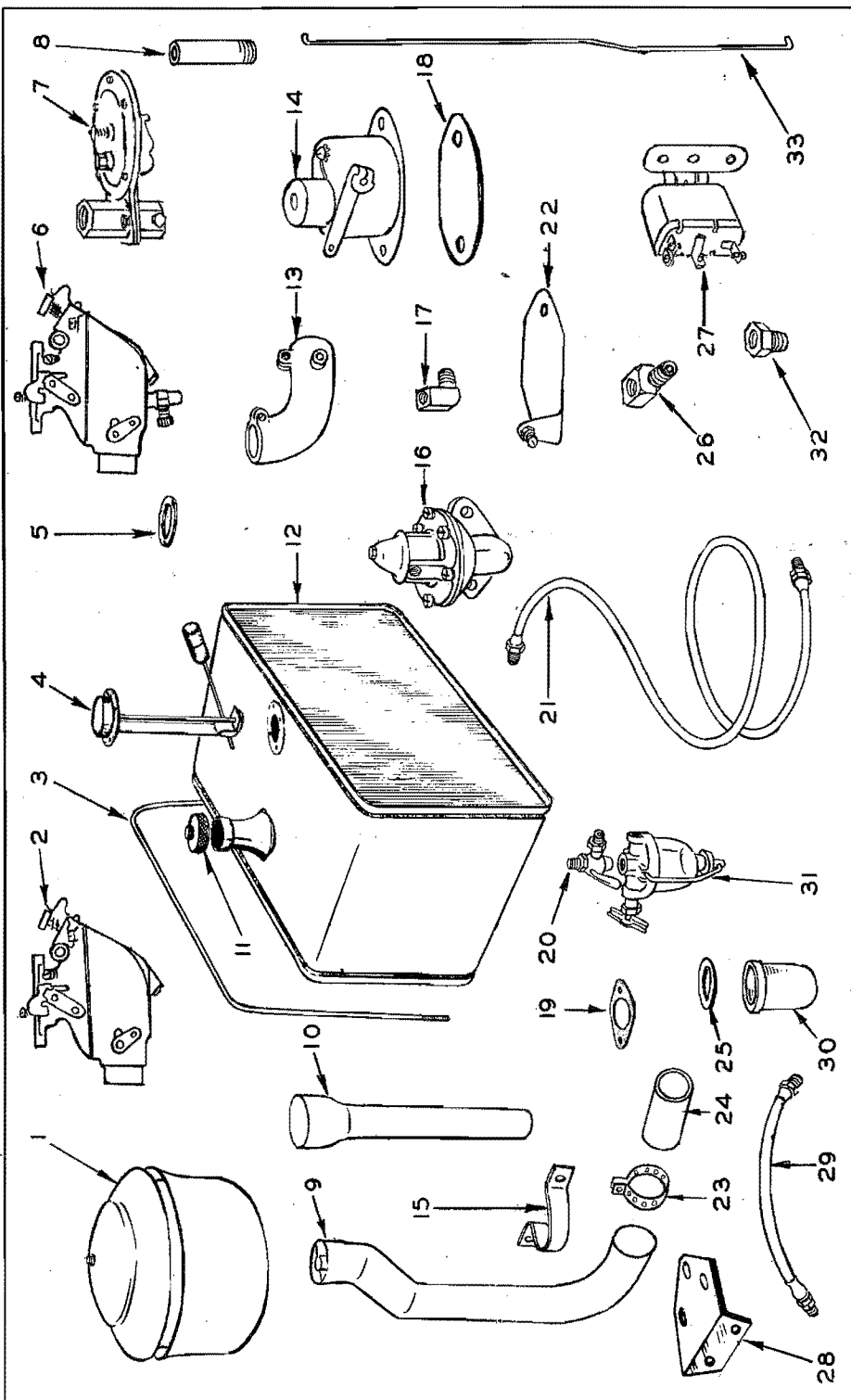


Fig. 8—FUEL SYSTEM GROUP

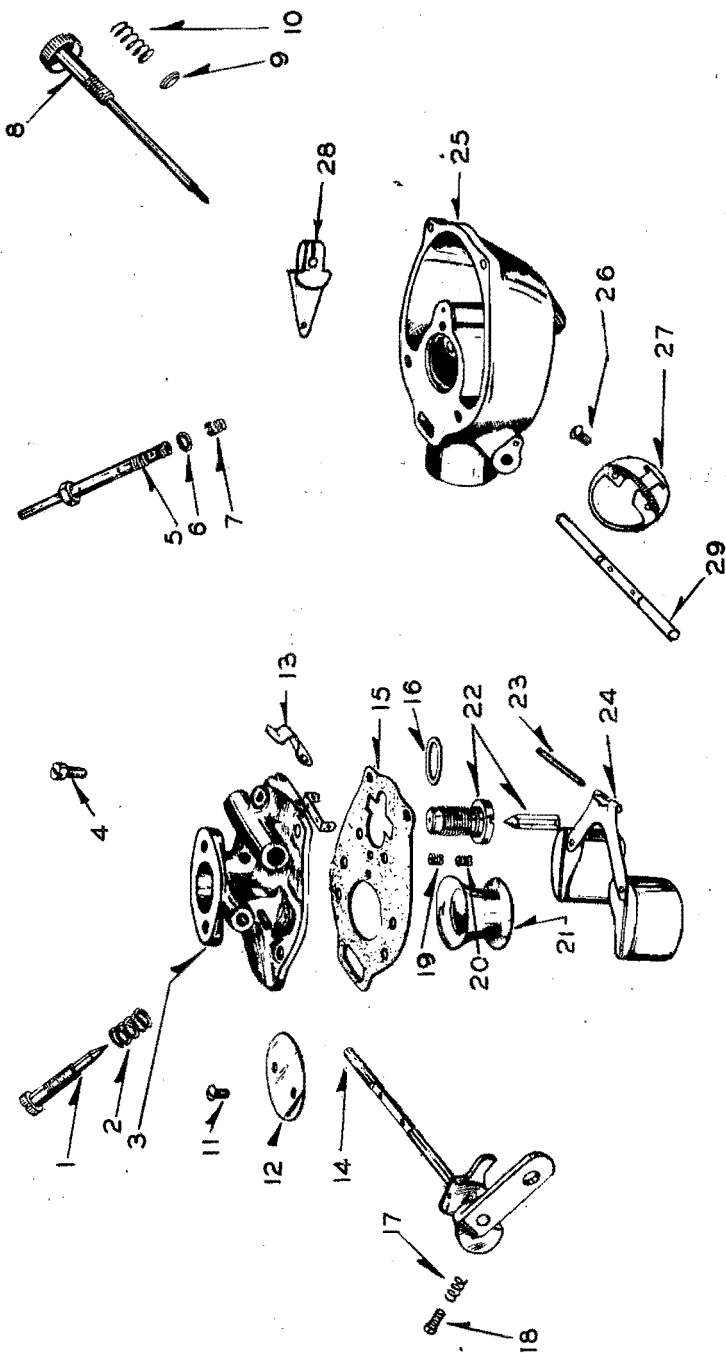


Fig. 9—CARBURETOR PARTS GROUP

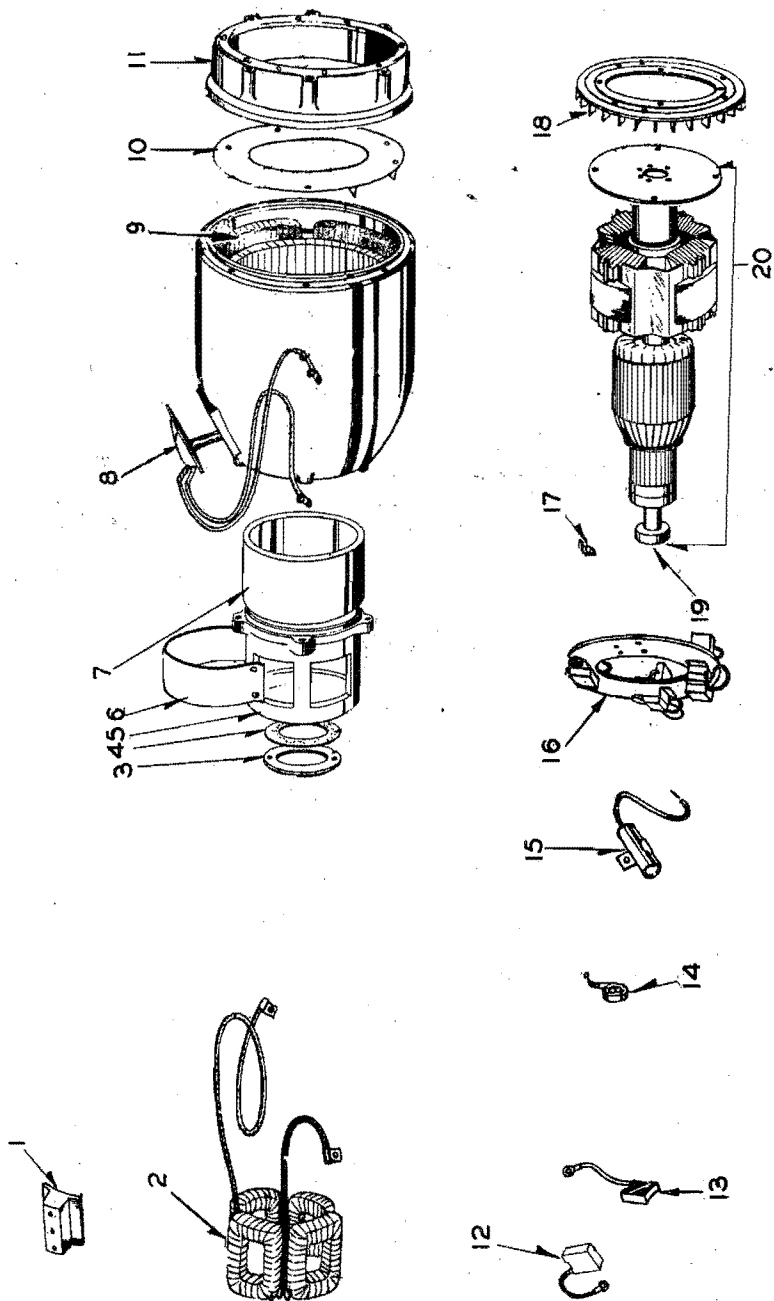


Fig. 10—GENERATOR PARTS GROUP

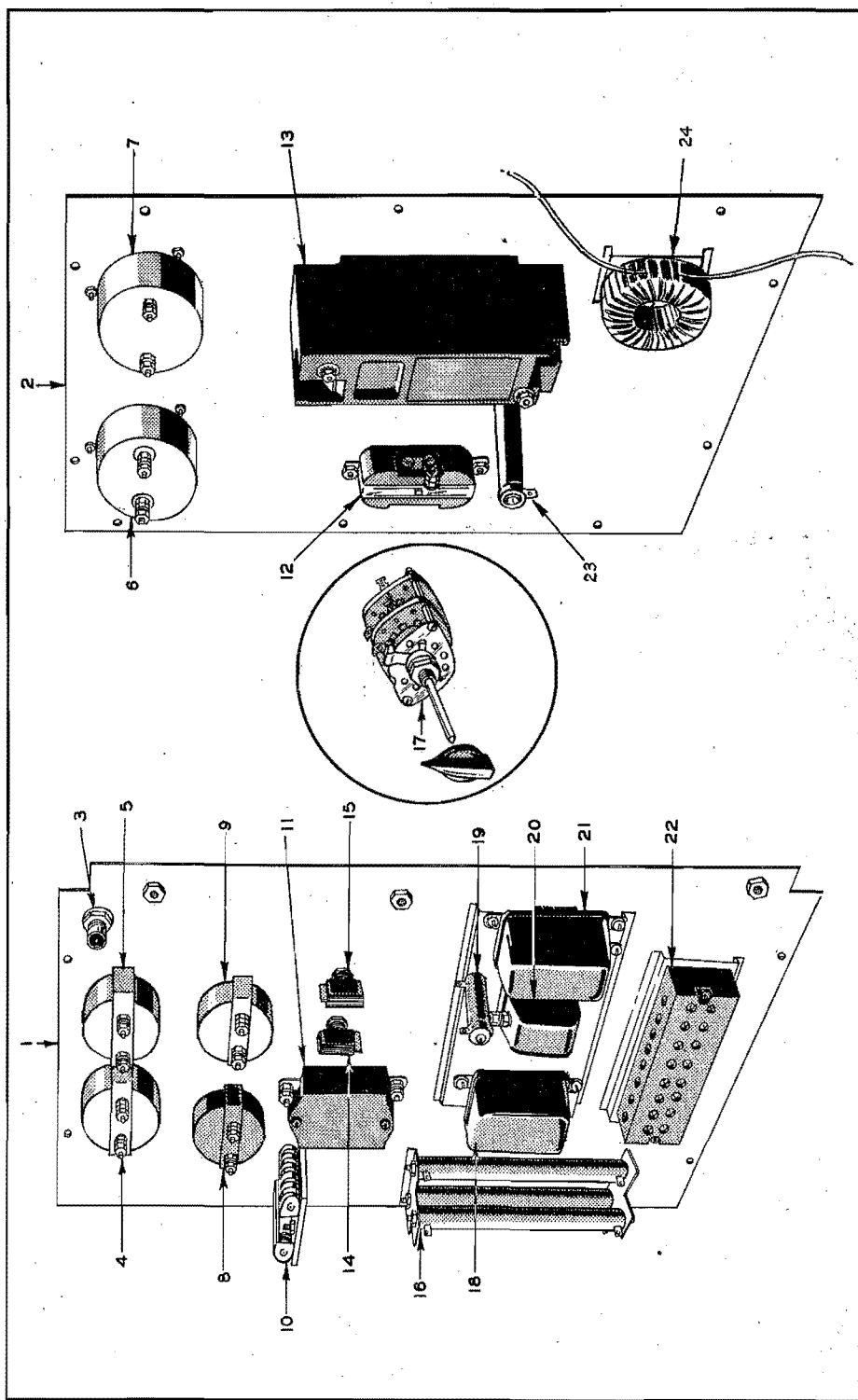


Fig. 11—CONTROL GROUP

PARTS LIST

REF. PART NO. NO.	DESCRIPTION	QUAN. USED	PRICE EACH
ENGINE GROUP (Fig. 1)			
1	2NC-6050	1	11.00
2	48-6067	4	.10
3	18-6066	14	.10
4	9N-6051	1	.85
5	9N-9448	2	.10
6	2NC-9425	1	7.60
7	99A-6055	4	1.95
8	123-188	1	2.25
9	123A190	1	.70
10	2N-6520	1	.50
10	123B189	1	
	110A347	1	1.25
	110A348	1	1.25
	406A45	1	.25
11	9N-6521	2	.15
12	9N-6017	2	5.00
13	2NC-6754	1	.25
14	2NC-6750	1	.25
15	123B216	1	
16	QNY-6010	1	65.25
17	123A20	1	1.00
18	9N-6018	1	.10
19	9N-8513	1	.20
20	9N-8508	1	.10
21	01A-6663	1	.10
22	01A-6654	1	.10
23	10A-6669	1	.10
24	68-6666	1	.10
25	2N-6019	1	.10
26	9N-6020	1	.10
	91A-6266	1	.15
	74120-S	3	.10
	Head, Cylinder		
	Stud, Cylinder Head - Long		
	Stud, Cylinder Head - Medium		
	Gasket, Cylinder Head		
	Gasket, Manifold		
	Manifold Assembly, Intake and Exhaust		
	Sleeve, Cylinder		
	Valve Assembly, Breather		
	Tube Assembly, Breather		
	Cover, Valve Chamber Front		
	Cover, Valve Chamber Rear		
	Baffle, Oil - Left		
	Baffle, Oil - Right		
	Spring, Oil Baffle		
	Gasket, Valve Chamber Cover		
	Cover, Timing Gear Side		
	Tube, Oil Level Gauge		
	Gauge, Bayonet - Oil Level		
	Tube Assembly, Oil Filler		
	Block, Cylinder - with Sleeves and Bearing Caps		
	Cap Assembly, Oil Filler - Crankcase Breather		
	Gasket, Timing Gear Side Cover		
	Basket, Water Pump to Block		
	Cover, Water Pump		
	Plunger, Oil Pressure Relief Valve		
	Spring, Oil Pressure Relief Valve		
	Gasket, Oil Pressure Relief Valve Nut		
	Nut, Oil Pressure Relief Valve		
	Cover, Timing Gear Front		
	Gasket, Front Cover		
	Seal, Camshaft Rear Bearing		
	Plug, Cylinder Block - Expansion		

WHEN ORDERING PARTS BE SURE TO INCLUDE MODEL AND SERIAL NUMBER OF UNIT.

PARTS LIST

101A129	Cover, Starter Hole	1	.25
40-8115	Cock, Cylinder Block Drain	1	.50
502-42	Elbow, Inverted Male - Breather Valve	1	.50
193-25	Gauge, Oil Pressure - Engine Element	1	2.00
193-23	Gauge, Water Temp. - Engine Element	1	2.00
403B140	Bracket, Front Engine Mtg.	1	
ENGINE GROUP			
(Fig. 2)			
1 9N-6505-A1	Valve, Exhaust	4	.90
1 11T-6505-A	Valve, Intake	4	.80
2 40-6512	Retainer, Valve Guide Bushing	8	.10
3 40-6510-B	Bushing, Valve Guide - Pair	8	.40
4 2NC-6513	Spring, Valve	8	.15
5 40-6514-B	Retainer, Valve Spring	8	.10
6 91A-6500-A2	Rod, Push - Valve Tappet	8	
7 2NC-6250	Camshaft	1	8.50
8 91A-6256A	Gear, Camshaft - Aluminum	1	3.75
8 11A-6256A	Gear, Camshaft - Fibre	1	3.95
9 91A-6258	Ring, Camshaft Gear Locking	1	.10
10 9N-6331-A1-2	Bearing Shell, Crankshaft Center - Upper or Lower	2	1.10
11 9N-6303	Crankshaft	1	.25
12 9N-6346	Stud, Crankshaft Front Bearing Cap	1	1.50
13 48-6306A	Gear, Crankshaft	1	.20
14 40-6310A	Slinger, Crankshaft Oil	1	
15 2NC-6312	Pulley, Crankshaft	1	
16 B-6319-A1	Jaw, Crankshaft Starting	1	2.15
17 9N-6384	Gear, Flywheel Ring	1	11.50
18 9N-6375	Flywheel Assembly, Includes Ring Gear	1	.40
19 91A-6335	Seal, Crankshaft Rear Oil	1	.20
20 9N-6345	Stud, Crankshaft Bearing Cap	5	2.00
21 9N-6325	Cap, Crankshaft Rear Bearing	1	
22 9N-6333-A1-2	Bearing Shell, Crankshaft Front or Rear - Upper or Lower	4	1.95
23 9N-6330	Cap, Crankshaft Center Bearing	1	5.95
24 9N-6603	Cap Assembly, Crankshaft Front Bearing and Oil Pump Body	1	2.50
25 1NC-6149A	Ring Set, Piston - For 4 Pistons - Expander Type	1	3.75
	Ring Set, Piston - For 4 Pistons - Steel Section Type	1	

PARTS LIST

REF. PART NO.	DESCRIPTION	QUAN. USED	PRICE EACH
ENGINE GROUP - CONT'D.			
26	Piston	4	2.60
27	Pin, Piston	4	.40
28	Ring, Piston Pin Retainer	8	.10
29	Rod, Connecting	4	4.50
30	Bearing Shell, Connecting Rod - Upper or Lower	8	.50
OIL PUMP AND PAN GROUP (Fig. 3)			
1	Gasket, Oil Pump	1	.10
2	Gear, Oil Pump Drive	1	1.00
3	Body, Oil Pump - Crankshaft Front Bearing Cap	1	5.95
4	Tube Assembly, Oil Pump Inlet	1	4.40
5	Gear, Oil Pump Driven	1	1.00
6	Gear and Shaft Assembly - Oil Pump Drive	1	3.95
7	Packing, Crankshaft Rear	1	.15
8	Gasket, Oil Pan - Right	1	.20
9	Pan, Oil	1	.35
10	Gasket, Oil Drain Cap	1	.20
11	Cap Assembly, Oil Drain - Includes Screen	1	2.00
12	Gasket, Oil Pan - Left	1	.15
13	Packing, Oil Pan	2	4.50
	Valve, Oil Drain Shut-Off	1	1.75
	Fitting, Oil Line - Oil Pressure Element	1	.65
	Connector, Oil Line	1	.80
	Filter Assembly, Oil	1	.55
	Switch, Low Oil Pressure (Special Models Only)	1	.30
	Line, Oil - Filter to Crankcase	1	1.25
	Line, Oil - To Filter		
	Line, Oil		
	Tee - Oil Lines		
	Elbow, Restricted Flow - Filter to Block		
	Cartridge, Oil Filter		

WHEN ORDERING PARTS BE SURE TO INCLUDE MODEL AND SERIAL NUMBER OF UNIT.

PARTS LIST

GOVERNOR GROUP

(Fig. 4)

1	151-32	Governor Assembly	1	
2	103453	Gasket, Governor Mounting	1	.10
3	75862B	Spring, Governor - Peirce Gov. No. SN-1264	1	.50
4	150-69	Joint Ball - Link Stud	2	.65
5	520A198	Stud, Link - Carburetor to Governor	1	.20

MUFFLER GROUP

(Fig. 5)

1	78021	Clamp, Exhaust Pipe	1	.50
2	155B74	Bracket, Muffler Mounting	1	.50
3	155A121	Elbow, Exhaust	1	
4	505-32	Coupling 1-1/2" Pipe	1	
5	155B77	Muffler, Exhaust	1	3.50
6	505-95	Pipe, Exhaust	1	
7	505-43	Elbow, Pipe - 1-1/2"	1	

RADIATOR AND WATER PUMP GROUP

(Fig. 6)

9N-8501	Pump Assembly, Water	1	11.00	
1	130B73	Radiator - Corrosion Resistant	1	47.50
1	130B72	Radiator - Standard	1	42.50
2	503A2	Hose, Upper - Straight	1	.35
3	130B58	Guard, Fan - Left Hand	1	3.00
4	130C59	Guard, Fan - Right Hand	1	3.00
5	75859	Fan Assembly - 6 Blade	1	7.00
6	9N-8606	Pulley, Fan	1	3.10
7	511-12	Belt, Fan	1	1.50
8	9N-8576	Ring, Snap - Water Pump Mounting	1	3.65
9	79-8530	Bearing and Shaft Assembly, Water Pump	1	
10	9N-8505	Housing, Water Pump	1	
11	68-8574	Ring, Snap - Water Pump Seal	1	.10
12	68-8557-A	Washer, Water Pump	1	.30
13	68-8524	Seal, Water Pump	1	
14	503A1	Hose, Lower - Curved	1	.65

PARTS LIST

REF. PART NO.	DESCRIPTION	QUAN. USED	PRICE EACH
RADIATOR AND WATER PUMP GROUP—CONT'D.			
15 503-4	Clamp, Hose	4	.10
16 309-1	Switch, Cut-Off - High Water Temperature	1	13.00
17 309-11	Thermostat	1	1.50
18 75757B	Arm, Idler Pulley	1	2.50
19 516-55	Pin, Idler Stud	1	.10
20 75760	Ring, Pulley Lock	1	.10
21 75759	Bearing, Idler Pulley	1	2.90
22 75755B	Pulley, Idler	1	2.50
23 75756	Stud, Idler Pulley	1	1.25
24 75690B	Bracket, Idler	1	3.50
25 68-8573	Guide, Seal Spring - Water Pump	1	.10
26 68-8572	Ring, Clamp	1	.10
27 68-8560	Spring, Water Pump Seal	1	.65
28 78-8512	Impeller, Water Pump	1	.10
29 9N-8507	Gasket, Water Pump to Cover	1	.50
2264	Cap, Radiator	1	
130A94	Screw, Hex. Hd. - Belt Tightening Adj.	1	
504-3	Screw, Hex. Hd. - 1/2" - 13 x 4-1/2" - Adjustment Pivot	1	.60
	Valve, Drain	1	
IGNITION GROUP (Fig. 7)			
1 166-5	Coil, Ignition - 12 Volt	1	5.50
2 307-40	Switch, Start Solenoid	1	4.50
3 166B101	Clamp, Coil Mounting	1	.50
4 166B102	Spacer, Coil Clamp	1	.20
5 166A33	Bracket, Coil Mounting	1	.40
6 416-1	Cable, Battery - Jumper - 4-3/4"	1	.85
7 416-14	Cable, Battery - 15"	1	1.10
8 166A59	Distributor Assembly - Ignition	1	13.75
9 167-4	Plug, Spark - Champion H-9	4	.75
10 166A78	Gasket, Distributor	1	.10

WHEN ORDERING PARTS BE SURE TO INCLUDE MODEL AND SERIAL NUMBER OF UNIT.

PARTS LIST

11	166A75	Gear, Distributor - Driver or Driven	2	2.50
12	160A186	Clamp, Distributor Adjusting	1	1.50
13	78108	Adapter, Spark Plug	4	.75
14	160A181	Shaft, Distributor Drive	1	2.00
15	9N-12143	Gasket, Distributor Gearcase	1	.10
16	160C179	Gearcase, Distributor Drive	1	6.50
17	103A52	Gasket, Gearcase Cover	1	.10
18	160A180	Cover, Gearcase	1	1.25
19	520A185	Stud, Distributor Drive Thrust	1	.75
20	312A15	Condenser, Coil - 1 Mfd	1	
20	312-10	Condenser, Distributor - 1 Mfd., Auto Lite No. IGB-1025	1	
21	167C26	Conduit, Spark Plug Wires	1	
22	314-32	Suppressor, "L" Type - Spark Plug	4	
23	314-6	Suppressor, Straight - Distributor	1	1.00
24	192B4	Crank, Manual Starting	1	1.25
	18906	Contact Point Set - Distributor60
	5924	Rotor, Distributor		1.15
	5927	Cap, Distributor		37.50
	161-93	Magneto - Manual Start Models	1	27.50
	74901	Gearcase, Magneto Adapter - Manual Start Models	1	.30
	502-40	Elbow, Restricted Flow - Gearcase	1	
	166A76	Spacer, Gear	1	
	167A1077	Lead - Spark Plug - #1	1	
	167A1078	Lead - Spark Plug - #2	1	
	167A1079	Lead - Spark Plug - #3	1	
	167A1080	Lead - Spark Plug - #4	1	
	167A1076	Lead - Distributor	1	
	306A28	Relay, Start Disconnect	1	5.75
	301B431	Box, Start Disconnect Relay	1	

FUEL SYSTEM GROUP (Fig. 8)

1	ONA-18205	Cleaner, Air	1	3.45
2	142C180	Carburetor - Gasoline Only Plant	1	12.50
3	*199B68	Rod, Tie - Fuel Tank Mounting	2	.60
4	*193-15	Gauge, Fuel - Tank Element Only	1	1.25
5	*193-10	Gasket - Fuel Gauge to Tank	1	.20

* Used only when fuel tank is mounted inside housing.

PARTS LIST

REF. PART NO. NO.	DESCRIPTION	QUAN. USED	PRICE EACH
FUEL SYSTEM GROUP—CONT'D.			
6	142C171	1	12.75
7	148-9	1	.20
8	505A10	1	
9	140B148	1	.80
10	140B56	1	25.00
11	*159B20	1	6.50
12	*159D70	1	5.00
13	148B47	1	
14	7451	1	
15	140A154	1	
16	149-67	1	
17	502-20	2	.35
18	153-26	1	.15
19	154A49	2	.10
20	*504-4	1	3.00
21	*501-9	1	1.35
22	153A20	1	.50
23	503-11	2	.10
24	9N-9652	1	.25
25	*149-157	1	.15
26	502-41	1	.50
27	307-81	1	3.00
28	140A153	1	1.50
28	140B65	1	.85
29	501-3	1	.20
30	*1098	1	1.35
31	*149-12	1	.30
32	502-33	1	.10
33	153B25	2	1.25
33	518-5	1	
	148A117	1	
	145A66	1	
	40-9417	1	

WHEN ORDERING PARTS BE SURE TO INCLUDE MODEL AND SERIAL NUMBER OF UNIT.

PARTS LIST

CARBURETOR GROUP

(Fig. 9)

1	142-85	Needle, Idle Adjusting	1	.30
2	142-76	Spring, Idle Needle	1	.10
3	142-122	Body Assembly, Throttle	1	5.55
4	142-67	Screw, Body to Bowl	4	.10
5	142-90	Nozzle, Discharge	1	.60
6	142-70	Gasket, Washer - Main Nozzle	1	.10
7	142-118	Jet, Main	1	.25
8	142-116	Needle, Main Adjusting	1	.50
9	142-71	Gasket, Main Adjusting Needle	1	.10
10	142-62	Spring, Main Adjusting Needle	1	.10
11	142-77	Screw, Throttle Valve	2	.10
12	142-60	Valve, Throttle	1	.25
13	142-78	Spring, Main Adjusting Needle Ratchet	1	.15
14	142-59	Shaft and Lever Assembly, Throttle	1	1.25
15	142-69	Gasket, Body to Bowl	1	.10
16	142-30	Gasket, Washer - Float Valve Seat	1	.10
17	142-75	Spring, Throttle Stop Screw	1	.10
18	142-64	Screw, Throttle Stop	1	.10
19	142-92	Jet, Economizer	1	.25
20	142-119	Jet, Idle	1	.25
21	142-117	Venturi	1	1.10
22	142-106	Valve Assembly, Fuel Inlet	1	.10
23	142-84	Shaft, Float	1	.10
24	142-83	Float Assembly	1	1.15
25	142-109	Bowl Assembly	1	5.25
26	142-61	Screw, Choke Valve	2	.10
27	142-112	Valve, Choke	1	.60
	141A162	Lever, Choke Shaft	1	.15
	145A36	Bushing, Choke Lever	1	.50
	142-88	Packing, Choke Shaft	1	
	142A277	Shaft, Choke	1	

* Used only when fuel tank is mounted inside housing.

PARTS LIST

REF. PART NO. NO.	DESCRIPTION	† QUANTITY USED					PRICE EACH
		A	B	C	D	E	
GENERATOR GROUP (Fig. 10)							
1	221A4	4	4		4	4	30.00
2	222A1036	1	1	1	1	1	1.25
3	232B55	1	1	1	1	1	.35
4	232A57	1	1	1	1	1	15.00
5	211C11	1	1	1	1	1	.75
6	232B122	1	1	1	1	1	
7	210A1049	1	1	1	1	1	1.50
8	232B84	1	1	1	1	1	
9	220-10	1	1	1	1	1	
9	220A38	1	1	1	1	1	
9	220A39	1	1	1	1	1	
10	75674	1	1	1	1	1	3.00
11	231D22	1	1	1	1	1	1.50
12	214A15	4	4	4	4	4	.75
13	214A8	4	4	4	4	4	.25
14	212A1004	4	4	4	4	4	.75
14	212A1011	4	4	4	4	4	15.00
15	312A27	2	2	2	2	2	.10
16	212C49	1	1	1	1	1	8.50
17	232A333	1	1	1	1	1	5.35
18	75584	1	1	1	1	1	
19	510A32	1	1	1	1	1	
20	201A252	1	1	1	1	1	
	Shoe, Pole - Exciter Field						
	Coil Assembly, Field - Exciter - Set of 4 Coils						
	Cover, Bearing						
	Gasket, Bearing Cover						
	Bell, End						
	Band, End Bell						
	Frame Assembly, Exciter - Includes Frame, Pole Shoes and Field Coils						
	Cover, Generator						
	Stator Assembly, Alternator - Winding and Laminations						
	Stator Assembly, Alternator - Winding and Laminations						
	Ring, Air Baffle						
	Adapter, Generator to Engine						
	Brush, Commutator						
	Brush, Collector Ring						
	Spring, Collector Ring Brush						
	Spring, Commutator Brush						
	Condenser - .5 Mfd						
	Rig Assembly, Brush - Includes Brushes and Springs						
	Clip, Bearing Retaining						
	Blower, Generator						
	Bearing, Ball						
	Rotor Assembly, Wound - Incl. Drive Disc, Alternator Field, Exciter Armature, and Ball Bearing						
	Stud - Alt. Frame to Adapter						
	Grease, Generator Bearing						
	520A362	1	1	1	1	1	.25
	420-82	6	6	6	6	6	
		1	1	1	1	1	

WHEN ORDERING PARTS BE SURE TO INCLUDE MODEL AND SERIAL NUMBER OF UNIT.

PARTS LIST

CONTROL PANEL GROUP

(Fig. 11)

1	301C327	Panel, Right Hand - Engine Control Half	1	1	1	1	4.50
2	301C426	Panel, Left Hand - Electrical Meter Half	1	1	1	1	3.00
2	301C348	Panel, Left Hand - Electrical Meter Half	1	1	1	1	6.50
2	301C390	Panel, Left Hand - Electrical Meter Half	1	1	1	1	1.75
3	322-5	Light, Pilot	1	1	1	1	2.25
4	193-24	Gauge, Engine Oil Pressure - Panel Element	1	1	1	1	13.00
5	193-22	Gauge, Engine Water Temperature - Panel Element	1	1	1	1	15.00
6	302-40	Voltmeter - 0-150 Volts	1	1	1	1	10.50
6	302-41	Voltmeter - 0-300 Volts	1	1	1	1	10.50
7	302-12	Ammeter - 0-150 Amps.....	1	1	1	1	13.25
7	302-9	Ammeter - 0-75 Amps.....	1	1	1	1	2.50
7	302-7	Ammeter - 0-50 Amps.....	1	1	1	1	1.65
7	302-124	Ammeter - 0-35 Amps.....	1	1	1	1	1.25
8	302-58	Ammeter, Charge - 10-0-10 Amps	1	1	1	1	1.40
9	193-11	Gauge, Fuel - Panel Element	1	1	1	1	.70
10	193-30	Divider, Voltage	1	1	1	1	13.00
11	308-9	Switch, Push - Start and Stop	1	1	1	1	32.00
12	323-48	Receptacle, Duplex Twistite	1	1	1	1	.75
12	320-28	Breaker, Circuit - 50 Amps. - 2 Pole	1	1	1	1	.75
13	320-54	Breaker, Circuit - 5 Amps. - 3 Pole	1	1	1	1	12.50
14	308-5	Switch, Toggle - Ignition	1	1	1	1	4.00
15	308-2	Switch, Toggle - Panel Light	1	1	1	1	.50
16	304-30	Resistor, Charge Circuit - 3 Ohm, 75 Watt	1	1	1	1	2.50
17	308-22	Switch, Meter Selector	1	1	1	1	2.00
18	305-1	Regulator, Voltage	1	1	1	1	.75
19	304-32	Resistor, Charge Relay - 15 Ohm, 10 Watt	1	1	1	1	11.00
20	307-69	Relay, Reverse Current	1	1	1	1	11.00
21	307-4	Relay, Start-Stop	1	1	1	1	15.00
22	332-54	Block, Terminal - 8 Place	1	1	1	1	1.00
23	304-99	Resistor - 5000 Ohms	1	1	1	1	3
24	302-79	Transformer, Current	1	1	1	1	1
24	302-76	Transformer, Current	1	1	1	1	1
24	302-123	Transformer, Current	1	1	1	1	1
24	302-68	Meter, Running Time	1	1	1	1	1
	301C446	Panel, Time Meter Mtg.	1	1	1	1	1

Refer to page 33 regarding the use of Quantity Used Symbols A, B, C, D, and E.

PARTS LIST

REF. PART NO.	DESCRIPTION	† QUANTITY USED					PRICE EACH
		A	B	C	D	E	
CONTROL PANEL GROUP - CONT'D.							
322-4	Lamp, Pilot Light - 12 Volt	1	1	1	1	1	.25
332A19	Stud, Output Terminal - Insulated	1	1				.35
332A56	Stud, Output Terminal - Grounded	1	1				.25
332A20	Stud, Output Terminal - Insulated			2	3	3	.25
332A35	Stud, Output Terminal - Grounded			1	1	1	.20
332A21	Block, Output Terminal Stud	1	1	2	3	3	.50
332A23	Bushing, Terminal Block	1	1				.15
332A22	Bushing, Terminal Block			2	3	3	.20
332A230	Terminal, Solderless	2	2				
332-142	Terminal, Solderless			3	4	3	.20
312A15	Condenser, Output Terminal - .1 Mfd	1		2	3		.75
312-16	Condenser, Output Terminal - .01 Mfd		1			3	.60
304-74	Resistor, Field Discharge			1			3.75
1741	Cable, 3 Wire - Remote Control				1		.035
HOUSING GROUP							
(Not Illustrated)							
403D121	Chassis, Mounting	1	1	1	1	1	5.00
405B321	Grille, Chassis	3	3	3	3	3	
405B293	Grille, Chassis	2	2	2	2	2	
405C236	Support, Battery & Fuel Tank	1	1	1	1	1	
405C234	Panel, Front End - Housing	1	1	1	1	1	
405C375	Plate, Top	1	1	1	1	1	
405C148	Casting, Top End	2	2	2	2	2	1.00
405C211	Cover, Top End Casting	2	2	2	2	2	
405D240	Panel, Rear End - Housing	1	1	1	1	1	
405C237	Panel, Chassis Rear End	1	1	1	1	1	2.00
416B61	Frame, Battery Hold Down	1	1	1	1	1	
416B87	Tray, Battery	1	1	1	1	1	.75
405A216	Cover, Bearing Inspection	1	1	1	1	1	.20
406-2	Knob, Door	3	3	3	3	3	1.00
406-9	Handle, Panel Door	4	4	4	4	4	
405D377	Panel, Door - Right - Includes Handles, etc.	1	1	1	1	1	

WHEN ORDERING PARTS BE SURE TO INCLUDE MODEL AND SERIAL NUMBER OF UNIT.

PARTS LIST

405D376	Panel, Door - Left	1	1	1.00
402-10	Mounting - Engine	1	1	.50
402-11	Mounting - Rebound - Engine	1	1	.50
402-12	Cup, Mounting	1	1	5.00
402-27	Cushion, Mounting	2	2	.50
402A13	Pin, Engine Mounting	1	1	.50
405A44	Clamp Assy., Crank	1	1	.20
SERVICE KITS				
168-19	Gasket Kit	1	1	3.50
110-278	Valve Grind Kit	1	1	5.00
522-61	Complete Overhaul Kit - A.C. Battery Ignition Plant	1	1	25.00
149-106	Fuel Pump Repair Kit	1	1	1.00

Refer to page 33 regarding the use of Quantity Used Symbols A, B, C, D, and E.

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SUPPLEMENT
FOR
DIRECT CURRENT
GENERATING PLANTS

If your plant is a direct current (DC) plant, use the information contained in the following pages to make the manual applicable to the DC plant. Unless otherwise stated in these supplementary pages, information contained in the main section of this manual applies to both alternating current and direct current generating plants. Information which does not apply to direct current plants is referred to by page number.

READ THIS SUPPLEMENT CAREFULLY

Page 1. Substitute the following General Data Table.

OUTPUT WATTS	OUTPUT VOLTS	STARTING METHOD	TYPE IGNITION	COOLING SYSTEM	FUEL TANK	CRANK- CASE	† PARTS REF. SYMBOL
10,000	115	Electric	Battery	14	60	4	A
10,000	230	Electric	Battery	14	60	4	B
10,000	115	Manual	Magneto	14	60	4	C
10,000	230	Manual	Magneto	14	60	4	D

† The Parts Reference Symbol in this column indicates the applicable column under "Quantity Used" in the Parts List - Generator Group, and Control Panel Group, beginning on page 61. Compare the characteristics of your plant, and the data given on the plant nameplate with the information in the above table in order to determine which column to use when ordering repair parts. Always be sure to give the plant model, serial number and spec. number when ordering parts. Refer to page 33 for more complete information on ordering parts.

Page 2. Delete the information under the headings "Generator" and "Controls", substituting the following information.

GENERATOR

The air cooled generator produces 10,000 watts of direct current. The voltage is either 115 or 230 volts, as indicated on the plant nameplate. The self excited generator is directly connected to the engine, the armature turning at crankshaft speed. The generator field is compound wound and has four interpole coils for sparkless commutation. The armature is supported at the inner end by the engine rear main bearing, and at the outer end by a large ball bearing. An extremely large commutator is mounted on the ball bearing end of the armature.

Voltage is proportional to engine speed, which is regulated by the engine governor. The generator design assures close voltage regulation between full load and no load conditions.

CONTROLS

A control panel, mounting the necessary meters, relays, etc. is located at the generator end of the housing. Models equipped with the automotive type starter may be started and stopped electrically at the plant or by means of remote control switches. Manual start models can be started only by hand cranking. Automatic or Line Failure Transfer equipment is not available for the DC plants.

Page 4. Under the paragraph heading "Connecting the Load Wires", substitute the following information.

Observe applicable electrical codes when connecting the load wires to the plant. Use sufficiently large, insulated wire, the size depending upon the distance and permissible voltage drop between the plant and the load.

Connect the positive wire of the main line to the positive (+) DC OUTPUT terminal on the plant. Connect the negative wire of the main line to the negative (-) terminal on the plant. The plant output terminals are located on the right hand side (facing the radiator end of the plant) of the chassis. Remove the short grille for access to the terminals. A duplex receptacle mounted on the control panel is provided for quick connection of loads up to 15 amps at 115 volts, or 10 amps at 230 volts.

Remote control type plants have a small terminal block marked REMOTE, to which one or more remote control switches may be connected for remote starting and stopping of the plant. Connect the switch terminal No. 1 to plant terminal No. 1, switch terminal No. 2 to plant terminal No. 2, etc. Use No. 19 wire for distances up to 250 feet, No. 16 wire up to 500 feet, or No. 14 wire up to 1000 feet.

Page 9. Add the following information to that given under STARTING THE PLANT MANUALLY.

The DC plant has no fuel pump, gasoline reaching the carburetor by gravity from the fuel tank.

The manual start, magneto ignition plant has a momentary contact toggle switch mounted on the front panel. This switch by-passes the low oil pressure cut-out switch which is connected to the ignition circuit. Hold this toggle switch in contact while manually cranking the engine, and until the oil pressure has built up to normal running pressure. Manual carburetor choking is provided on the manual start plant.

Page 19. Add the following information to that given in paragraph 3 under GOVERNOR.

For direct current plants, the full load voltage should be approximately 110 volts, and at no load approximately 121 volts, for a 115 volt plant. The engine speed should be between 1800 and 2000 r.p.m., with a spread between no load and full load of not more than 100 r.p.m. Voltage of the 230 volt plant will be correspondingly higher.

Page 24. The illustration GENERATOR ASSEMBLY does not apply to the DC generator.

Page 25. Disregard references to collector rings and collector ring brushes, which are not used on DC generators.

Page 32. The Sectional View shows the AC type of generator. The engine half of the illustration applies to both the AC and DC type plants.

Pages 42, 43. The Generator Parts Group, and Control Group illustrations do not apply to the DC plants.

Page 47. Governor Group - Reference No. 1 - Add to description: For Magneto Ignition DC Plant.
Add Part No. 151-29 - Governor Assembly - For Battery Ignition DC Plant. - Quantity of 1 - Price \$32.50.

Page 47. Reference No. 5 - Add to description: For Magneto Ignition DC Plant.
Add Part No. 520A158 - Stud, Link - Carburetor to Governor -
For Battery Ignition DC Plant. - Quantity of 1.

Radiator and Water Pump Group - Reference No. 7 - Add to description: For Magneto Ignition DC Plant.
Add Part No. 9N-8620-B2 - For Battery Ignition DC Plant -
Quantity of 1.

Page 48. Ignition Group - Reference No. 1 - Add Part No. 9N-12024 -
Coil, Ignition - For Battery Ignition DC Plant - Quantity of 1.
Reference No. 2 - Add Part No. 307-29 - Switch, Start Solenoid -
For Battery Ignition DC Plant - Quantity of 1 - Price \$3.25.
Reference No. 8 - Add Part No. 9N-12100 - Distributor Assembly -
For Battery Ignition DC Plant - Quantity of 1.
Reference Nos. 11, 14, 16, 17, 18, 19, 20, and Part Nos. 18906,
5924, 5927, 166A76, 306A28, and 301B341. - Add to description:
For AC Plants Only.
Add to the Group: Part No. 308-37 - Switch, Momentary Contact -
For Magneto Ignition Plant - Quantity of 1 - Price \$1.50.
Part No. INC-10000- Generator, Battery Charging - For Battery
Ignition DC Plant - Quantity of 1.
Part No. 52-11002 - Motor, Starting - For Battery Ignition DC
Plant - Quantity of 1.
Part No. 01A-10505C - Regulator, Voltage - For Battery Ignition
DC Plant - Quantity of 1.
Part No. 52-11350C - Drive, Starter - For Battery Ignition DC
Plants - Quantity of 1.

Page 50. Fuel System Group. - Ref. No. 14 - Add to description:- For AC
Plants Only.
Add Part No. 7274 - Control, Choke - 6 Volt Sisson - For Bat-
tery Ignition DC Plant - Quantity of 1 - Price \$5.00.
Add Part No. 153B43 - Control, Choke - Manual - For Manual
Start Plant - Quantity of 1 - Price \$.50.
Reference No. 33 - Add to description: For AC Plants Only.
Add Part No. 153A12 - Rod, Link - Choke Control - For 6 Volt
Choke - Quantity of 1 - Price \$.50.
Part No. 518-5 - Add to Description: For AC Plant Only.
Add Part No. 518-4 - Clip, Choke Rod End - For 6 Volt Choke
Control Rod - Quantity of 2 - Price \$.10.

Pages 52, 53, and 54. - Substitute the following Generator, Control Panel,
and Housing Groups.

PARTS LIST

PART NO.	DESCRIPTION	† QUANTITY USED				PRICE EACH
		A	B	C	D	
GENERATOR GROUP						
231D23	Adapter, Generator to Engine	1	1			
211C36	Bell, End	1	1			
232A376	Cover, Bearing Inspection	1	1			
232B375	Gasket, Bearing Cover	1	1			
232B377	Band, End Bell	1	1			
520A362	Stud, Generator Frame	6	6			
75676	Scroll, Air - Generator Blower	1	1			
75877	Blower, Generator	1	1			
213B82	Ring, Brush Rig Mounting	1	1			
232A264	Post, Extension - Brush Rig Mounting	4	4			
201A324	Armature Assembly	1	1			
201A325	Armature Assembly	1	1			
222A1240	Coil Assembly, Field - Set	1	1			
222A235	Coil Assembly, Interpole - Set	1	1			
510-17	Bearing, Ball - Armature	1	1			8.75
212C126	Rig Assembly, Brush - Includes Brushes and Springs	1	1			
212C133	Rig Assembly, Brush - Includes Brushes and Springs	1	1			
214A26	Brush	8	4			1.50
212A1011	Spring, Brush	8	4			.25
CONTROL PANEL GROUP						
301C326	Panel, Engine Half	1	1			4.00
301C437	Panel, Engine Half			1		
301C319	Panel, Meter Half	1				
301C280	Panel, Meter Half			1		
193-22	Gauge, Water Temperature	1	1			2.25
193-24	Gauge, Oil Pressure	1	1			2.25
193-11	Gauge, Fuel Level	1	1			1.65
308-9	Switch, Start-Stop	1	1			1.40
308-2	Switch, Toggle - Panel Light	1	1			.75
308-5	Switch, Toggle - Ignition	1	1			.75
307-4	Relay, Start-Stop	2	1			2.00

WHEN ORDERING PARTS BE SURE TO INCLUDE MODEL AND SERIAL NUMBER OF UNIT.

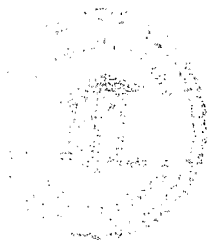
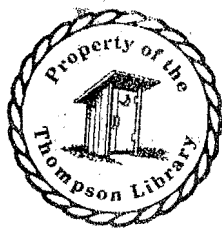
PARTS LIST

PART NO.	DESCRIPTION	QUANTITY USED				PRICE EACH
		A	B	C	D	
CONTROL PANEL GROUP - CONT'D.						
332-54	Block, Terminal - 8 Place	1				2.50
322-5	Light, Pilot	1				1.75
322-12	Lamp, Pilot Light - 6 Volt	1				
302-62	Ammeter, Charge - 45-0-45	1				2.50
304-55	Resistor, Fixed - 5 Ohm - 75 Watt	1				4.50
193-2	Gauge, Water Temperature					2.00
193-5	Gauge, Oil Pressure					1.15
308-29	Switch, Stop					
304-38	Resistor, Fixed - 5 Ohm - 10 Watt	1				15.00
302-50	Voltmeter - 0-150	1				12.25
302-115	Voltmeter - 0-300	1				12.25
302-32	Ammeter - 0-150					29.00
302-30	Ammeter - 0-50	1				6.50
320-60	Breaker Circuit - 100 Amp	1				8.50
320-59	Breaker, Circuit - 50 Amp	1				.35
302-71	Shunt, Ammeter	1				.25
332A19	Stud, Output Terminal - 3-1/4"	1				.50
332A56	Stud, Output Terminal - 2-1/2"	1				.15
332A21	Block, Terminal Stud	1				
332A23	Bushing, Block Adapter	1				1.75
332A230	Terminal, Solderless Connector	2				
332-18	Block, Terminal - Remote - 4 Place	1				.75
312-61	Condenser, Output Terminals	1				
312A27	Condenser, Output Terminals	1				
304-98	Resistor, Adj. - 300 Ohm	1				
HOUSING GROUP						
403D121	Chassis, Mounting	1				5.00
405B321	Grille, Chassis	1				
405B293	Grille, Chassis	3				
405D294	Support, Battery and Fuel Tank	2				
405C234	Panel, Front End	1				
405D240	Panel, Rear End	1				

WHEN ORDERING PARTS BE SURE TO INCLUDE MODEL AND SERIAL NUMBER OF UNIT.

PARTS LIST

405C375	Plate, Top	1	1	1.00
405G148	Casting, Top End	2	2	
405C211	Cover, Top Casting	1	1	
405C237	Plate, Chassis End	1	1	
405B245	Cover, Top Casting - Rear	1	1	.75
405A216	Cover, Bearing Inspection	1	1	
416B72	Frame, Battery Hold Down	1	1	.20
406-2	Pull, Door	2	2	1.00
402-10	Bushing, Engine Mounting	1	1	.50
402-11	Bushing, Rebound	1	1	.50
402-12	Cup, Mounting	1	1	.50
402A13	Pin, Engine Mounting	1	1	
405D377	Panel, Door - Right - Includes Handles, etc.	1	1	
405D376	Panel, Door - Left - Includes Handles, etc.	1	1	
405D390	Panel, Door - Left - Includes Handles, etc.	1	1	
405A44	Clamp Assembly, Crank	1	1	.20
402-27	Bushing - Generator Mounting	2	2	5.00



I hope someday this manual is of great help to someone. It is 67 years old at this time, the paper is getting brittle & hard to handle. After my document feeder ate 2 pages, I had to revert to manually scanning it one page at a time.

Keep the old Onans going & visit SmokeStak (Onan forum) if you need help.



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