MODEL NO. V45

# SERVICE MANUAL AND PARTS LIST FOR YOUR ELECTRIC PLANT

READ THIS BOOK CAREFULLY AND PRESERVE FOR FUTURE REFERENCE

For help with your old Onan generator, visit Smoke Stak
http://www.smokstak.com/forum/forumdisplay.php?f=1
You will find "The Smart Guys" here, with many years of experience repairing old Onan generators.
3/21/2015

# WARNING

THIS ELECTRIC PLANT MUST BE INSTALLED AND BE OPERATED ACCORDING TO OUR INSTRUCTIONS. AN IMPROPER INSTALLATION OR THE USE OF OIL OR FUEL OTHER THAN THAT RECOMMENDED IN THIS MANUAL, RELIEVES THE MANUFACTURER OF ALL RESPONSIBILITY FOR PLANT PERFORMANCE.

READ THIS SERVICE MANUAL CAREFULLY!

PRINTED IN U. S. A.

# IMPORTANT!!!

## USE OF LEADED FUELS

The performance of gasoline engines deteriorates with use until it eventually becomes necessary to remove the carbon, grind the valves, install new spark plugs, etc.

Lead is added to many gasolines to increase the octane rating. Due to the action of the lead in the combustion chamber, on the valve seats, and on the spark plugs, the use of such fuels causes the engine performance to deteriorate more rapidly. When using highly leaded fuel, there is a regularly increasing lead content in the crankcase oil.

If the gasoline contains ½ cubic centimeter, or less, of lead per gallon there is little such effect. However, as the proportion of lead is increased the deterioration in engine performance is greatly accelerated.

Under normal operating conditions with unleaded fuel it may be necessary to remove carbon each 1000 operating hours, grind valves each 1000 to 2000 operating hours, clean spark plugs each 200 operating hours, and change crankcase oil each 100 to 200 operating hours.

When using Army 80 octane fuel, aviation 100 octane fuel, or other fuel containing more than 2 cubic centimeters of lead per gallon, change the crankcase oil each 50 operating hours. When using such highly leaded fuels it may be necessary to remove carbon and grind valves each 100 to 200 operating hours, clean spark plugs each 50 operating hours, and replace them each 100 to 200 operating hours. If carbon is removed every 100 to 150 operating hours, the periods between valve grinding jobs usually can be considerably lengthened.

When using leaded fuels, inspect the engine more often and give it the more frequent service required.

## 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 fuels, 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 the book, or if he is unable to determine what repair parts are required, the manufacturer will, upon request, furnish any advice needed. When asking for advice, be sure to state the Model, Serial, and Generator numbers of this plant. This information is absolutely necessary and may be obtained from name plates on the plant. Be sure to give all other details available.

## 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.

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# SPECIFICATIONS

## MECHANICAL DETAILS

Engine - A four cylinder, four cycle, L head, water cooled engine is used in this plant. Two blocks of two cylinders each are mounted at a 90° angle from one another on a common crankcase. The cylinder bore is 3", the stroke 2-1/4", the piston displacement 77.8 cubic inches, and the compression ratio is 5-1/2 to 1. Due to the V design, the engine develops 14.5 horsepower within an overall length but slightly longer than a two cylinder engine with half the power.

Cylinder heads and cylinders are removeable. The crankcase can be separated from the cast iron oil and mounting base. Inspection plates are located on either side of the crankcase.

Cast iron three ring (2 compression and 1 oil control) pistons are used. Connecting rods are drop forged steel with replaceable steel backed babbit liners. The crankshaft is also drop forged. Main and camshaft bearings are steel backed babbit. The main bearings are pressed into bearing plates bolted to the crankcase and line-reamed. The camshaft bearings are pressed directly into the crankcase and then line-reamed.

Two types of governors can be furnished. With one, the governor mechanism is an integral part of the camshaft timing gear. With the other, an industrial type governor is bolted to the front gearcase and is driven by the camshaft gear. Neither type should require any servicing or adjusting unless they have been tampered with or the engine has been disassembled.

The downdraft carburetor is equipped with needle valves. The choke is either manual or automatic. In the latter case, the automatic element is mounted on the carburetor choke valve shaft and controlled by a thermostatic coil actuated by an electric element. The air cleaner mounts on the carburetor intake and draws air thru a conduit to the front of the radiator. A connection between the crankcase ventilator and the air cleaner draws oil fumes back into the engine thru the carburetor where they help lubricate the upper cylinder walls and valves.

Spark plugs and high tension cables are shielded to prevent radio interference. Ignition current is supplied either from a battery thru coils and distributor, or from a magneto driven from the camshaft.

A gear type oil pump furnishes pressure lubrication to the main and connecting rod bearings. Spray from the ends of the bearings lubricates the pistons, valves, and other wearing parts. An oil drain is located in the base. A bayonet type oil level gauge extends thru the right hand inspection plate. Oil capacity is 8 quarts.

The cooling system is of the thermal syphon type having a capacity of 17 quarts. The fan is four bladed and has an oil lubricated hub which is driven by a V-belt at 1-1/10 times engine speed. Air is discharged or pushed out over a radiator located directly in front of the fan.

## ELECTRICAL DETAILS

Generator - The generator is a standard, four pole, self-excited alternating current type with the frame bolted to an adapter ring on the engine crankcase. The armature is coupled to the flywheel by a metal disk type coupling which serves as a solid drive member and at the same time accommodates any misalignment between the engine and the generator. The rear main crankshaft bearing supports the forward end of the armature, and the outboard end is carried in a grease sealed ball bearing.

Both alternating and direct current are produced. Windings for both types of current are wound on the same armature shaft and pole pieces. The direct current is taken from an oversized commutator and the alternating current from large brass collector rings by carbon brushes. The direct current is used to excite the alternator stator coils, and also, in the case of the self-starting models, to keep the starting batteries charged. The exciter armature winding acts as a motor to crank the engine.

All the windings of the generator have been heavily impregnated with insulating varnish and then baked to provide maximum protection against moisture penetration. The plant is sufficiently insulated to operate in all types of weather and in all climates from the tropics to the arctic. However, the plant should be sheltered as much as possible as it is impossible to entirely protect against corrosion, and any plants operated in damp humid countries should be serviced more often than is normal.

The generator frame is a rolled steel ring machined on the inside. The pole pieces are punched from laminations of 22 gauge electrical steel. The armature laminations are punched from 26 gauge electrical steel. A cooling fan is bolted to the engine end of the armature and it in turn bolts to the flywheel. Cooling air is drawn in thru vents in the generator end bell band, passed over the brushes, commutator and collector rings, and the armature and field windings, and is then forced out thru openings in the adapter casting at the engine end of the generator.

The generator is shielded to minimize radio interference. It is rated at 5000 watts, 115 volts, 60 cycle alternating current, and operates within a 40° Centigrade temperature rise.

## CONTROLS

Manual Plants - These plants are equipped with a crank for starting and a push button for stopping. Ignition is furnished by a gear driven magneto with an impulse coupling to insure easy starting. The carburetor is manually choked.

Remote Control Plants - These plants can be started electrically by pushing a button either at the plant or at a remote control station which can be set up at any point within 250 feet of the plant. Ignition may be either of the magneto or the battery - distributor type. An automatic choke properly controls the mixture of fuel and air entering the carburetor. Stop buttons are also located at the plant and at the remote control station.

In case the starting batteries are discharged, or if for any reason the plant will not start when the button is pushed, a hand crank is furnished by which the plant can be started manually.

## INSTALLATION

The proper installation of the plant is absolutely necessary for satisfactory and continuous service. Location, ventilation and temperature are among the main factors to consider.

LOCATION - The plant should be located centrally with respect to the electrical equipment it is to operate. This allows the use of small size current carrying wires. As a result there is less voltage loss, the equipment operates more satisfactorially and the entire system is more efficient.

The location should be such that the air is not dirty or extremely humid. If these conditions can not be avoided, the plant should be inspected more often. Also take any preventive or corrective measures necessary. Sub-ground levels are to be avoided because of dampness, poor air circulation and possible collection of dangerous exhaust gases leaking from the line.

If the plant is to be permanently mounted, a base should be built and the enclosure should be at least 10 feet square. If it is to be operated as a portable unit, a sub-base should be provided and the plant protected against extreme exposure to the elements. If installed aboard a mobile vehicle, the compartment must be as large as possible and sufficient ventilating openings provided.

VENTILATION - This is an important factor as any gasoline engine generates a great deal of heat which must be dissipated. Overheating will reduce the efficiency and may cause damage to the plant.

The air that circulates must be clean. Otherwise it will deposit the dirt on the plant. This will act as a blanket and reduce the cooling so that the plant will overheat. The plant should be installed at least 24" away from any wall or air circulation barrier.

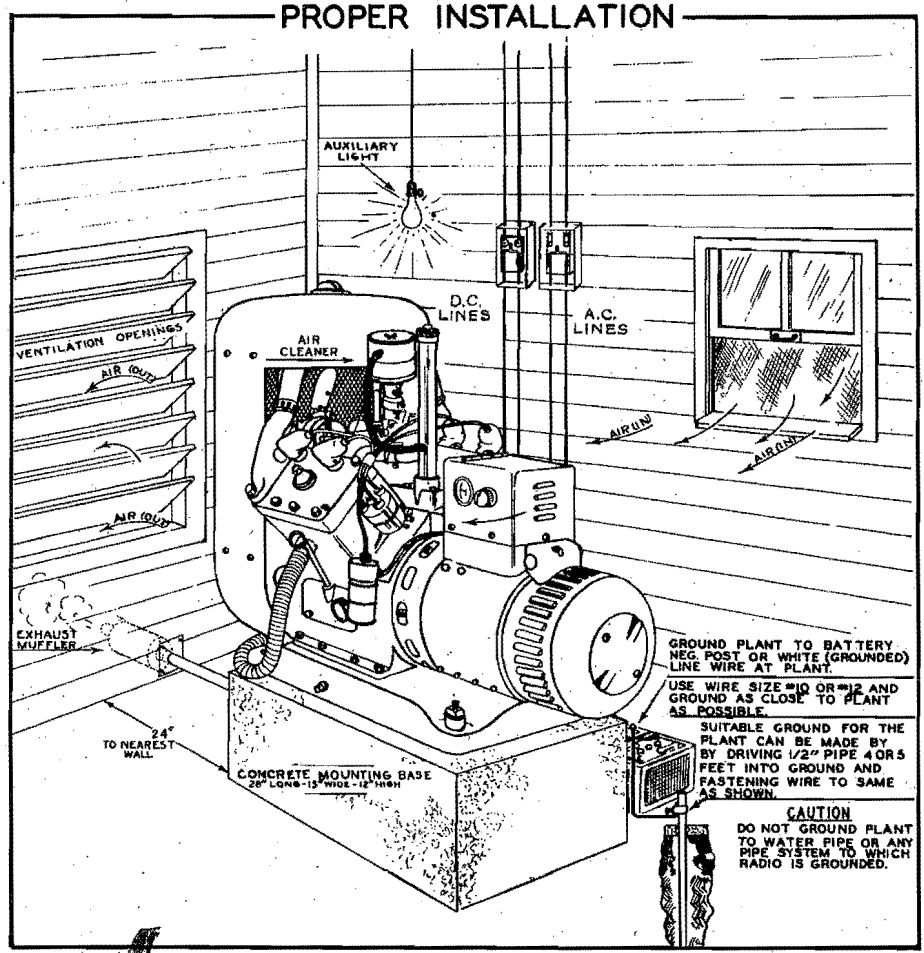
If the plant is mounted in an enclosure, air intake and discharge openings should be provided. They should be at least 1-1/2 times the size of the radiator. The air inlet should be as close to the plant as possible. Both types of openings should be shielded with a screen and louvres. A thermal ventilator in the form of a cupola or stack can be built into the roof to provide normal air circulation when the plant has shut down.

Additional ventilation precautions must be observed when the plant is mounted aboard a vehicle. Usually the compartment is small so that more openings have to be provided. These can be directly above the cylinders, opposite the fan or in the floor.

In extremely cold weather the temperature of the enclosure can be controlled by closing off the openings and allowing the heat of the plant to heat the room. Normal temperatures can thus be maintained. When used as a portable unit, some type of wind barrier or temporary walls should be used to keep the plant at the correct operating temperature.

MOUNTING BASE - If the plant is installed permanently on a base, it should be high enough from the floor to allow easy access to all of the parts, and to guard against damage which may be caused by bumping the plant with other objects. The base should be from 9" to 12" high. The plant should never be bolted solidly to any foundation. Shock absorber mountings are provided to prevent vibration from reaching the plant.

# PROPER INSTALLATION




## PROPER INSTALLATION

A PROPERLY INSTALLED ELECTRIC PLANT FOR PERMANENT INSTALLATION SHOULD BE SET UP IN A WELL VENTILATED ROOM OF AMPLE SIZE (AT LEAST 10' X 10'). INSTALL PLANT AT LEAST 24" AWAY FROM WALLS TO ALLOW EASY ACCESS TO PLANT FOR STARTING OR SERVICING.

RUBBER SHOCK ABSORBING BUSHINGS FURNISHED WITH THE UNIT SHOULD BE SET UNDER THE PLANT TO PREVENT THE SLIGHTEST VIBRATION. SHOCK ABSORBING VALUE OF BUSHINGS WILL BE GREATER IF NOT BOLTED DOWN TOO TIGHT.

EXHAST PIPE, BATTERY AND LINE CONNECTIONS ARE ON OPPOSITE SIDE OF THE UNIT AS SHOWN ABOVE. EXHAUST TUBING CAN BE RUN EITHER DIRECTLY TO THE OUTSIDE OF THE BUILDING OR INTO AN UNDERGROUND EXHAUST CHAMBER IF EXTREME SILENCE IS DESIRED.

CAUTION—ALL EXHAUST CONNECTIONS MUST BE TIGHT AS LEAKAGE OF EXHAUST FUMES WHICH CONTAIN POISONOUS MONOXIDE GAS IS EXTREMELY DANGEROUS.

IF PLANT MUST BE INSTALLED IN BASEMENT, INSTALL A WATER TRAP TO TAKE CARE OF CONDENSATION IN THE EXHAUST PIPE. DO NOT RUN EXHAUST PIPE OVER TWENTY FEET

## PROPER VENTILATION

A FREE FLOW OF CLEAN FRESH AIR MUST BE AVAILABLE FROM SUITABLE WINDOWS OR OPENINGS IN THE WALLS THROUGH AND AROUND RADIATOR AND PLANT. SKETCH SHOWS A VERY SATISFACTORY METHOD OF AIR CIRCULATION. WITH AMPLE PROTECTION FROM OUTSIDE ELEMENTS. DO NOT OPERATE YOUR PLANT IN A CLOSED ROOM AT ANY TIME.

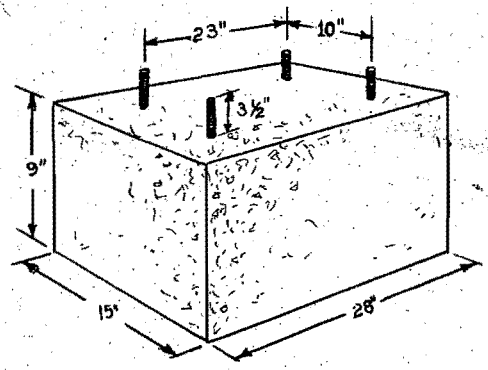
OPENINGS OR VENTILATORS SHOULD BE AT LEAST 18"X18" WITH LOUVERS. COVER VENTILATORS OR OPENINGS WITH LARGE MESH SCREEN.

IF PLANT MUST BE INSTALLED IN BASEMENT BE SURE TO PROVIDE EXTRA CELLAR OPENINGS FOR THE AIR CIRCULATION NEEDED BY PLANT. BASEMENT LOCATIONS ARE NOT RECOMMENDED BECAUSE OF DAMPNESS AND POOR AIR CIRCULATION.—ALSO EVEN A SLIGHT AMOUNT OF MECHANICAL NOISE IS USUALLY OBJECTIONABLE.

DO NOT INSTALL YOUR PLANT IN A HEN HOUSE OR BARN. (FEATHERS, HAY OR STRAW WILL CREATE A FIRE HAZARD AND ALSO DAMAGE YOUR ENGINE).

# PLANT BASE

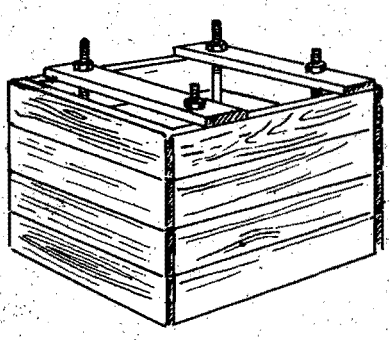
## CONCRETE BASE




Above base dimensions are a minimum and may be larger. Keep same bolt spacing. The base must be at least 24" from any wall.

Use 4 - 3/8" x 9" bolts. See that they extend 3-1/2" above the top of the concrete.

## CONCRETE FORM



A form should be built into which the concrete can be poured and allowed to harden. The form should be large enough so base will be of the minimum size.

A mixture of 1 part cement, 2 parts sand and 4 parts gravel or crushed stone may be used. Fill form, tap down but do not move bolts. Allow to harden for three days.

## MOUNTING BOLT SUSPENSION

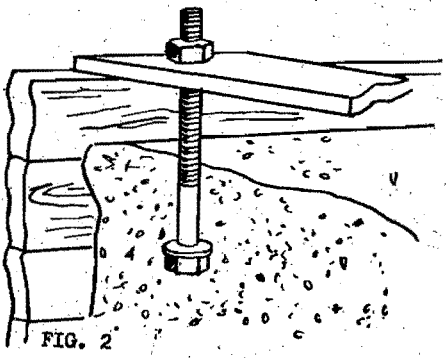
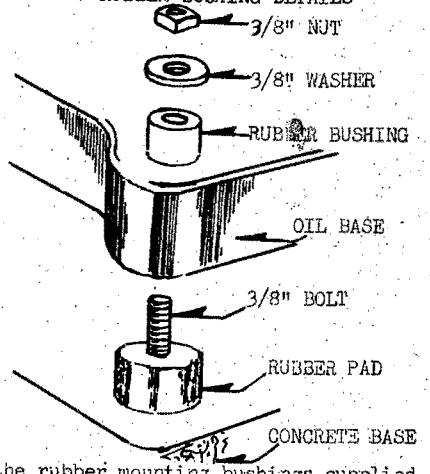


FIG. 2

Suspend mounting bolts from cross cleats nailed to the top of the concrete form before pouring concrete. Place large washer under head of bolt and adjust for proper height - 3-1/2"

Be sure top of foundation is level and smooth to prevent plant base breakage.

## RUBBER BUSHING DETAILS




Use the rubber mounting bushings supplied with the plant.
place one bushing between plant and base so that bushing fits in recess in plant. Set Plant in place. Assemble balance of mounting as shown above.
Tighten nuts but not so that bushings flatten or compress.

## INSTALLATIONS

All accessories necessary to put the plant into immediate service are included with the plant. However, no main line wires or switches are furnished. These must be purchased to meet the individual requirements of each plant. If special conditions are encountered, additional equipment may be needed in addition to that furnished, and this, too, must be purchased.

Fuel Tank - A standard fuel tank is furnished with each plant. If the tank is not mounted on the plant, a flexible fuel line must be used to connect the tank to the engine. If a larger tank is desired, an underground tank may be used if the plant is to be permanently installed. A suggested tank is shown on the next page, but check the underwriters instructions before making this installation. The lift from the tank to the plant should never be greater than 6 feet, nor longer than 25 feet unless a separate fuel pump is used. Be sure that the tank is well vented.

Exhaust System - Flexible exhaust tubing and an automotive type muffler come with the plant. If the exhaust line passes thru a wall, shield the wall by passing the tubing thru a metal flange. Iron pipe can be used in place of the flexible tubing, but at least 12" of the tubing should be inserted between the pipe and the plant. Increase the size of the tubing or pipe one size for every six feet in length if the line is to extend over 10 feet.

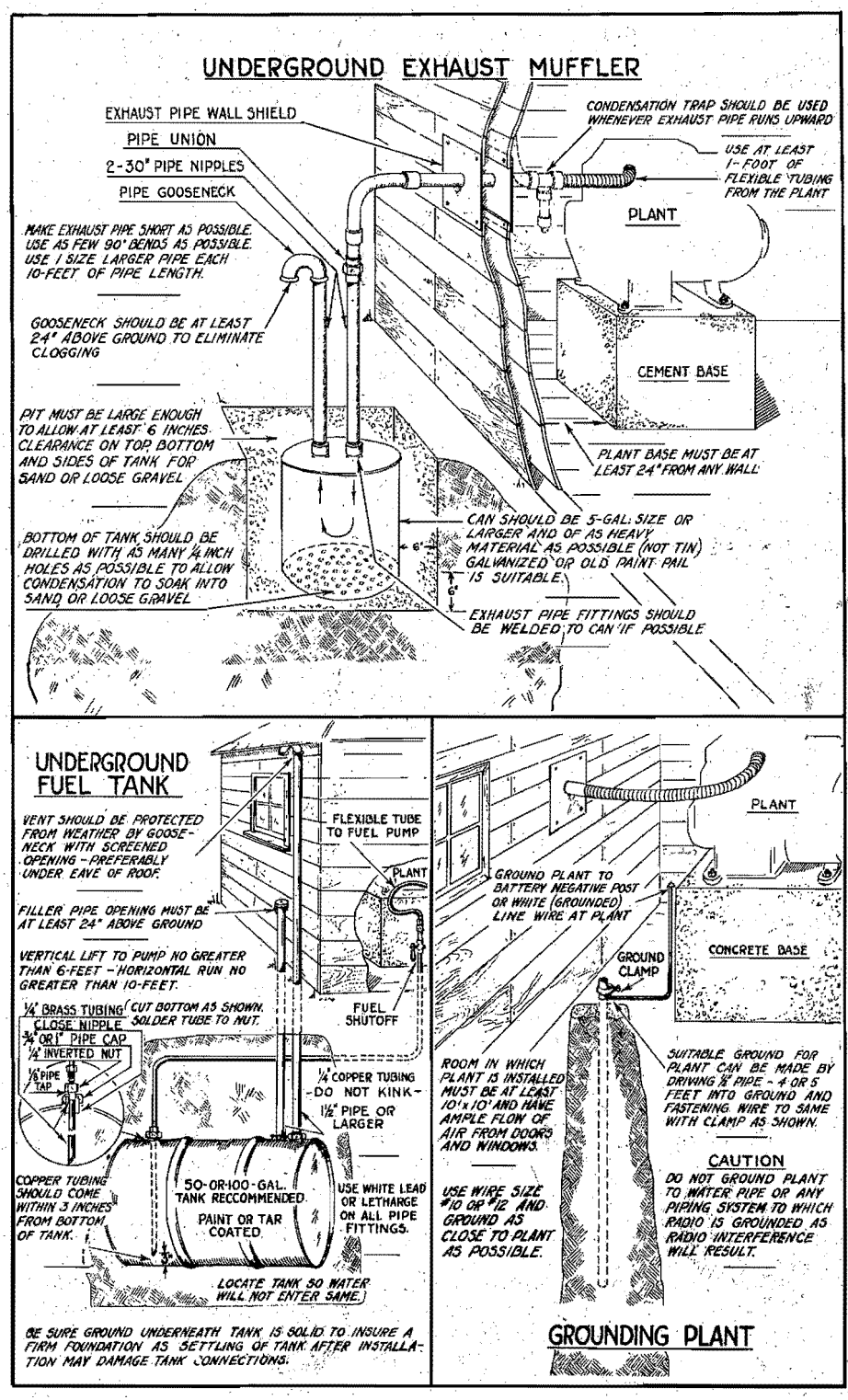
All exhaust connections must be tight and free from leaks. Carbon monoxide fumes are poisonous and extremely dangerous. Be especially careful if a sub-ground level installation is used, because carbon monoxide is also heavier than air.

The exhaust line should slope downward from the plant. If it must be pitched upward, a condensation trap should be installed close to the plant. Any type of fitting which will collect the condensation of moisture in the line can be used, and it should be inspected and drained often. An underground exhaust muffler. Refer to the illustration on the following page for details.

Grounding - The plant should always be grounded. This can be done by driving a grounding rod or 1/2" pipe into the ground near the plant. Connect either the negative (-) battery post or the neutral (white) main line wire to the ground with a #10 or #12 wire and a ground clamp. Never use a radio ground, and do not ground the plant itself.

Main Lines - External wiring should be of the correct size and sufficiently insulated to protect both the plant and the operator. Consult the local code before making the installation. A main line fused switch or circuit breaker should be installed in the line near the plant.

Batteries - When batteries are used with the plant, they should be set on a wooden frame or mat and connected to the plant with the cables furnished. The polarity markings of the battery posts and panel terminals must be observed. See Battery Preparation before connecting the batteries.


UNDERGROUND EXHAUST MUFFLER
EXHAUST PIPE WALL SHIELD
PIPE UNION
2-30° PIPE NIPPLES
PIPE GOOSENECK
MAKE EXHAUST PIPE SHORT AS POSSIBLE. USE AS FEW 90° BENDS AS POSSIBLE. USE 1 SIZE LARGER PIPE EACH 10-FEET OF PIPE LENGTH.
GOOSENECK SHOULD BE AT LEAST 24" ABOVE GROUND TO ELIMINATE CLOGGING
PIT MUST BE LARGE ENOUGH TO ALLOW AT LEAST 6 INCHES CLEARANCE ON TOP, BOTTOM AND SIDES OF TANK FOR SAND OR LOOSE GRAVEL
BOTTOM OF TANK SHOULD BE DRILLED WITH AS MANY ¼ INCH HOLES AS POSSIBLE TO ALLOW CONDENSATION TO SOAK INTO SAND OR LOOSE GRAVEL
CONDENSATION TRAP SHOULD BE USED WHENEVER EXHAUST PIPE RUNS UPWARD
USE AT LEAST 1-FOOT OF FLEXIBLE TUBING FROM THE PLANT
PLANT
CEMENT BASE
PLANT BASE MUST BE AT LEAST 24" FROM ANY WALL
CAN SHOULD BE 5-GAL. SIZE OR LARGER AND OF AS HEAVY MATERIAL AS POSSIBLE (NOT TIN) GALVANIZED OR OLD PAINT PAIL IS SUITABLE.
6"
6"
EXHAUST PIPE FITTINGS SHOULD BE WELDED TO CAN IF POSSIBLE
UNDERGROUND FUEL TANK
VENT SHOULD BE PROTECTED FROM WEATHER BY GOOSE-NECK WITH SCREENED OPENING - PREFERABLY UNDER EAVE OF ROOF.
FILLER PIPE OPENING MUST BE AT LEAST 24" ABOVE GROUND
VERTICAL LIFT TO PUMP NO GREATER THAN 6-FEET - HORIZONTAL RUN NO GREATER THAN 10-FEET.
¼" BRASS TUBING
CUT BOTTOM AS SHOWN. SOLDER TUBE TO NUT.
CLOSE NIPPLE
¾" OR 1" PIPE CAP
¼" INVERTED NUT
⅛" PIPE TAP
FLEXIBLE TUBE TO FUEL PUMP
PLANT
FUEL SHUTOFF
¼" COPPER TUBING - DO NOT KINK -
1½" PIPE OR LARGER
COPPER TUBING SHOULD COME WITHIN 3 INCHES FROM BOTTOM OF TANK.
50-OR-100-GAL. TANK RECCOMMENDED.
PAINT OR TAR COATED
USE WHITE LEAD OR LETHARGE ON ALL PIPE FITTINGS.
3"
LOCATE TANK SO WATER WILL NOT ENTER SAME.
BE SURE GROUND UNDERNEATH TANK IS SOLID TO INSURE A FIRM FOUNDATION AS SETTLING OF TANK AFTER INSTALLATION MAY DAMAGE TANK CONNECTIONS.
PLANT
GROUND PLANT TO BATTERY NEGATIVE POST OR WHITE (GROUNDED) LINE WIRE AT PLANT
GROUND CLAMP
CONCRETE BASE
ROOM IN WHICH PLANT IS INSTALLED MUST BE AT LEAST 10'x10' AND HAVE AMPLE FLOW OF AIR FROM DOORS AND WINDOWS.
USE WIRE SIZE #10 OR #12 AND GROUND AS CLOSE TO PLANT AS POSSIBLE.
SUITABLE GROUND FOR PLANT CAN BE MADE BY DRIVING ¾" PIPE - 4 OR 5 FEET INTO GROUND AND FASTENING WIRE TO SAME WITH CLAMP AS SHOWN.
CAUTION
DO NOT GROUND PLANT TO WATER PIPE OR ANY PIPING SYSTEM TO WHICH RADIO IS GROUNDED AS RADIO INTERFERENCE WILL RESULT.
GROUNDING PLANT

## PREPARATION

After the plant has been installed in the proper location and on a mounting base, the following paragraph will outline the preparation necessary before putting the plant into operation.

Inspection - Check all fittings, bolts, and nuts. Tighten any mechanical or electrical connections which may be loose. Visually inspect the plant. Replace any parts which may have been damaged.

Cooling System - A thermal syphon type cooling system is used on this plant. Water rises when it is heated; and as the liquid in the cylinder block and head becomes warmed, it rises to the top of the radiator. Cooler water from the bottom of the radiator takes its place and in turn becomes heated. Air driven by the fan over the radiator surfaces and fins cools the water in the radiator and a constant circulation is thus maintained. The capacity of the cooling system is 17 quarts. Use only clean water or anti-freeze in the system. Rain water can be used, but salt water or alkali water will cause corrosion in the radiator and should never be used. Check all hose and block connections and tighten any that are loose. Fill the radiator to a point somewhat below the level of the overflow pipe to allow for expansion of the liquid. Test the tension of the fan belt. A properly adjusted belt can be moved inward or outward about 3/4". V-belts do not require the tension to prevent slipping that flat belts do and a too tight belt will cause rapid wear of the fan hub. If the belt requires adjusting, loosen the cap screw holding the fan support arm to the cylinder water outlet and turn the adjustment stud screw in or out to increase or decrease the tension. Lock the adjusting screw and retighten the fan support arm when adjustment has been made.

The cooling system can be drained by opening the petcocks at the bottom of the radiator support casting and at the water inlet elbows on the cylinder blocks.

Lubrication - Fill the crankcase with 8 quarts of a good grade of lubricating oil. Use an S.A.E. #20 oil if the temperature ranges between 50° and 80° Fahrenheit. Use an S.A.E. #10 oil if the temperature is below 50°. If the temperature range is above 80° or below 10°, check the section on "Abnormal Operating Conditions" for the proper grade of lubricant.

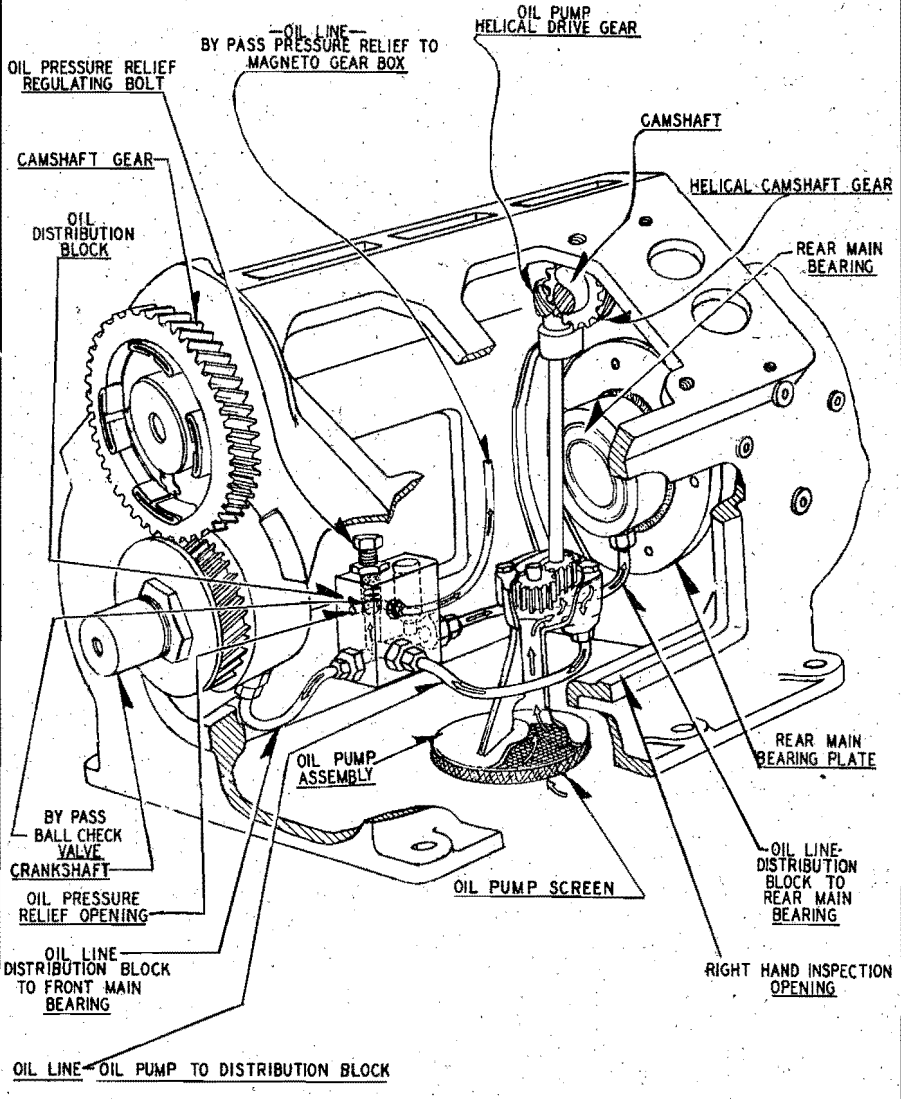
The oil level is indicated by a bayonet type oil gauge extending from the right hand crankcase inspection plate. Check the level daily, maintaining the level between the "full" and the "low" marks on the gauge. Never allow the level to drop below the "low" mark.

Place several drops of lubricating oil on the joints of the linkage between the governor and the carburetor, and on the carburetor throttle and choke shaft bearings. Remove the plug in the fan hub and fill the fan oil resivoir to the point of overflowing. Remove the cover and filter element from the air cleaner. Fill the body of the air cleaner to the level indicated with new oil of the same visiosity as that used in the crankcase.

# W4A OILING SYSTEM

THIS SKETCH ILLUSTRATES THE OPERATION OF THE MODEL V-45 FULL PRESSURE TYPE GEAR DRIVEN OIL PUMP - OPEN ARROWS INDICATE THE DIRECTION OF OIL FLOW FROM OIL PUMP THROUGH DISTRIBUTION BLOCK TO FRONT AND REAR CRANKSHAFT BEARINGS.

EXCESS OIL PRESSURE OPENS VALVE IN DISTRIBUTION BLOCK ALLOWING OIL TO ESCAPE THROUGH PRESSURE RELIEF OPENING TO OIL BASE. PRESSURE AT WHICH VALVE OPENS MAY BE REGULATED WITH PRESSURE RELIEF REGULATING BOLT.



## PREPARATION

Spark Plugs - Remove the spark plugs and crank the engine several times. Rust inhibitor was placed in the cylinders for protection before the plant left the factory. Being an oily liquid, it is very apt to foul the spark plug points making starting difficult. Clean the points and replace the plugs.

Fuel - Any good grade of gasoline between a range of 67 to 80 octane can be used, either leaded (Ethyl) or unleaded. A leaded fuel will give more efficient operation by allowing the ignition timing to be further advanced without knocking or pinging. It also has less tendency to form carbon. However, it will eventually form a coating over the internal surfaces which, in the case of the spark plugs, may cause hard starting. Proper maintenance of the engine calls for periodic inspection and cleaning of the spark plugs, and if followed, this possible trouble will never develop.

Check the connections running between the fuel tank and the carburetor. On plants having a mechanical fuel pump, the pump will be located on the left side of the crankcase below the cylinder block. Check the connections at the pump, and be sure that the glass filter bowl is securely tightened and that is seats properly on the gasket.

The fuel pump is equipped with a manual operating handle. Use this handle to pump gasoline to the carburetor at any time the gas tank has run dry. It will save battery wear or a great deal of hand cranking, and can also be used to check the operation of the fuel pump.

Batteries - Check the connections to the batteries. The positive (+) terminal at the control box must be connected to the positive (+) post of one battery. The negative (-) terminal of the control box must be connected to the negative (-) post of the second battery. Then the negative (-) post of the first battery and the positive (+) post of the second should be connected together. If these connections are reversed, the batteries would soon be discharged and would eventually be ruined. Cover the terminals with petroleum jelly to prevent corrosion.

Check the electrolyte or acid in the cells of the battery. If the batteries were received in a wet charged condition and the level of the electrolyte is low, add distilled water to bring the level of the solution over the plates. If the batteries were received in a dry charged condition, add electrolyte to the batteries according to the instructions attached to them.

## OPERATION

### STARTING THE PLANT

Before attempting to start the plant, be sure that the plant has been properly installed, that lubricating oil, fuel, and cooling liquid has been been added, and that proper ventilation and exhaust has been provided. Be sure that all the previous instructions on preparation have been followed.

Open the disconnect switch on the main line.

Manual Plants - Insert the crank thru the opening in the radiator grille and engage it with the crankshaft so it can be pulled upwards. With a strong upward pull, turn the engine over. Do not spin the crank and never take too tight a grip on the crank handle. Hold the crank in such a manner that if the engine backfires, or kicks back, the handle will be pulled from your grasp.

While cranking the plant, partially close the choke valve. In cold temperature, completely close the choke to obtain a rich fuel mixture. In average temperature, or when the engine is warm, only slight choking will be required. Avoid too rich a mixture or flooding of the carburetor.

If the engine does not start, repeat the process. If it will not start after several attempt, check the ignition system, fuel supply position of the fuel shut-off valve, etc. With a new plant, or one which has not been used for some time, several cycles of cranking may be necessary to bring fuel to the carburetor.

When the engine has started, vary the choke adjustment until the engine has warmed up. Gradually open the choke valve until the full open position is reached with the engine running satisfactorily.

Electric Start Plants - Press the "start" button and hold it down for about 5 seconds and then release it. Repeat this procedure until the plant starts, allowing about 10 seconds between attempts. If the plant does not start after several attempts check the fuel and ignition systems. An automatic choke is mounted on the carburetor, and no manual choking is necessary.

In an emergency, if the electric start system fails to start the plant, or the starting batteries are low, the plant may be started in the same manner as the "Manual Plants".

Check the panel controls if any, to see that the engine is operating satisfactorily. After the engine is warm, close the electrical disconnect switch to connect the load. Check engine operation periodically. During the first 10 hours of operation, when the plant is new or has just been overhauled, run the plant at not over 1/2 load.

### STOPPING THE PLANT

To stop the plant, press the "Stop" button on the plant or at a remote control station. Hold this button down until the engine has completely stopped.

In an emergency, if the stop button fails to work, the plant can be stopped by closing the fuel shut-off valve at the gas tank. The engine will continue to run until the fuel in the carburetor bowl has been nearly used up and will then stop for want of fuel. Use this method to stop the plant for the last time if the plant is to be moved to a new location.

## ABNORMAL OPERATING CONDITIONS

### COLD WEATHER

Fuel - The fuel tank should always be kept full to prevent condensation within the tank. Under extremely low temperature strain the gasoline thru a chamois skin to remove all particles of ice or water. Check all filters and screens periodically and clean thoroughly each time.

Lubrication - Keep the temperature around the plant as high as possible.

Crankcase - Run the plant until the engine is warm and then drain the oil. Mix 6 quarts of S.A.E. #10 oil with one quart of kerosene or any other suitable diluent. Fill the crankcase and run the engine for at least 10 minutes to be sure the oil has circulated to all parts of the motor. Never dilute an oil heavier than S.A.E. #20, nor add kerosene alone.
Diluted oil must be drained after 50 to 60 hours of operation and replaced with a new mixture. The oil must be warm before it is drained. Under extreme low temperatures, drain the oil more often to remove water condensation.

Air Cleaner - Clean and refill the air cleaner with oil of the same viscosity as that used in the crankcase. If the oil tends to congeal, or frost forms to restrict operation of the cleaner, rinse the cleaner element in gasoline and replace it dry.

Cooling System -

Radiator - Flush thoroughly.

Engine - Flush thoroughly and separately from the engine.

Hoses - Check all hoses and replace them if necessary. Tighten all hose clamps.

Gaskets - Inspect all gaskets, especially the cylinder head gaskets. Replace if necessary. Tighten all nuts.

Fan Belt - Inspect the fan belt. Adjust or replace it.

Anti-freeze - Use an available anti-freeze of a standard type. Alcohol, Glycerine, or Eltylene Glycol types may be used. Prepare the mixture according to the manufacturers instructions. Never mix two types of anti-freeze together.

Add the solution to the cooling system, but leave room for expansion of the liquid when heated. Check the level daily especially when temperature changes are frequent, and add anti-freeze to maintain the strength of the solution.

Never use kerosene or distillate for an anti-freeze. Such liquid will not satisfactorily cool the engine, and will allow overheating with a resultant wear on the engine parts. With inflamable liquids, the danger of fire is also increased.

Electrical System -

Ignition - Inspect the spark plugs and breaker points periodically. Keep them cleaned and adjusted properly.

Batteries - Batteries must be kept fully charged in low temperatures. Discharged batteries will freeze and become damaged beyond repair at about 20° F. Never add water to a cold battery. The water might freeze before it became mixed with the electrolyte. Store low or discharged batteries in a warm place until they can be recharged.

## ABNORMAL OPERATING CONDITIONS

### HIGH TEMPERATURES

Fuel - Never fill the fuel tank completely when the weather is extremely warm. Gasoline is very apt to expand and overflow a full tank creating a possible fire hazard.

Lubrication - Keep the oil level at the full mark on the gauge. Maintaining a lower level is dangerous as the engine will run hot. Maintaining a higher level can be equally dangerous as the oil may foam and as a result the parts which are normally spray lubricated would receive no oil.

If the engine is in good condition, S.A.E. #20 oil should be used with a change after every 100 hours of operation. If the engine is worn, or the temperature is excessively high, an S.A.E. #30 oil may be used.

Cooling System - Keep the cooling system full of clean soft water, flushing it at regular intervals to remove all rust, scale, and foreign matter. Flush the block and the radiator separately. Check the level daily, and add water whenever necessary.

The radiator shell, grille, and engine must be kept free from dirt, bugs, leaves or any other matter which would reduce the cooling effect. Tighten all hose connections, replacing the hoses if necessary. Check the fan belt tension. Replace the belt if worn, or adjust it if necessary.

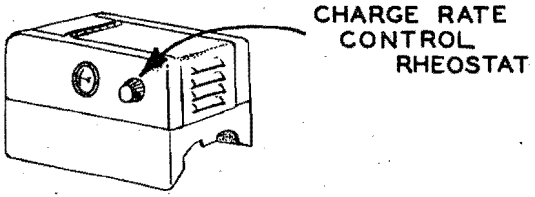
Ignition System - Keep the ignition system adjusted properly at all times. Advanced ignition reduces efficiency, while retarded ignition causes overheating. Check the ignition wires and all electrical connections. Keep the spark plugs and breaker points clean and properly set. Time the engine to operate just below the "ping" point.

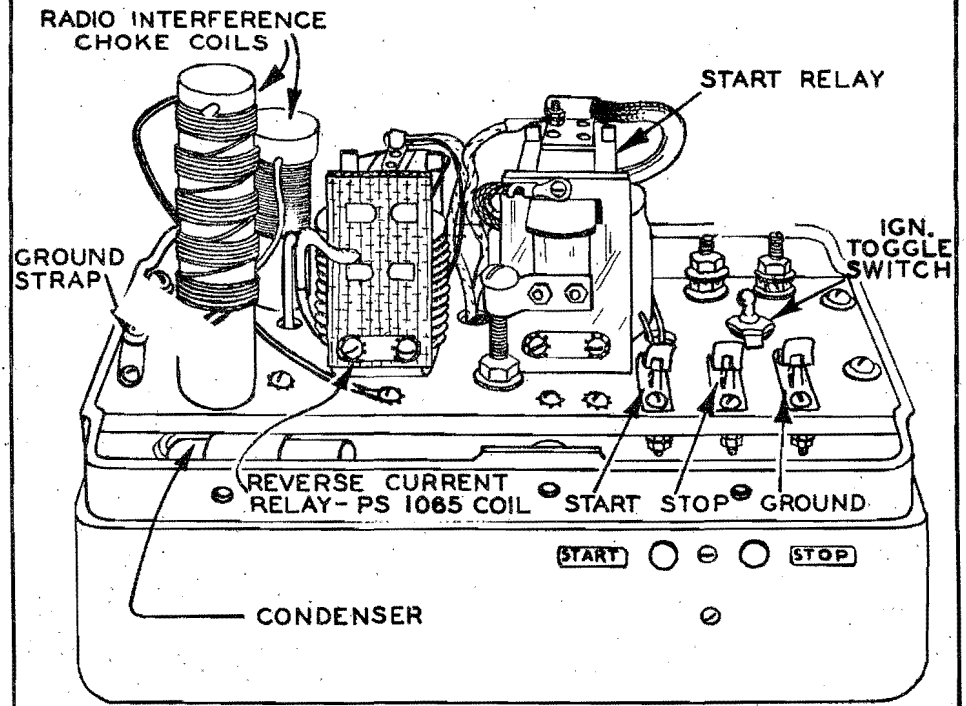
### DUST OR DIRT

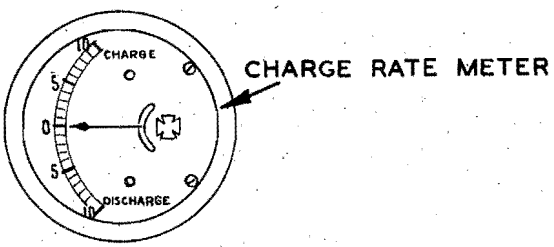
Under such adverse conditions it is necessary to check the plant and service it more often. Pay particular attention to the following points:

1. Keep the plant (engine, radiator, and accessories) as clean as possible.
2. See that supplies of fuel and oil are kept in air tight containers. Strain them if they are dirty.
3. Check the ignition system (breaker points and spark plugs) more often. Clean and adjust them when necessary.
4. Check the air cleaner daily. Clean and refil with fresh oil whenever necessary.
5. Clean the brush rig and armature often. Be sure that the brushes ride easily in the holders.

# CONTROL PARTS



## CONTROL SYSTEM

The electric self-start and the remote control plants have a control cabinet mounted at the generator end of the plant. The wiring diagram in this book outlines the electrical system of the entire plant. Reference should be made to this diagram whenever servicing the electrical system.

## SELF-STARTING

The self-start type of control is used basically on the D.C. plants. It consists primarily of a manually operated start switch, a charge relay and a charging ammeter. On the starting cycle, the current flows from the starting batteries through the start switch to the generator which acts as a starting motor. Upon starting, the switch is released and opened thereby breaking that circuit. As the plant generates current, a charging current flows through the charge relay and ammeter to the starting batteries. This type of control only permits starting at the plant and stopping at either the plant or a remote station.

## REMOTE CONTROL

The remote type of control is used basically on the A.C. plants. It consists primarily of a start-stop switch, start relay, charge relay, charge ammeter, and a charge rheostat plus a set of remote terminals. This control permits starting and stopping either at the plant or at any remote point up to within 250 feet of the plant.

When the start button is pressed, it closes the start relay. The contacts of the relay close the starting circuit so that current from the starting batteries is fed to the generator whose exciter acts as a starting motor. Upon release of the start button, the start relay opens, and opens the starting circuit. Upon reaching speed the exciter part of the generator becomes a generator in itself. Current then flows into the charge relay rheostat and ammeter and then to the starting batteries. The rheostat controls the charging rate to the batteries.

PROPER STARTING - The proper method of starting any self-starting switch is not to hold down continuously on the start button, but to intermittently close the start button for a period of about five seconds, and release for a second or two. Then if the plant does not continue to run, press the start button the second or third time, holding each time, for about five seconds, until the plant continues to operate.

STOPPING CYCLE - When the Stop Button at the plant or at a remote start-stop switch is pressed, the ignition secondary circuit is grounded, thereby causing a failure of ignition and stopping the engine.

SERVICING - It is not necessary to provide any regular servicing for the electrical control system. However, it is advisable to inspect the Start Relay contacts occasionally to determine whether they have become burned or pitted in operation. If this is found to be the case, the contact points should be cleaned carefully with 00 sandpaper.

## EMERGENCY STARTING

If the starting batteries do not have sufficient power to crank the engine, it may be started by hand whether the ignition is battery or magneto. A hand crank is provided and this is inserted into the crankshaft at the front end of the engine. Crank with a steady pull but do not spin the crank.

## MAINTENANCE

It is important that certain inspections and maintenance procedures be made at definite periods to keep the plant operating at a maximum level of efficiency. It is recommended that a service log be kept. If operation is to be under abnormal conditions, check those pages for correct maintenance.

## DAILY MAINTENANCE

A daily check of the following points should become a matter of routine.

1. Cooling liquid level.
2. Crankcase oil level.
3. Fuel supply - do not fill tank while plant is running.
4. Inspection of operating gauges.
5. Keep the plant clean.

## WEEKLY MAINTENANCE

Each week, or after every 50 hours of operation:

Oil - Check the oil level, adding whatever is necessary to bring it to the "full" mark on the gauge. If necessary change oil.

1. In cold weather - change every 50-60 hours.
2. In high temperatures - change every 100 hours.
3. In average temperatures - change every 200 hours.

When changing oil run the plant until it is warm. Then drain and refill with new oil. Do not drain when the engine is cold.

Fan Belt - There should be 3/4" movement "in" or "out" from the normal position. Adjust if necessary.

Water - Check the water level and add whatever is necessary. If anti-freeze is used, add the correct proportion.

Fuel - Check the strainer on the fuel tank or pump. Remove the filter bowl and screen and clean both. Replace carefully and check for leaks.

Batteries - If used, check the water level. Add distilled water to bring the level 3/8" above the top of the plates. Do not fill to the top of the battery.

Check the charge condition with a hydrometer. If the reading is below 1250 specific gravity, increase the charging rate. If above, decrease the charging rate.

Electrical Connections - Inspect all electrical connections. Be sure that they are tight and clean.

## MAINTENANCE

### MONTHLY MAINTENANCE

Each month, or after 200 hours of operation, check the following points in addition to those covered in the regular weekly servicing.

Lubrication - Drain the crankcase while the engine is warm. Replace the plug and refill with 8 quarts of new oil of the proper grade and viscosity.

Check the oil level in the fan hub and add oil if necessary. Be sure that the filler plug is tight.

Place a drop of light lubricating oil on the following points: carburetor throttle shaft bearings, choke shaft bearings, and governor link joints.

Clean the air cleaner element, drain the oil cup, and refill with engine oil of the same grade as that used in the crankcase.

Ignition - If the plant has magneto ignition, remove the cover from the magneto and inspect the breaker points. Clean the points with a fine stone. Readjust the gap to .014" - .016".

On plants having battery ignition, remove the cover from the distributor, clean the points, crank the engine until the points open and adjust the gap to .019" - .021".

Remove the covers from the spark plugs and the spark plugs from the cylinder heads. Remove the carbon from the electrodes and porcelain. Reset the electrode gap at .025".

Generator - Inspect the commutator and collector rings and clean them if dirty. Use a lint free cloth. The brushes should ride easily in the holders and make good contact.

### SIX MONTHS INSPECTION

Every six months go over all of the weekly and monthly maintenance, and in addition remove the gasket plate and gasket from the rear of the generator. Clean out all the hardened grease from the generator ball bearing. Repack the bearing with not over one tablespoonful of approved ball bearing grease. Never use ordinary cup grease. Replace the gasket and cover.

Check all electrical connections including main line wires, check the brushes, and replace any worn to 5/8". If the plant has batteries, clean the contact posts, tighten the connections, and cover them with petroleum jelly.

Check all nuts, bolts, and screws. Vibration may loosen them impairing the efficiency of the plant. Tighten any that are loose.

Check all hose connections. Replace any hose that is weak or leaking. Flush the radiator and engine thoroughly with clean water.

## GENERAL TROUBLE CAUSES

If trouble develops or the plant is not operating correctly, check the oil and fuel to be sure that the proper grades are being used. Check the wiring installation. Refer to the chart below and take steps to return the plant to good running condition.

1. Plant will not start or is hard to start:
   - a.) Empty fuel tank.
   - b.) Poor grade of fuel used.
   - c.) Fuel line clogged or air locked.
   - d.) Spark plugs fouled, wrongly spaced, or cracked.
   - e.) Ignition wires loose.
   - f.) Ignition breaker arm sticking.
   - g.) Stop button defective or shorted.
   - h.) Oil too heavy due to drop in temperature.
   - i.) Main line switch closed - too heavy an electrical load.

2. Plant starts but will not produce current:
   - a.) Open switch or line wiring.
   - b.) Fuses blown.
   - c.) Brushes stuck in holders and not touching commutator.
   - d.) Brushes worn too low.

3. Plant runs too hot:
   - a.) Spark timing retarded.
   - b.) Improper exhaust discharge.
   - c.) Insufficient ventilation.
   - d.) Radiator water level low.
   - e.) Oil level low.
   - f.) Oil too thin.
   - g.) Carburetor mixture too rich.

4. Excessive oil consumption:
   - a.) Oil dirty - not changed often enough.
   - b.) Fuel mixture too rich causing excessive cylinder wear.
   - c.) Piston rings stuck caused by improper lubrication, overheating, or defective rings.
   - d.) Engine overheated due to poor ventilation.

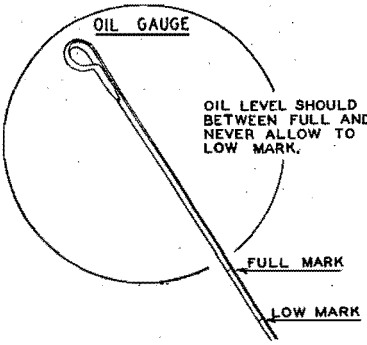
Troubles peculiar to electric start plants only:

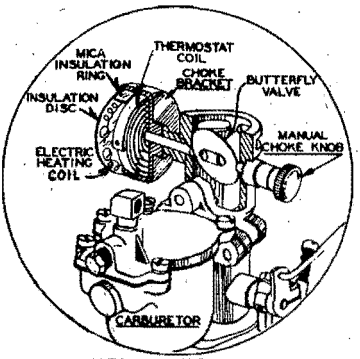
1. Plant does not crank:
   - a.) Discharged starting batteries.
   - b.) Loose battery connections.
   - c.) Open circuit in control box.

2. Battery run down:
   - a.) Open circuit in wiring.
   - b.) Charge relay not closing
   - c.) Voltage regulator relay not functioning properly (cuts down charging rate before the batteries are fully charged).
   - d.) Dead cell in battery.
   - e.) Lack of water.

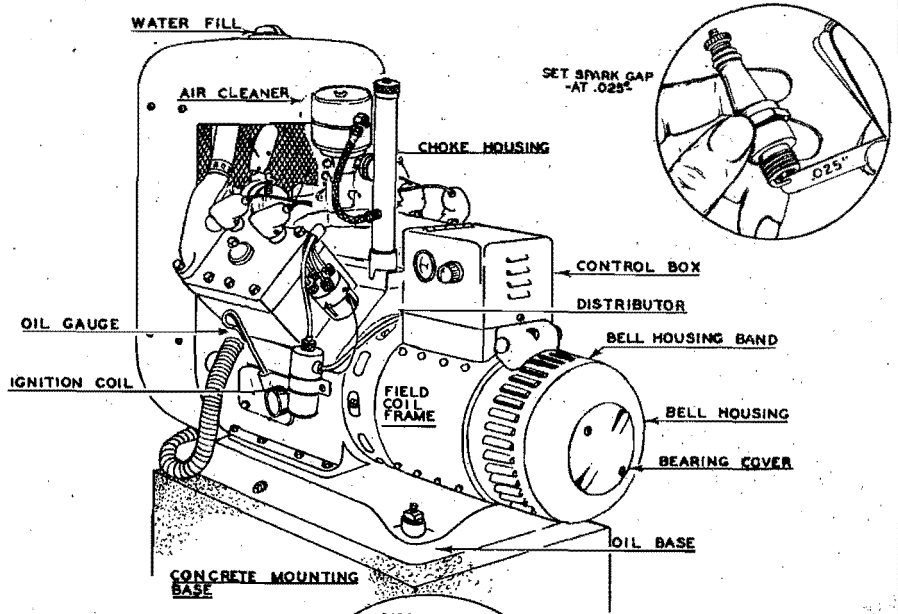
3. Battery will not take charge:
   - a.) Dead cell in battery.
   - b.) Internal short in battery.
   - c.) Open circuit in charging control winding.
   - d.) Battery plates sulphated.

# ACCESSORY SERVICE SHEET



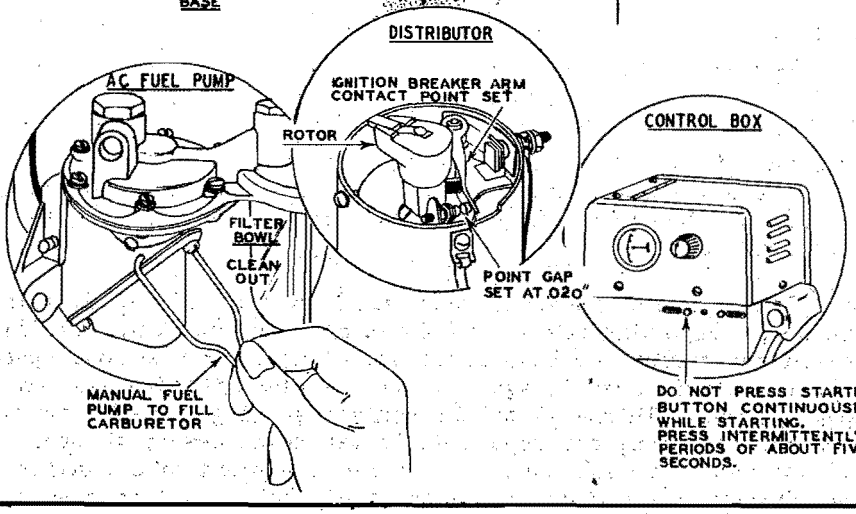




AUTOMATIC CHOKE ASSY.
USED ON FULL AUTOMATIC & SELF STARTING MODELS



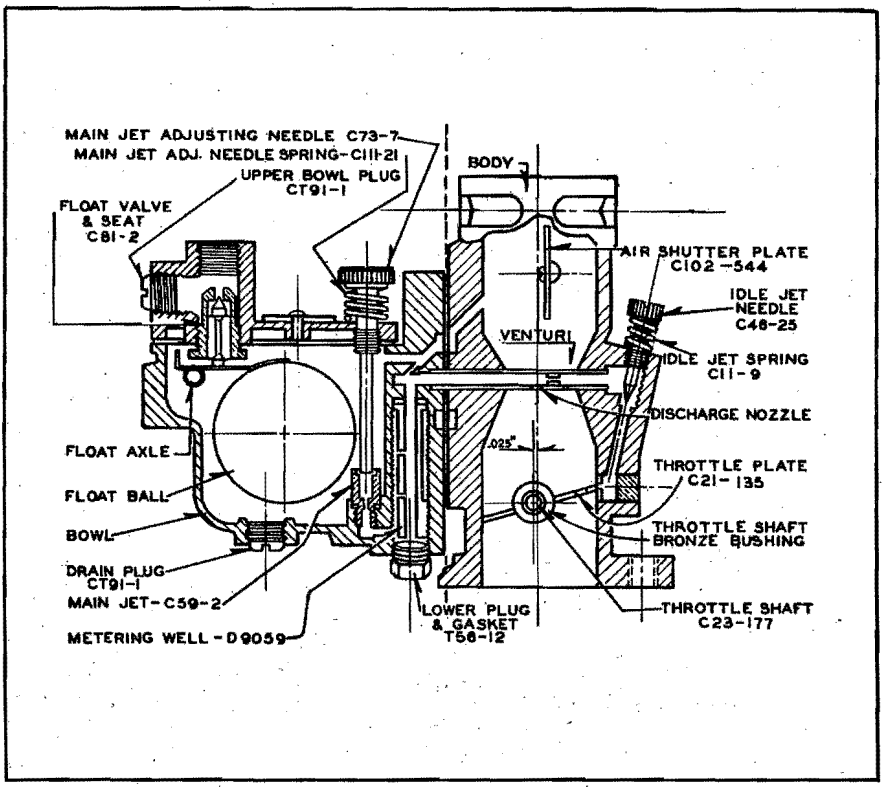






## CARBURETOR

This plant is equipped with a downdraft carburetor of the adjustable jet type. It is one of the most trouble free accessories on the plant, and should not be tampered with. The only care and attention ordinarily required is to clean the bowl each year to remove accumulated sediment. However, changes in the type of fuel used, or in operating or climatic conditions may make readjustment necessary to keep the plant operating efficiently.




ZENITH TU3Y

Never make a final adjustment of the carburetor unless the plant has been in continuous operation for at least half an hour. This will give the plant ample time to reach its normal operating temperature.

If the plant operates unevenly under half load or full load, turn the main jet adjusting needle out for 4 or 5 turns. Then turn it in toward the carburetor bowl until the plant begins to lose speed and power. Slowly open it again until the plant regains maximum speed and power. This will be the correct setting for efficient economical operation, but sometimes it may be necessary to open the adjustment up to 1/2 turn more to rid the plant of a hunting condition where the engine will alternately gain and lose speed.

## CARBURETOR

If increasing the jet opening by 1/2 turn will not correct the hunt, the sensitivety of the governor must be decreased. A serious hunt can be drowned out by using a too rich fuel mixture, but economy of operation would be impossible, and possible damage to the plant could result.

If the plant operates unevenly under no load or light load, turn the idle jet needle into the carburetor body until the plant nearly stops. Then open it slowly to the point at which the engine runs the smoothest. Usually the setting for smooth and economical operation will be between 1/2 and 1/4 turns.

Continued irregular operation of the engine, hard starting, or loss of power may indicate that the main jet of the carburetor has become clogged. The fuel passage in this jet is very small and if foreign material should succeed in getting thru the screen and filter bowl it can become lodged in this jet. It will then be necessary to remove the float bowl cover of the carburetor and remove and clean the jet.

Be careful to use a proper sized screwdriver whenever removing the main jet. Otherwise the brass might burr or distort and be worthless. Blow the jet out with air to clean it. Never use a wire to scrape the jet or the size might be changed. When replacing the jet, be sure that the small fibre gasket is in place beneath the head of the jet.

## AIR CLEANER

The air cleaner is of the oil bath type mounted on the carburetor intake. A flexible hose to the radiator allows clean air to be thrown into the carburetor. The cleaner is also connected to the oil filler tube from which it draws all oil fumes back into the engine where they help to lubricate the valve stems and upper cylinder walls. The filter so operates that dirt and dust are deposited directly in the oil or accumulate on the screen from which they drain into the oil.

The air cleaner should be serviced each time the oil is changed in the crankcase. If dust conditions are severe, or there is more than 1/2" of accumulated dirt in the oil cup, service it more often. Remove the cleaner, pour out the old oil, and clean the dirt out of the cup. Dip the cleaner element in gasoline or kerosene to clean the screen, and allow it to dry. Fill the oil cup with clean oil of the same grade as that used in the crankcase, replace the cleaner, and tighten securely.

AUTOMATIC CHOKE - The automatic choke consists of a thermostat mounted directly on the choke butterfly shaft of the carburetor and operated by a nichrome heating element obtaining current from the D.C. Generator winding. A valve is mounted on the choke shaft and is off-center in the body. When the engine is cranked and the air passes from the cleaner to the carburetor, the off-center position of the choke shaft allows the valve to be pushed open slightly by the air stream working against the tension created by the thermostat on the shaft.

During the period while the engine is warming up to normal operating temperatures, the small choke shaft knob or sheel, located at its outer end, will indicate the choke valve is oscillating rapidly. As the engine reaches normal temperature, the oscillation will cease and the choke valve will be open. With the engine cold, turning the choke knob to the left, counter-clockwise, should result in the carburetor being completely choked.

Improper operation of the choke assembly will be indicated by hard starting or irregular running during the warm-up periods. A proper adjustment of the assembly can be made by loosening the small screw clamping the thermostat housing to the carburetor choke shaft boss and rotating it in a clockwise direction (when looking at the choke knob), to decrease the air mixture, or counter-clockwise (when looking at the choke knob), to increase the air mixture, to a position where it will give the results indicated in the foregoing paragraphs. Re-tighten the clamp screw securely after the proper adjustment has been made.

SPARK PLUGS - The spark plugs used in this plant are Champion #M-6. They should be removed, cleaned, and gap set to .025" to .030". A close inspection should be made to determine by the condition of the porcelain and spark electrodes if the plugs should be replaced. As a rule, replacements should be made after 1500 to 2000 hours of operation. The new plugs should be of the same or a comparable make and type.

Visual Tests of spark plug operation:

1. If the insulator is a light brown, operation is satisfactory.
2. If insulator is a dead white color, plug is too hot or mixture too lean.
3. If insulator has dull sticky deposit, plug is too cold or mixture too rich.
4. If insulator has shiny black deposit, plug is too cold or engine is pumping oil.
5. If electrodes are burned, plug is too hot or poor fuel has been used.

A "hot" plug has a large area of the insulator exposed to the burning gases.
A "cold" plug has a small area of the insulator exposed to the burning gases.

DISTRIBUTOR - Plants using battery ignition have an Auto-Lite IGW 4115 distributor. This is gear driven by the camshaft. An oil cup at the base is provided for lubrication. The distributor oiling and breaker points should be checked according to the service page. Breaker point clearance is .025" to .030".

## BATTERY CARE AND ATTENTION

With any plants using batteries, certain periodic care and attention is necessary to increase the life and efficiency of the batteries. Always follow the battery manufacturers recommendations if handy. If not, use the following:

1. Keep the level of the electrolyte about 1/4" to 3/8" above the top of the plates.
2. Add only distilled water to the electrolyte.
3. Clean battery terminals by using a solution of soda and water. Apply a coating of petroleum jelly to prevent corrosion.
4. When connecting batteries together, be sure that the positive (+) post of one battery is connected to the negative (-) post of the other battery.
5. When connecting batteries to the plant, make certain that a battery positive (+) post is connected to the positive (+) terminal on the plant, and that a battery negative (-) post is connected to the negative (-) terminal of the plant. Reversing these connections would discharge and ruin the batteries.
6. The average ampere charging rate should be approximately one-twentieth (1/20) of the Ampere Hour Capacity of the batteries. When the battery is discharged, it can be charged faster, but with a nearly charged battery, the rate should be reduced.
7. Remove the vent caps while charging the batteries unless the caps are marked otherwise.
8. When charging batteries, make certain that the internal temperature of the batteries does not rise over 110° F. If the temperature nears 110° F., reduce the charging rate.
9. Check the specific gravity of the batteries at regular intervals with a good hydrometer. A discharged battery will read from 115° to 1175; a half-charged battery from 1200 to 1225; and a fully charged battery from 1250 to 1280.
10. Keep the batteries in a fully charged condition. If allowed to stand in a discharged state, the plates will harden or sulphate, and the battery will not take or hold a charge.
11. If the batteries are in a discharged or near discharged condition during cold weather, they may freeze and be ruined. A discharged battery will freeze at about 20° above zero F., while a fully charged battery will not freeze until it gets about 80° below zero F.
12. Never add water to a battery during cold weather without letting it stand in a warm place long enough for the water to become mixed with the electrolyte. Water might freeze and crack the battery case if it was not given a chance to mix with the electrolyte.
13. If batteries are received in a Semi-Dry condition from the manufacturer, follow the instructions that accompany them for putting into service.

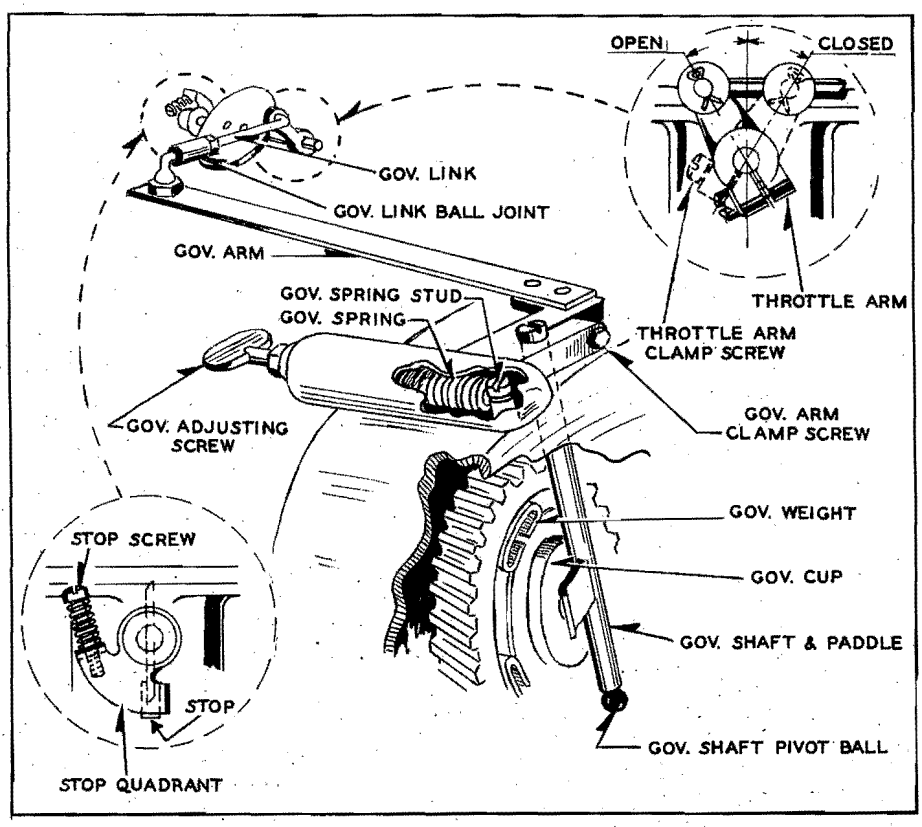
## ACCESSORY SERVICE

### GOVERNOR

The purpose of the governor is to keep the generator voltage within proper limits by holding the engine speed at a constant rate. Failure of the governor to control the speed properly would cause varying brilliancy of lights, or constantly changing performance of accessories and appliances whenever the load was increased or decreased.

Two types of governors are used on these plants. With one, the operating mechanism is built as an integral part of the camshaft timing gear and gearcase cover. The other is a commercial type mounted to the top of the gearcase and driven by the camshaft timing gear. Both types are as simple and trouble free as any mechanical unit can be, and neither type should need adjusting or servicing unless the plant has been overhauled or the adjustment tampered with.

### INTERNAL TYPE GOVERNOR



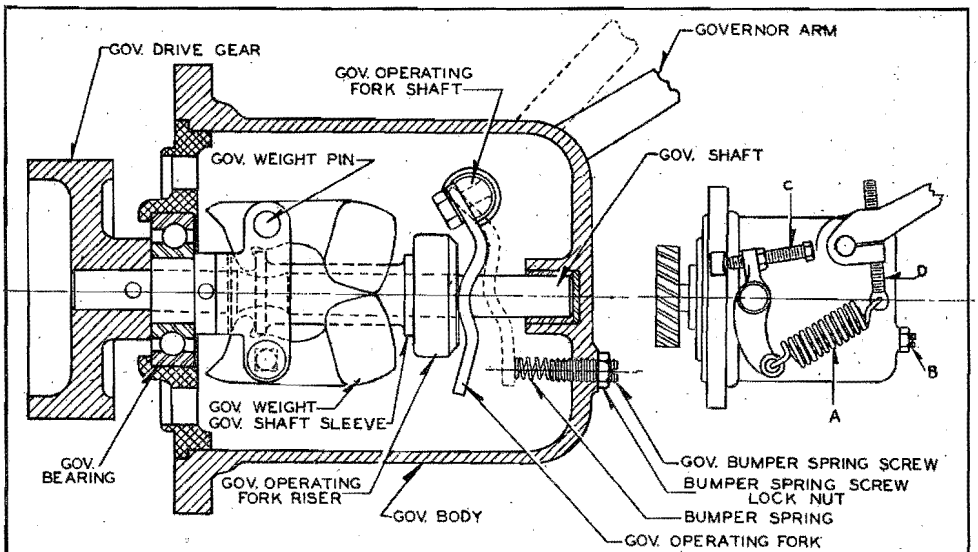
The governor arm is linked to the carburetor throttle arm. This, whenever the load changes and the speed tends to gain or drop, the governor mechanism immediately moves to offset the change in load and either opens or closes the throttle valve to compensate for the change.

An oval headed thumb screw permits adjusting the tension of the governor spring. Turning the screw in towards the body of the governor arm bracket increases the tension on the spring, the engine speed, and the generator voltage. Turning the screw out decreases tension speed and voltage. Whenever adjustment has been made and the voltage brought to the proper figure (not to exceed 125 volts at no load), tighten the locknut against the bracket.

If, for any reason, the governor arm has become loosened from the governor shaft, it will be necessary to reset the arm. To do this, loosen the governor arm clamp screw, insert a screwdriver in the slot in the governor shaft, and turn it to the right as far as possible. Allow the governor spring to hold the throttle arm against the stop and retighten the clamp screw securely. This will correctly set the governor arm and it will then be necessary to reset the adjustment on the spring tension to correct the speed and voltage.

Four flyweights are so pivoted to the face of the camshaft gear that as the engine speed increases, the weights tend to fly outwards, forcing the governor cup away from the gear. The cup bears against a paddle welded to the governor shaft, rotating the shaft and the governor arm attached to its end. Tension of the governor spring against the governor arm resists this motion, and it is the balance of force between the spring and the flyweights that maintains an even speed.

## EXTERNAL TYPE GOVERNOR




GOVERNOR ASSEMBLY

A Pierce industrial type governor is bolted to the top of the gearcase cover where it is driven by the camshaft timing gear. There is no routine servicing required for this governor. In fact, it should never need attention unless the engine has been overhauled.

To adjust the governor, proceed as follows:

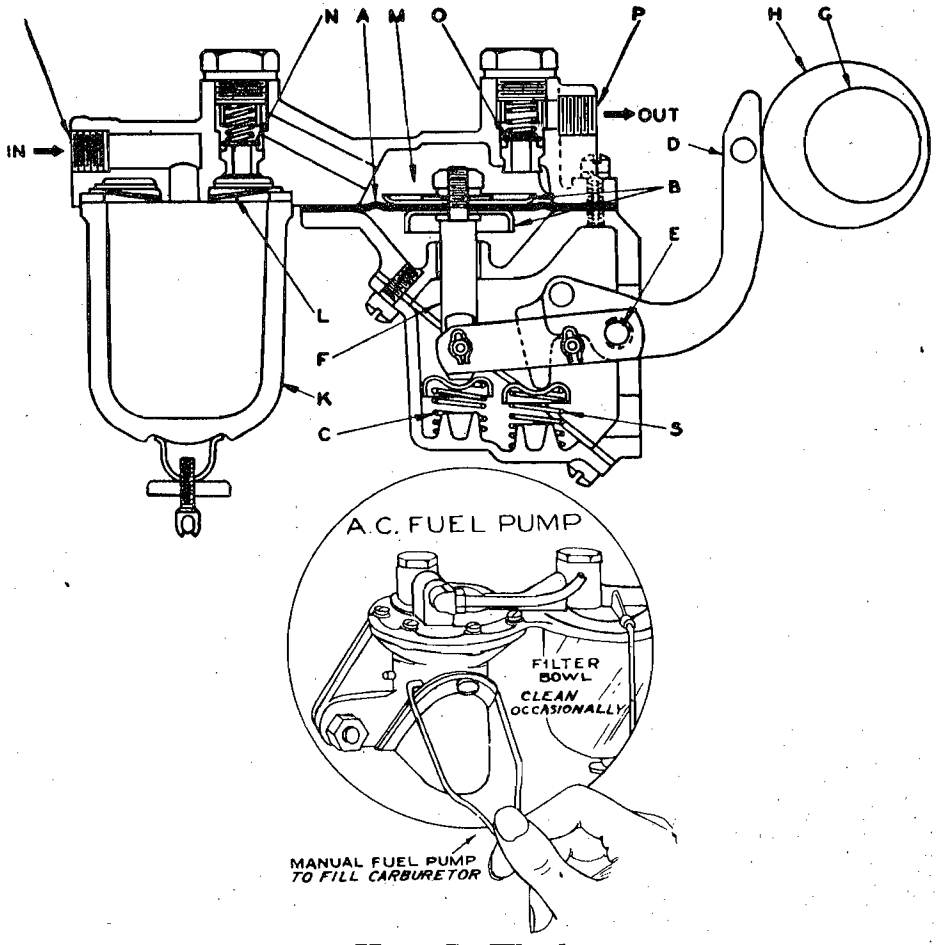
1. With the spring tension on the main governor spring "A" adjust the length of the throttle control rod so the carburetor lever clears the wide open stop by at least 1/64".

2. Loosen the lock nut and screw bumper "B" out far enough so it does not function. Then adjust the governor for the desired speed by turning the adjusting screw "C".

3. If the governor surges under load or port load conditions, screw the auxiliary adjusting screw "D" out a few turns at a time until the surging stops. Keep the screw "D" in as close as possible without surging to give close regulation.

4. If the governor surges at a no load speed, screw the bumper "B" in far enough to eliminate the surge, and then lock it. Do not screw "B" in far enough to increase the engine speed.

# THE AC FUEL PUMP




## How It Works

By revolving shaft (G) the eccentric (H) will lift rocker arm (D) which is pivoted at (E) and which pulls the pull rod (F) together with diaphragm (A) held between metal discs (B) downward against spring pressure (C) thus creating a vacuum in pump chamber (M).

Fuel from the rear tank will enter at (J) into sediment bowl (K) and through strainer (L) and suction valve (N) into pump chamber (M). On the return stroke, spring pressure (C) pushes diaphragm (A) upward forcing fuel from chamber (M) through pressure valve (O) and opening (P) into the carburetor.

When the carburetor bowl is filled the float in the float chamber will shut off the inlet needle valve, thus creating a pressure in pump chamber (M). This pressure will hold diaphragm (A) downward against the spring pressure (C) where it will remain inoperative until the carburetor requires further fuel and the needle valve opens.

Spring (S) is merely for the purpose of keeping rocker arm (D) in constant contact with eccentric (H) to eliminate noise.

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## Service Hints

Service on the AC Fuel Pump is available through United Motors Service Branches and Authorized AC Service Stations, who are prepared with parts and fixtures for repairing all types of pumps. There are some service operations on this fuel pump that can, if necessary be done without referring to the service station and these are tabulated on the reverse side of this sheet. In some instances trouble is attributed to the fuel pump which in reality is caused by some other condition. These should be carefully checked to avoid the needless replacement of fuel pumps.

# THE AC FUEL PUMP—Service Hints (cont'd)

## LACK OF FUEL AT THE CARBURETOR

Check as follows:

| Cause | Remedy |
|---|---|
| Gasoline tank empty. | Refill |
| Leaky tubing or connections. | Replace tubing and tighten all pipe connections at the fuel pump and gasoline tank. |
| Bent or kinked tubing. | Replace tubing. |
| Glass bowl loose. | Tighten thumb nut, making certain that cork gasket lies flat in its seat and not broken. |
| Dirty screen. | Clean the screen. Make certain that cork gasket is properly seated when reassembling. |
| Loose valve plug. | Tighten valve plug securely, replacing valve plug gasket if necessary. |
| Dirty or warped valves. | Remove valve plug and valves. Wash valves in kerosene. If damaged or warped, replace them. Examine valve seat to make certain there are no irregularities which prevent proper seating of valves. Place valve in valve chamber. Reassemble valve plug and spring, making certain that spring is around the lower stem of the valve plug properly. Use new gasket under valve plug if necessary. |

## FUEL LEAKAGE THROUGH VENT HOLE IN BODY

Check as follows:

| Cause | Remedy |
|---|---|
| Worn or punctured diaphragm. | Replace diaphragm. |
| Loose diaphragm nut or defective pull rod gasket. | Tighten or replace. |

## LEAKAGE OF FUEL AT THE DIAPHRAGM

Check as follows:

| Cause | Remedy |
|---|---|
| Loose cover screws. | Tighten cover screws alternately and securely. Also check inlet and outlet pipe connections. |

## FLOODING OF CARBURETOR

Check as follows:

| Cause | Remedy |
|---|---|
| Carburetor needle valve not seating. | Check carburetor for proper adjustment. |

IMPORTANT: When the above remedies do not correct the condition, replace with a new fuel pump sending the old fuel pump to the nearest AC service station for repairs.

# ENGINE SERVICE DIAGNOSIS

## Lack of Power

1. Poor Compression
2. Poor Carburetion.
3. *Improper Valve Seating.*
4. Defective Ignition.
5. Restricted Air Intake.
6. Low Octane Fuel.
7. *Restricted Exhaust.*
8. *Overheating.*

## Poor Compression

1. Incorrect Valve Clearance.
2. Incorrect Valve Timing.
3. Worn or Sticking Valves.
4. Weak or Broken Springs.
5. Leaking Gaskets.
6. Worn or Broken Rings.
7. Excessively Worn Cylinders.
8. Excessive Carbon Deposits.

## Overheating

1. Insufficient Ventilation.
2. Improper Lubrication.
3. Improper Carburetion.
4. Improper Ignition Timing.
5. Restricted Air Intake.
6. Restricted Exhaust.
7. Electrical Overload.

## Excessive Oil Consumption

1. Worn, Broken, or Stuck Rings.
2. Worn or Scared Cylinders.
3. Overheating.
4. Leaking Seals or Gaskets.
5. Worn Bearings.
6. Improper Lubricant.
7. Too much Oil.
8. Excessive Oil Pressure.

## Excessive Cylinder and Piston Wear

1. Improper Lubricant.
2. Lack of Lubrication.
3. Overheating.
4. Improperly Fitted Pistons and Rings.
5. Stuck or Broken Rings.
6. Dirt.
7. Improper Carburetion.

## Connecting Rod Bearing Failure

1. Restricted Oil Passage.
2. Improperly Fitted Bearing.
3. Bent Connecting Rod.
4. Lack of Oil.
5. Bearing Journal Rough.
6. Loose Connecting Rod.
7. Insufficient Oil Pressure.
8. Improper Lubricant.

## Crankshaft Bearing Failure

1. Restricted Oil Passage.
2. Bearing Sprung or Loose.
3. Journal Rough or Out of Round.
4. Lack of Oil.
5. Insufficient Oil Pressure.
6. Improper Lubricant.
7. Improperly Fitted Bearing.
8. Dirt.

## ENGINE SERVICE DIAGNOSIS

### Burned Valves and Seats

1. Insufficient Tappet Clearance.
2. Weak or Broken Springs.
3. Incorrect Valve Timing.
4. Late Ignition Timing.
5. Excessive Carbon Deposits
6. Sticking Valves.
7. Improper Valves.
8. Valve Head Too Thin.
9. Valve Seat Too Narrow.
10. Overheating.

### Sticking Valves

1. Incorrect Tappet Adjustment.
2. Insufficient Clearance in Guide.
3. Weak or Broken Springs.
4. Scared or Dirty Stems.
5. Excessive Carbon.
6. Gum Content of Fuel Too Great.

### Insufficient Oil Pressure

1. Improper Lubricant.
2. Relief Valve Stuck.
3. Oil Intake Screen Clogged.
4. Excessive Oil Dilution.
5. Excessive Bearing Clearance.
6. Worn Oil Pump.
7. Insufficient Oil.

### Defective Ignition

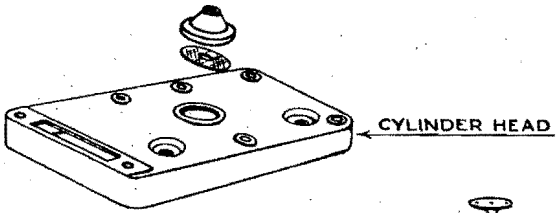
1. Breaker Arm Sticking.
2. Breaker Points Pitted.
3. Defective Condenser.
4. Point Setting Incorrect.
5. Spark Plugs Fouled or Dirty.
6. Stop Wire Grounded.
7. Defective Coil.
8. Low Power Source.
9. Leak in System.

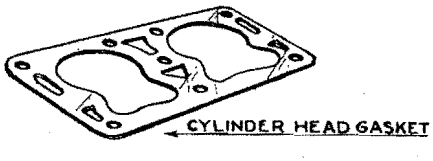
### Popping, Spitting, or Spark Knock

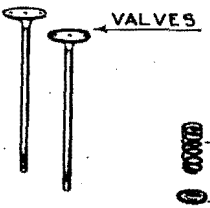
1. Improper Ignition Adjustment.
2. Improper Carburetor Adjustment.
3. Insufficient Valve Clearance.
4. Excessive Carbon.
5. Worn Pistons or Rings.
6. Valve Timing Incorrect.
7. Weak Valve Springs.
8. Hot Spot in Cylinder Head.
9. Inferior Fuel.

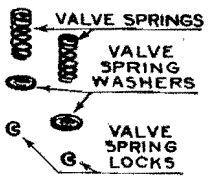
Pinging or Spark Knock is usually caused by the spark being advanced too far.

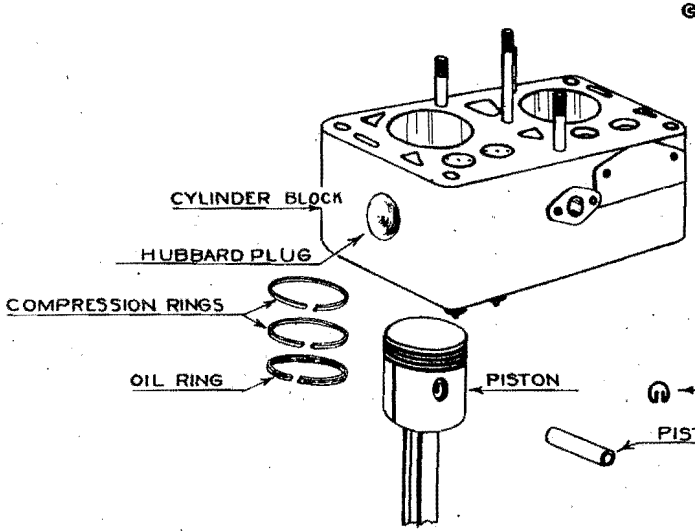
# CYLINDER AND VALVE SERVICE SHEET

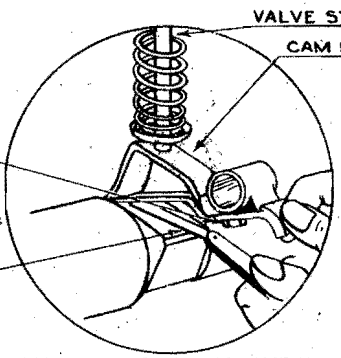



- CAM LOCK BOLT -

-LOOSEN BOLT TO ADJUST-
TO INCREASE - PUSH IN
TO DECREASE - PULL OUT
LOCK SECURELY AFTER ADJUSTING.

THICKNESS GAUGE

ADJUST CLEARANCE WITH PISTON ON TOP POSITION OF THE COMPRESSION STROKE. BOTH VALVES MUST BE CLOSED.
SET INTAKE VALVE — .008
SET EXHAUST VALVE — .010

VALVE CLEARANCE CHECK

## YEARLY ENGINE SERVICING

Each year, if the plant is used under normal conditions the accumulated hours of operation will total 2500 or more. After every 2500 to 3000 hours, the engine should be given a thorough checking over, the valves should be ground, the carbon removed, and the pistons, piston rings, valves, bearings, etc. should be carefully checked.

Valve grinding, accompanied by a thorough cleaning of carbon, is one of the most frequently required service operations in a modern gasoline engine. As the plant, during the years service, has ordinarily been used to an extent comparable to 4000 to 5000 miles in an automobile, the increased efficiency and savings in operating costs will more than make up for the time and labor invested.

Inspection plates are provided on both sides of the engine crankcase. By removing these plates and inserting a trouble lamp into the crankcase, practically all of the wearing parts can be inspected by sight or by feel to determine the extent of the servicing needed. By making this inspection first, and estimating the extent of repairs beforehand, necessary parts and gaskets can be ordered from the factory so the plant will not be out of operation for more time than the actual servicing requires.

We recommend that the following parts, plus any additional parts which inspection has indicated are needed, should be on hand:

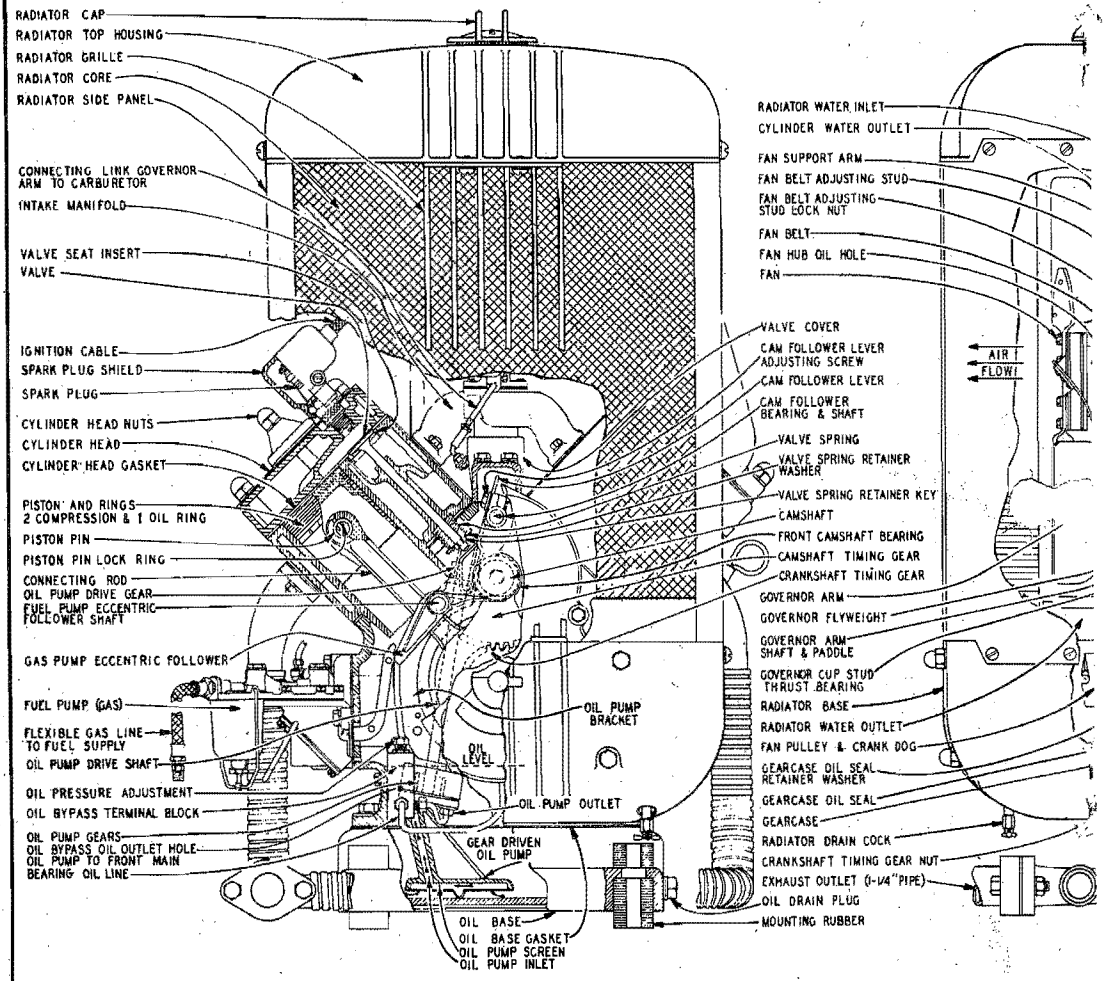
1. A complete set of engine gaskets, to include:

| | |
|---|---|
| 2 cylinder head gaskets | 2 cylinder head cap gaskets |
| 2 cylinder base gaskets | 2 intake manifold gaskets |
| 2 water inlet gaskets | 2 exhaust manifold gaskets |
| 2 water outlet gaskets | 1 carburetor flange gasket |
| 2 inspection plate gaskets | 1 valve tappet cover gasket |

2. A complete set of radiator hoses.
3. A set of piston rings.
4. An assortment of valves, valve guides, springs, locks, etc. sufficient to replace any warped or burned valves broken springs, or worn guides that may be discovered.

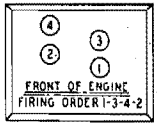
To disassemble the engine for valve or piston service, follow the outlined procedure.

1. Disconnect all main lines or batteries from the plant.
2. Drain the water from the cooling system.
3. Remove the radiator hoses, and the water inlets and outlets. If there is a temperature guage, disconnect it first.
4. If an external governor is used, remove the oil line between the crankcase and the governor.
5. Disconnect the governor arm from the carburetor, and remove the governor if an external type.
6. Remove the fuel line leading to the carburetor.
7. Disconnect the air cleaner from the breather tube and from the air inlet hose. Remove the cleaner.
8. Remove the carburetor, choke, and intake manifold assembly.


RADIATOR CAP
RADIATOR TOP HOUSING
RADIATOR GRILLE
RADIATOR CORE
RADIATOR SIDE PANEL
CONNECTING LINK GOVERNOR ARM TO CARBURETOR
INTAKE MANIFOLD
VALVE SEAT INSERT
VALVE
IGNITION CABLE
SPARK PLUG SHIELD
SPARK PLUG
CYLINDER HEAD NUTS
CYLINDER HEAD
CYLINDER HEAD GASKET
PISTON AND RINGS 2 COMPRESSION & 1 OIL RING
PISTON PIN
PISTON PIN LOCK RING
CONNECTING ROD
OIL PUMP DRIVE GEAR
FUEL PUMP ECCENTRIC FOLLOWER SHAFT
GAS PUMP ECCENTRIC FOLLOWER
FUEL PUMP (GAS)
FLEXIBLE GAS LINE TO FUEL SUPPLY
OIL PUMP DRIVE SHAFT
OIL PRESSURE ADJUSTMENT
OIL BYPASS TERMINAL BLOCK
OIL PUMP GEARS
OIL BYPASS OIL OUTLET HOLE
OIL PUMP TO FRONT MAIN BEARING OIL LINE
OIL LEVEL
OIL PUMP BRACKET
OIL PUMP OUTLET
GEAR DRIVEN OIL PUMP
OIL BASE
OIL BASE GASKET
OIL PUMP SCREEN
OIL PUMP INLET
RADIATOR WATER INLET
CYLINDER WATER OUTLET
FAN SUPPORT ARM
FAN BELT ADJUSTING STUD
FAN BELT ADJUSTING STUD LOCK NUT
FAN BELT
FAN HUB OIL HOLE
FAN
VALVE COVER
CAM FOLLOWER LEVER ADJUSTING SCREW
CAM FOLLOWER LEVER
CAM FOLLOWER BEARING & SHAFT
VALVE SPRING
VALVE SPRING RETAINER WASHER
VALVE SPRING RETAINER KEY
CAMSHAFT
FRONT CAMSHAFT BEARING
CAMSHAFT TIMING GEAR
CRANKSHAFT TIMING GEAR
GOVERNOR ARM
GOVERNOR FLYWEIGHT
GOVERNOR ARM SHAFT & PADDLE
GOVERNOR CUP STUD THRUST BEARING
RADIATOR BASE
RADIATOR WATER OUTLET
FAN PULLEY & CRANK DOG
GEARCASE OIL SEAL RETAINER WASHER
GEARCASE OIL SEAL
GEARCASE
RADIATOR DRAIN COCK
CRANKSHAFT TIMING GEAR NUT
EXHAUST OUTLET (1-1/4" PIPE)
OIL DRAIN PLUG
MOUNTING RUBBER
AIR FLOW

MODEL V-45

# ELECTRIC PLANTS




**DIMENSIONS**

| | | |
|---|---|---|
| LENGHT | OVERALL | 43 1/2" |
| WIDTH | OVERALL | 21" |
| HEIGHT | OVERALL | 34" |

MOUNTING HOLE CENTERS
10 WIDE 23 LONG

9. Remove the valve tappet cover and oil filler tube.
10. Disconnect the ignition wires and remove the spark plugs.

11. Remove the cylinder head nuts and lift the cylinder heads from the blocks. If they stick, tap the head sharply with a lead hammer to loosen. Never attempt to pry them off with a bar or screwdriver.
12. Remove the cylinders blocks from the crankcase. Be careful not to let the pistons drop on the edges of the crankcase and become damaged.

Inspect the pistons and piston rings carefully. Remove the rings, keeping them in order so they can be replaced in the same grooves and positions. Scrape any carbon from the grooves in the oil control piston rings and from the grooves and oil return holes in the pistons. Clean the carbon from the piston heads. If the rings have considerable tension, are bright and shiny showing a good fit to the cylinder walls, are not worn excessively, and fit snugly in the piston grooves, replace them in the grooves from which they were taken.

If the rings show signs of wear, they should be replaced with new ones. Fit each ring individually to the cylinder for which it is intended. If necessary, file the ends of the rings slightly so there will be an end gap of approximately .010" when the ring is in position in the cylinder.

After the pistons and rings have been cleaned or replaced, wrap a clean rag or piece of cardboard around the pistons to keep them from being damaged.

Valve Grinding - Compress the valve springs and remove the valve locks. With the locks removed, the washers, valve springs, and valves can be lifted out of the block. Inspect the condition of the valves. If the stems are worn or bent, replace with new ones. Pitted valve faces can be refaced on a valve face grinder if the valve is otherwise in good condition. However, never use a re-faced valve that has a thin edge. Valves with thin edged heads will warp or burn after a short time. When refacing valves, be sure to get a true 45° angle to the faces.

Clean the valve heads, stems and guides of all dirt and carbon. If the valve guides are badly worn, they can be punched out and replaced with new ones. Check the condition of the valve seats. The exhaust valve seats can be removed and replaced if too badly burned or cracked. Usually, a pitted valve seat can be restored to good condition by using a reamer designed for that purpose. Scrape all carbon from around the valve seats and the top of the cylinders.

Put a thin coating of a medium grade of valve grinding compound on the face of valve. Slip a thin coil spring over the valve stem, and insert the valve stem in the guide. Using a valve grinding tool, rotate the valve back and forth against the seat. The spring prevents too much pressure and assures easy removal.

After several cycles back and forth, lift the valve and turn it so different surfaces of the valve face and seat will be touching. Repeat the rotating process until a bright silvery band, the width of the valve seat, extends all around the valve face, and the valve seat shows a high polish. Add new compound whenever it loses its cutting properties.

Remove the valve and wipe all traces of the grinding compound from the valve and valve seat. Using a soft pencil, draw marks across the valve face. Reinsert the valve, and rotate it against the seat. If the pencil marks are erased, a gas-tight fit has been secured, but if not, repeat the grinding process until each valve will pass this test.

After all the valves have been ground to their individual seats, and all traces of carbon scraped from the blocks, replace the valves, valve springs, washers, and locks. Install the cylinder blocks onto the crankcase, compressing each piston ring carefully to prevent breakage. Oil the pistons and piston rings before sliding then into the cylinder walls, and be sure to use new cylinder base gaskets.

Clean the carbon from the cylinder heads. Using new gaskets thruout, replace the cylinder heads and draw them tight. When tightening the cylinder head nuts, tighten them evenly and never draw one up tight until the others are nearly so. Tighten the center one first and then tighten the others. This assures a better seal, and prevents the possibility of the head warping.

Tappet Adjustment - Loosen the cap screws locking the tappet levers to their bearings, and push the levers as far into the crankcase as possible. With each piston at top dead center on the compression stroke while making the adjustment, insert an .008" feeler gauge between the camshaft and the face of the cam follower lever. Pull the lever upward until the guage is squeezed lightly between cam and the lever face, and then tighten the cap screw securely.

CARBURETOR - Remove the carburetor and disassemble it to clean out the jets and remove any sediment from the bowl. See the carburetor accessory page. Replace all gaskets including the one between the intake manifold and the carburetor. Then replace it and oil the moving parts such as the throttle and choke arms.

COOLING - The cooling system should be thoroughly flushed and if available a cleaning agent should be used for the radiator. Inspect the condition of the hoses and if necessary replace them. Check the tension of the fan belt and see that the hub is well lubricated.

GOVERNOR ADJUSTMENT - See the Accessory Service Section for the operation of the governor before making any adjustments. The proper operation is essential for correct engine speed and generator output.

## YEARLY ENGINE SERVICING

RUNNING - When a reconditioned plant is first started, little or no load should be connected during the first several hours of operation. This will allow the new and reconditioned parts to wear in without excessive wear and prolong their life.

It is advisable after such a run-in period to go over each of the nuts and bolts, especially those holding the cylinder and cylinder head and retighten them. Also remove the valve tappet cover and recheck the clearances, readjust them if necessary.

THE FOLLOWING IS A TABLE OF CLEARANCES FOR BEARINGS AND OTHER PARTS OF THE ENGINE, AND SUGGESTED METHODS FOR CHECKING THEM.

| | MINUMUM | MAXIMUM | TESTING DEVICES |
|---|---|---|---|
| Valve Tappet Clearance (Intake) | .008" | .010" | Thickness Gauge |
| Valve Tappet Clearance (Exhaust) | .010" | .012" | Thickness Gauge |
| Valve Seat Width (All) | (3/64") | (1/16") | |
| Valve Stem Clearance in Guide (Intake) | .002" | .003" | Go-No Go Gauge |
| Valve Stem Clearance in Guide (Exhaust) | .0025" | .003" | Go-No Go Gauge |
| Crankshaft Main Bearings (Dia.) | .0015" | .0025" | Micrometer |
| Crankshaft End Play | .015" | .020" | Thickness Gauge |
| Connecting Rod Bearing (Dia.) | .0015" | .0025" | |
| Connecting Rod Bearing (End Play) | .004" | .006" | Thickness Gauge |
| Timing Gear Backlash | .004" | .005" | Paper or Hand Fit |
| Piston - Cylinder Clearance | .003" | .005" | Thickness Gauge |
| Piston Pin in Piston | HAND PUSH FIT | | |
| Piston Pin in Rod | .0002 | .0003" | Drags when cold |
| Camshaft Main Bearings | .002 | .0025 | Thickness Gauge |
| Piston Ring Gap in Cylinder | .008 | .015 | Thickness Gauge |

## MAJOR ENGINE OVERHAUL

After long periods of time, usually from one to five years or more of hard operation, a complete overhauling of the engine and generator will become necessary. However, a major overhauling should not be attempted until a crankcase inspection has been made to determine whether or not it is needed.

No person unfamiliar with the operation of modern internal combustion engines should attempt to overhaul this plant. The disassembly of the engine and generator will follow a natural sequence, and the sections on "Yearly Engine Servicing" and on "Generator Service" should be thoroughly studied before starting the work. These two sections cover the disassembly of the generator in its entirety and of the engine up to a certain point.

Remove the radiator from the engine. With this removed, the crankcase can be unbolted and removed from the oil base. The gearcase is also exposed and can be removed to service the governor or the timing gears.

Examine each part as it is removed, and decide which must be replaced, which need adjustment, and which just need cleaning. Replace any parts of which there is any doubt, as it is poor economy to use a part worn to an extent that replacement would be necessary before another servicing should be due.

Replace all worn or scared pistons, pins, and rings. The cylinders can be honed or bored to an oversize diameter and larger pistons can be furnished by the factory. Have this work done in a competant, properly equipped shop, or if this is not practical, new cylinder blocks, using standard sized parts can be obtained. New connecting rod bearing inserts can be installed to restore proper bearing clearance unless the bearing journal surfaces have become scared or rough.

The main engine bearings are not adjustable, but should seldom, if ever, need replacement. If necessary, the old bearings can be punched out of the case and new bearings can be set in. Be sure that the oil groove in the babbited bearings heads in a direction opposite to the rotation of the shaft. The bearings must then be line reamed to the proper size.

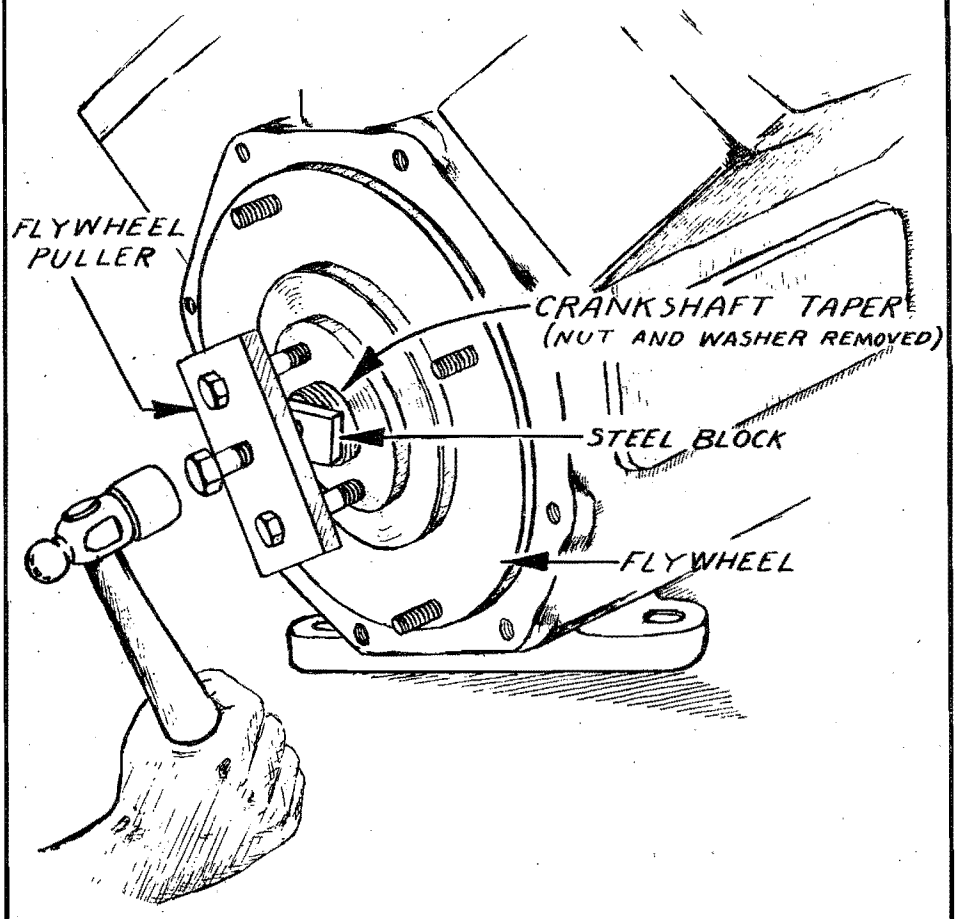
Two oil seals are used. Both are of leather and sheet metal construction with the rear main bearing oil seal being larger, and pressed into the rear main bearing. The front oil seal is pressed into the gearcase cover. Both seals must be replaced whenever the engine is overhauled, and at any other time when they fail to operate properly and allow oil to be thrown from the crankcase. Use care when installing new seals not to damage the lip of the seals on the keyways on the crankshaft. Grease the shaft carefully before slipping the seal over the shaft. Tap the seals into place, and shellac the surface after the seal has been installed.

The camshaft is driven by a helical cut steel gear keyed to the crankshaft and retained by a large hexagon nut and washer. This gear meshes with a cast iron gear keyed to the camshaft and held in place by a lock ring. Ordinarily, one gear should not be replaced unless the other is also.

Before installing a new crankshaft gear, the timing marks on the two gears should be lined up to provide correct timing of the camshaft. Then press or tap the gear in place and tighten it securely. The mesh between the gears should be checked carefully. A piece of newspaper should pass between the teeth of the gears without binding. A piece of heavy wrapping paper should not pass between the teeth. This test indicates a clearance or backlash of from .003" to .005".

It will be necessary to reset the governor after a major overhauling. See the section on governor adjustment under "Accessory Service" for complete details on adjustment.

## FLYWHEEL PULLER ASSEMBLY




THE REAR ENGINE VIEW SKETCH ABOVE ILLUSTRATES THE OPERATION OF THE FLYWHEEL PULLER IN REMOVING THE FLYWHEEL FROM THE CRANKSHAFT TAPER.

THE OUTER BOLTS OF THE PULLER ARE TURNED INTO THE FLYWHEEL HUB. A STEEL BLOCK IS THEN PLACED OVER THE CRANKSHAFT END TO PROTECT IT FROM BEING DAMAGED BY THE CENTER BOLT OF THE PULLER. THE CENTER BOLT OF THE PULLER IS THEN DRAWN DEAD TIGHT AGAINST THE STEEL BLOCK AND RAPPED SHARPLY WITH A HAMMER AS SHOWN IN SKETCH. THIS WILL LOOSEN THE FLYWHEEL FOR REMOVAL.

## GENERATOR SERVICE

The interior and exterior surfaces of the generator must be kept clean and free from metal dust, dirt, oil, and water. A stream of compressed air directed thru openings in the generator frame after the cover has been removed, is the most satisfactory method of removing ordinary accumulations of dirt and dust. Be sure that the air stream is free from oil or water, or the condition will be made worse.

If the interior surfaces of the generator are oily, the generator will have to be disassembled and the parts thoroughly cleaned with a solvent such as gasoline, benzine, or carbon tetrachloride. An oily condition may be an indication that the rear main bearing oil seal is leaking and needs replacing. Check the condition of this seal and replace it if necessary while the generator is separated from the engine.

The following chart has been prepared to assist in locating both the most common troubles and their causes as associated with electric generators.

### GENERATOR HEATING

1. Overloading.
2. Shorted Coil or Coils.
3. Grounded Armature or Commutator.
4. Poor Commutation.
5. Unequal Air Gap.
6. Reversed Field Coil

Note: Any of these conditions cause a large circulating current in the windings to the commutator, the brushes, and the brush connections, and cause an artificial overloading of the armature.

### FIELD COIL HEATING

1. Operating Speed Too High with a Resultant High Output Voltage.
2. A Partial Short Circuit of One Coil

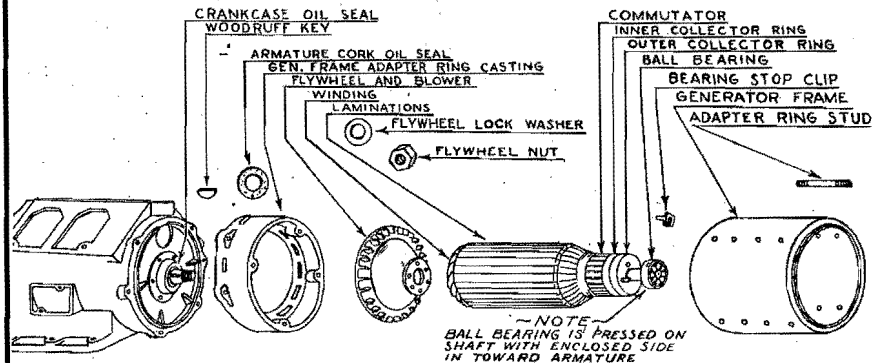
### POOR COMMUTATION

1. Brushes Unevenly Set.
2. Brushes Not Fitted.
3. Brushes Binding.
4. Brush Spacing Unequal.
5. Worn Brushes.
6. Brush Pressure Insufficient.
7. Brush Pressure Uneven.
8. Wrong Type of Brushes.
9. Commutator Bars Loose.
10. High Mica.

### FAILURE OF GENERATOR BUILD-UP

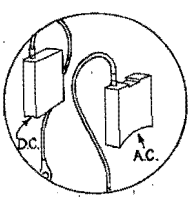
1. Plant Speed Below Normal.
2. Reversed Field Winding.
3. Reversed Shunt Field.
4. Brush Location Wrong.
5. External Short Circuit.
6. Open Circuit in Shunt Field.

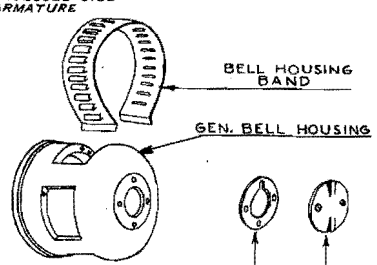
# ALTERNATING CURRENT GENERATOR ASS'Y

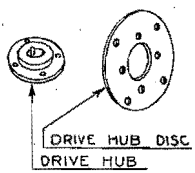



—NOTE—
BALL BEARING IS PRESSED ON SHAFT WITH ENCLOSED SIDE IN TOWARD ARMATURE

—CAUTION—
CRANKSHAFT TAPER MUST BE CLEAN AND FREE OF MARKS TO OBTAIN A TRUE RUNNING ARMATURE.



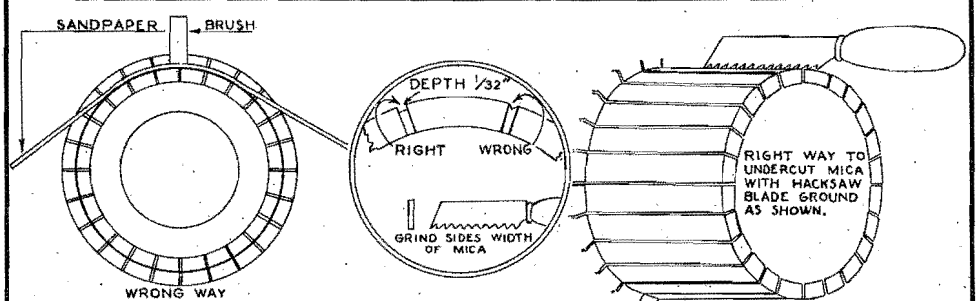



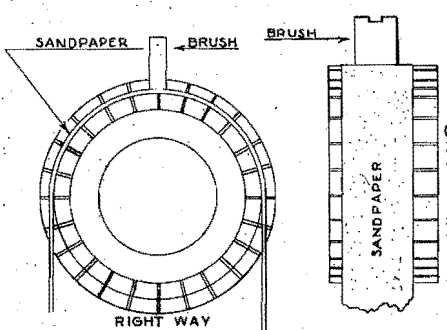







# CARE OF COMMUTATOR AND BRUSHES

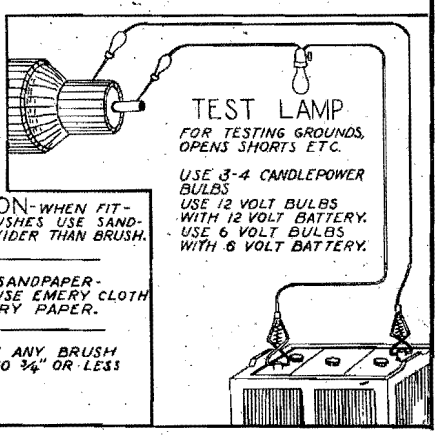



CAUTION-WHEN FITTING BRUSHES USE SANDPAPER WIDER THAN BRUSH.

USE 00 SANDPAPER-NEVER USE EMERY CLOTH OR EMERY PAPER.

REPLACE ANY BRUSH WORN TO 3/4" OR LESS



GENERAL - The generator consist of two assemblies; the armature, which is the rotating part of the generator, and the frame assembly, which is the stationary part of the generator. The frame is a steel ring with two or four field coils and pole shoes bolted to the inside. The brush rig assembly, located in the generator end bell, is also a part of the frame assembly, and it is not necessary to separate these when removing the generator from the engine.

Ordinarily, most generator troubles can be checked and corrected without disassembling the generator, by removing the band around the generator end bell. When this band has been removed, there is ample room for replacing the brushes or brush springs, or for checking the various parts of the generator.

The most common reason for a generator failing to produce current is an external short on the main line, or in the control or outlet box. Disconnect all wires leading from the generator, and run a test lamp across the output of the generator while it is running. If the test lamp lights, the external circuit must be checked for a short circuit or a loose connection, but if it fails to light, the generator is at fault and steps must be taken to locate and correct the trouble.

Check the brushes to make sure that they ride freely in their holders and that there is sufficient spring tension on all the brushes. Check the wires leading from the brushes. If everything appears to be normal, disconnect all batteries or main line wires from the plant. Raise the brushes in their holders until the springs slip down the sides of the brushes and keep them from making contact with the armature. Disconnect the D.C. field wire, and proceed as outlined in the following paragraphs, using the tests which apply to the generator to be tested. All Onan generators produce direct current, but only those rated as alternating current generators need be given the additional tests for that type of generator.

TESTING FIELDS FOR OPEN CIRCUITS - Connect one end of a test lamp wire to one field wire and the other end to the other field wire. The test lamp should light if the field coil wiring has not been broken. If it fails to light, the winding or circuit is open and a new field coil set must be installed. However, if the break is in a wire connecting two coils, the connection can be resoldered, and the plant will again operate.

TESTING FIELDS FOR GROUNDS - Connect one end of the test lamp wire to one field wire and the other end to a clean surface on the generator frame. If the lamp lights, a field coil is grounded, and the field coils must either be replaced or repaired.

Temperature changes cause metal to expand or contract. Varying degrees of expansion between the iron in the frame and pole pieces and the copper in the wiring of the field coils can cause a chafing which may, over a long period of time, wear thru the insulation protecting the field coils and allow the wires to touch the frame. The electric current which should go to magnetize the pole pieces will be side-tracked, no magnetic field will be set up, and consequently no current will be produced.

The pole pieces can be unbolted from the frame allowing the removal of the field coils. If the wires are not damaged, a piece of tape can be placed over the worn spot, and the grounded field coils made serviceable again.

TESTING FOR A SHORTED FIELD COIL - A shorted or partially shorted field coil can be tested by a meter which will measure the amount of resistance in each coil. As the amount of resistance should be practically the same in each coil, if one coil shows less than the others, it is a good indication that that coil is shorted.

If there are no instruments handy for making this test, a fairly accurate check can be made when the symptoms are first noticed by feeling the temperature of the coils before stopping the plant. If one coil is shorted, it will run much cooler than the others, and by feeling the generator frame where the pole shoes are bolted to it, a shorted coil can be located. A shorted coil must be replaced.

TESTING THE D.C. WINDING OF THE ARMATURE FOR GROUNDS - If one end of a test lamp wire is placed on a clean surface of the armature shaft, the lamp should not light when the other end is touched to the commutator. If the lamp lights, the commutator or D.C. windings of the armature are grounded and the armature will have to be replaced.

TESTING THE D.C. WINDING OF THE ARMATURE FOR OPEN CIRCUITS - A test lamp should light when one end of the wire is connected to one commutator bar, and the other end touched to each of the other bars. If it fails to light when touched to any bar, the wire leading to that bar is open and the armature must be replaced.

TESTING A.C. WINDING OF THE ARMATURE FOR OPEN CIRCUITS OR GROUNDS - Place one end of a test lamp wire on the outer or insulated collector ring, and the other end on the inner collector ring. If the windings are in good condition, the lamp will light. If it fails to light, the circuit is open, and the armature must be replaced.

Place one end of the test lamp wire on the armature shaft. Touch the other end to each of the collector rings. If the lamp lights, the winding is grounded, and the armature must be replaced.

> Note: Only a competant, well trained, armature repair service man is qualified to repair an armature that is either open or grounded. The armature must be completely rewound to correct either of these conditions, and no person without special training should ever attempt to do this work.

FILTER CONDENSERS Filter condensers are mounted inside the generator frame. If one of these condensers should become shorted, no current would be generated. Disconnect the condenser leads and try the plant with the condensers disconnected. If the plant operates satisfactorily, check each condenser, and replace the one that is faulty. It is necessary to use condensers in the generator to supress radio interference.

GENERATOR DISASSEMBLY - If the foregoing tests have shown that the field coils or armature need servicing or replacing, the generator must be removed from the engine and the armature disconnected from the engine crankshaft. If there is a fuel tank mounted on the generator, it must be removed. Likewise, any control box installation mounted on the generator should be taken off and set aside. On plants which have a starting sheave at the rear of the generator, loosen the set screw and pull it off the armature shaft, taking care not to lose the key which locks it to the shaft.

REMOVING THE FRAME FROM THE ENGINE - All generators are carried on a turned diameter at the rear of the crankcase. After any accessories which were mounted on the generator have been removed, the frame itself can be separated from the engine by loosening and removing the bolts which hold it in place and drawing it off over the armature. If it should stick when unbolted, a well directed blow with a hammer and punch at the inner rim will loosen the frame from the adapter ring.

Use great care when drawing the frame over the armature. Never allow the frame to touch or rest on the armature, as the weight of the frame can bend or distort the armature shaft enough to make it unserviceable.

BRUSH RIG - It is not necessary to remove the brush-rig assembly from the generator end bell when disassembling the generator. If it should have been removed accidentally, or for servicing, line up the mark on the rig with the indicator point on the frame when reinstalling it. Unless the brush rig is in the proper position, excessive arcing of the brushes, heating of the generator armature and field windings, and low voltage production will result.

POLE SHOES - The pole shoes are made up of laminations of special electrical steel stacked and riveted together and bolted to the generator frame. They are to be removed only in order to remove the field coils. When replacing pole shoes, be very careful that all surfaces are clean. An accurate clearance must be maintained between the pole shoes (when assembled in the generator frame) and the revolving armature. Any dirt between the pole shoe and the generator frame would change this clearance and possibly cause damage to the armature. Use lock washers with the bolts, and be sure that they are tightened securely.

REMOVING ARMATURE FROM ENGINE - The armature is coupled to the crankshaft, and supported at the forward end by the rear main crankshaft bearing. On smaller generators, the armature shaft is tapered and fits into a tapered surface in the crankshaft. The armature shaft is hollow, and a drawbolt runs from the crankshaft to a nut at the outboard end of the armature shaft which clamps the two securely together. Loosen this nut and back it off until the nut is even with the end of the bolt and then strike it a sharp blow. This will loosen the armature shaft, and it can be drawn off over the stud when the nut is removed.

On medium sized generators, a more flexible type of coupling is used which will allow for slight misalignment between the engine and the generator. In this arrangement, a flywheel is tapered and keyed to the crankshaft. A machined surface at the end of the armature shaft fits against a similar surface on the flywheel, and dowel pins lock them together. A drawbolt clamps the entire assembly together in a manner similar to the arrangement used on the smaller generators.

Loosening and removing the nut at the end of the armature shaft permits withdrawal of the armature. If it is desired to remove the flywheel to check the rear main engine bearing oil seal, strike the flywheel a sharp blow at the edge to loosen it, and pull it off.

On larger sized generators the armature is bolted to the generator blower. The blower in turn is bolted to a separate flywheel. Remove the four nuts just inside the rim of the blower. Support the armature while these are being loosened, and when the last one is off, slide the armature over the studs and set it to one side where it cannot roll or become damaged.

ARMATURE - The armature is made of of a stack of perforated disks or laminations pressed onto a shaft. Wire is wound on this stack, and the ends are connected to copper bars or rings. On direct current generators, there are only the bars, called a commutator, from which direct current is drawn. On alternating current generators, there are both the bars (commutator) which supply direct current for exciting the alternator field coils, and rings, known as collector rings, which supply alternating current. Separate windings are used for the bars and rings, but both windings are wound on the same shaft.

Always handle the armature carefully and do not allow it to roll around. It can be easily damaged by rough handling.

The commutator on the armature is probably the most frequent source of generator trouble. If it is dirty from brush wear, clean it with kerosene. If it is rough or pitted, the armature must be mounted in a lathe and the commutator turned until smooth. It will then be necessary to shave or undercut the mica insulation about 1/32" below the level of the copper to allow the brushs to ride on the copper bars without interference. Polish the commutator carefully, and be sure that there are no metal particles in the cuts. If the plant should be started with metal particles between the bars, the armature windings would burn out.

The commutator should maintain a polished surface. Blackening of all the bars indicates an incorrect brush position. Blackening of groups of bars at regular intervals may be due to the same cause or to poor contact. Blackening at irregular intervals indicates a rough or eccentric commutator. A severely burned bar or number of bars, plus excessive flashing when the plant is under load, indicates an open circuit in the windings. Use a lint free cloth to keep the commutator clean.

Over a period of time, the copper bars will wear down to the level of the mica insulation. The mica is harder than the copper, and will form ridges which will cause the brushes to jump, make poor contact, and be very noisy (noisy brushes are always an indication of a rough commutator). It will be necessary to re-turn the commutator as described above, to correct this condition.

Never use a lubricant on the commutator or brushes. The use of any lubricant will increase commutation difficulties and spoil the brushes.

REASSEMBLING THE GENERATOR - Reassembly is made by reversing the procedure used in disassembly. BE SURE THAT ALL PARTS ARE CLEAN. Before installing the armature, grease the end surface to keep it from rusting while in service, check the rear main bearing oil seal to be sure it is functioning properly.

Before installing the frame onto the crankcase, remove the bearing cap at the rear of the generator, and clean the bearing surface in the frame and the bearing on the armature shaft. Line up the notch in the bearing with the pin in the frame. Install the frame over the armature carefully, and tighten the bolts that hold it gradually and alternately. Never pull one down tight until the others are nearly tight. Repack the ball bearing with ball bearing grease only, and replace the gasket and cap.

BRUSHES - The brushes must move freely in their holders and make firm even contact with the commutator or collector rings. Always keep an extra set on hand and replace any brush that wears to 3/8" in length or less. See the illustration on "Care of Commutator and Brushes" for proper method of seating brushes to the commutator.

Brush spring tension must be the same on all brushes. Measure tension with the brush spring raised to a point where the top of the brush is even with the top of the brush holder. Install new springs if the tension is unequal.

Replace all the accessories which were mounted on the generator, and the plant will be ready to be put into operation. However, before attempting to start the engine, turn it over slowly for several revolutions to be sure that the armature is not binding or striking against the pole pieces. The armature would be spoiled if such a condition should exist when the plant is started.

## STORAGE

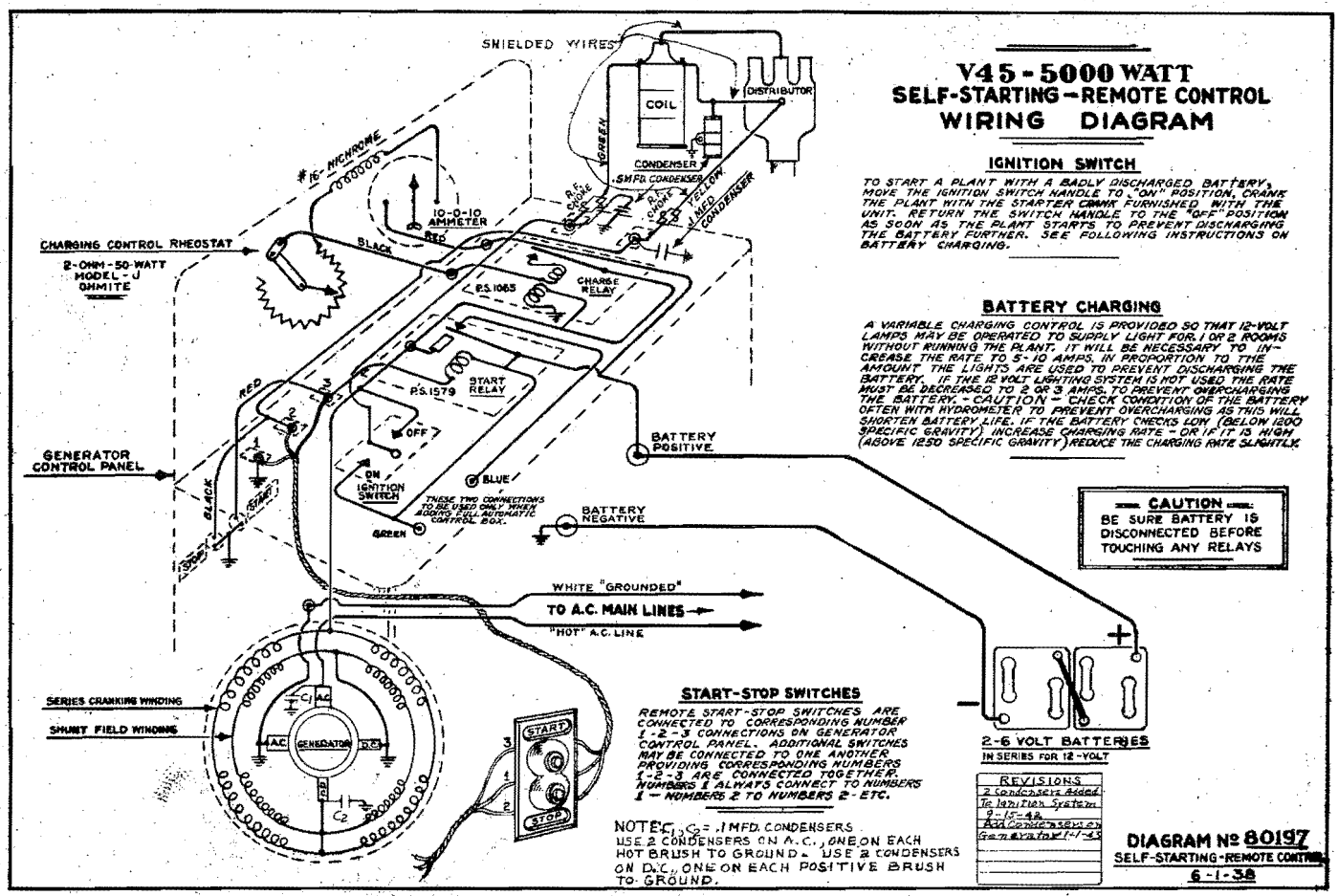
Certain precautions must be taken if the plant is not to be used for an extended period. Otherwise, rust or exposure may cause serious harm.

Preparation for Storage:

1. Drain the fuel from the tank and filter bowl.
2. Run the plant until it stops. This will remove the fuel from the line and the carburetor.
3. Drain all the oil from the crankcase.
4. Drain the liquid from the cooling system or add anti-freeze sufficient to protect against freezing.
5. Remove the spark plugs and pour 1/4 pint of S.A.E. #10 lubricating oil into each cylinder. Replace the plugs.
6. Cover all exposed rustable mechanical parts with a thin coating of grease.
7. Clean the commutator and brushes. Wipe with a fine lint-free cloth. Cover but do not coat any of the electrical parts.
8. Plug the exhaust opening so mositure cannot enter the valves, pistons, or cylinders.
9. Cover the plant so dirt and dust cannot settle on it.
10. Every two or three weeks turn the engine over a few times to redistribute the oil film over the wearing surfaces.
11. If the plant has batteries, store them in a warm spot. Check them periodically and recharge them every six to twelve weeks when needed.

Withdrawal from Storage:

1. Remove all protective coverings from the plant. Wipe off all traces of the grease.
2. Drain the fuel system of any water or sediment which may have accumulated.
3. Check all the fuel lines to be sure that they are "open" and that the connections are tight.
4. Replace the filter bowl gasket.
5. Fill the fuel tank and open the shut-off valve.
6. Fill the lubricating system with the proper grade of oil.
7. Fill the cooling system - use anti-freeze if necessary.
8. Check and tighten all electrical connections.
9. Inspect and clean the spark plugs.
10. Clean the breaker points in the magneto or distributor. Adjust them.
11. Turn the engine over several times with the spark plugs removed. This will remove the oil in the cylinders and fill the fuel lines and carburetor.
12. Check the tension of the fan belt. Readjust if needed, and add oil to the level in the fan hub.
13. When batteries are used, check the condition, and connect them to the plant.
14. Replace the spark plugs and start the plant in the usual manner.




# V45 - 5000 WATT SELF-STARTING - REMOTE CONTROL WIRING DIAGRAM

## IGNITION SWITCH

TO START A PLANT WITH A BADLY DISCHARGED BATTERY, MOVE THE IGNITION SWITCH HANDLE TO "ON" POSITION, CRANK THE PLANT WITH THE STARTER CRANK FURNISHED WITH THE UNIT. RETURN THE SWITCH HANDLE TO THE "OFF" POSITION AS SOON AS THE PLANT STARTS TO PREVENT DISCHARGING THE BATTERY FURTHER. SEE FOLLOWING INSTRUCTIONS ON BATTERY CHARGING.

## BATTERY CHARGING

A VARIABLE CHARGING CONTROL IS PROVIDED SO THAT 12-VOLT LAMPS MAY BE OPERATED TO SUPPLY LIGHT FOR 1 OR 2 ROOMS WITHOUT RUNNING THE PLANT. IT WILL BE NECESSARY TO INCREASE THE RATE TO 5-10 AMPS. IN PROPORTION TO THE AMOUNT THE LIGHTS ARE USED TO PREVENT DISCHARGING THE BATTERY. IF THE 12 VOLT LIGHTING SYSTEM IS NOT USED THE RATE MUST BE DECREASED TO 2 OR 3 AMPS. TO PREVENT OVERCHARGING THE BATTERY. - CAUTION - CHECK CONDITION OF THE BATTERY OFTEN WITH HYDROMETER TO PREVENT OVERCHARGING AS THIS WILL SHORTEN BATTERY LIFE. IF THE BATTERY CHECKS LOW (BELOW 1200 SPECIFIC GRAVITY) INCREASE CHARGING RATE - OR IF IT IS HIGH (ABOVE 1250 SPECIFIC GRAVITY) REDUCE THE CHARGING RATE SLIGHTLY.

**CAUTION**
BE SURE BATTERY IS DISCONNECTED BEFORE TOUCHING ANY RELAYS

## START-STOP SWITCHES

REMOTE START-STOP SWITCHES ARE CONNECTED TO CORRESPONDING NUMBER 1-2-3 CONNECTIONS ON GENERATOR CONTROL PANEL. ADDITIONAL SWITCHES MAY BE CONNECTED TO ONE ANOTHER PROVIDING CORRESPONDING NUMBERS 1-2-3 ARE CONNECTED TOGETHER. NUMBERS 1 ALWAYS CONNECT TO NUMBERS 1 - NUMBERS 2 TO NUMBERS 2 - ETC.

NOTE: $C_1, C_2$ = .1 MFD. CONDENSERS
USE 2 CONDENSERS ON A.C., ONE ON EACH HOT BRUSH TO GROUND - USE 2 CONDENSERS ON D.C., ONE ON EACH POSITIVE BRUSH TO GROUND.

| REVISIONS |
|---|
| 2 Condensers Added To Ignition System 9-15-48 |
| Add Condensers on Generator 1-1-49 |
| |
| |
| |
| |

DIAGRAM № 80197
SELF-STARTING-REMOTE CONTROL
6-1-38

# INSTRUCTIONS FOR ORDERING REPAIR PARTS

**FOR SERVICE OR PARTS, SEE THE DEALER FROM WHOM YOU PURCHASED THIS EQUIPMENT, OR REFER TO THE COMPANY REFERRED TO ON THE NAMEPLATE.**

Following these instructions will help to fill your order promptly and correctly.

Be sure to state on your order the Model Number and Serial 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.

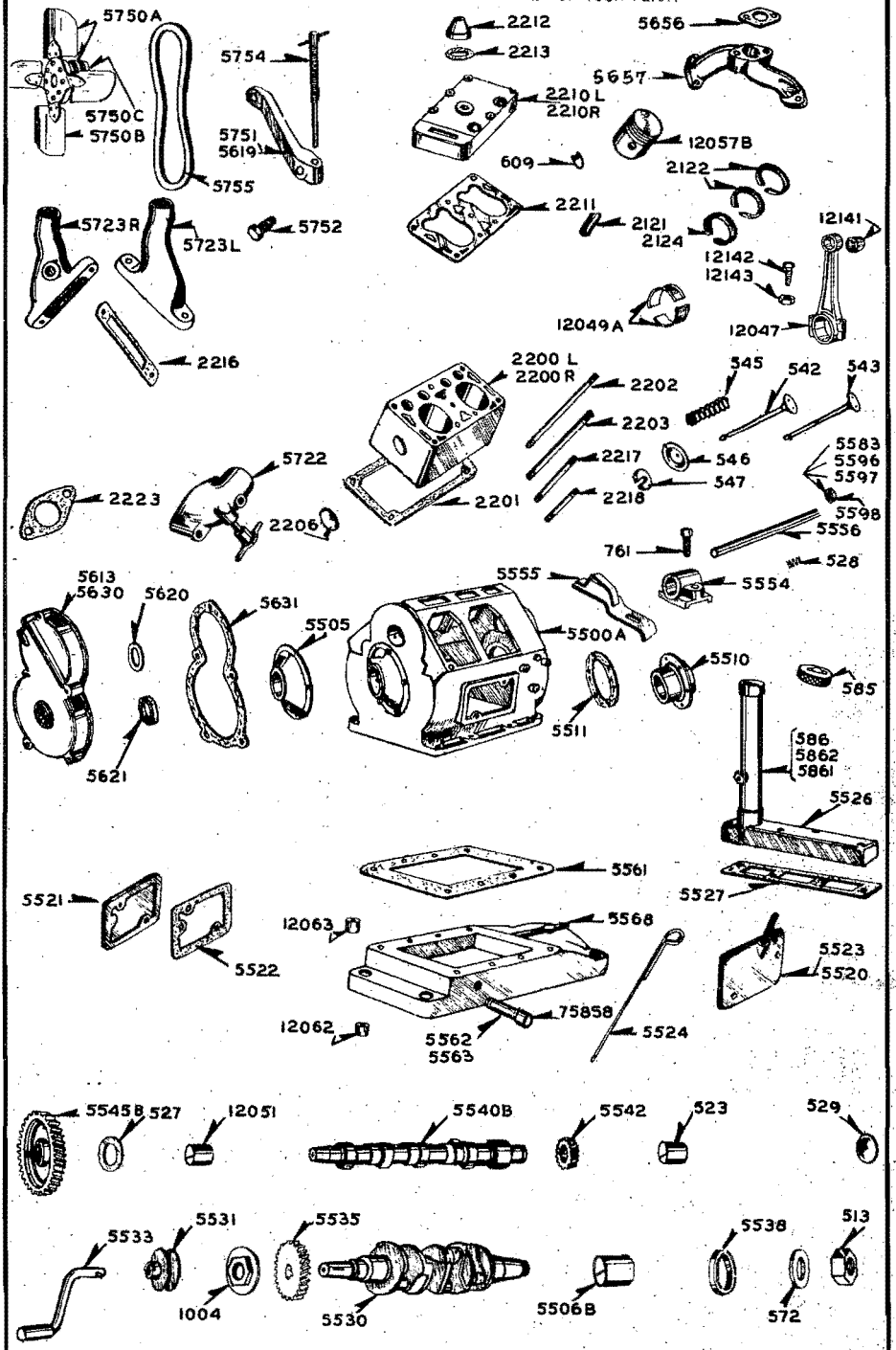
All shipments are complete unless the packing list indicates items are back ordered. Shipments are properly packed and in good order when delivered to the transportation company. Any claim for loss or damage in transit should be filed promptly against the transportation company making the delivery.

Prices quoted herein are F.O.B. factory.

**ADD 15% TO ALL PRICES LISTED**

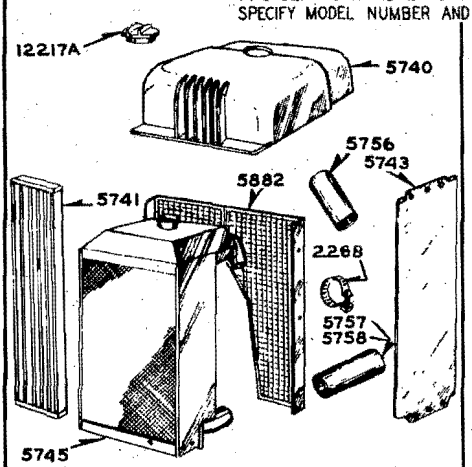
# V45 ENGINE PARTS

IN ORDER TO AVOID ERRORS WHEN ORDERING PARTS ALWAYS SPECIFY MODEL NUMBER AND SERIAL NUMBER OF YOUR PLANT

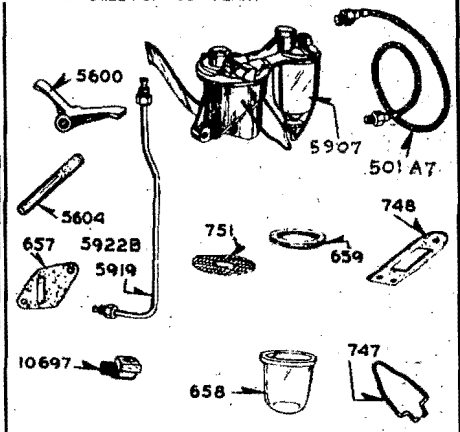


# V45 ENGINE ACCESSORIES

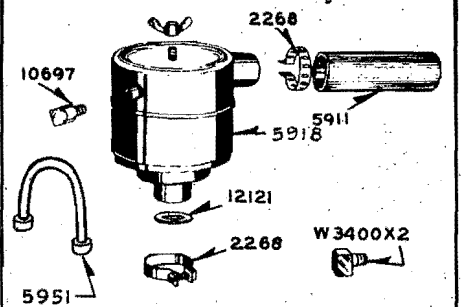
IN ORDER TO AVOID ERRORS WHEN ORDERING PARTS ALWAYS SPECIFY MODEL NUMBER AND SERIAL NUMBER OF YOUR PLANT



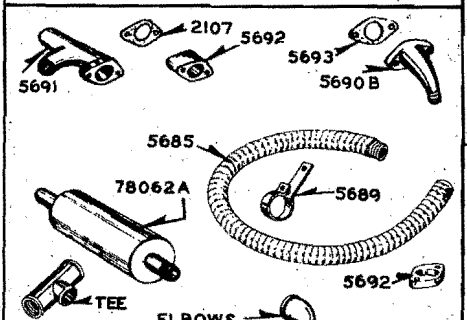

RADIATOR

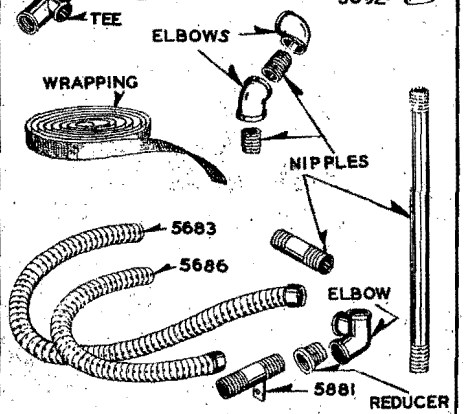



FUEL PUMP

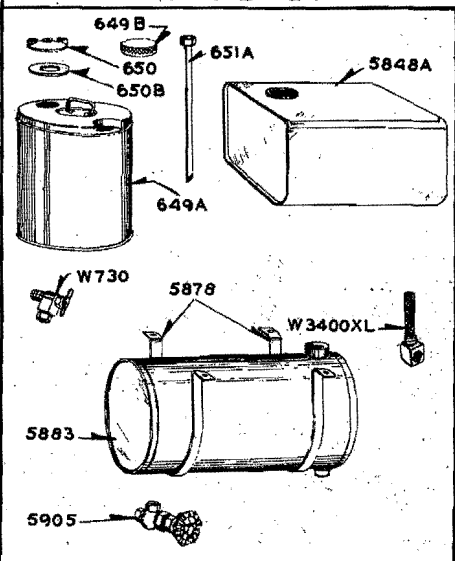



AIR CLEANER



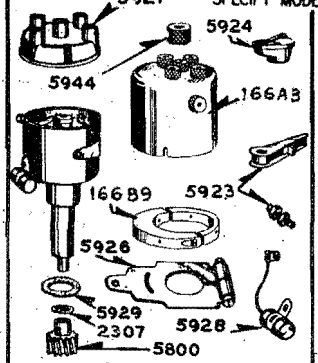

EXHAUST MUFFLER



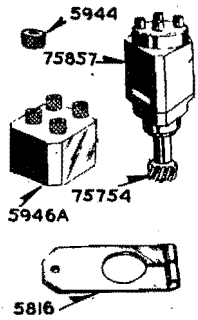

FUEL TANK & FITTINGS

# V45 ENGINE ACCESSORIES

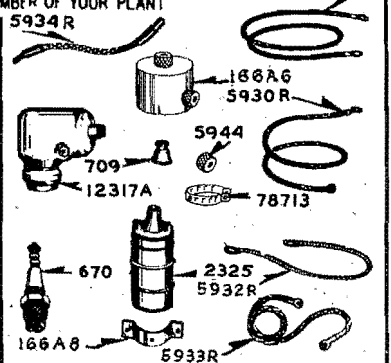
IN ORDER TO AVOID ERRORS WHEN ORDERING PARTS ALWAYS SPECIFY MODEL NUMBER AND SERIAL NUMBER OF YOUR PLANT



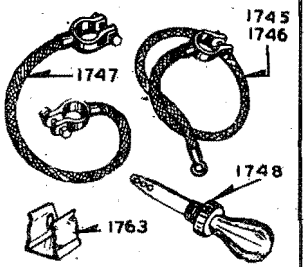

DISTRIBUTOR



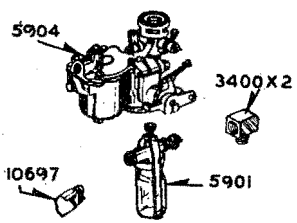

MAGNETO



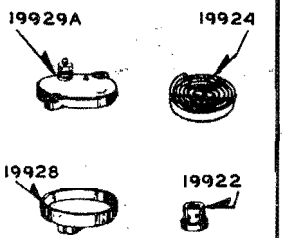

IGNITION COIL & SPARK PLUG



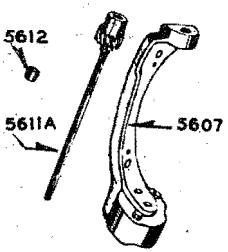

BATTERY ACCESSORIES

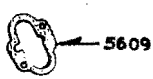


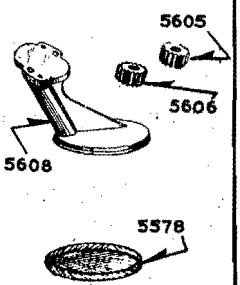

CARBURETOR & FILTER



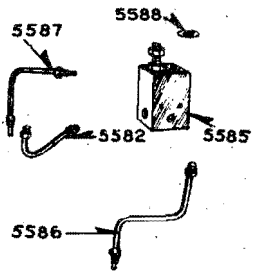

ELECTRIC CHOKE



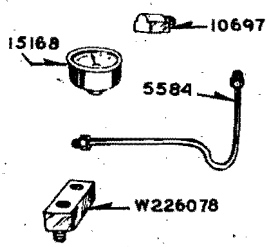



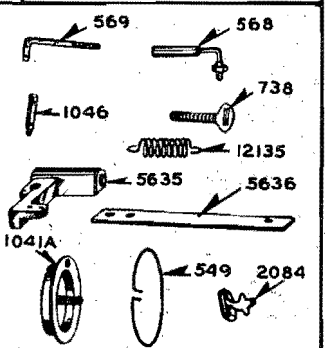

OIL PUMP



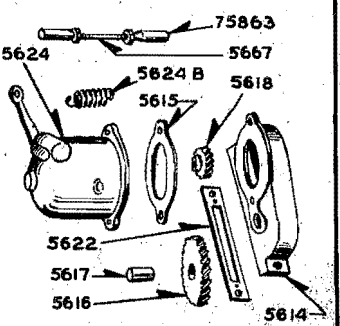

OIL BY PASS




OIL GAUGE

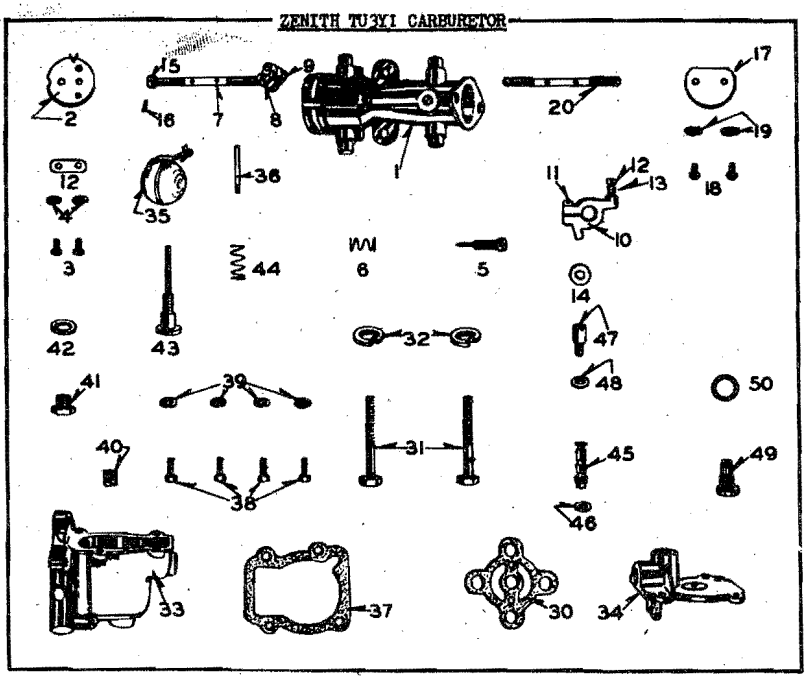



INTERNAL GOVERNOR



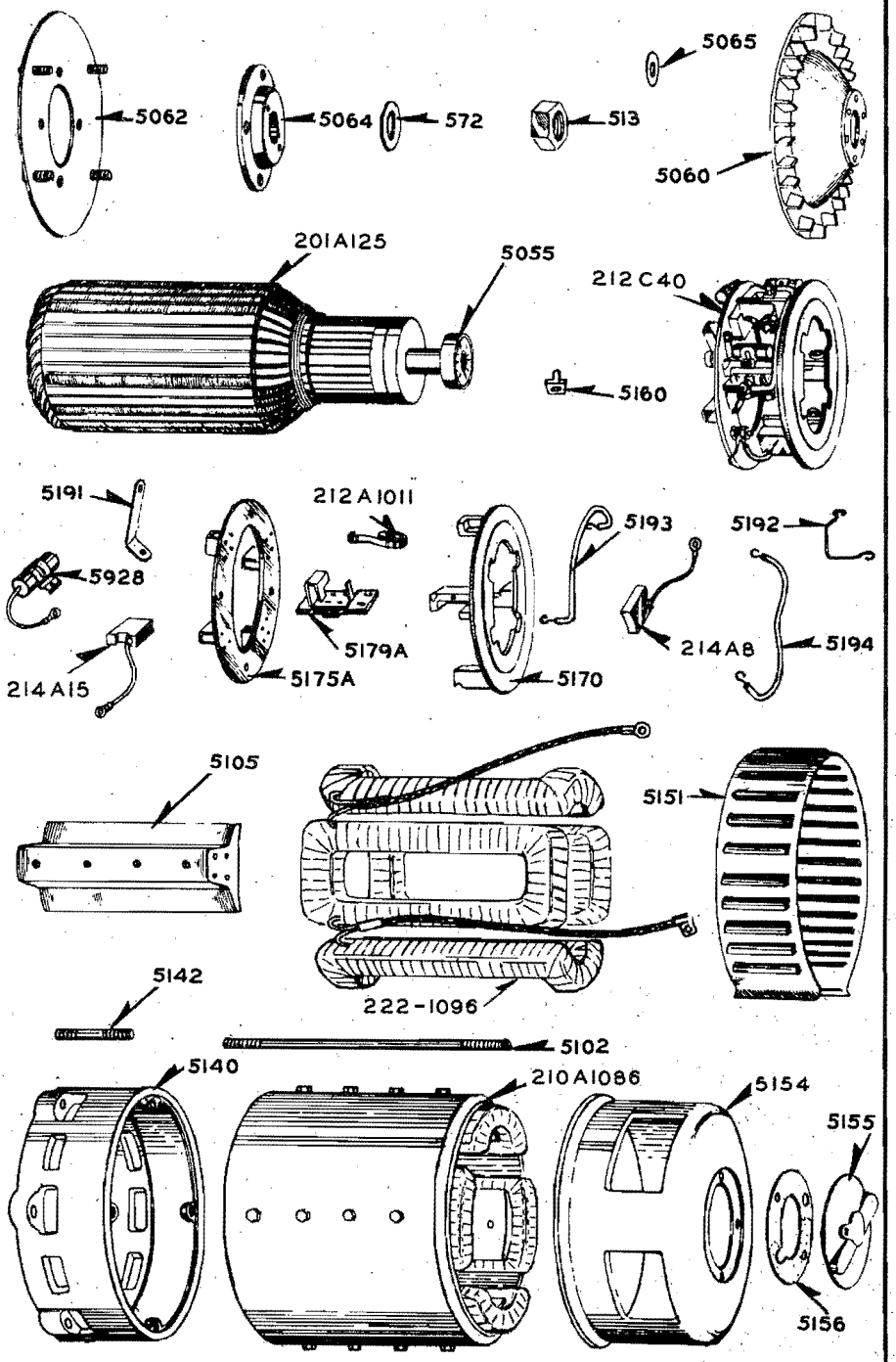

EXTERNAL GOVERNOR

## ZENITH TU3VI CARBURETOR




| NO. | PART NO. | PART NAME | PRICE EACH |
|---|---|---|---|
| 1 | B2-148-1 | Assembly - Throttle Body | $ 4.00 |
| 2 | C21-135 | Throttle Plate | .40 |
| 3 | T15B5-3 | Throttle Plate Screw (2 used) | .05 |
| 4 | CR22-1 | Lockwasher - Throttle Plate Screw | .10 |
| 5 | C46-25 | Idle Adjusting Screw | .30 |
| 6 | C111-9 | Idle Adjusting Screw Spring | .10 |
| 7 | C23-7 | Throttle Shaft | .50 |
| 8 | C24-42 | Throttle Clamp Lever (1") | .75 |
| 9 | T1S10-8 | Clamp Screw - Clamp Lever | .05 |
| 10 | C28-27 | Throttle Stop Lever | .50 |
| 11 | T8S10-9 | Clamp Screw - Stop Lever | .05 |
| 12 | T1S10-14 | Throttle Stop Screw | .05 |
| 13 | C111-62 | Spring - Stop Screw | .10 |
| 14 | CT52-8 | Spacer - Throttle Lever (3 used) | .05 |
| 15 | C130-3 | Thrust Washer - Throttle Shaft | .05 |
| 16 | CT63-1 | Taper Pin - Thrust Washer | .05 |
| 17 | D-8967 | Air Shutter | .25 |
| 18 | T15B5-3 | Retaining Screw - Air Shutter (2 used) | .05 |
| 19 | CR22-1 | Lockwasher - Retaining Screw | .10 |
| 20 | C23-213 | Air Shutter Shaft | .50 |
| 30 | C142-2 | Gasket - Throttle Body to Bowl | .10 |
| 31 | T285-20 | Assembly Screw - Body to Bowl (2 used) | .10 |
| 32 | T44-25 | Lockwasher - Body to Bowl (2 used) | .05 |
| 33 | B3-7-2 | Assembly - Fuel Bowl | 2.00 |
| 34 | C6-3D | Assembly - Fuel Bowl Cover | .75 |
| 35 | C85-15 | Assembly - Float | .60 |
| 36 | C121-14 | Float Axle | .10 |
| 37 | C144-1-1 | Gasket - Bowl to Cover | .10 |
| 38 | T1S10-8 | Assembly Screw - Bowl to Cover (4 used) | .05 |
| 39 | T41-10 | Lockwasher - Bowl to Cover (4 used) | .05 |
| 40 | CT91-1 | 1/8" Pipe Plug - Bowl Drain | .10 |
| 41 | C138-23 | Lower Plug | .35 |
| 42 | TSC-23 | Fibre Washer | .05 |
| 43 | C73-7 | Assembly Main Jet Adjustment | .90 |
| 44 | C111-21 | Spring - Jet Adjustment | .10 |
| 45 | C76-23 | Metering Well #50 | .75 |
| 46 | T56-24 | Fibre Washer - Metering Well | .05 |
| 47 | C59-2 | Main Jet #20 | .75 |
| 48 | T56-4 | Fibre Washer - Main Jet | .05 |
| 49 | C81-2 | Assembly - Fuel Valve Seat #22 | .75 |
| 50 | T56-23 | Fibre Washer - Fuel Valve | .05 |

# GENERATOR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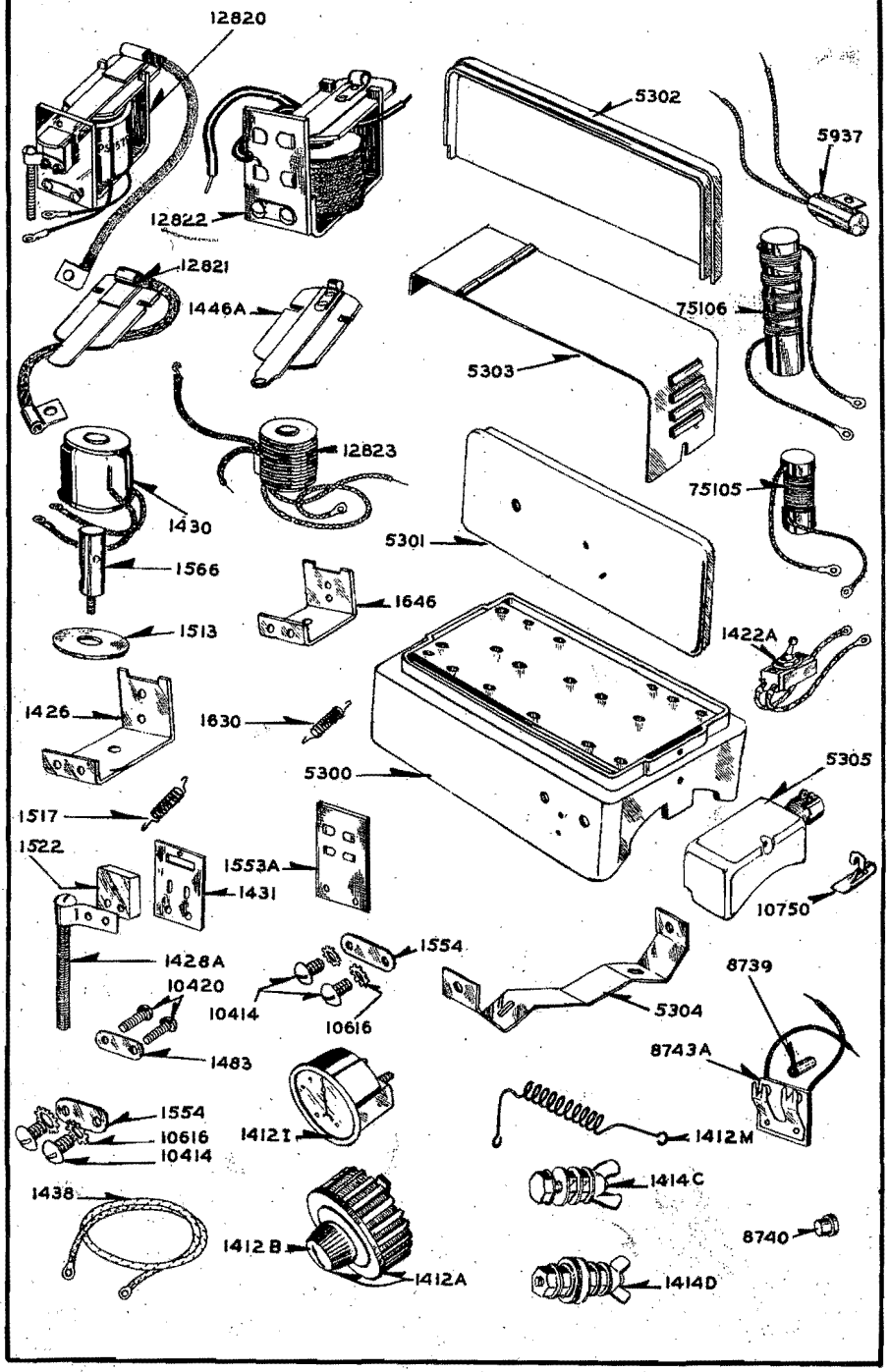
# CONTROL PARTS



| PART NO. | DESCRIPTION | PRICE EACH |
|---|---|---|
| 513 | Flywheel Nut | $ .35 |
| 523 | Rear Camshaft Bearing | .65 |
| 527 | Cam Gear Washer | .20 |
| 528 | Cam Follower Spring | .15 |
| 529 | Camshaft Rear Bearing Hubbard Plug - 2" | .05 |
| 542 | Intake Valve | .80 |
| 543 | Exhaust Valve | .80 |
| 544 | Exhaust Valve Seat | .50 |
| 545 | Valve Spring | .15 |
| 546 | Valve Spring Washer | .05 |
| 547 | Valve Lock | .05 |
| 572 | Flywheel Nut Lockwasher | .05 |
| 585 | Oil Filler Cap | .50 |
| 586 | Oil Filler Neck | .25 |
| 609 | Piston Pin Lock Ring | .05 |
| 761 | Cam Follower Screw - 1/4" x 3/4" S.A.E. Hardened | .05 |
| 1004 | Crankgear Nut | .50 |
| 2121 | Piston Pin -3/4" x 2-7/16" | .50 |
| 2122 | Compression Ring - 3/32" x 3" S-113-39 | .40 |
| 2124 | Oil Ring - 3/16" x 3" | .50 |
| 2200L | Cylinder Block - Left - 3" | 20.00 |
| 2200R | Cylinder Block - Right - 3" | 20.00 |
| 2201 | Cylinder Block Base Gasket | .30 |
| 2202 | Cylinder Block Stud - Long | .30 |
| 2203 | Cylinder Block Stud - Short | .30 |
| 2206 | Cylinder Block Hubbard Plug | .05 |
| 2210L | Cylinder Head - Left - 3" | 7.50 |
| 2210R | Cylinder Head - Right - 3" | 7.50 |
| 2211 | Cylinder Head Gasket | .85 |
| 2212 | Cylinder Head Cap | .35 |
| 2213 | Cylinder Head Cap Gasket | .10 |
| 2216 | Cylinder Water Outlet Gasket | .15 |
| 2217 | Cylinder Head Stud - Long | .25 |
| 2218 | Cylinder Head Stud - Short | .25 |
| 2223 | Cylinder Water Inlet Gasket | .10 |
| 5500A | Crankcase Assembly - with Bearings | 50.00 |
| 5505 | Crankcase Front Bearing Plate | 2.75 |
| 5506B | Main Bearing Only - Front & Rear | .85 |
| 5510 | Crankcase Rear Bearing Plate | 3.50 |
| 5511 | Rear Bearing Plate Gasket - 1/64" Vellumoid | .20 |
| 5520 | Crankcase Inspection Plate - Right | .65 |
| 5521 | Crankcase Inspection Plate - Left | .65 |
| 5522 | Crankcase Inspection Plate Gasket | .20 |
| 5523 | Oil Level Gauge Tube | .25 |
| 5524 | Oil Level Gauge - Bayonet Type - 5/16" Half-round c 8-5/16" | .35 |
| 5526 | Valve Tappet Cover | 1.75 |
| 5527 | Valve Tappet Cover Gasket | .30 |
| 5530 | Crankshaft | 35.00 |
| 5531 | Fan Pulley and Crankdog | 1.50 |
| 5533 | Hand Crank | 1.25 |
| 5534 | Set Screw for Fan Pulley - 5/16" x 5/8" | .10 |
| 5535 | Crankshaft Gear - Steel | 3.25 |
| 5538 | Crankshaft Oil Seal - #40076 | 1.00 |

## ENGINE PARTS

| PART NO. | DESCRIPTION | PRICE EACH |
|---|---|---|
| 5540B | Camshaft | $ 10.00 |
| 5542 | Camshaft Distributor Drive Gear | 1.25 |
| 5545B | Camshaft Gear | 3.75 |
| 5554 | Cam Follower Bearing | .45 |
| 5555 | Cam Follower Lever Only - 5/8" x 1/8" | .65 |
| 5556 | Cam Follower Shaft - 1/2" | 1.10 |
| 5561 | Oil Base Gasket | .35 |
| 5562 | Oil Base Drain Nipple - 1/2" x 3" | .15 |
| 5563 | Oil Base Drain Nipple 1/2" x 6" - Housed Models | .25 |
| 5568 | Oil Base | 10.00 |
| 5583 | Cam Follower Shaft Spacer - 3/32" Thick x 1/2" I.D. x 5/8" O.D. | .05 |
| 5596 | Cam Follower Shaft Spacer - 5/32" Thick x 1/2" I.D. x 5/8" O.D. | .05 |
| 5597 | Cam Follower Shaft Spacer - 1/4" Thick x 1/2" I.D. x 5/8" O.D. | .05 |
| 5598 | Cam Follower Shaft Spacer - 5/16" Thick x 1/2" I.D. x 5/8" O.D. | .05 |
| 5613 | Gearcase Cover - For use with Pierce Governor | 4.50 |
| 5619 | Fan Support Arm - Used with Pierce Governor | 1.50 |
| 5620 | Front Oil Retaining Washer | .10 |
| 5621 | Front Oil Seal | .15 |
| 5630 | Gearcase Cover - for Onan Governor | 4.50 |
| 5631 | Gearcase Cover Gasket | .35 |
| 5654R | Cylinder Water Outlet Right (Use with Pierce Governor | 2.00 |
| 5657 | Intake Manifold | 2.50 |
| 5656 | Intake Manifold Gasket | .10 |
| 5722 | Cylinder Water Inlet | 1.25 |
| 5723R | Cylinder Water Outlet - Right | 1.50 |
| 5723L | Cylinder Water Outlet - Left | 1.50 |
| 5750A | Fan Assembly with Hub and Blade | 8.50 |
| 5750B | Fan Blade Assembly | 4.50 |
| 5750C | Fan Hub Assembly | 4.00 |
| 5751 | Fan Support Arm Only | .50 |
| 5752 | Fan Support Arm Bolt 5/8" x 1-1/2" | .15 |
| 5754 | Fan Support Arm Adjusting Stud | .40 |
| 5755 | Fan Belt - "V" #3033 | 1.15 |
| 5861 | Oil Filler Tube - Standard Models | .75 |
| 5862 | Oil Filler Tube - Housed Models | .75 |
| 12047 | Connecting Rod - Insert Type - Forged | 3.75 |
| 12047A | Connecting Rod Assy. - Includes Inserts, Bushings and Bolts | 4.75 |
| 12049A | Bearing Insert Assembly - 2 Halves. 11.48/12 | 1.00 |
| 12051 | Camshaft Bearing - Front | .70 |
| 12057B | Piston & Pin Assembly | 5.50 |
| 12062 | Oil Base Mounting Rubber - Lower - 1-7/8" Long. | .20 |
| 12063 | Oil Base Mounting Rubber - Upper - 1" Long | .20 |
| 12141 | Piston Pin Bushing | .45 |
| 12142 | Connecting Rod Bolts | .10 |
| 12143 | Connecting Rod Bolt Nut | .05 |
| 76567 | Water Temperature Gauge | 3.00 |
| 75858 | Oil Drain Coupling - 1/2" | .15 |

## SCREWS, NUTS AND BOLTS

| QUAN. USED | DESCRIPTION | PRICE EACH |
|---|---|---|
| 6 | 5/16" x 7/8" Hex. Hd. Cap Screw - Rear Bearing Plate | $ .05 |
| 6 | 5/16" Copper Washer - Rear Bearing Plate | .05 |
| 5 | 5/16" x 7/8" Hex Hd. Cap Screw - Front Bearing Plate | .05 |
| 5 | 5/16" Steel Spring Lockwasher - Front Bearing Plate | .05 |
| 16 | 7/16" S.A.E. Cap Nut - Cylinder Head | .05 |
| 2 | 7/16" Copper Washer - Cylinder Head Cap | .05 |
| 2 | 5/16" x 2-3/4" Hex. Hd. Cap Screw - Water Inlet to Block | .05 |
| 2 | 5/16" x 1-1/2" Hex Hd. Cap Screw - Water Inlet to Block | .05 |
| 4 | 5/16" Copper Washer - Water Inlet to Block | .05 |
| 4 | 3/8" x 1-1/4" Hex. Hd. Cap Screw - Crankcase Inspection Plate | .05 |
| 4 | 3/8" Lockwasher - Crankcase Inspection Plate | .05 |
| 8 | 7/16" x 1-1/2" - Oil Base Mtg. Screw | .05 |
| 8 | 7/16" Lockwasher - Oil Base Mtg | .05 |
| 4 | 5/16" x 2" Hex. Hd. Cap Screw - Valve Cover | .05 |
| 4 | 5/16" Copper Washer - Valve Cover | .05 |
| 4 | 5/16" x 3/4" Hex. Hd. Cap Screw - Int. Man. to Cylinder Block | .05 |
| 4 | 5/16" Copper Washer - Int. Man. to Cyl. Block | .05 |
| 4 | 5/16" x 1/2" Hex. Hd. Cap Screw - Cyl. Block Side | .05 |
| 4 | 5/16" Copper Washer - Cyl Block Side | .05 |
| 3 | 5/16" x 2-1/2" Hex. Hd. Cap Screw - Gearcase Cover | .05 |
| 2 | 5/16" x 7/8" Hex. Hd. Cap Screw - Gearcase Cover. | .05 |
| 5 | 5/16" Copper Washer - Gearcase Cover | .05 |
| 2 | 5/16" x 5/8" USS Allen Hd. Set Screw - Crankdog | .05 |
| 1 | 5/8" x 1-1/4" Hex. Hd. Cap Screw - Fan Arm Mtg. | .05 |
| 1 | 5/8" Lockwasher - Fan Arm. Mtg | .05 |
| 1 | 1/2" Hex. Nut - Fan Support Arm | .05 |
| 2 | 5/16" x 3/4" Hex. Hd. Cap Screw - Crank Guide Brkt. | .05 |
| 2 | 5/16" Lockwasher - Crank Guide Brkt | .05 |
| 2 | 5/16" Hex. Nut - Crank Guide Brkt | .05 |
| 1 | #10 x 1/2" Self Tapping Screw - Manual Choke Mtg. Brkt | .05 |
| 2 | 1/2" Pipe Plug - Oil Base Drain | .05 |
| 1 | 3/8" Pipe Plug - Cyl. Water Outlet Temperature Guage Hole | .05 |

## ENGINE ACCESSORIES PARTS

### RADIATOR

| PART NO. | DESCRIPTION | PRICE EACH |
|---|---|---|
| 2268 | Radiator Hose Clamp | $ .10 |
| 5729 | Radiator Filler Cap Only | .35 |
| 5740 | Radiator Top - Casting | 6.00 |
| 5741 | Radiator Grille | 1.00 |
| 5742 | Radiator Base - Casting | 5.00 |
| 5743 | Radiator Side Panel | 2.25 |
| 5745 | Radiator Core and Tank Assembly | 36.00 |
| 5746 | Radiator Base Stud Long - 3/8" x 10-5/16" | .35 |
| 5747 | Radiator Base Stud Short - 3/8" x 9-3/4" | .30 |
| 5748 | Radiator Base Gasket 1/8" Cork | .35 |
| 5756 | Radiator Hose - Upper - 1-5/8" x 5-1/2" | .40 |
| 5757 | Radiator Hose - Lower Rt. - 1-5/8" x 4-1/2" | .35 |
| 5758 | Radiator Hose - Lower Left 1-5/8" x 7-1/2" | .50 |
| 5882 | Fan Shroud | 4.35 |
| 12217A | Radiator Cap Assembly | 1.20 |
| 12219 | Radiator Drain Nipple - 1/8" x 6" | .15 |
| 12220 | Radiator Drain Lock - Long #185 - 1/8" x 1-3/4" | .50 |
| 12221 | Radiator Drain Coupling - 1/8" Pipe | .10 |

### SCREWS, NUTS AND BOLTS

| QUAN. USED | DESCRIPTION | PRICE EACH |
|---|---|---|
| 12 | 5/16" x 1/2" Rd. Hd. Mach. Screw - Radiator Side Panel | $ .05 |
| 12 | 5/16" Lockwasher - Radiator Side Panel | .05 |
| 2 | 5/16" x 5/8" Rd. Hd. Mach. Screw - Radiator to Top Bracket | .05 |
| 2 | 5/16" Lockwasher - Radiator to Top Bracket | .05 |
| 2 | 5/16" Hex. Nut - Radiator to Top Bracket | .05 |
| 4 | 1/4" x 1/2" Rd. Hd. Mach. Screw - Radiator Grille | .05 |
| 4 | 1/4" Lockwasher - Radiator Grille | .05 |
| 8 | 10-24 x 1-1/2" Rd. Hd. Mach. Screw - Radiator Hose Clamp | .05 |
| 8 | #10 Square Head Nut - Radiator Hose Clamp | .05 |
| 4 | 3/8" Lockwasher - Radiator Base Stud | .05 |
| 4 | 3/8" S.A.E. Cap Nut - Radiator Base Stud | .05 |
| 2 | 5/16" x 1" Hex. Hd. Cap Screw - Radiator Mtg. Screw | .05 |
| 2 | 5/16" Lockwasher - Radiator Mtg. Screw | .05 |
| 2 | 5/16" Hex. Nut - Radiator Mtg. Screw | .05 |
| 1 | #8 x 3/8" Flat Hd. Self Tapping Screw - Rod Cap Cover | .05 |

## FUEL PUMP

| PART NO. | DESCRIPTION | PRICE EACH |
|---|---|---|
| 501A7 | Fuel Line - Flexible - Tank to Pump..... | $ 1.25 |
| 657 | Fuel Pump Mounting Gasket..... | .15 |
| 658 | Fuel Pump Glass Bowl - AC #848004..... | .25 |
| 659 | Fuel Pump Bowl Gasket - AC #854003..... | .10 |
| 747 | Fuel Pump Primer Lever - AC #1522280.... | .25 |
| 748 | Fuel Pump Primer Lever Cover Gasket - AC #855229..... | .10 |
| 750 | Fuel Pump Diaphragm Kit..... | .75 |
| 751 | Fuel Pump Filter Screen..... | .20 |
| 5600 | Fuel Pump Eccentric Follower Lever..... | 1.25 |
| 5604 | Fuel Pump Eccentric Follower Shaft..... | .60 |
| 5907 | Pump, Fuel-Assembly ..... | 6.50 |
| 5919 | Fuel Line - Copper Tank to Pump - Manual Plants with Mounted Tank ..... | .75 |
| 5922B | Fuel Line - Copper - Pump to Carburetor. | 1.00 |
| 10697 | Inverted Male Elbow..... | .25 |

### SCREWS, NUTS AND BOLTS

| QUAN. USED | DESCRIPTION | PRICE EACH |
|---|---|---|
| 2 | 5/16" x 7/8" Hex. Hd. Cap Screws - Fuel Pump Mtg..... | $ .05 |
| 2 | 5/16" Copper Washer..... | .05 |

## EXHAUST MUFFLER

| PART NO. | DESCRIPTION | PRICE EACH |
|---|---|---|
| 737 | Exhaust Manifold Stud | $ .10 |
| 2107 | Exhaust Flange Gasket | .10 |
| 5683 | Exhaust Tube - Long - 1-1/4" x 24" Flexible - Standard | .75 |
| 5685 | Exhaust Tube - 1-1/16" x 36" - Outlet Stardard Models | 1.50 |
| 5686 | Exhaust Tube - Short - 1-1/4" x 16" - Flexible Standard | .30 |
| 5689 | Exhaust Tube Bracket - Std. Models | .85 |
| 5690B | Exhaust Outlet | 1.25 |
| 5691 | Exhaust Outlet Tee - 1-1/2" | 1.75 |
| 5692 | Exhaust Tee Flange - 1 used on Std. - 2 on Spec. Housed | .40 |
| 5693 | Exhaust Tee and Outlet Gasket | .15 |
| 5881 | Nipple and Bracket Assy. 1" x 4" - Spec. Housed Model Only | .45 |
| 78062A | Exhaust Muffler Assy | 5.00 |
| | Side Outlet Elbow - 1/4" Std. - Special Housed Model Only | 1.50 |
| | Reducing Bushing - 1-1/4" to 1". Special Housed Model Only | .15 |
| | Pipe Nipple - 1" x 4" - Special Housed Model Only | .20 |
| | Pipe Nipple - 1-1/4" x 29" - Special Housed Model Only | 1.25 |
| | Pipe Elbow - 1-1/4" x 45° - Special Housed Model Only | .5( |
| | Pipe Tee - 1-1/2" - Spec. Housed Model Only | .7( |
| | Close Nipple - 1-1/4" - Spec. Housed Model Only | .2( |
| | Reducing Elbow - 1-1/2" to 1-1/4" x 90° - Spec. Housed Model Only | .6( |
| | Asbestos Wrapping - 2" "ide - Spec. Housed Model Only per ft. | .1( |

## SCREWS, NUTS AND BOLTS

| QUAN. USED | DESCRIPTION | PRICE EACH |
|---|---|---|
| 4 | 5/16" Lockwasher - Exhaust Outlet | $ .05 |
| 4 | 5/16" S.A.E. Nut - Exhaust Outlet | .0 |
| 1 | 5/16" x 1" Hex. Hd. Cap Screw - Exhaust Tube to Radiator | .( |
| 1 | 5/16" Hex Nut - Exhaust Tube to Radiator | . |
| 1 | 5/16" Lockwasher - Exhaust Tube to Radiator | |
| 1 | 5/16" x 1" Hex. Hd. Cap Screw - Exhaust Tube Clamp | |
| 1 | 5/16" Lockwasher - Exhaust Tube Clamp | |

## AIR CLEANER

| PART NO. | DESCRIPTION | PRICE EACH |
|---|---|---|
| 2268 | Radiator Hose Clamp - 2" - To Air Cleaner... | $ .10 |
| 5911 | Air Cleaner to Radiator Hose..... | .50 |
| 5918 | Cleaner, Air ..... | 5.25 |
| 5951 | Breather, Crankcase ..... | 1.00 |
| 10697 | Inverted Male Elbow - 400 x 4 Weatherhead... | .25 |
| 12121 | Air Cleaner Gasket ..... | .10 |
| W-3400x2 | Stret Elbow - 1/8" Pipe Thread - Weatherhead | .25 |

## SCREWS, NUTS AND BOLTS

| QUAN. USED | DESCRIPTION | PRICE EACH |
|---|---|---|
| 1 | 1/4" x 1" Rd. Hd. Mach. Screw - Clamp Screw. | $ .05 |
| 1 | 1/4" Square Nut - Clamp Screw..... | .05 |
| 1 | 1/4" Wing Nut - Air Cleaner Stud..... | .05 |
| 2 | 10-24 x 1-1/2" Rd. Hd. Mach. Screw - Radiator Hose Clamp..... | .05 |
| 2 | #10 Square Hd. Nut - Radiator Hose Clamp.... | .05 |

## FUEL TANK AND FITTINGS

| PART NO. | DESCRIPTION | PRICE EACH |
|---|---|---|
| 649A | Fuel Supply Tank - Complete - Round 5 Gal... | $ 3.50 |
| 649B | Fuel Tank Cap..... | .15 |
| 650 | Fuel Tank Tube Base - Complete - Round 5 Gal | .40 |
| 650B | Fuel Tank Tube Base Gasket..... | .10 |
| 651A | Fuel Tank Tube with Fittings..... | .45 |
| 5848A | Fuel Supply Tank - Square 5 Gal. Manual Plants Only..... | 11.00 |
| 5878 | Fuel Tank Brackets for #5883 Fuel Tank..... | .50 |
| 5905 | Fuel Valve - Drain and Outlet to Carburetor. | 2.50 |
| 5913 | Reservoir Tank..... | 4.25 |
| 5914 | Tank Mounting Bracket..... | 2.75 |
| 5915 | Gasoline Line Support..... | .30 |
| 5917 | Gasoline Line Clamp..... | .15 |
| 19466 | Two Way Valve for Fuel Line..... | 2.00 |
| 19469 | Flexible Fuel Line - 42" Long with 1/4" Inverted Nuts..... | 1.50 |
| W730 | Fuel Tank Shut-off Cock - Manual Plants Only | .75 |
| W3400X2 | Street Elbow with Screen - Manual Plants Only | .40 |

## DISTRIBUTOR

| PART NO. PART NO. | DESCRIPTION | PRICE EACH |
|---|---|---|
| 2307 | Distributor Gear Thrust Washer | $ .10 |
| 5800 | Distributor Driven Gear | 1.25 |
| 5923 | Breaker Contact Arm and Screw Set | .95 |
| 5924 | Ignition Distributor Rotor | .50 |
| 5925 | Distributor Assembly - Less Gear | 9.50 |
| 5926 | Distributor Lock Clamp | .35 |
| 5927 | Distributor Cap | 1.25 |
| 5928 | Ignition Condenser .1 MFD. | .50 |
| 5929 | Distributor Gasket | .10 |
| 166A3 | Distributor Shield | 3.00 |
| 5944 | Distributor Radio Shield Outlet Nipple Coupling Nut | .25 |
| 166B9 | Distributor Shield Collar | .85 |

## SCREWS, NUTS AND BOLTS

| QUAN. USED | DESCRIPTION | PRICE EACH |
|---|---|---|
| 1 | 1/4" x 5/8" Hex. Hd. Cap Screw - Distributor Clamp | .05 |
| 1 | 1/4" Lockwasher - Distributor Clamp | .05 |
| 1 | 10-32 x 1-3/8" Clamp Screw - Dist. Clamp | .05 |
| 1 | 10-32 Square Nut - Distributor Clamp | .05 |
| 2 | 10-32 Hex. Nut - Dist. Coil Primary Terminals | .05 |
| 2 | 10-32 Lockwasher - Dist. Coil Primary Terminals | .05 |

## IGNITION COIL AND SPARK PLUG

| PART NO. | DESCRIPTION | PRICE EACH |
|---|---|---|
| 670 | Spark Plug - Champion 6M ..... | $ .65 |
| 709 | Ignition Coil Nipple ..... | .05 |
| 2325 | Ignition Coil - 12 Volt ..... | 5.50 |
| 78713 | Ignition Coil Clamp ..... | .25 |
| 5930R | Spark Plug Cable #1 (16" Long) Radio Shielded ..... | .75 |
| 5931R | Spark Plug Cable #2 (21-1/4" Long) Radio Shielded .. | .85 |
| 5932R | Spark Plug Cable #3 (9-1/4" Long) Radio Shielded ... | .60 |
| 5933R | Spark Plug Cable #4 (19-3/4" Long) Radio Shielded .. | .85 |
| 5934R | Coil to Distributor High Tension Cable ..... | .35 |
| 166A6 | Ignition Coil Shield ..... | 3.10 |
| 5944 | Ignition Coil Shield Outlet Nipple Coupling Nut .... | .25 |
| 12317A | Spark Plug Shield Assembly ..... | .75 |
| 166A8 | Ignition Coil Shield Clamp ..... | 1.60 |
| 336A23 | Lead - Coil To Stop Circuit (1), Coil To Battery (1) | .50 |
| 336A26 | Lead - Coil To Distributor (Not Illustrated) ..... | .35 |
| 314A7 | Shield, Suppressor (Not Illustrated) ..... | .35 |
| 314A8 | Tube, Suppressor Shield (Not Illustrated) ..... | .10 |
| 167A1060 | Lead, Coil to Distributor (Not Illustrated) ..... | |

## SCREWS, NUTS AND WASHERS

| QUAN. USED | DESCRIPTION | PRICE EACH |
|---|---|---|
| 1 | 10-32 x 1-1/4" - Rd. Hd. Mach. Screw ..... | .02 |
| 1 | 10-32 - Plated Hex. Nut ..... | .01 |
| 1 | #10 - Split Lockwasher ..... | .01 |
| 1 | #10 - Int. Ext. Tooth Lock Washer ..... | .01 |

## BATTERY

| PART NO. | DESCRIPTION | PRICE EACH |
|---|---|---|
| 1745 | Cable - Battery to Plant Positive - 36" Long ..... | $ .90 |
| 1746 | Cable - Battery to Plant Negative - 36" Long ..... | .90 |
| 1747 | Battery Connector Cable - 6-3/4" Long ..... | .50 |
| 1748 | Battery Hydrometer ..... | .75 |
| 1763 | Battery Fuse Clip ..... | .15 |
| 1767B | Battery Fuse - 50 Amp ..... | .25 |
| 5939 | Battery - 17CL - Grant ..... | 12.00 |

## CARBURETOR AND FILTER

| PART NO. | DESCRIPTION | PRICE EACH |
|---|---|---|
| 5901 | Gasoline Filter Bowl Assemlby | $ 1.25 |
| 5902 | Filter Bowl - Glass | .30 |
| 5903 | Filter Bowl Gasket | .10 |
| 5904D | Carburetor - Zenith TU3Y1 - With Needle Bearings | 9.75 |
| 10697 | Inverted Male Elbow - #400X x 4 -1/4" - 1/8" | .25 |
| 3400X2 | Street Elbow - 1/8W Pipe Thread | .25 |

### SCREWS, NUTS AND BOLTS

| QUAN. USED | DESCRIPTION | PRICE EACH |
|---|---|---|
| 2 | 1/4" x 1-1/2" Hex. Hd. Cap Screw - Carburetor to Intake Manifold | $ .05 |
| 2 | 1/4" Lockwasher - Carburetor to Intake Manifold | .05 |

## ELECTRIC CHOKE

| PART NO. | DESCRIPTION | PRICE EACH |
|---|---|---|
| 19922 | Choke Shaft Knob | $ .35 |
| 19924 | Choke Thermostat Element | .75 |
| 19928 | Bracket for Automatic Choke | .40 |
| 19929A | Electric Choke Element and Cover | 1.50 |
| 19932A | Choke, Electric-Assembly | 3.00 |

### SCREWS, NUTS AND BOLTS

| QUAN. USED | DESCRIPTION | PRICE EACH |
|---|---|---|
| 1 | 10-32 x 3/4" Rd. Hd. Mach. Screw - Choke to Carburetor | $ .05 |
| 1 | 10-32 Lockwasher - Choke to Carburetor | .05 |
| 2 | 8-32 x e/4" Rd. Hd. Mach. Screw - Choke Cover to Body | .05 |
| 2 | 8-32 Lockwasher - Choke Cover to Body | .05 |
| 1 | 8-32 x 3/16" Rd. Hd. Mach. Screw - Choke Cover | .05 |
| 1 | 8-32 Flat Washer - Choke Cover | .05 |
| 1 | 10-32 c 3/4" Rd. Hd. Mach. Screw - Choke Cover Term. Screw | .05 |
| 3 | 10-32 Flat Washer - Choke Cover Term. Screw | .05 |
| 1 | 10-32 Outside Shakeproof Lockwasher - Choke Cover Term. Screw | .05 |
| 2 | 10-32 Hex Nut - Choke Cover Term. Screw | .05 |
| 1 | 10-32 Mica Washer - Choke Cover Term. Screw | .05 |
| 1 | 10-32 Fibre Washer - Choke Cover Term. Screw | .05 |
| 1 | 10-32 Insulator Bushing - Choke Cover Term Screw | .05 |
| 1 | 8-32 x 3/8" Rd. Hd. Mach. Screw - Bimetal to Choke Body | .05 |
| 1 | 8-32 Flat Washer - Bimetal to Choke Body | .05 |
| 1 | 8-32 Lockwasher - Bimetal to Choke Body | .05 |
| 1 | 8-32 Hex. Nut - Bimetal to Choke Body | .05 |

## OIL PUMP

| PART NO. | DESCRIPTION | PRICE EACH |
|---|---|---|
| 1037 | Oil Pump Dowel Pin - 3/16" x 3/4" | $ .05 |
| 5578 | Oil Pump Screen - #24 Brass | .30 |
| 5605 | Oil Pump Driver Gear - with Keyway | 2.00 |
| 5606 | Oil Pump Driven Gear - Idler Gear | 2.00 |
| 5607 | Oil Pump Body with Idler Shaft - #5610 | 3.50 |
| 5607A | Oil Pump Assembly | 11.00 |
| 5608 | Oil Pump Inlet - Cover | 2.50 |
| 5609 | Oil Pump Body Gasket | .10 |
| 5610 | Shaft for Oil Pump Driven Gear | .25 |
| 5611A | Oil Pump Drive Shaft and Gear Assembly | 2.00 |
| 5612 | Bushing for Oil Pump Drive Shaft | .25 |

## SCREWS, NUTS AND BOLTS

| QUAN. USED | DESCRIPTION | PRICE EACH |
|---|---|---|
| 2 | 5/16" x 3/4" Hex. Hd. Mach. Screw - Oil Pump Mounting | $ .05 |
| 2 | 5/16" Copper Washer - Oil Pump Mounting | .05 |
| 2 | 5/16" Lockwasher - Oil Pump Mounting | .05 |
| 2 | 5/16" Hex Nut - Oil Pump Mounting | .05 |

## OIL BY-PASS

| PART NO. | DESCRIPTION | PRICE EACH |
|---|---|---|
| 5582 | Oil Pump Outlet Tube - 5/16" x 3-1/8" | $ .35 |
| 5585 | By-Pass Terminal Block | 1.50 |
| 5586 | Rear Main Bearing Oil Line - 1/4" x 8" | .50 |
| 5587 | Front Main Bearing Oil Line - 1/4" x 8" | .50 |
| 5588 | By-Pass Block Gasket | .05 |
| 5589 | By-Pass Relief Spring | .10 |
| 5590 | By-Pass Relief Check Valve Ball | .05 |
| 5591 | By-Pass Spring Adjusting Screw | .05 |
| 120A29 | Line, Oil-Governor to Bypass | .50 |

## SCREWS, NUTS AND BOLTS

| QUAN. USED | DESCRIPTION | PRICE EACH |
|---|---|---|
| 2 | 1/4" x 1" Hex. Hd. Cap Screw - Oil Pump By-Pass Mounting | $ .05 |
| 2 | 1/4" Copper Washer - Oil Pump By-Pass Mounting. | .05 |

## INTERNAL GOVERNOR

| PART NO. | DESCRIPTION | PRICE EACH |
|---|---|---|
| 549 | Governor Weight Retaining Wire..... | $ .20 |
| 568 | Governor Arm Ball Joint..... | .20 |
| 569 | Governor Arm to Carburetor Control Rod..... | .30 |
| 738 | Governor Regulator Spring Adjusting Screw.... | .15 |
| 1041A | Governor Cup and Stud Assembly..... | .65 |
| 1046 | Governor Spring Stop Stud..... | .15 |
| 2084 | Governor Weight - Heavy..... | .40 |
| 5635 | Governor Spring and Arm Bracket..... | 1.15 |
| 5636 | Governor Arm..... | .20 |
| 12135 | Governor Arm Spring..... | .20 |

## SCREWS, NUTS, BOLTS ETC.

| QUAN. USED | DESCRIPTION | PRICE EACH |
|---|---|---|
| 1 | 1/4" x 1" Hex. Hd. Cap Screw - Governor Arm Bracket Clamp Screw..... | $ .05 |
| 1 | 1/4" Inside Shakeproof Lockwasher - Governor Arm Bracket Clamp Screw..... | .05 |
| 1 | 1/4" Hex Nut - Governor Arm Bracket Clamp Screw | .05 |
| 1 | Hex Nut for Governor Adjusting Screw..... | .05 |
| 2 | 10-32 x 3/8" Rd. Hd. Mach. Screw - Governor Arm to Bracket..... | .05 |
| 2 | 10-32 Inside Shakeproof Lockwasher - Governor Arm to Bracket..... | .05 |
| 1 | 10-32 Inside Shakeproof Lockwasher - Governor Arm Ball Joint..... | .05 |
| 1 | 10-32 Hex Nut - Governor Arm Ball Joint..... | .05 |
| 2 | Cotter Keys - Governor Link to Ball Joing.... | .05 |

## OIL GAUGE ASSEMBLY

| PART NO. | DESCRIPTION | PRICE EACH |
|---|---|---|
| 5584 | Oil Pressure Gauge Tube..... | $ .65 |
| 10697 | Inverted Male Elbow - 400 x 4 Weatherhead.... | .25 |
| 15168 | Oil Pressure Gauge..... | 1.50 |
| W-226078 | Special Double Ell-Weatherhead - Tube Size 5/16" x 1/4" - 1/8" Pipe Thread..... | .50 |

## EXTERNAL GOVERNOR ASSEMBLY

| PART NO. | DESCRIPTION | PRICE EACH |
|---|---|---|
| 5614 | Governor Gearcase..... | $ 3.00 |
| 5615 | Governor Gasket..... | .05 |
| 5616 | Governor Idler Gear..... | 3.25 |
| 5617 | Governor Gear Shaft..... | .75 |
| 5618 | Governor Gear..... | 1.75 |
| 5622 | Governor Gearcase Gasket..... | .05 |
| 5624 | Governor - GC413 -Pierce..... | 24.00 |
| 5624B | Governor Spring..... | .75 |
| 5667 | Carburetor to Governor Link..... | .10 |
| 75863 | Governor Ball Joints ..... | .50 |

## V45 GENERATOR PARTS

| PART NO. | DESCRIPTION | PRICE EACH |
|---|---|---|
| 513 | Armature Hub Drive Disc. Nut..... | $ .35 |
| 572 | Armature Hub Drive Disc. Nut Lockwasher.. | .05 |
| 1269 | Ball Bearing Grease (not illustrated).... | .45 |
| 201A125 | Armature Assembly..... | |
| 5055 | Armature Ball Bearing - #7306..... | 5.35 |
| 5060 | Armature Drive and Blower..... | 4.00 |
| 5062 | Armature Hub Drive Disc..... | .75 |
| 5064 | Armature Drive Hub..... | 1.10 |
| 5065 | Armature Drive Washer - 11/32" ID x 3/8" OD x 1/32"..... | .05 |
| 210A1086 | Generator Frame Assembly with Field Coils | |
| 5102 | Governor Frame Thru Stud.....(4 used) | .35 |
| 5105 | Pole Shoe Assembly - 7-1/2" - 5000 Watt (4 used)..... | 4.50 |
| 5106 | Frame, Generator-(Not Illustrated)..... | 24.00 |
| 222-1096 | Generator Field Coil Assembly..... | |
| 5116 | Generator Field Coil Only (not illustrated) (4 used)..... | 7.50 |
| 5140 | Generator Frame Adapter Ring..... | 4.00 |
| 5142 | Generator Adapter Ring Stud..... (6 used) | .15 |
| 5154 | Generator Frame End Bell Housing..... | 6.50 |
| 5151 | Generator Framd End Bell Band..... | .65 |
| 5155 | Generator Bearing Cover..... | 1.25 |
| 5156 | Generator Bearing Cover Gasket - 1/16" Cork..... | .20 |
| 5160 | Generator Bearing Stop Clip..... | .15 |
| 5170 | Brush Spider Casting..... | 2.25 |
| 212C40 | Brush Rig Assembly..... | 11.00 |
| 5175A | Brush Rig Insulator Ring and DC Brush Guide Assembly..... | 6.50 |
| 5179A | A.C. Brush Guide and Insulator Panel - (4 used)..... | .65 |
| 212A1011 | Brush Spring.....(4 used) | .35 |
| 5191 | D.C. Ground Strap .020" x 1/2" x 2-1/2" Brass..... | .15 |
| 5192 | Jumper Lead..... | .30 |
| 5193 | D.C. Jumper - 11" Long - 10-32 Loop on Each end..... | .30 |
| 5194 | A.C. Jumper - 9-1/4" Long - 10-32 Loop on Each End..... | .30 |
| 214A15 | D.C. Carbon Brush - 1/2" x 1-1/4" x 1-1/4" (4 used)..... | 1.00 |
| 214A8 | A.C. Carbon Brush - 9/32" x 7/8" x 1-1/4" (4 used)..... | .65 |
| 5928 | A.C. Filter Condenser - .1 MFD - L.H..... (2 used)..... | .50 |
| 212A1004 | Spring, Brush -(Not Illustrated)-(4 used) | .25 |

| QUAN. USED | DESCRIPTION | PRICE EACH |
|---|---|---|
| | **Screws, Nuts and Bolts** | |
| 4 | 1/4" x 5/8" Rd. Hd. Mach. Screw - Insul. Ring to Spider | $ .05 |
| 4 | 1/4" Shakeproof Inside Washers - Insulating Ring to Spider | .05 |
| 4 | 1/4" Flat Brass Washer - Insulating Ring to Spider | .05 |
| 2 | 10-32 x 7/8" Rd. Hd. Mach. Screw - DC Brush Jumper Terminal | .05 |
| 2 | 10-32 Flat Brass Washer - DC Brush Jumper Terminal | .05 |
| 4 | 10-32 Hex. Brass Nut - DC Brush Jumper Terminal | .05 |
| 2 | 10-32 Outside Shakeproof Lockwasher - DC Brush Jumper Term. | .05 |
| 2 | 10-32 x 3/4" Rd. Hd. Mach. Screw - AC Brush Jumper Terminal | .05 |
| 2 | 10-32 Outside Shakeproof Lockwasher - AC Brush Jumper Terminal | .05 |
| 4 | 10-32 Hex. Brass Nut - AC Brush Jumper Terminal | .05 |
| 8 | 10-32 x 5/8" Rd. Hd. Mach. Screw - AC Brush Guide Bracket to Spider | .05 |
| 8 | 10-32 Outside Shakeproof Lockwasher - AC Brush Guide Bracket to Spider | .05 |
| 8 | 10-32 Flat Brass Washer - AC Brush Guide Bracket to Spider | .05 |
| 2 | 6-32 x 3/8" Rd. Hd. Mach. Screw - Condenser Mounting | .05 |
| 2 | 6-32 Outside Shakeproof Lockwasher | .05 |
| 2 | 10-32 x 7/8" Rd. Hd. Mach. Screw - DC Jumper Strap Brush Guide End | .05 |
| 2 | 10-32 x 3/8" Rd. Hd. Mach. Screw - Spider End | .05 |
| 2 | 10-32 Outside Shakeproof Lockwasher - Brush Guide End | .05 |
| 2 | 10-32 Outside Shakeproof Lockwasher - Spider End. | .05 |
| 2 | Flat Brass Washer - Brush Guide End | .05 |
| 2 | Flat Brass Washer - Spider End | .05 |
| 6 | 3/8" Lockwasher - Gen. Adapter Mounting Stud | .05 |
| 6 | 3/8" SAE Nuts " " " " | .05 |
| 1 | 7/16" Generator Frame Support Stud | .05 |

| PART NO. | DESCRIPTION | PRICE EACH |
|---|---|---|
| 1412A | Charge Rheostat Assembly - 2 Ohm Model J Ohmite | $ 2.50 |
| 1412B | Charge Rheostat Knob | .10 |
| 1412M | Resistance Unit Wire - 10 Turns - 250 W., 12 Volt D.C. | .70 |
| 1412I | Charge Ammeter - 10-0-10 D.C. - Side Reading Scale | 2.50 |
| 1414C | Terminal Post Assembly - Battery Negative 5/16" x 1-3/4" Cap Screw | .30 |
| 1414D | Terminal Post Assembly - Battery Positive 5/16" x 2" Cap Screw | .30 |
| 1422A | Ignition Toggle Switch - Arrow H. & H. | .75 |
| 1426 | Start Relay Frame - High | .95 |
| 1428A | Start Relay to Control Panel Connector Strap Assembly | .35 |
| 1430 | Start Relay Coil - P.S. 1579 | 1.25 |
| 1431 | Start Relay Fram Insul. Panel - Formica | .40 |
| 1438 | Start Relay Frame to Control Panel Cable - 6" Long | .50 |
| 1446A | Charge Relay Armature and Blade Assembly | 1.10 |
| 1483 | Start Switch Brush Reinforcing Strip - 3/8" x 5/16" Brass | .05 |
| 1513 | Fibre Coil Washer - 1-1/2" O.D. | .10 |
| 1517 | Start Switch Armature Return Spring | .10 |
| 1522 | Start Switch Lower Contact | .35 |
| 1553A | Charge Relay Insulator Panel with Contacts | .80 |
| 1554 | Charge Relay Insul. Panel Reinforcing Strip 3/8" x 1" Brass | .05 |
| 1566 | Start Relay Coil Core | .35 |
| 1630 | Charge Relay Armature Return Spring | .10 |
| 1646 | Charge Relay Frame | .95 |
| 5300 | Control Unit Base | 1.75 |
| 5301 | Control Box Side Panel - Instrument Side - Without Instruments | 5.00 |
| 5302 | Control Box Side Panel - Plain Side | 1.25 |
| 5303 | Control Box Cover - 22 Ga. S.M. | 1.25 |
| 5304 | Control Base Clamp - 1/8" x 1-1/4" x 8-1/2" | .25 |
| 5305 | Wire Outlet Box | .45 |
| 12795 | Control Panel Only - Not Illustrated | 1.50 |
| 12795A | Control Panel Assembly - Without Box - Not Illustrated | 15.00 |
| 5937 | Double Filter Condenser - 1/2 - 1/10 MFD | 1.00 |
| 8739 | Start-Stop Switch Panel Spacer | .05 |
| 8740 | Push Button | .15 |
| 8743A | Start-Stop Switch Assembly | .65 |
| 10750 | Fahnstock Clip #1 | .05 |
| 10414 | 8-32 x 5/16" Rd. Hd. Mach. Screw for #1553A and 1431 (2 used) | .05 |
| 10420 | 8-32 x 3/4" Rd. Hd. Mach. Screw for #1552 (2 used) | .05 |
| 10616 | 8-32 Shakeproof Lockwasher for #10414 and #10420 | .05 |
| 12820 | Start Relay Assembly | 5.00 |
| 12821 | Start Relay Armature Blade Assembly | 1.10 |
| 12822 | Charge Relay Assembly | 4.50 |
| 12823 | Charge Relay Coil and Core Assembly - P.S. 1065 | 1.50 |
| 75105 | Radio Choke Coil - Small | .65 |
| 75106 | Radio Choke Coil - Large | .85 |

## TOOL GROUP

| PART NO. | DESCRIPTION | QUAN. USED | PRICE EACH |
|---|---|---|---|
| 77510 | Screwdriver - 5" | 1 | .25 |
| 77535 | Pliers - 6" | 1 | .30 |
| 77570 | Wrench, Adj. - 9" | 1 | .60 |
| 77581 | Wrench, Breaker Point | 1 | .10 |
| 77623 | Wrench, Open End - 3/8" x 7/16" | 1 | .40 |
| 77624 | Wrench, Open End - 7/16" x 1/2" | 1 | .55 |
| 77625 | Wrench, Open End - 9/16" x 5/8" | 1 | .60 |
| 77661 | Socket - 1/2" | 1 | .35 |
| 77662 | Socket - 9/16" | 1 | .35 |
| 77665 | Socket - 3/4" | 1 | .45 |
| 77678 | Handle - For Sockets | 1 | 1.50 |
| 77707 | Wrench, Allen Head - 5/16" Screw | 1 | .15 |
| 77973 | Bag, Cloth | 1 | .15 |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