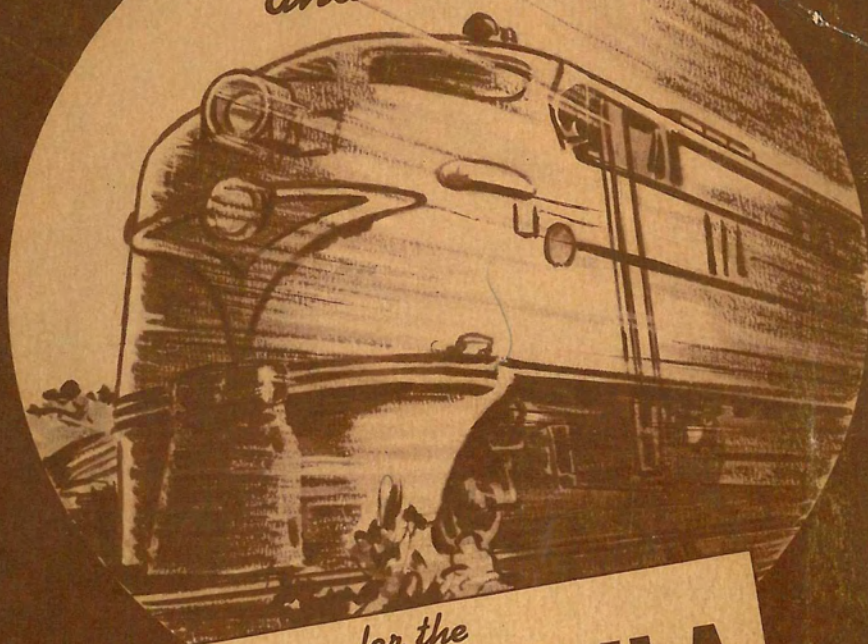


OPERATING MANUAL *and* PARTS LIST



for the
WAUKESHA
RAILWAY ICE ENGINE

MODEL E

— an engine driven refrigerating unit
for railway car air conditioning systems

and the
ENGINE-GENERATOR

MODEL C

— an engine driven electric generating unit for
railway car lighting and electrical accessories

REFRIGERATION DIVISION:
WAUKESHA MOTOR COMPANY
WAUKESHA, WISCONSIN

EDITION 1—FORM 1242

PRICE \$3.00

E E MURPHY

INSTRUCTIONS FOR INSTALLATION, CARE, AND MAINTENANCE

of the

WAUKESHA

ENGINE-GENERATOR UNIT

Model C

and

ICE-ENGINE UNIT

Model E

* * * * *

WAUKESHA MOTOR COMPANY
REFRIGERATION DIVISION
WAUKESHA WISCONSIN

Form 1142

1941

PUBLISHED

by

WAUKESHA MOTOR COMPANY

1M - 5 - 41

Litho. in U.S.A.

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and

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WAUKESHA ENGINE-GENERATOR UNITINSTALLATIONGENERAL INFORMATION

The Waukesha Engine-Generator Unit is a self-powered generating system consisting of:

- (1) A Waukesha heavy duty four-cylinder internal combustion engine with accessories.
- (2) A Waukesha direct connected generator of special design, heavy duty, ball bearing, fully enclosed and fan cooled.
- (3) A fuel system consisting of propane fuel cylinders, the necessary pressure regulators and valves for safety and sequence unloading, and an exhaust by-pass valve for maintaining propane pressures.
- (4) The Engine-Generator panel, on which is mounted the necessary controls which automatically start the engine at constant intervals, and stop the engine according to the electrical load and battery condition.
- (5) A load current relay panel, when used, automatically starts the engine at a predetermined electrical load regardless of the automatic timer.

The engine and generator are assembled on a structural steel chassis mounted on cushioned spring wheels and supported by steel channel cushioned tracks. The unit may be rolled out from under the railway car for any major servicing without disconnecting fuel, exhaust or electrical lines.

In locating the Engine-Generator under the car, it is important that the radiator end be accessible to free air movement, and if possible, mount the unit so that the radiator end is in the direction of train movement. Installation drawing (SK-656) gives complete dimensions for mounting tracks, generator terminal block, fuel lines, fuel cylinder parts, and exhaust pipe. (Copies may be obtained from the Waukesha Motor Company.) Wiring diagram SK-420-N or SK-470-D gives complete instructions for car wiring necessary to the Engine-Generator.

STARTING THE ENGINE-GENERATOR UNIT FOR THE FIRST TIMEGENERAL

After the Engine-Generator unit is in place and all the car wiring is complete, the engine is ready to be put in service;

Part 1

however, the following instructions should be followed step by step for this first starting of the engine.

LUBRICATION

Fill the engine crankcase with four quarts of a good quality automobile cylinder oil (Use #10 oil for the first filling with new engine and always in winter. Use #30 oil in summer.)

Fill the engine air cleaner and the crankcase breather only up to the oil level indicated with the same grade oil as used in the engine.

RADIATOR

Fill the engine radiator with clean soft water. In the radiator expansion tank will be found a small air relief cock (top cock) which will facilitate filling of the radiator -- be sure to close this after system is filled. The lower cock is used in servicing for a quick check on the water level.

Where a separate external radiator water supply expansion tank is used, water is added only at the filler cap provided in the supply tank. Be sure the top hose connection from the radiator connects to the top hose connection on the water supply tank, and the bottom radiator connection to the bottom water supply tank connection. The initial filling of an empty radiator can be expedited by venting the radiator and external radiator water supply tank.

When the car is subject to freezing weather, its cooling system will have to be protected with an anti-freeze solution. (See manufacturer's recommendations for proper mixture.) For immediate information, the following table for Prestone is included:

25% - +10° F.	40% - -12° F.
33% - -0° F.	50% - -34° F.

STARTING ENGINE

Engine may now be started from the manual start switch in the control box or the start switch on the control panel in car locker.

STOPPING ENGINE

The engine continues to run until stopped automatically by the low current relay or manually. To manually stop unit, push stop button either on car panel or in the control box.

GENERAL OPERATING INFORMATION

OPERATING SPEEDS

The Engine-Generator speed is set at 1100 RPM at full load, and approximately 1150 - 1200 RPM no load. The engine maintains this speed regardless of the generator load within the regulator range of the governor.

ENGINE OIL PRESSURE

Engine oil pressure should range between 15 and 35 pounds. The pressure may be adjusted by turning the adjusting screw on the engine block directly beneath the carburetor.

FUEL SUPPLY PRESSURES

The approximate fuel pressures shown on the gauge in the fuel cylinder cabinet will depend on the number of fuel cylinders as follows (engine running):

(Outside temperature must be above zero degrees)

One cylinder	10 pounds
Two cylinders	20 "
Three cylinders	30 "
Four cylinders	40 "

It is assumed that each cylinder contains sufficient fuel -- at least 3 to 4 pounds -- otherwise the above pressures might be considerably lower.

The pressure in the car line from the main pressure regulator to the engine regulator should be 4 ounces when a single cabinet is used, or 3 ounces and 5 ounces where two fuel supply cabinets are used. Be sure to set with both engines running. To vary this pressure, remove the hexagon cap in the center of the large regulator and turn the adjusting screw clockwise for more pressure, and vice versa.

Where two fuel cabinets are used, it is usually convenient to have the fuel always drawn from one cabinet first, until all those cylinders are empty. This can be readily accomplished regardless of the number of fuel cylinders in each cabinet by setting the main pressure regulator (Y-6162) in one fuel cabinet to maintain 2 ounces higher pressure to the engine than from the other cabinet. Thus, set one regulator to maintain 5 ounces (when the engine is running) and the other, 3 ounces. The fuel will flow from the cabinet maintaining the higher pressure until all the fuel cylinders in that cabinet are approximately empty. See SK-557 for piping details.

The regulator located in the engine compartment shuts off the fuel supply whenever the engine stops. It performs the same general function as the float bowl of a gasoline carburetor. The fuel must be drawn into the carburetor at a pressure slightly below atmospheric. See the regulator drawing included in this book (SK-275).

In the case of a 3-cylinder fuel supply, the fuel will first flow from the right cylinder, called cylinder #1 to the manifold, maintaining a pressure of approximately 30 pounds at the main regulator (40 pounds if a fourth cylinder is used). As long as this cylinder maintains this pressure, the fuel will flow from this cylinder alone, until it is emptied or until less than 2 pounds of fuel remain. The manifold pressure will then drop to approximately 20 pounds, the pressure at which the second cylinder cuts in. The fuel will now flow from the second cylinder until it is empty, when the third cylinder will automatically cut in to supply the fuel at approximately 10 pounds pressure to the main regulator.

Hence, if the fuel pressure gauge shows approximately 30 pounds with the engine running, it is apparent the first cylinder is supplying the fuel. If the gauge shows approximately 20 pounds, obviously the fuel is being drawn from the second cylinder; the first cylinder now being empty, it may be removed. Similarly, if this gauge shows approximately 10 pounds, the first and second cylinders both are empty and may be removed. Due to variations in tank pressures with outside temperature, each tank should be weighed if the exact fuel content must be known.

In all cases when changing fuel tanks, move the cylinder then in use to position #1. Then load positions #2 and #3 with the full cylinders.

Under cold operating conditions, the vaporization of propane is much slower, and under sub-zero conditions too slow for the proper operation of the Engine-Generator Unit. To overcome this condition, a fuel pressure controlled exhaust by-pass valve is used to by-pass the hot engine exhaust gases to heater pads located under the fuel cylinders. These pads raise the propane temperature and vaporization rate. In extremely cold weather all fuel cylinders should be as full as possible, as this helps to keep the fuel pressures up, in addition to the heater pads.

The exhaust by-pass valve by-passes all of the engine exhaust gases through the propane cylinder heating pads whenever the propane cylinder pressure is below 75 pounds (approximately 40 degrees outside temperature). The exhaust by-pass valve will be exhausting all of the exhaust gases through the muffler whenever the propane cylinder pressure is above 125 pounds

(approximately 70 degrees F. outside).

PROTECTIVE DEVICES

Fuel Safety Devices

The following safety devices are incorporated in the fuel system:

- (1) If the cylinder should be overfilled with propane, a relief valve located on the side of the cylinder valve will open at 350 pounds and allow the extra liquid to escape before an excessive pressure is reached.
- (2) Should the handle of the cylinder valve be in the "OPEN" position, and the hose connection to the valve be removed, a spring loaded check valve automatically closes as the hose connection is unscrewed. This makes it impossible to let fuel out of a disconnected fuel cylinder by turning the handle to "OPEN."
- (3) If a hose connection from a fuel cylinder should break and cause a sudden increase in gas flow to more than approximately 200 - 300 cubic feet per hour, or if the handle on the fuel cylinder valve is opened too suddenly, causing a momentary rush of fuel, a slug check valve automatically shuts off the fuel from that cylinder. This automatic check valve is located in the main cylinder valve on the fuel cylinder. It is opened again by manually closing and slowly opening the fuel valve handle on the fuel cylinder.
- (4) A break or leak in the low pressure line - after the main regulator, with a flow of approximately 125 cubic feet per hour or more, will close an excess flow valve located in the fuel cabinet in series with the 3/4 inch iron pipe fuel line to the engine. This valve will open again automatically in a few minutes, when the pressure equalizes if there is no broken line.
- (5) A reverse flow check valve, located in the high pressure line out of each fuel cylinder, closes automatically to prevent the discharge of the other fuel cylinder in the event a fuel hose connection is ruptured. It opens automatically again when normal flow is resumed.
- (6) An automatic shut-off regulator located in the engine compartment near the carburetor, shuts off the fuel supply whenever the engine stops. Furthermore, when the engine is running, this regulator meters the quantity of fuel to the engine in accordance with the power requirements, and at a pressure slightly below atmospheric.

- (7) A high pressure excess flow valve located in the high pressure line from each of the 1st stage fuel regulators closes in case of a break anywhere in the high pressure fuel lines between the 1st and 2nd stage pressure regulators. This valve will open automatically in a few minutes when the pressure equalizes if there is no broken line.

Intermittent Starting Switch

The intermittent starting switch (N), which is mounted on the control panel serves two purposes (see SK-420-N):

- (1) It permits the generator to crank the engine for approximately 15 seconds and then breaks the starting circuit for 45 seconds, recycling until the engine starts or until the automatic starting timer advances off its starting position in approximately 3 minutes.
- (2) The second purpose is to open the control relay circuit to stop the Engine-Generator when the low current relay reaches its cutout point.

Excessive Cranking Protection

Should the engine fail to start for any reason, the engine will be cranked intermittently by the intermittent starting switch until the automatic starting timer advances off its starting position in approximately 3 minutes.

Oil-Heat Switch

Should the engine for any reason become overheated, causing the engine head temperature to go above 220 - 230° F., or should the oil pressure go below 4 - 6 pounds, an oil-heat switch located in an enclosed box on the magneto side of the engine will make contact to energize the oil-heat thermal switch located on the Engine-Generator control panel. In about 1-1/2 minutes this switch will trip open, stopping the Engine-Generator. This switch must be manually reset.

Tip-Over Switch

This switch, which is mounted inside the control box on the Engine-Generator, will ground the magneto in case the Engine-Generator unit tips more than 45 degrees in any direction.

Fuses

A starting fuse, located on the Engine-Generator control panel, protects against a stalled Engine-Generator. It should blow in 10 - 30 seconds with a locked armature.

CAUTION: Use only a 150 amp. Buss "D" or a 125 amp. Multi-notch link for 40-volt generators, and a 125 amp. Buss "D" or a 112½ amp. Multi-notch link for 80-volt generators.

ENGINE-GENERATOR CONTROLS

GENERAL

The operation of the automatic controls which stop and start the Engine-Generator depend upon the correct setting of the generator voltage regulator. Before attempting to set the regulator, permit the Engine-Generator to run a sufficient time so that both the generator and regulator are hot. The regulator is set by first inserting a piece of paper in the reverse current relay and the low current relay. Then adjust the potential coils spring tension to the following voltages: On lead batteries, set the potential coil at 38 volts with 16 cells and 76 volts for 32 cells. When Edison batteries are used, the setting is 43 - 45 volts and 86 - 90 volts respectively. NOTE: Lowest possible resistance is recommended for the generator regulator in the shunt field for close voltage regulation. Use 1/32 inch carbon pile discs for the 40-volt regulators.

Next, check the setting of the maximum current regulator. Discharge the battery sufficiently, or obtain sufficient load by train lining. CAUTION: Maximum generator output must not exceed 187 amperes and 7½ KW.

AUTOMATIC STARTING TIMER

This timer is used to start the Engine-Generator at either 1/4 or 1 hour intervals (Customer Option), depending upon type of service, size of batteries, and connected load. One-quarter hour cam is supplied for winter service. The timer receives its electrical impulses from the timing relay.

TIMING RELAYS

Two timing relays are used. These relays provide the electrical impulse to the automatic starting timer. This impulse is given every 3 minutes. See SK-468 and SK-469 for details of their operation.

CONTROL CIRCUIT RELAY

This is the pilot relay which is controlled either by the automatic starting timer or the manual switch on the panel or the manual switch in the engine control box. This relay when de-energized grounds the magneto to stop the engine.

STARTING CONTACTOR

The starting contactor is used to motor the generator for starting the engine. It is controlled by the control circuit relay and the reverse current relay.

LOW CURRENT RELAY

This relay is used to stop the engine whenever the generating rate reduces to a pre-determined setting, determined by the battery capacity, voltage, and leveling off rate of the battery. The low current relay should be set at a few amperes above the leveling off rate of the battery plus the minimum continuous car electrical load when in service.

LOAD CURRENT RELAY PANEL

This panel, when used, will automatically start the Engine-Generator above a predetermined load on the battery, regardless of the position of the automatic timer. This setting depends on the size of the battery, size of the load, and length of the "off" cycle of the generator. This panel operates as follows: When the load current is of sufficient amount to open contact "F" of the load current relay, the time delay relay "R" is de-energized. In approximately 10 seconds its contact "R" closes to start the Engine-Generator. Contact "R" has also approximately 10 seconds delay in opening. This time delay to close or to open eliminates any false starts or stops of the Engine-Generator due to sudden fluctuations in the load current. (Refer to wiring diagrams SK-420-N and SK-470-D).

AUXILIARY PANEL FOR EDISON BATTERIES

To minimize battery flushing and fuel consumption, it has been found desirable with Edison batteries to use an auxiliary control panel in conjunction with the standard Engine-Generator panel. This panel consists of a sensitive voltage relay with normally open contacts connected in series with the generator regulator potential coil. As the battery voltage rises as it becomes charged, the voltage relay is set to pull in at a given voltage, representing an approximately fully-charged battery. The voltage relay contacts are now closed, energizing the generator regulator potential coil, which is set to regulate at a reduced voltage, and a correspondingly lower charging rate. The low current relay on the Engine-Generator panel is set to stop the Engine-Generator at a fully-charged current value corresponding to the reduced voltage, plus the minimum continuous car electrical load when in service.

CYCLE OF OPERATION

The complete cycle of the Engine-Generator is as follows:

- (1) When the control circuit is energized for the first time, the 3-minute timing relay coil (26-27) (normally open, quick make, slow break) and the automatic starting timer coil (34-35) are energized. The automatic starting timer coil advances the automatic starting timer one step. The 3-minute timing relay coil closes its contacts (24-25). This energizes the relay coil (30-31) of the 5-second timing relay (normally closed, quick make, slow break) and after 5 seconds this opens its relay contacts (28-29) which then de-energizes the 3-minute timing relay coil (26-27) and also the automatic starting timer coil (34-35). Since the 3-minute timing relay is slow opening, it will take approximately 3 minutes to open. When it opens it de-energizes the 5-second timing relay coil (30-31) closing its contacts (28-29), and energizing the 3-minute timing relay coil (26-27) and the automatic starting timer coil (34-35). The cycle is then repeated. (See wiring diagrams SK-420-N and SK-470-D).
- (2) When the automatic starting timer coil (34-35) is energized, it moves the cam in the automatic starting timer one step. (Assume the operation is for 15-minute intervals). After 5 impulses or steps, the cam has moved to the position where contact is made (36-37) energizing the control circuit relay.
- (3) The control circuit relay, when energized by the automatic starting timer, energizes the starting contactor and also opens the ground circuit to the magneto.
- (4) The starting contactor energizes the series starting field in the generator. This motors the generator until the engine starts. As soon as the engine starts and the generator voltage is $1/2$ volt above battery voltage (1 volt on 80-volt equipment) the back contact on the reverse current relay opens the circuit to the starting contactor coil.
- (5) As the batteries approach a charged condition, the charging rate drops. At a pre-determined setting the low current relay drops out, closing the circuit to the heating element in the intermittent switch.
- (6) After the heating element is energized for 15-20 seconds, the contacts open to de-energize the control circuit relay.

- (7) The control circuit relay drops out and grounds the magneto, stopping the engine. As the generator comes to rest, the polarity of terminal #14 on the Engine-Generator control panel reverses, energizing the starting timer until the 5-second relay opens its contact (28-29). This, in turn, advances the cam one notch to open the starting circuit (36-37).
- (8) Approximately three minutes after the engine has stopped, the timing relay again moves the timing cam one step. After 5 impulses the automatic starting timer energizes the control circuit relay, again starting the engine.

SERVICE INSTRUCTIONS

LUBRICATION

The engine crankcase requires draining and refilling every 300 hours of operation. Use #10 oil for winter and also the first filling of a new engine, and #30 oil for summer.

The engine water pump requires turning of the grease cup 1/2 turn approximately once a week. Use a good automotive water pump grease.

The magneto requires lubrication twice a year, also when the magneto is overhauled.

The ball bearing in the generator requires greasing approximately once every two months. The following is a partial list of recommended greases:

1. Master Lubricant Company Lubrico M-6
2. Cities Service Oil Company Trojan M-3
3. Sinclair Refining Company Universal
4. Standard Oil Company Superla 4X or 6X
5. Texas Company Starfak #3
6. Socony Vacuum Oil Company BRB #4

Note: The above lubrication instructions are only suggestions. The variations in length of run, climatic conditions, etc., will vary the above instructions.

RADIATOR

The auxiliary radiator water supply tank will automatically keep the radiator as full of water as needed, therefore, it is necessary only to fill the auxiliary radiator water supply tank whenever the level is not visible in the sight glass in the auxiliary tank.

CLEANING THE RADIATOR AND ENGINE COMPARTMENT

Frequency of cleaning will depend entirely upon the type of service in which the car is operating. Radiator and engine compartment should be blown out as often as the type of service demands.

The radiator is equipped with convenient inspection holes for inspecting the internal condition of the radiator. Grease, sludge, or lime deposits in the radiator greatly reduce the cooling efficiency of the radiator and must be periodically removed. Suitable cleaning compounds are available on the market for removing such deposits and should be used as often as necessary, depending upon the operating conditions. For detailed cleaning and flushing instructions refer to printed data and sketch in the pocket of the rear cover of this Manual.

ELECTRICAL CONTACTS

Regular attention is necessary to clean and keep clean all the electrical contacts in the control equipment. These contacts should have periodical inspection by competent employees.

AIR CLEANER AND BREATHER CAP (CRANKCASE)

The air cleaner to the carburetor intake and the crankcase breather must be cleaned as often as conditions require it. It is extremely important that the oil in the cleaner and crankcase breather does not become thick with suspended dust particles. Clean and fill the removable cup to the level indicated—using engine oil.

Experience has shown that the air intake from the filter to the carburetor and also the carburetor venturi tend to become coated with a thick sludge. Especially is this true if the air filter is not properly serviced. Hence, it has been found necessary every 300 hours of engine operation to remove the upper half of the air filter, the air connection to the carburetor, and the carburetor itself, and wash these parts thoroughly in gasoline. Any coating in the venturi throat of the carburetor seriously impairs the power output of the engine and the movement of the butterfly valve; hence, the importance of regular cleaning.

FUEL MIXTURE ADJUSTMENT

The fuel adjustment screw will be found on the side of the carburetor secured by a lock nut. When the Engine-Generator is operating at normal load, turn the screw clockwise until

the engine starts to lose speed. Then turn it counter-clockwise until the highest vacuum is reached. (Vacuum gauge in control box.) Do not turn further. This is the most economical adjustment and gives the best engine performance. **CAUTION:** Tighten the hexagonal lock nut securely. (See SK-275).

ENGINE ADJUSTMENTS AND MAINTENANCE

VALVE TIMING

The flywheel is stamped "INO-1" for opening position of the intake valve for cylinder #1; "EXO-1" for the opening position of the exhaust valve for cylinder #1; and "FIRE" for the ignition timing for cylinder #1. These marks can be seen through a small inspection hole on the top of the flywheel bell housing. Be sure the valve tappet clearances are correct before checking or changing the valve timing. Refer to the Tabulated Data sheet for the proper clearances.

MAGNETO TIMING

On the flywheel, 12 degrees (1-9/32 inches) before top dead center of piston #1, is stamped the word "FIRE" for the correct instant for the ignition timing of cylinder #1. A deep groove is provided at this point which can be readily seen through the inspection hole in the bell housing. The magneto is held in place by two cap screws, and it is connected to the drive shaft through an adjustable coupling, so that it is easily disconnected or retimed when necessary. Before loosening this coupling, mark the exact shaft positions to simplify timing the magneto when it is replaced. Always refer to the flywheel markings or to the piston position as a final check as to the correctness of the ignition timing.

CAUTION: Since the magneto fires only every other time the #1 piston is up, it is extremely important that spark occurs at the proper stroke. To check this, remove spark plug #1 and turn the engine by means of the generator until air flows out of the spark plug opening. The ignition should occur 12 degrees before the piston reaches top dead center on this compression stroke.

With the #1 piston in the proper position for ignition, proceed as follows to check or retime the magneto.

- (1) Loosen the hexagonal lock nut on the drive coupling. This loosens the coupling drive on the shaft from the pump and permits the magneto to be turned without disturbing the engine.
- (2) Rotate the magneto clockwise (facing the drive end) until the impulse trips and spark occurs at spark plug #1. (If no spark occurs, the magneto may be grounded. In that

case remove the ground wire from the top of the magneto.) The impulse coupling automatically retards the spark 15 degrees on starting. Hence, do not tighten magneto coupling at the position where the above spark occurs, but proceed as directed in next paragraph.

- (3) Now slowly rotate the impulse coupling back, counter-clockwise (after the spark has occurred in plug #1), until the magnetic pull is felt, but not far enough to engage the impulse coupling again. The spark occurs at the point of highest magnetic pull, and can be readily seen or felt. With the magneto held in this position, tighten the hexagonal lock nut on the drive coupling (loosened in paragraph #1).

The breaker points, located behind the bakelite distributor cap, should be honed or filed and adjusted twice a year. Breaker gap clearance should be .014 - .016 inches. To adjust, loosen the three small screws holding the breaker arm assembly. Then by rotating the entire assembly, the desired breaker gap clearance may be obtained.

If excessive wear shows on the distributor rotor, it can be made smooth again with a fine sandpaper or by a fine cut taken off by a lathe.

Be sure that the high tension ignition wires make good clean metallic contact in the distributor on the magneto. Any green corrosion at these points indicates arcing due to poor or no metallic contact, which, in turn, seriously impairs the spark intensity, plus over-burdening the magneto. (See SK-272, Figure 5, for cross section of the magneto).

GRINDING ENGINE VALVES

Examine the valves and valve seats once a year for any carbon or pitting. Replace any valves that are pitted or grooved. If possible, have the valves reground on a special grinding machine for that purpose, and have the valve seats refaced with a special fine reaming tool for that purpose. However, if only a slight grinding and reseating is needed, it is possible to use some fine valve grinding compound (Cloverleaf No. 2-A is recommended) on each valve face, and then with a slight pressure and an oscillating motion, proceed to grind the valve until a smooth face and seat results. Apply the compound sparingly. Turn the valve about a quarter turn each way for about three or four times, then raise the valve and turn it about a quarter or half a turn to another position. Then lower the valve until it seats and continue grinding. Do not overdo the grinding. It is better to replace or re-machine any valves or seats that are badly pitted or scored, than to remove all of it by grinding.

REMOVING ENGINE HEAD

The engine head is removed by draining the radiator water, removing all the spark plugs to avoid breakage, the engine heat switch thermal bulb, and then removing the hexagon nuts holding the head and the top water connection.

In replacing the head, however, it is extremely important that the gasket surfaces on the head and block be thoroughly cleaned, including any carbon deposit on the pistons and in the combustion chambers. Always use a new gasket every time the head is removed. Apply a small amount of grease to each side of the gasket, then place it on the stud bolts, and follow with the head. In drawing up the cylinder head nuts, be sure to draw them up evenly all around, drawing them up with a torque wrench set for 700 inch pounds. Then after the engine has run until hot, tighten all the cylinder head nuts again. This is extremely important due to the high compression engine. After the engine has been in service, it is well to check the nuts again while the engine is hot.

MAGNETO MAINTENANCE

The magnetos require complete overhaul at least twice a year. This work should only be done by trained magneto men or the magneto manufacturer representative.

RADIATOR FAN DRIVE

A friction disc drive is used to drive the radiator fan to minimize the pulsating torque stress on the driving gears. The fan should slip when a 20-pound pull is exerted at the outer edge of the fan. An adjustment nut is located on the fan drive shaft in front of the fan.

GENERATOR MAINTENANCE

The generator and regulators require the same maintenance as the axle-driven units. Weekly inspection of the generator commutator and brushes is recommended. Also weekly blowing out of any accumulated dust in the generator housing. Check brush tension periodically. Check by hooking a spring scale on the brush holder clamp. Tension should read 3 - 4 pounds.

ARMATURE REMOVAL

The generator armature may be removed as follows:

1. Remove end cover and fan assembly.
2. Disconnect the three leads to the generator brush holders.
3. Remove front head.
4. Armature may now be removed. (No puller required.)

OPERATING DIFFICULTIESIMPROPER PRESSURESFuel Pressures

If the fuel pressure gauge located in the fuel cabinet shows a pressure considerably higher than the desired pressure for that fuel cylinder with engine running, and also will not reduce when the adjusting screw is turned in (clockwise), it indicates that the small fuel regulator (Y-6163-B) seat or diaphragm is defective and should be replaced.

If the fuel pressure to the engine, which should be 3 - 5 ounces varies considerably, as shown on the manometer, it indicates a defective seat in the main fuel regulator (Y-6162). If fuel is escaping through the vent, the diaphragm is ruptured and must be replaced.

In extremely cold weather be sure to keep all of the fuel cylinders as full as possible to minimize the refrigerating effect in each cylinder as fuel is being drawn.

Be sure all exhaust connections are reasonably tight so that maximum exhaust enters the heater pads. All exhaust piping, wherever possible, must be well insulated.

The heater pads may be opened for cleaning should they become coated or dirty.

Oil Pressure

The engine oil pressure should range between 15 - 35 pounds. For oil pressure adjustment see "GENERAL OPERATING INFORMATION."

ENGINE FAILS TO START (SK-420-N or SK-463-E)

If generator fails to crank engine, check the following:

- (1) Starting fuse.
- (2) Control circuit fuse.
- (3) Contacts in oil-heat switch.
- (4) contacts in intermittent starting switch.

If the generator cranks but the engine fails to start check the following:

- (1) Fuel pressures.

- (2) Ignition. If no spark at plugs, check for ground on magneto by removing the ground wire from the magneto.
- (3) Improper fuel adjustment on the carburetor.
- (4) If choking of air intake to carburetor starts the engine, it indicates a defective fuel shut-off regulator.
- (5) Air in the fuel line.
- (6) Carburetor venturi dirty, restricting flow.

Ignition

The gaps in the spark plugs should be checked every 150 hours of engine operation. The gaps must be between .015 - .018 inches. This gap size is extremely important, due to the high compression engine. Replace the spark plugs every 600 hours of engine operation, but be sure to reset the gaps on the new plugs to the above dimension.

If no spark occurs at the plugs, the fault may be a ground on the wire from the magneto or a defective magneto itself. The magneto breaker point gap is set at .016 - .018 inches.

Check also for good clean metallic contact of the high tension ignition wires at the magneto distributor block and the spark plug shields. Green corrosion at these points indicates arcing due to poor or no metallic contact.

TABULATED DATAENGINE-GENERATORENGINE

Model	FCX
Bore (inches)	3-3/8
Stroke (inches)	4
Cylinders	4
Displacement (cu. in.)	143
Oil Capacity, without Filter (quarts)	4
Oil Pressure (lbs. per sq. in.)	15 - 35
Oil, Summer Operation S.A.E. No.	30
Winter Operation S.A.E. No.	10
Water Capacity - Engine & Radiator only (gallons)	4
Valve Tappet Clearance Cold - Exhaust (inches)008
Intake (inches)006
Firing Order	1-3-4-2
Spark Advance, degrees ahead of dead center on flywheel	12°
inches ahead of dead center on flywheel	1-9/32
Intake valve opens, degrees after dead center on flywheel	5°
Spark Plugs (4) Part No. Y-6635	18 mm

GENERATOR

Voltage (DC)	40 or 80
KW	7-1/2
Field Poles	4
Interpoles	4

GENERAL

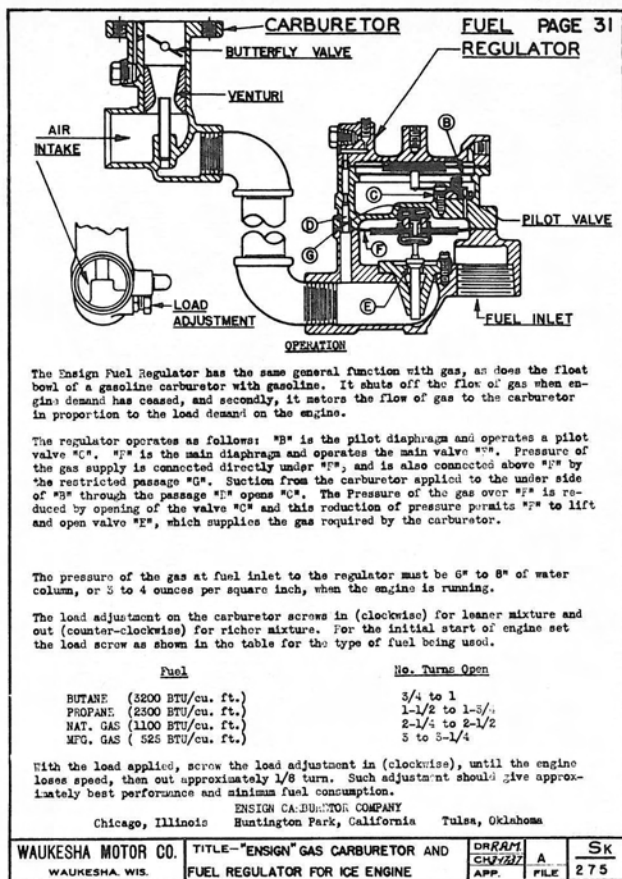
Weight Engine-Generator (lbs.)	1330
Fuel Cylinder Capacity, Propane (23.6 gal.) lbs.	100
Oil-Heat Stop Switch trips out in (min.)	3
Intermittent Switch, closed for (sec.)	15
open for (sec.)	45
Oil-Heat Switch closes above	220° - 230°
or below oil pressure of	4 - 6 lbs.
Oil-Heat Switch opens below	210° - 220°
or above oil pressure of	8 - 10 lbs.

SERVICE CHART

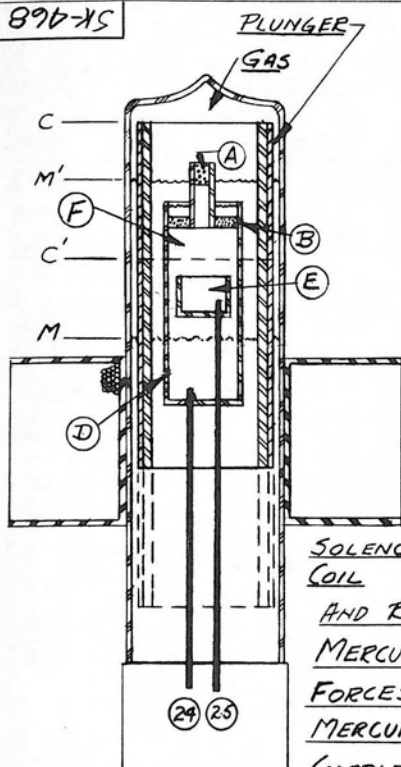
Weekly Service or Every Trip

1. Clean engine compartment and radiator with air hose.
2. Clean and refill bottom half of air cleaner according to instructions on name plate. Clean crankcase breather and refill with engine oil.
3. Check engine crankcase oil level.
4. Give water pump grease cup a half turn.
5. Check and fill engine radiator every trip.
6. Other services.
 - (1) Grease generator bearing every two months.
 - (2) Lubricate magneto twice a year, also when overhauled.
 - (3) Clean out radiator annually, or as often as necessary with special radiator cleaning compound for that purpose.

SK
654



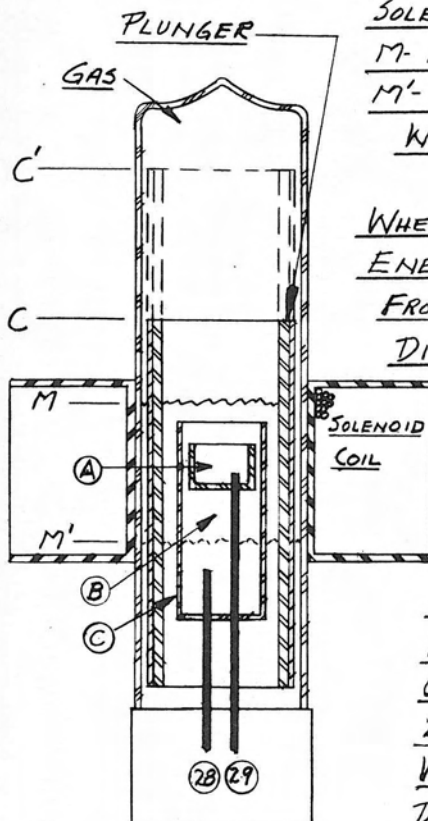
896-XS

3-MINUTE TIMING RELAYC- NORMAL HEIGHT OF
PLUNGERC'- HEIGHT OF PLUNGER
WHEN SOLENOID COIL IS
ENERGIZEDM- NORMAL HEIGHT OF MERCURYM'- HEIGHT OF MERCURY
WITH PLUNGER AT C'

WHEN SOLENOID COIL IS
ENERGIZED, PLUNGER
MOVES FROM C TO C'.
SOLENOID COIL DISPLACING THE MERCURY
AND RAISING ITS LEVEL FROM M TO M'.
MERCURY ENTERING HOLE AT D,
FORCES THE GAS FROM F THRU B UNTIL
MERCURY SPILLS INTO CUP E AND
COMPLETES CIRCUIT BETWEEN 24&25

WHEN SOLENOID COIL IS DEENERGIZED, PLUNGER THEN
RISES AND MERCURY LEVEL FALLS. MERCURY WILL BLEED
THRU HOLE D, FLOW BEING RESTRICTED BY GAS RETURNING THRU A,
(MERCURY SEALING B) UNTIL LEVEL IS BELOW CUP E, BREAKING CIRCUIT.

MODELS-	DRAWN C.E.M.	A	WAUKESHA MOTOR CO.	5K-468
	TRACED 7-239		WAUKESHA, WIS.	PART NO.
	CHECKED E.A.F.	FILE		
	APPROVED N.W.			

5- SECOND TIMING RELAYC- NORMAL HEIGHT OF PLUNGERC'- HEIGHT OF PLUNGER WHENSOLENOID COIL IS ENERGIZEDM- NORMAL HEIGHT OF MERCURYM'- HEIGHT OF MERCURYWITH PLUNGER AT C'

WHEN SOLENOID COIL IS
ENERGIZED, PLUNGER MOVES
FROM C TO C'. MERCURY
DISPLACES THE PLUNGER

AND ITS LEVEL FALLS

FROM M TO M'. THE
LOWERING OF MERCURY

LEVEL IN B IS

RETARDED BY BLEED
HOLE C. WHEN LEVEL

FALLS BELOW TOP OF
CUP A, CIRCUIT BETWEEN

28 AND 29 IS BROKEN.

WHEN SOLENOID COIL IS
DEENERGIZED, PLUNGER

FALLS AND MERCURY RISES

UNTIL IT SPILLS INTO CUP A

COMPLETING CIRCUIT BETWEEN 28 AND 29

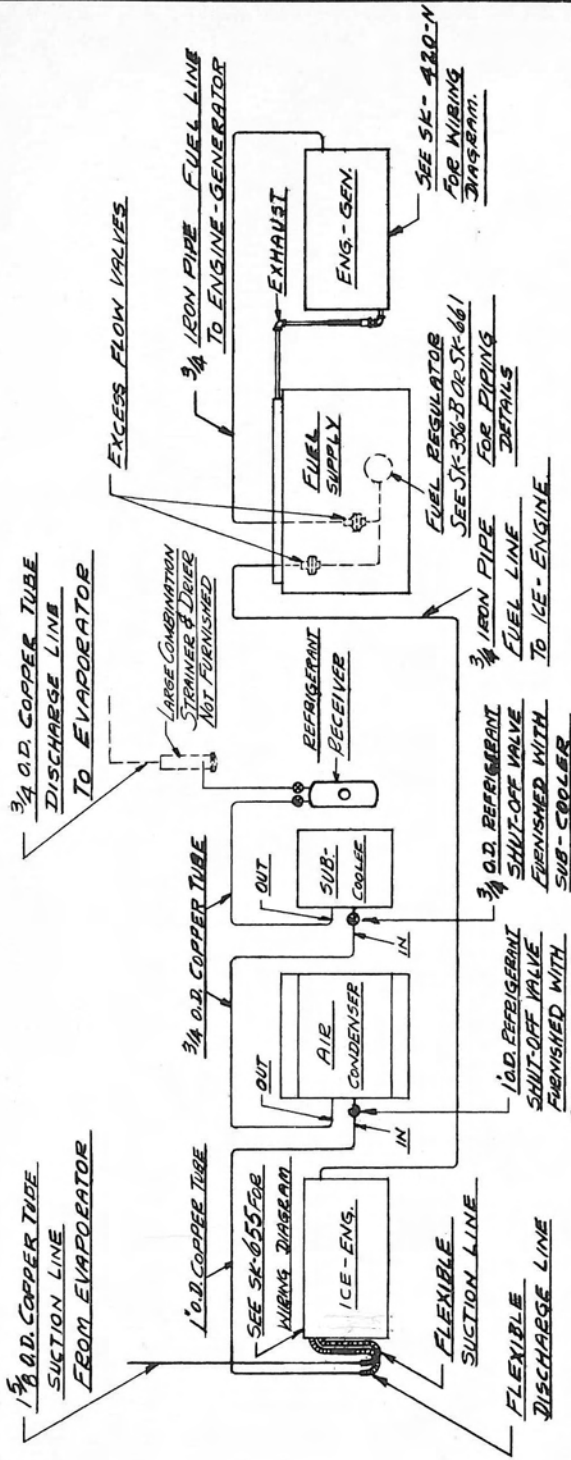
WAUKESHA MOTOR CO.
 WAUKESHA, WIS.

TITLE- 5-SECOND TIMING RELAY

DRGEM
 CH 7/27
 APR 1941

A SK
 FILE 469

SK-557



NOTE

ALL REFRIGERANT, FUEL AND EXHAUST
LINES, EXCEPT FLEXIBLE LINES TO
UNIT, ARE FURNISHED BY CUSTOMER.

SCHEMATIC PIPING DIAGRAM OF
WAUKESHA EQUIPMENT FOR UNDER SILL
MOUNTING ON GONDOLA TYPE RAILWAY CARS

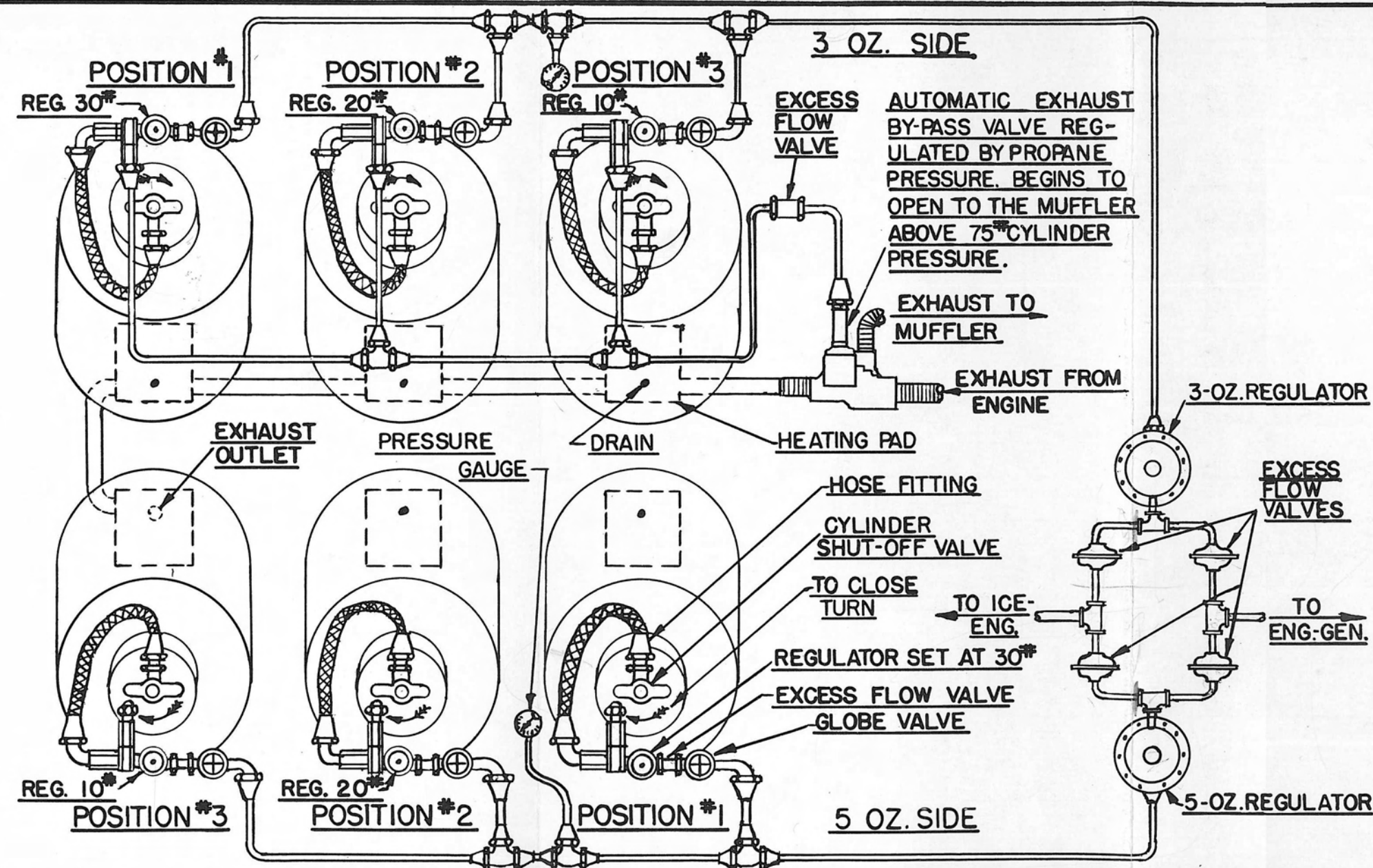
REVISED 4-18-41
REVISED 2-7-41

MODELS-	DRAWN <u>HOLMES</u>	FILE	WATKESHA MOTOR CO.
	TRACED <u>3-21-40</u>		WAUKESHA, WIS.
	CHECKED <u>TRAC</u>		
	APPROVED <u>TRAC</u>		

ON ALL FRACTIONAL MACHINE DIMENSIONS
ALLOW .010 UNLESS OTHERWISE SPECIFIED
REF. DWG.

SK-557

PART NO.



TO OPERATE

OPEN ALL CYLINDER SHUT-OFF VALVES & GLOBE VALVES BY TURNING COUNTER-CLOCKWISE. GAUGES WILL SHOW APPROX. 10, 20 OR 30 LBS. DEPENDING ON WHICH CYLINDER IS BEING USED.

TO CHECK SUPPLY

CAUTION:— ALL VALVES MUST BE OPEN & AT LEAST ONE ENGINE MUST BE RUNNING.

NOTE:— IF THE 5 OZ. SIDE GAUGE SHOWS 10" OR MORE, ALL CYLINDERS ON THE 3 OZ. SIDE ARE FULL. CHECK CYLINDERS ON THE 5 OZ. SIDE AS FOLLOWS:—

IF THE 5 OZ. SIDE GAUGE SHOWS LESS THAN 10", CHECK CYLINDERS ON BOTH SIDES AS FOLLOWS:—

IF GAUGE SHOWS APPROX. 30", CYLINDER IN POSITION #1 MAY BE PARTLY EMPTY AND SHOULD BE WEIGHED.

IF GAUGE SHOWS APPROX. 20", CYLINDERS IN POSITION #1 & #2 MAY BE EMPTY AND BOTH SHOULD BE WEIGHED.

IF GAUGE SHOWS APPROX. 10" OR 0", CYLINDERS IN POSITION #1, #2 & #3 MAY BE EMPTY AND ALL SHOULD BE WEIGHED.

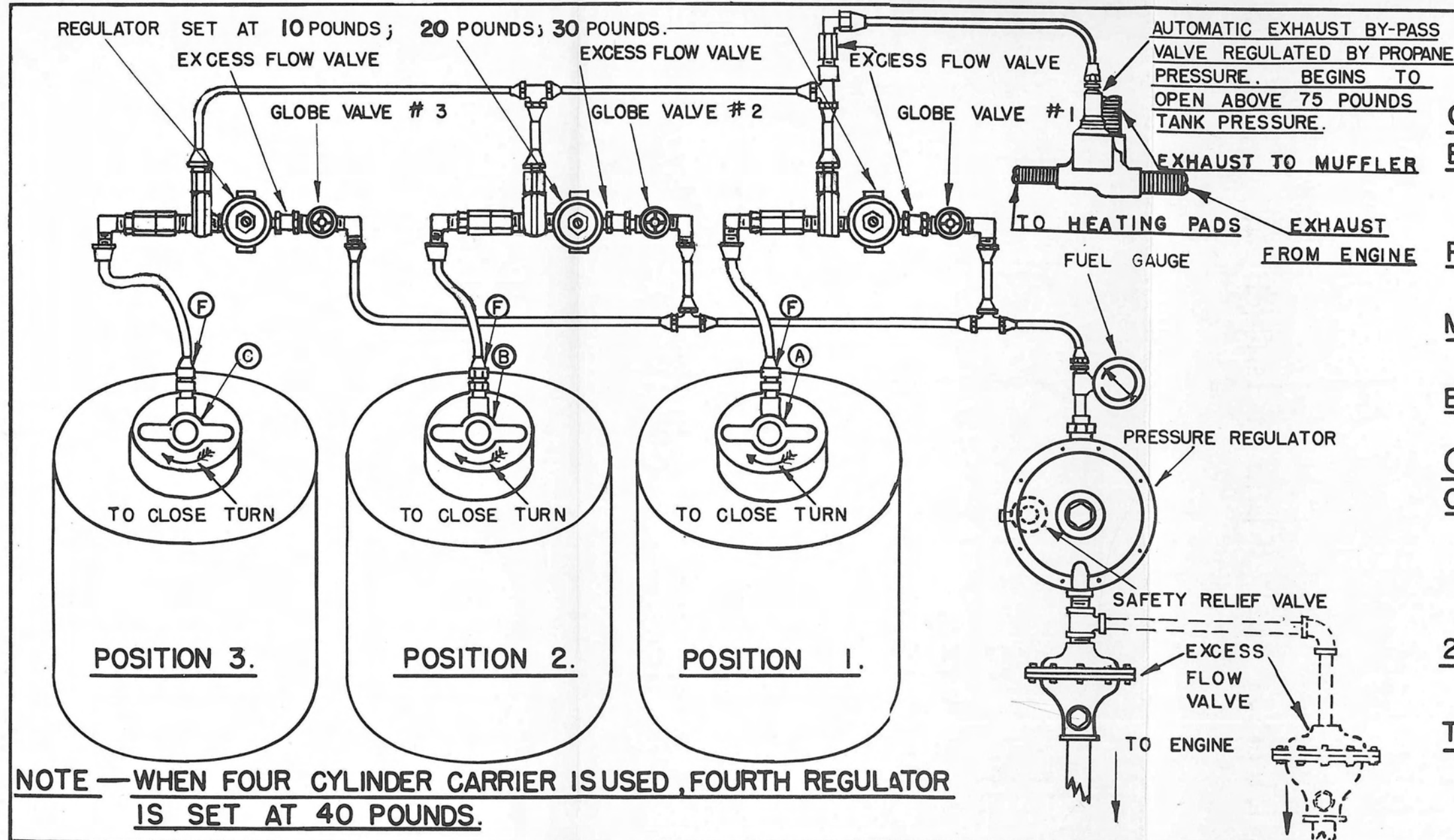
TO CHANGE CYLINDERS

CAUTION:— ALWAYS REPLACE PARTLY FILLED CYLINDERS WITH FULL ONES AND TRANSFER PARTLY FILLED CYLINDERS TO POSITION #1.

CLOSE CYLINDER SHUT-OFF VALVE & CORRESPONDING GLOBE-VALVE BY TURNING CLOCKWISE.

DISCONNECT HOSE FITTING AT CYLINDER BY TURNING CLOCKWISE. THIS IS A "LEFT HAND" THREAD.

CYLINDER TYPE	NO. 4B240	NO. 4B260	NO. 4B300
GROSS WEIGHT OF FULL CYLINDER	198 LBS.	214 LBS.	228 LBS.
WEIGHT OF FUEL	100 LBS.	100 LBS.	100 LBS.
WEIGHT OF EMTY CYLINDER	98 LBS.	114 LBS.	128 LBS.



TO OPERATE
 OPEN VALVES A, B, C, 1, 2, & 3 BY TURNING COUNTER-CLOCKWISE.
 GAUGE WILL READ 10, 20, OR 30 POUNDS DEPENDING UPON WHICH CYLINDER IS BEING USED.

TO CHECK SUPPLY
 WITH ALL VALVES OPEN GAUGE WILL READ 30 POUNDS. CYLINDER IN POSITION # 1 MAY BE PARTLY EMPTY OR FULL AND SHOULD BE WEIGHED.
 IF GAUGE READS 20 POUNDS, CYLINDER IN POSITION # 1 IS EMPTY AND # 2 MAY BE PARTLY EMPTY OR FULL AND SHOULD BE WEIGHED.

IF GAUGE READS 10 POUNDS, CYLINDERS IN POSITIONS # 1 & # 2 ARE EMPTY AND # 3 MAY BE PARTLY EMPTY OR FULL AND SHOULD BE WEIGHED.

CAUTION — ALWAYS REPLACE PARTLY FILLED CYLINDER WITH FULL ONE AND TRANSFER PARTLY FILLED CYLINDER TO POSITION # 1.

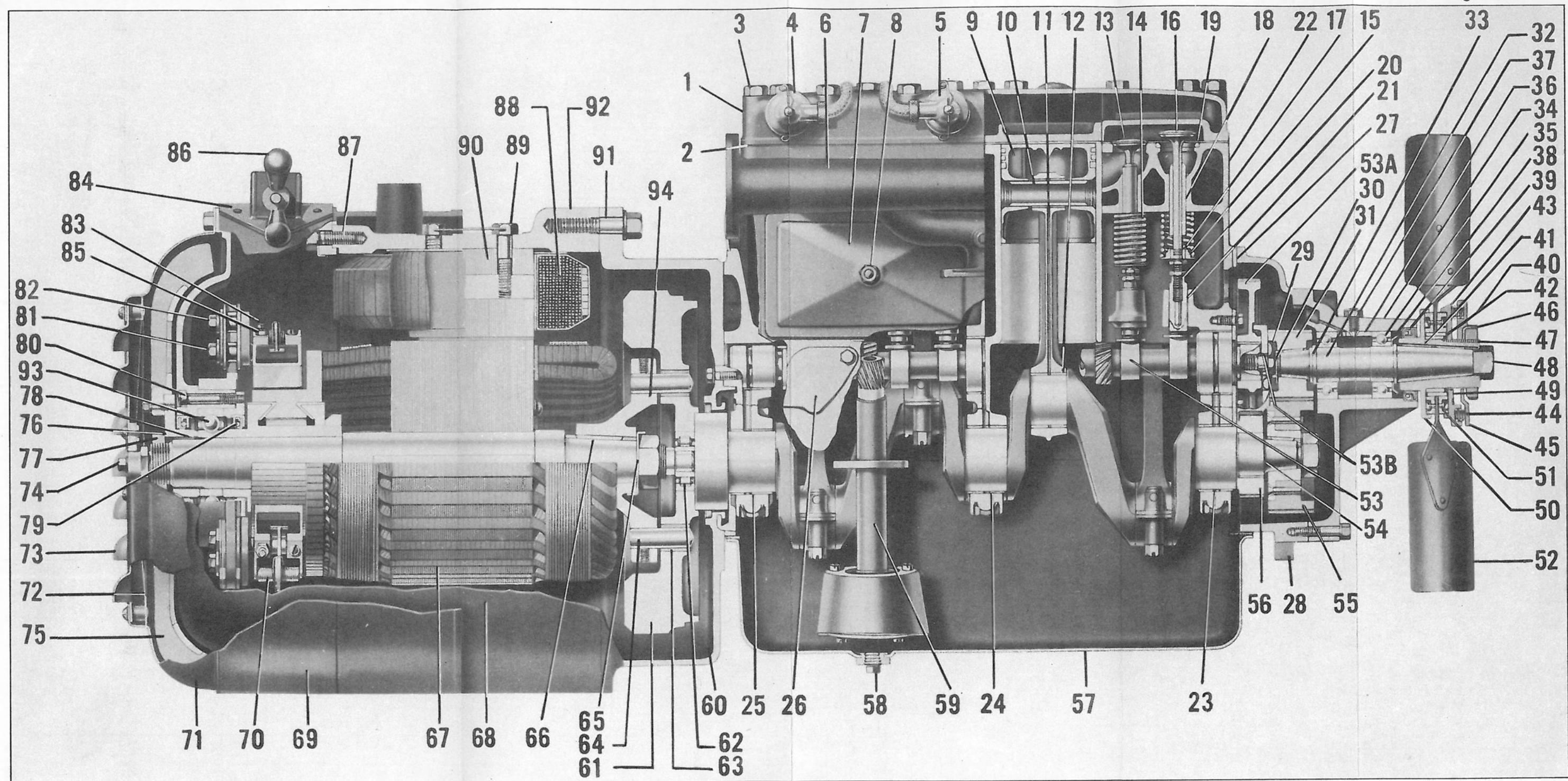
TO CHANGE CYLINDERS
 CYLINDER VALVE "A", "B", OR "C" AND CORRESPONDING GLOBE VALVE # 1, 2, OR 3 ARE CLOSED BY TURNING CLOCKWISE.

DISCONNECT HOSE BY TURNING FITTING "F" AT CYLINDER CLOCKWISE.
 THIS IS A "LEFT-HAND" THREAD.

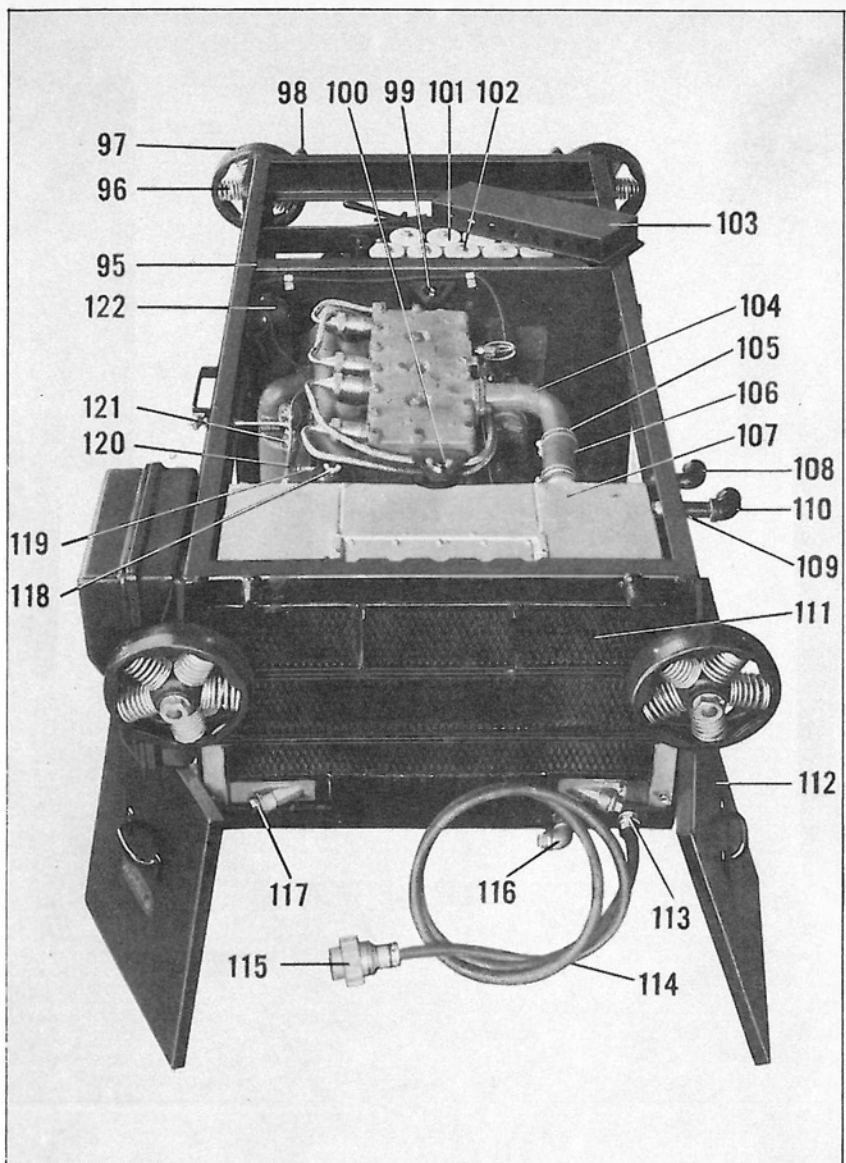
	CYLINDER TYPE NO. 4B240	NO. 4B260
GROSS WEIGHT OF FULL CYLINDER	198 LBS.	214 LBS.
WEIGHT OF FUEL	100 LBS.	100 LBS.
WEIGHT OF EMPTY CYLINDER	98 LBS.	114 LBS.

TYPE "RH" SYSTEM

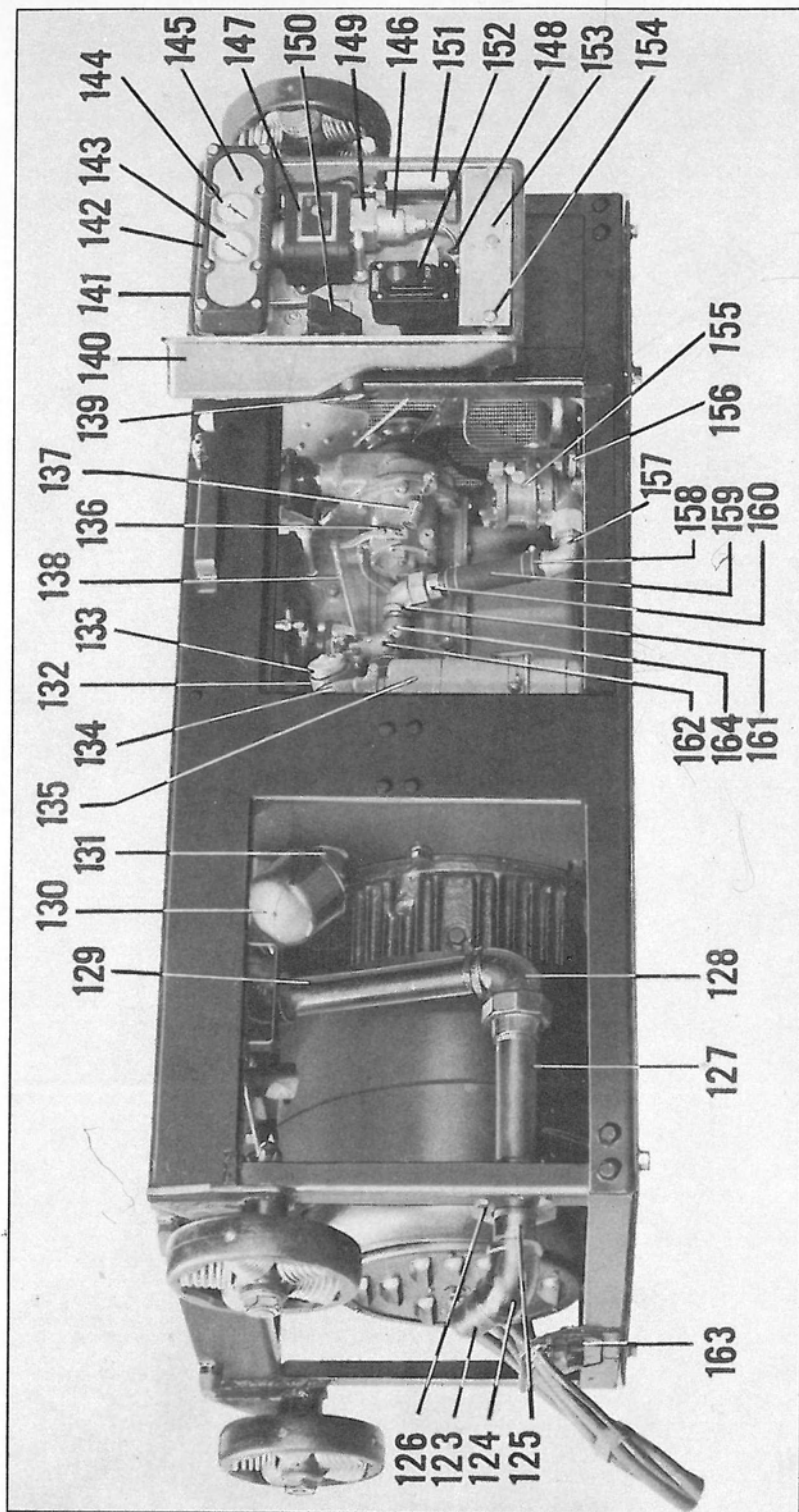
OPERATING INSTRUCTIONS FOR PROPANE FUEL SYSTEM USED WITH ENG-GEN.SET. WAUKESHA MOTOR CO., WAUKESHA, WISCONSIN.



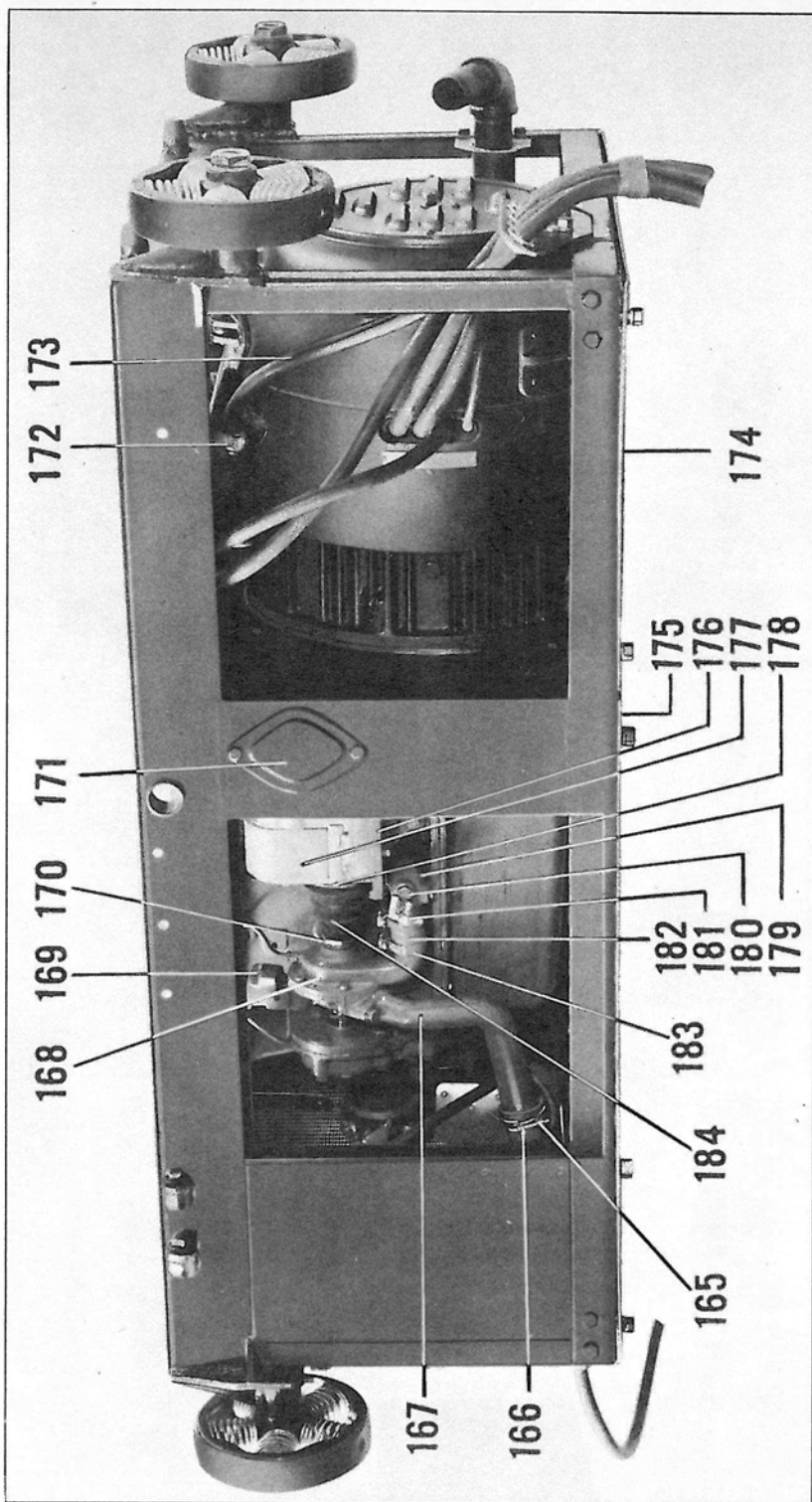
ENGINE-GENERATOR CROSS SECTION



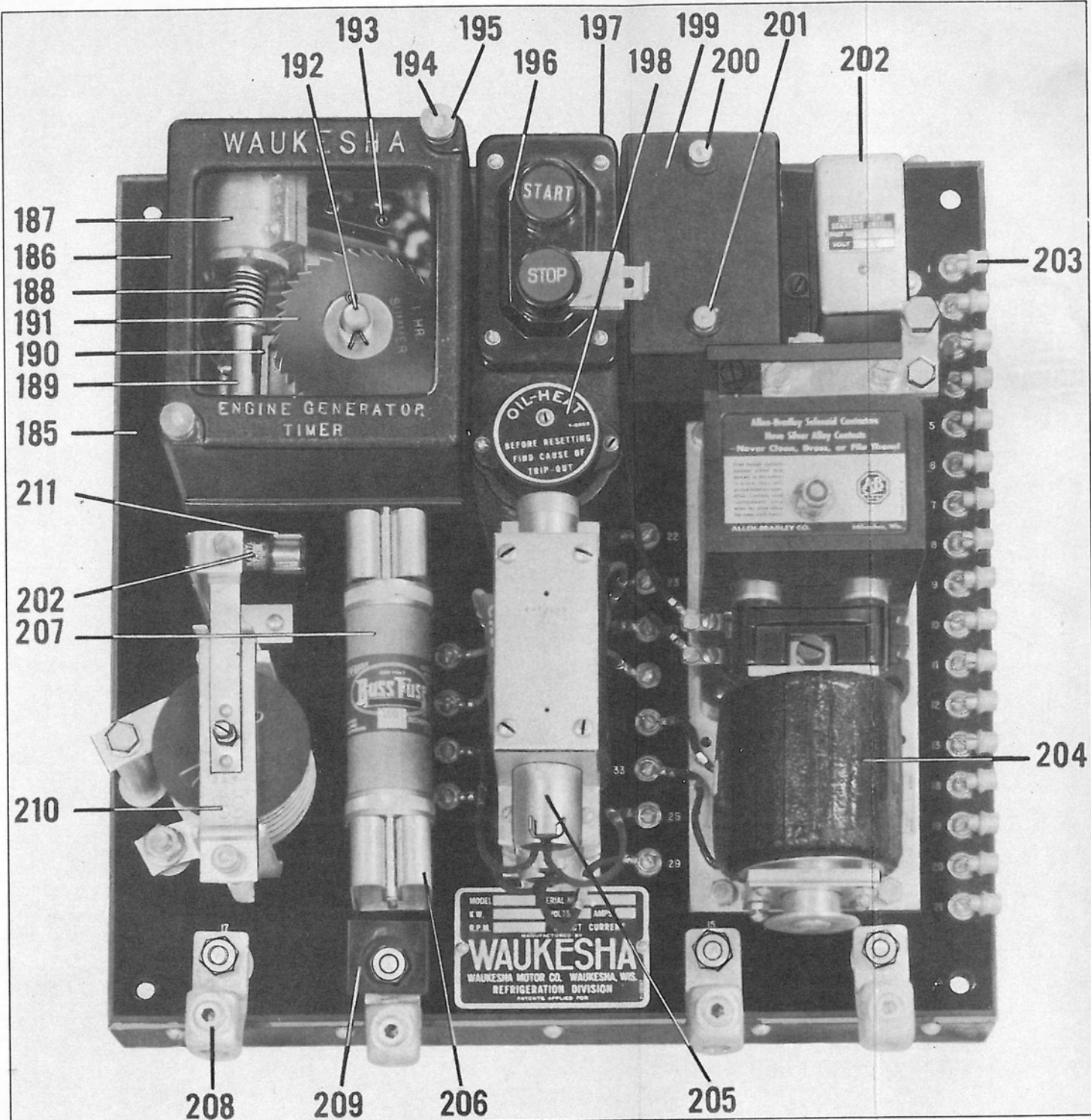
TOP VIEW OF ENGINE-GENERATOR UNIT



CARBURETOR SIDE VIEW OF ENGINE-GENERATOR UNIT

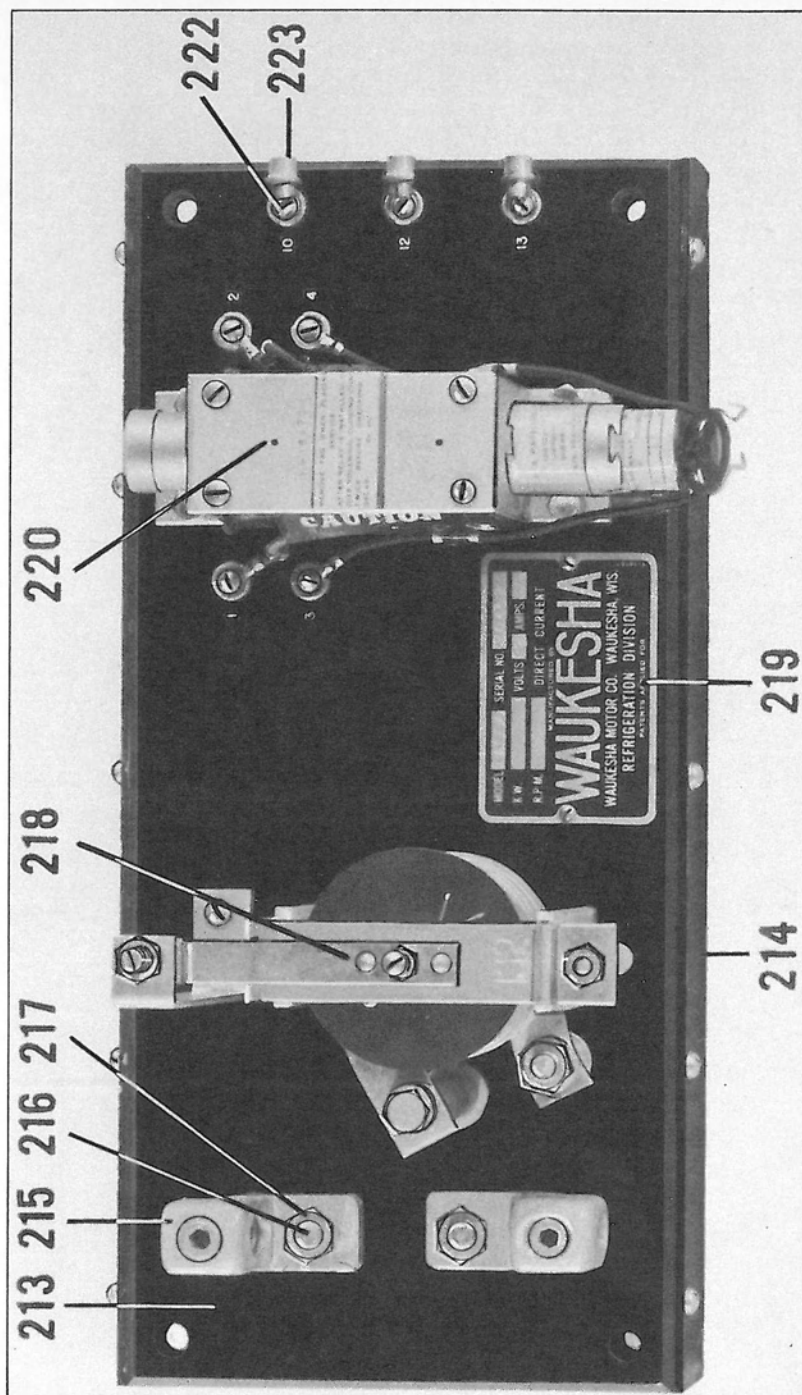


MAGNETO SIDE VIEW OF ENGINE-GENERATOR UNIT

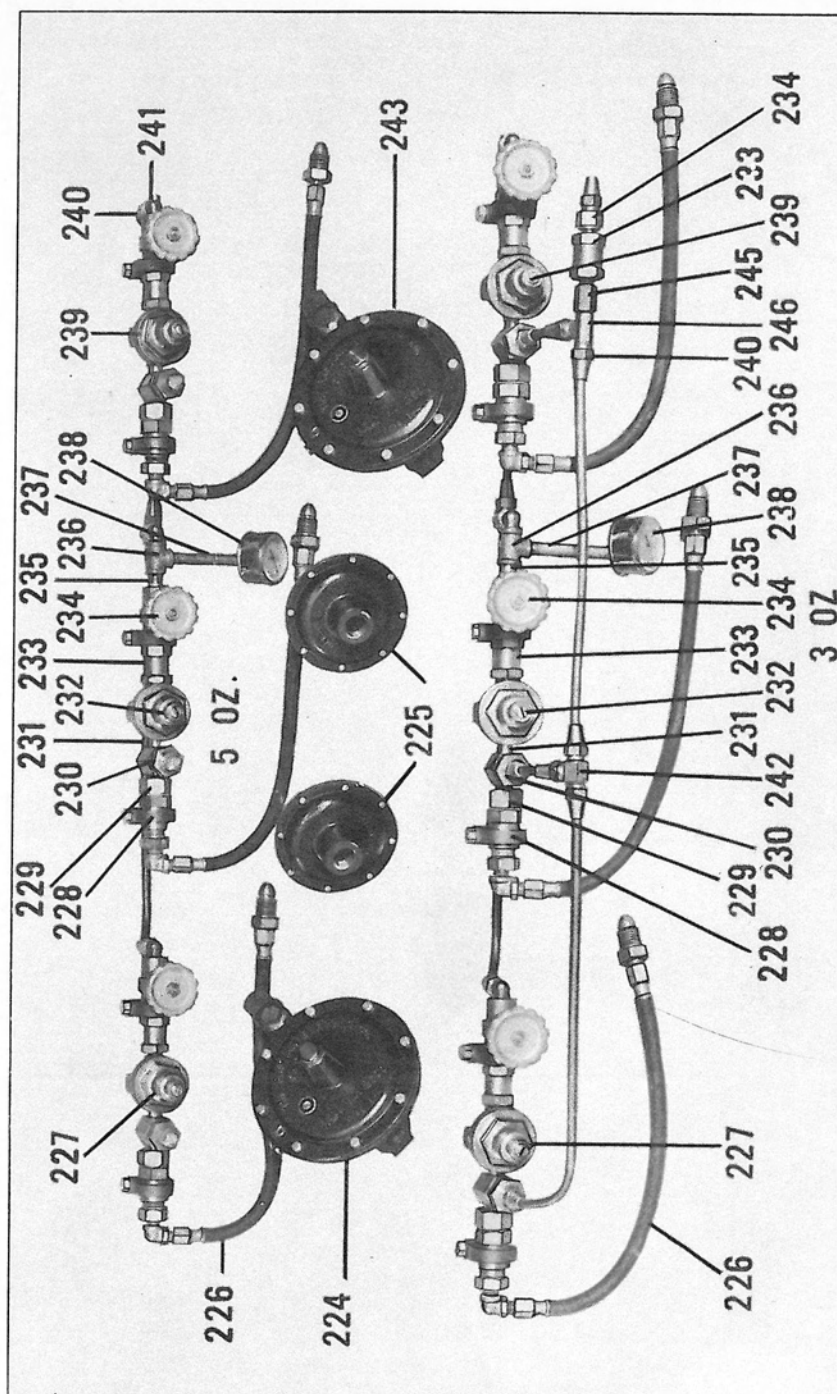


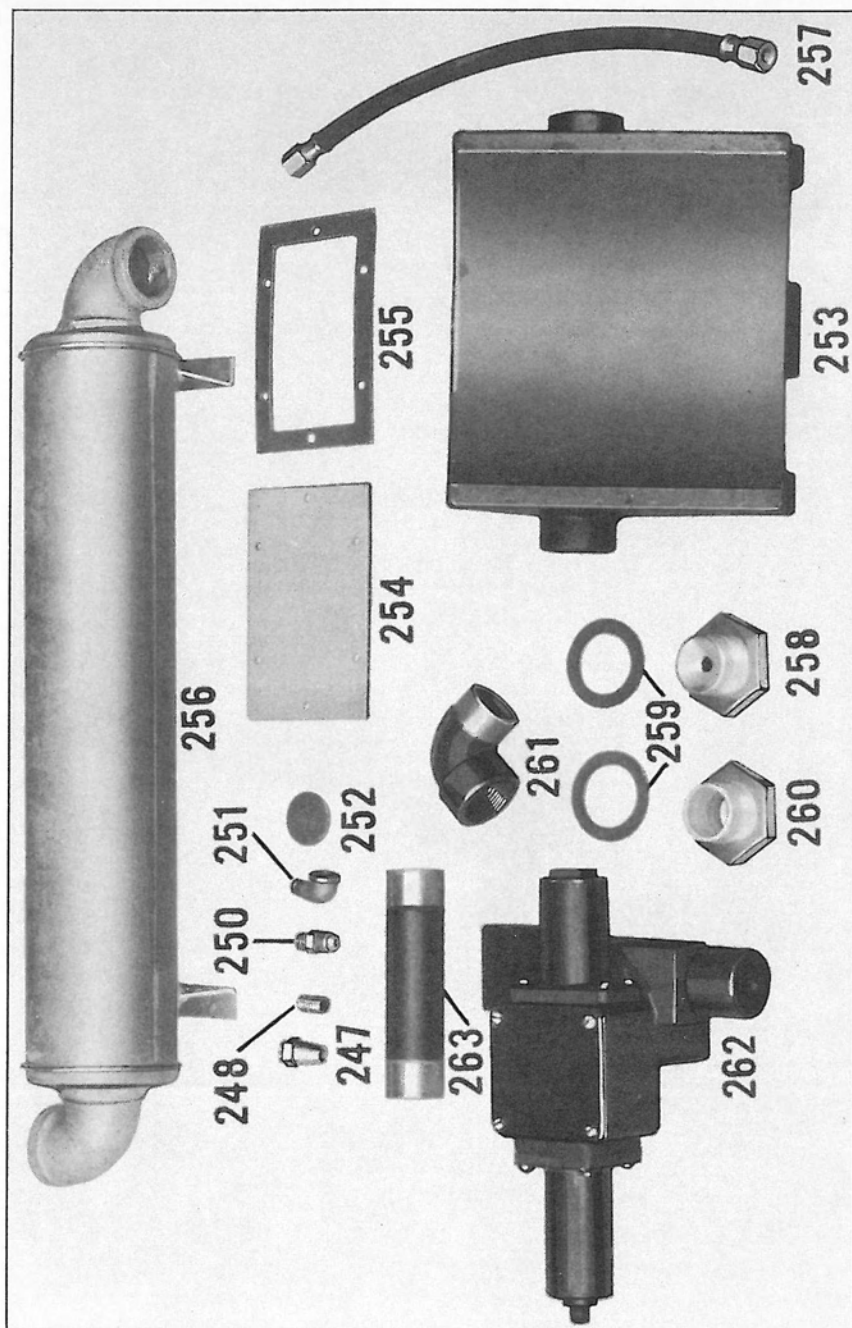
CONTROL PANEL

Fig. 7, Part 1



LOAD CURRENT RELAY PANEL





PART 2

ICE-ENGINE UNIT
MODEL "E"

* * * * *

AIR CONDENSER

* * * * *

SUB-COOLER

C O N T E N T S

INSTALLATION

GENERAL INFORMATION

OPERATING THE ICE-ENGINE UNIT FOR THE FIRST TIME

GENERAL

LUBRICATION

RADIATOR

CHARGING THE SYSTEM FOR THE FIRST TIME

STARTING ENGINE FOR TEST

STOPPING THE ICE-ENGINE

GENERAL OPERATING INFORMATION

CYCLE OF OPERATION

OPERATING SPEEDS

OPERATING PRESSURES

Refrigerant Pressures

Engine Oil Pressure

Fuel Supply Pressures

PROTECTIVE DEVICES

Refrigerant High-Low Pressure Switch

Oil-Heat Switch

Tip-Over Switch

Fuel Safety Devices

Fuses

SERVICE INSTRUCTIONS

LUBRICATION

Engine

Air Condensing Unit and Sub-Cooler

Compressor

RADIATOR

CLEANING CONDENSERS AND RADIATOR

Part 2

ELECTRICAL CONTACTS

FREON LEVEL

AIR CLEANER AND CRANKCASE BREATHER

FUEL MIXTURE ADJUSTMENT

ENGINE ADJUSTMENTS AND MAINTENANCE

COMPRESSOR MAINTENANCE

Oil Level

Compressor Seal

Compressor Rotor and Blades

Magnetic Sediment Plug and Drain Sump

Reverse Check Valve

STARTER-GENERATOR MAINTENANCE

Commutator and Brushes

Removing Armature

AIR CONDENSING UNIT

GENERAL

FAN CLEARANCE

AIR DEFLECTION ADJUSTMENT

COMMUTATOR AND BRUSHES

REMOVING CONDENSING UNIT MOTORS

EVAPORATIVE SUB-COOLER (LOW-TYPE WITHOUT WATER STORAGE CAPACITY)

GENERAL

OPERATION

MAINTENANCE

Air Filter

Motor-Pump-Blower Unit

Flushing Tank

SNAP ACTION FLOAT VALVE

OPERATING DIFFICULTIES

IMPROPER PRESSURES

High-Side Pressure

Suction Pressure

Fuel Pressures

Oil Pressure

ADJUSTING SPEED

ICE-ENGINE UNIT FAILS TO START

AIR CONDENSING UNIT MOTORS FAIL TO START

SUB-COOLER MOTOR FAILS TO START

TABULATED DATA

ENGINE

COMPRESSOR

STARTER-GENERATOR

AIR CONDENSING UNIT

SUB-COOLER

GENERAL

LIST OF ILLUSTRATIONS

SK-611-B	Wiring Diagram (Line Diagram)
SK-655	Wiring Diagram
SK-482-F	Wiring Diagram
SK-275	Carburetor and Fuel Regulator (See Part 1)
SK-238	Modulated Control
SK-676	Modulated Speed Curves
SK-657	Starter-Generator
SK-632	Air Condenser Wiring Diagram

SERVICE PARTS ILLUSTRATIONS

Figure 1	Ice-Engine Cross Section
Figure 2	Top View of Ice-Engine Unit
Figure 3	Carburetor Side View of Ice-Engine Unit
Figure 4	Magneto Side View of Ice-Engine Unit
Figure 5	Magneto Cross Section (See Part 1)
Figure 6	Control Panel (ZA-1009)
Figure 7	Air Condenser Unit
Figure 8	Sub-Cooler
Figure 9	Cross Section of Float Valve
Figure 10	Front View of 3-cylinder Fuel Cabinet
Figure 11	Rear View of 3-cylinder Fuel Cabinet (Heater type)

SERVICE PARTS -- See Part 3

MODEL "E" ICE-ENGINE UNIT

AIR CONDENSING UNIT

SUB-COOLER

INSTALLATION

GENERAL INFORMATION

The Waukesha Model "E" Ice-Engine Unit for Railway Air Conditioning is a self-powered refrigerating system consisting of:

- (1) A Waukesha heavy-duty, 4-cylinder, internal combustion engine with accessories.
- (2) A direct connected rotary type Refrigerant Compressor.
- (3) A Starter-Generator direct connected between the engine and the compressor.
- (4) A separate Air Condensing Unit electrically operated from the Starter-Generator in the Ice-Engine unit.
- (5) An Evaporative-type Sub-Cooler electrically operated by the Starter-Generator in the Ice-Engine unit.
- (6) An Ice-Engine Control Panel with the necessary starting and operating relays and protective devices.
- (7) A Fuel System consisting of the fuel cylinder carrier, cylinders of propane, and the various pressure regulators, shut-off valves, and safety devices.

When locating the Ice-Engine under the car it is important to provide sufficient openings on all sides for free air movement. Installation drawing SK-656 gives dimensions for mounting tracks, receiver, air condensing unit, and Sub-Cooler. (Copies may be obtained from the Waukesha Motor Company, Refrigeration Division.) Wiring diagrams SK-655 and SK-611-B show the complete car and Ice-Engine wiring.

OPERATING THE ICE-ENGINE UNIT FOR THE FIRST TIME

GENERAL

After the Ice-Engine is in place and also the remaining part of the system is completed, it will be necessary to thoroughly clean the refrigerant system, then to evacuate or purge the system. Following this a preliminary charge of Freon should be introduced for testing for leaks under pressure with a Halide lamp. Then a final charge of Freon should be added preparatory to putting the Ice-Engine in regular service. The following instructions should be observed step-by-step for this first starting of the Ice-Engine.

LUBRICATION

Fill the engine crankcase with four (4) quarts of good quality S.A.E. #10 automotive cylinder oil. Also fill the engine air cleaner and crankcase breather with similar oil. The compressor is shipped from the factory filled with the proper amount of oil.

RADIATOR

Fill the engine radiator auxiliary supply tank with clean, soft water. Be sure that the top hose connection from the expansion tank connects to the top of the radiator and the bottom hose connection from the expansion tank to the bottom of the radiator. With an empty radiator, allow sufficient time for it to fill from the auxiliary expansion tank before operating the engine.

If the car is subject to freezing weather on a portion of its run, then protect with a suitable anti-freeze solution. (See Part 1).

CHARGING THE SYSTEM FOR THE FIRST TIME

After the air condensing unit, Sub-Cooler, receiver and evaporator are in place and connected to the refrigerant lines and before the Ice-Engine unit is connected, it is strongly recommended that some cleansing solution be circulated through the entire refrigerant system to thoroughly clean the system and also to remove all loose dirt. Then connect the Ice-Engine unit. **CAUTION:** DO NOT PUMP A VACUUM WITH THE ICE-ENGINE UNIT. The Ice-Engine unit must never be operated below 5 lbs. suction pressure nor without pressure differential between the high side and low side to insure lubrication. The entire refrigerant system must be evacuated by a separate evacuating pump connected anywhere in the system

preferably in the discharge valve on the compressor. All valves in the entire refrigerant system must, of course, be open. Where a separate evacuating pump is not available, purge the entire system with Freon. Then introduce a small charge of Freon that will give sufficient pressure for checking for leaks with a Halide lamp.

After all leaks have been eliminated the Ice-Engine is ready for its final complete charge of Freon. This charge may be added by either pumping it into the system with a separate compressor unit or by connecting a Freon drum to the suction valve on the compressor and running the Ice-Engine.

STARTING ENGINE FOR TEST

After the proper amounts of water and oil have been added to the engine, as already mentioned, then connect the fuel cylinder and open all the fuel valves. The fuel pressure should now be indicated on the manometer in the Ice-Engine control box. All refrigerant valves should be in their normally "OPEN" operating positions. Connect a refrigerant drum to the suction valve on the compressor. The Ice-Engine may now be started by operating either the "START" button in the Ice-Engine control box or the "START" button on the Ice-Engine panel in the electric locker or by energizing the thermostat circuit. If the refrigerant is added to the compressor as a vapor, sufficient heat must be applied to the refrigerant drum to keep its pressure above 5 lbs. If the refrigerant is added as a liquid, caution must be taken that the refrigerant is added very slowly as the Ice-Engine is running. The Freon level is correct when it shows in the bull's-eye of the receiver when the Ice-Engine has been operated for some time under normal operating conditions.

STOPPING THE ICE-ENGINE

The Ice-Engine is stopped by merely de-energizing the thermostat circuit or releasing either of the "START" buttons mentioned above. The air condensing unit automatically starts and stops whenever the Ice-Engine is started and stopped. With the Ice-Engine running, the Sub-Cooler will run only when the head pressure is above the predetermined setting of the pressure switch in the Sub-Cooler.

GENERAL OPERATING INFORMATION

CYCLE OF OPERATION

Refer to wiring diagrams SK-655 and SK-611-B. The starting cycle of the engine is as follows: When either the "START" button in the Ice-Engine control cabinet or on the Ice-Engine panel located in the electric locker is operated, or the

thermostat circuit is energized, the control relay "A" is energized, which closes one contact to energize the condenser contactor "E"; another contact closes in the generator shunt field circuit; the third contact of relay "A" removes the ground circuit from the magneto. Condenser contactor "E," when energized, picks up to open the circuit to both the air condensing unit motors and the Sub-Cooler. Starting contactor "D" picks up to close the starting circuit to the series field of the Starter-Generator, which now begins to motorize. When the engine starts to operate, the vacuum switch "K" opens (above approximately 1-1/2" of engine manifold vacuum) to de-energize the condenser contactor "E," which closes and thus energizes both air condensing unit motors and the Sub-Cooler motor, if its pressure switch is closed. When the manifold vacuum rises above approximately 7" of vacuum, vacuum switch "L" opens to de-energize the starting contactor "D," which opens the Starter-Generator series field circuit, and also closes a contact in the generator shunt field circuit. The generator now picks up voltage as a generator to operate the air condensing unit motors and the Sub-Cooler motor. The battery now supplies current to the generator shunt field only, which is separately excited.

If the Ice-Engine does not start in 15 to 20 seconds, the intermittent starting switch "AA" opens to de-energize the starting contactor "D" for approximately 45 seconds. It then closes automatically and the cranking cycle repeats for another 15 to 20 seconds. If the engine fails to start in approximately 3 minutes the Crank Limit Switch "F" will trip out, thus de-energizing relays "A," "D," and "E," until the Crank Limit Switch is manually reset.

The Oil-Heat Switch "G" is de-energized during the cranking cycle even though the Oil-Heat Switch "I," located in the Ice-Engine unit, will be closed due to low oil pressure. After the Ice-Engine has started, then oil-heat protection starts. Should the oil pressure go below approximately 4 to 6 lbs. or the engine head temperature go above 220° F. to 230° F., the Oil-Heat Switch "I" will close its contact to energize the stop switch "G" located on the Ice-Engine panel. In approximately 1-1/2 minutes "G" will trip out to stop the Ice-Engine until it is manually reset.

Similarly, the High-Low Stop Switch "H" is de-energized during the cranking cycle, but after the engine has started the High-Low pressure protection starts. Should the head pressure go above approximately 290 lbs., or the suction pressure go below approximately 7-1/2 lbs., the High-Low Pressure Switch "J," located in the Ice-Engine unit, closes its contact to energize the stop switch "H." In approximately 1-1/2 minutes "H" will

trip out to stop the Ice-Engine until it is manually reset.

Any time that the refrigerant load becomes so excessive that the engine manifold vacuum drops below approximately 3" of vacuum, the high vacuum switch "L" will close its contact to energize starting contactor "D," also de-energizing the generator shunt field. This relieves the engine of its electric load which will now be supplied from the battery as long as the engine has an excessive refrigerant load. Whenever the engine manifold vacuum again rises above approximately 7", the vacuum switch "L" will reopen to de-energize starting contactor "D," again putting the electric load directly across the generator.

OPERATING SPEEDS

Drawing SK-676 shows the relation between the suction pressure and the engine speed as determined by the modulated control drawing SK-238. For adjustment of the modulated control see "ADJUSTING SPEED" under "OPERATING DIFFICULTIES."

OPERATING PRESSURES

Refrigerant Pressures

The refrigerant suction or low side pressure will vary according to the temperature of the air passing through the evaporator and also according to the speed of the Ice-Engine. After the unit has operated a few minutes, the suction pressure should range from 20 to 45 lbs., being higher with a higher car temperature. The suction pressure will also vary considerably, depending upon whether the entire evaporator is operated or just a small part of the evaporator coil.

The discharge or high side pressure will increase with an increase in suction pressure or with an increase in the air temperature through the condensers. The high side pressure in pounds will be approximately double the air temperature in degrees—with 70° air entering the condenser the high side pressure should be approximately 140 to 150 lbs. per square inch, with a normal suction pressure of 35-37 lbs.

For excessive or abnormal high side or low side pressures refer to paragraph entitled "IMPROPER PRESSURES" under "OPERATING DIFFICULTIES."

Engine Oil Pressure

The engine oil pressure should range between 15 and 35 lbs. The pressure may be adjusted by turning the adjusting screw on the engine block directly beneath the carburetor.

Part 2

Fuel Supply Pressures

See "FUEL SUPPLY PRESSURE" under "GENERAL OPERATING INFORMATION" in Part 1 of this book referring to the Engine-Generator.

PROTECTIVE DEVICES

Refrigerant High-Low Pressure Switch

Should the refrigerant head pressure go above approximately 290 lbs. or the suction pressure go below approximately 7-1/2 lbs., the high-low pressure switch "J," located in the Ice-Engine control box, will close its contact to energize the stop switch "H" on the Ice-Engine panel in the electric locker. After 1-1/2 minutes the stop switch "H" will trip out to stop the Ice-Engine until manually reset. The high-low pressure switch "J" (See SK-611-B) opens its contact below approximately 275 lbs. head pressure or above approximately 15 lbs. suction pressure.

Oil-Heat Switch

The Oil-Heat Switch "I" will close its contact below approximately 4 to 6 lbs. oil pressure, or above 220 to 230° F. engine head temperature. This will energize the stop switch "G" which trips out in approximately 1-1/2 minutes to stop the Ice-Engine until manually reset.

Tip-Over Switch

This switch is mounted inside of the Ice-Engine control box and will ground the magneto in case the Ice-Engine unit tips more than 45° in any direction.

Fuel Safety Devices

See "Fuel Safety Devices" under "PROTECTIVE DEVICES" in Part 1 of this book referring to the Engine-Generator.

Fuses

See SK-611-B. The starting fuse "O" will blow in 10 to 30 seconds if the Engine-Generator fails to turn over for any reason. The control circuit fuse "P" protects the control wiring on the Ice-Engine panel. Motor fuses "Q" and "R," also on the Ice-Engine panel, protect both the air condensing unit motors and the Sub-Cooler motor against continued overload or short circuits.

CAUTION: When renewing the fuse links be sure to use only the same size and type of link as indicated on the Ice-Engine panel.

SERVICE INSTRUCTIONSLUBRICATIONEngine

The engine crankcase requires draining and refilling every 300 hours of operation. Use #10 oil for winter and also the first filling of a new engine, and #30 oil for summer.

The engine water pump requires turning of the grease cup one-half turn approximately once a week. Use a good automotive water pump grease.

The magneto requires lubrication twice a year, also when the magneto is overhauled.

Air Condensing Unit and Sub-Cooler

The air condensing unit motors and Sub-Cooler motor should be greased approximately every 450 hours of operation. The following is a partial list of recommended greases:

1. Master Lubricant Company Lubrico M-6
2. Cities Service Oil Company Trojan M-3
3. Sinclair Refining Company Universal
4. Standard Oil Company Superla 4X or 6X
5. Texas Company Starfak #3
6. Socony Vacuum Oil Company BRB #4

Compressor

Use only a high-grade automotive oil SAE #60 obtained in sealed cans. The oil level should be visible in the bull's-eye in the compressor after the Ice-Engine has been operated for some time with normal load. Oil is added to the compressor by closing the suction valve on the compressor and pumping down the low side of the compressor until the suction pressure is about 5 lbs., then stop the unit immediately and close the compressor discharge valve. Now slowly remove the 1/8" pipe plug in the discharge valve and vent to atmosphere the small amount of refrigerant gas contained in the compressor. The oil may now be poured in through this connection with suitable pipe fittings.

RADIATOR

The auxiliary radiator water supply tank will automatically keep the radiator full of water as needed; therefore, it is necessary only to fill the auxiliary radiator water supply tank whenever the level is not visible in the sight glass in the auxiliary tank.

CLEANING CONDENSERS AND RADIATOR

Frequency of cleaning will depend entirely upon the type of service in which the car is operated. Radiator and engine compartment, also the air condensing unit, should be blown out as often as necessary.

The radiator is equipped with convenient inspection holes for inspecting the internal condition of the radiator. Grease, sludge, or lime deposits in the radiator greatly reduce the cooling efficiency of the radiator and must be periodically removed. Suitable cleaning compounds are available on the market for removing such deposits and should be used as often as necessary, depending upon the operating conditions. See cleaning and flushing instructions contained in envelope on rear cover.

ELECTRICAL CONTACTS

Regular attention is necessary to clean and keep clean all the electrical contacts in the control equipment. These contacts should have periodical inspection by competent employees.

FREON LEVEL

When the Ice-Engine is running under normal conditions and load, the refrigerant level should be visible in the bull's-eye in the receiver. Any refrigerant level considerably below the bull's-eye would indicate a loss of refrigerant and will result in Freon gas passing out into the liquid line, with consequent loss in cooling effect.

AIR CLEANER AND CRANKCASE BREATHER

See "AIR CLEANER AND BREATHER CAP (CRANKCASE)" under "SERVICE INSTRUCTIONS" in Part 1.

FUEL MIXTURE ADJUSTMENT

See "FUEL MIXTURE ADJUSTMENT" under "SERVICE INSTRUCTIONS" in Part 1.

ENGINE ADJUSTMENTS AND MAINTENANCE

See "ENGINE ADJUSTMENTS AND MAINTENANCE" in Part 1. NOTE: On the Ice-Engine there is no flywheel on which to indicate the timing marks. A stationary indicator, fastened to the Starter-Generator brush ring assembly (on the magneto side of the Ice-Engine unit), points to three drilled indentations on the top of the commutator risers. These indentations refer to piston #1 after its compression stroke and indicate (from left to right facing commutator end of armature) "FIRE," "DEAD CENTER," and "INTAKE OPENS."

COMPRESSOR MAINTENANCE

Oil Level

Be sure to keep the oil level always visible in the bull's-eye in the compressor. Check after the Ice-Engine has been operating for some time with normal load. Oil is added as described under "LUBRICATION."

Compressor Seal

The compressor seal is removed as follows:

- (1) Close the compressor suction valve and operate the Ice-Engine until the suction pressure is 5 lbs., then stop immediately.
- (2) Close the discharge valve.
- (3) Slowly remove the 1/8" pipe plug in the compressor discharge valve and vent the small amount of Freon in the compressor to the atmosphere.
- (4) The refrigerant lines may now be disconnected from the compressor, the compressor valve remaining attached to the flexible refrigerant lines. Unsweat the small refrigerant control lines.
- (5) Remove the supporting bolts that hold the compressor to the Starter-Generator, then remove the bolts holding the compressor bracket on top of the compressor to the frame, and gently pull out the compressor unit.
- (6) Very carefully remove the drive coupling from the end of the compressor shaft. CAUTION: Use only a suitable puller and do not pound on the shaft. Remove the cap screws holding the large end plate on the compressor. The seal is now visible and can be readily removed and replaced.

Compressor Rotor and Blades

Proceed as outlined for removing the compressor seal, then continue as follows:

- (1) Remove the spiral oil circulating line.
- (2) Remove the cap screws holding the inner end plate of the compressor. The entire rotor and cylinder assembly can now be readily pulled out.
- (3) Remove the cap screws and the end plate over the compressor shaft opposite to the driving end.

- (4) Remove the screw in the end of the compressor shaft retaining the bearings. The entire rotor assembly may now be readily removed. CAUTION: Before the rotor is entirely removed from the cylinder, tie a string around the rotor to hold all the vanes in their respective places. It is best wherever possible that the same vanes stay in the same slots and in the same positions. All the blades must be perfectly free to slide in and out. Be sure that no dirt or grit enters the slots so as to interfere with the free movement of the blades.

Magnetic Sediment Plug and Drain Sump

A convenient magnetic sediment plug and drain sump are incorporated in the bottom of the compressor to attract and retain any iron particles. After the refrigerant pressure in the compressor has been vented to the atmosphere, the magnetic plug may be removed and cleaned. Also replace compressor oil with new oil.

Reverse Check Valve

A reverse check valve is incorporated between the compressor suction valve and the compressor. This valve closes instantly when the Ice-Engine unit stops to prevent the high side pressure from passing out into the low side of the system. The valve should operate freely. Replace the composition seat when necessary.

STARTER-GENERATOR MAINTENANCE

Commutator and Brushes

The commutator and brushes of the Starter-Generator must be given periodical inspection like any other generator. Frequently note the condition of the brushes and whether they move freely in the brush holders. Observe the commutation with the Ice-Engine operating. The entire brush holder assembly may be readily rocked back and forth for position of best commutation. Periodically blow out the generator housing. See SK-657 for details and cross section.

Removing Armature

After the compressor has been removed, as described under "Compressor Seal," proceed as follows:

- (1) Remove the large end plate and brush holder assembly.
- (2) Remove the nut in the end of the armature shaft.

- (3) With suitable puller, the armature may now be readily removed from the stub shaft extending from the engine crank-shaft.

AIR CONDENSING UNIT

GENERAL

The air condenser unit is a remote primary condenser. It is connected in series with the compressor and Sub-Cooler. The air flow is into the unit through the two side air condenser coils and out the bottom of the unit. The special blower fans are driven by two 1/2 H.P. electric motors. The motors are energized by the Ice-Engine generator under normal load and by the car batteries under excessive refrigeration load.

FAN CLEARANCE

CAUTION: The clearance between the fan blades and shrouds should be 3/16". This is very important. The shroud is adjustable.

AIR DEFLECTION ADJUSTMENT

The air deflector vanes are fixed in the shroud ring, which can be turned to direct discharge air from the unit.

COMMUTATOR AND BRUSHES

The commutator and brushes should be periodically inspected the same as described under "STARTER-GENERATOR MAINTENANCE."

REMOVING CONDENSING UNIT MOTORS

Either condensing unit motor may be removed as follows:

- (1) Remove the bottom shroud and deflector assembly.
- (2) Remove the fan from the motor shaft by removing the nut on the end of the shaft with a socket wrench.
- (3) Detach the electric plug.
- (4) Remove the cap screws which hold the cushion support for the motor.
- (5) The motor can now be readily removed by turning it one-half turn in either direction.

Condenser coils should be cleaned frequently, depending on type of service. Coils should be blown out with compressed air or steam from the inside toward the outside.

EVAPORATIVE SUB-COOLER
(LOW-TYPE WITHOUT WATER STORAGE CAPACITY)

GENERAL

The purpose of the Evaporative Sub-Cooler is to increase the refrigerating capacity of the air condensers and compressor unit under extreme temperature conditions. The Evaporative Sub-Cooler has another function and that is it reduces the temperature or sub-cools the liquid refrigerant below the normal pressure-temperature point necessary to maintain the refrigerant completely in the liquid state. An adjustable pressure switch, located in the motor compartment, starts the blower pump motor when the discharge pressure of the refrigerant reaches a predetermined point (usually 175 lbs. per square inch gauge).

The refrigerant connections of the Evaporative Sub-Cooler on the system are shown on the piping diagram (SK-557), and the electrical circuit diagram (SK-655). The power for the electric motor is supplied by the Starter-Generator of the Ice-Engine unit.

OPERATION

Water is circulated from the sump tank and sprayed over a finned tube coil simultaneously with a stream of air. Evaporation results and a temperature approaching that of the outside wet bulb temperature is reached, which is usually much lower than the outside dry bulb temperature, particularly where the outside temperatures are extremely high and the air dry, such as on the desert.

Since water is evaporated in this process, it is necessary to add water to the supply maintained in the sump of the Sub-Cooler. This is accomplished automatically by the use of a snap action float valve and a connection to the car water supply. The sump tank on this unit has no storage capacity, and therefore must be assured of a constant source of water supply. When the car is in motion, the snap action float valve is more positive in operation under vibration and thereby conserves water.

MAINTENANCE

Air Filter

The Air Filter should be cleaned at frequent intervals and is removed from the unit by lifting up and pulling the bottom out. It should never be oiled, as its primary purpose is to remove the coarse dirt particles.

With the filter removed, the top front panel can be taken off by loosening the two hex head cap screws. The Motor-Pump-Blower Assembly is mounted on cushion hinge pins and can be swung out for running inspection by loosening the hand knob between the motor and blower housing.

The entire Motor-Pump-Blower unit can be removed readily by disconnecting the electrical plug, the suction hose connection to the pump, and taking out the two hinge pins.

Frequent checks should be made of the Motor-Pump-Blower Assembly to assure that the motor is thoroughly lubricated. Keep the two grease chambers partially filled with any good motor ball bearing grease.

The motor brushes should be inspected occasionally to see that they are contacting the commutator properly and that there is good running commutation.

There are no bearings in the water pump, as the impeller is mounted directly on the motor shaft. The pump packing gland should be tightened or repacked when necessary, but care should be used not to overload the motor by excessive pressure on the pump packing.

A vent cock is provided on the pump to release any air accumulations which might keep the pump from operating properly.

There is a removable 16-mesh screen between the pump suction compartment and the main tank. This should be cleaned and inspected frequently.

The main spray nozzle has a $3/8$ orifice and under normal operation should not clog. However, the spray pattern should be checked with the motor-pump-blower unit in the outward position to be sure complete coil coverage is being obtained.

Flushing Tank

There is a large drain plug in the bottom of the main tank which should be removed at regular intervals and the tank should be thoroughly flushed to remove all sediment. It is also advisable to swing the motor-pump-blower assembly away from the tank so that the flushing stream can be directed over the coil as well.

SNAP ACTION FLOAT VALVE

Occasional checks of the operating mechanism of the snap action float valve should be made to see that it is shutting

off positively so as not to permit the wasting of water. Scale accumulations on the snap action valve parts can be removed with a dilute solution of muriatic or hydrochloric acid.

OPERATING DIFFICULTIES

IMPROPER PRESSURES

High-Side Pressure

A high-side pressure considerably higher than twice the outside temperature with a normal back pressure of 35 - 37 lbs. indicates ineffective condensers, too much refrigerant, or air in the system. Clean each condenser thoroughly with both steam and air. Check the operation of the condenser motors by noting the speed. If the speed is considerably below the name plate rating, check further as to the impressed voltage and current draw. Excess refrigerant should be removed. Air may be purged from the top of the receiver through the purge connection provided for this purpose. Operate the unit for a few minutes, then stop and repeat the purging process. It may be necessary to do this several times if considerable air has been drawn into the system for any reason.

Suction Pressure

Suction pressure varies with the load in the evaporator and the compressor speed. The load varies directly with the size of the evaporator, and the amount, temperature, and humidity of the air passing through it. Abnormally low suction pressure may be due to any of the following reasons:

- (1) One or more expansion valves not functioning, due either to clogged strainer screen or valve orifice.
- (2) The thermostatic bulb on the expansion valve may have lost its charge, or it may not be in good contact with the refrigerant suction line.
- (3) The strainer in the liquid line from the receiver may be clogged and require cleaning. There is also a strainer in the liquid solenoid valve, when used, which may become clogged if the strainer in the liquid line ahead of it has failed.
- (4) The strainer in the suction line near the compressor may be clogged.
- (5) The evaporator may be restricted, dirty or inefficient.
- (6) There may be too little refrigerant in the system.

- (7) There may be expansion valves improperly adjusted.

Abnormally high suction pressure may be due to:

- (1) The expansion valves not operating, or being stuck open due to dirt or foreign matter in the valve mechanism.
- (2) The system may have too much refrigerant.
- (3) The expansion valves may be adjusted for too high a suction pressure, or the expansion valve orifices may be too large. This would be indicated by the temperature of the return line being too cold, considering the evaporator pressure.

A superheat of 10° to 15° is satisfactory.

Fuel Pressures

If the fuel pressure gauge located in the fuel cabinet shows a pressure considerably higher than the desired pressure for that fuel cylinder, and also will not reduce when the adjusting screw is turned in (clockwise) with the engine running, it indicates that the small fuel regulator (Y-6163-B) seat or diaphragm is defective and should be replaced.

If the fuel pressure to the engine, which should be 3 - 5 ounces, varies considerably, as measured with a mercury "U" gauge, it indicates a defective seat in the main fuel regulator (Y-6162). If fuel is escaping through the vent, the diaphragm is ruptured and must be replaced.

Oil Pressure

The engine oil pressure should range between 15 and 35 lbs. For oil pressure instructions see "GENERAL OPERATING INFORMATION."

ADJUSTING SPEED

The following procedure must be followed in installing or re-adjusting the modulated control (See SK-676 and SK-238):

- (1) Adjust the governor damping screw (A) so it protrudes 1/8 inch beyond the lock nut.
- (2) Remove the pin (N) from the governor arm.
- (3) The minimum speed of the engine is determined only by the screw (I) on the carburetor and the load on the engine. Therefore, first start the engine and obtain 18 - 22

Part 2

pounds suction pressure by throttling the compressor suction valve. Then adjust the screw (I) on the carburetor until the desired speed is obtained.

- (4) Adjust the distance (G) to approximately $1/4$ inch by loosening the screw (M) and slipping the carburetor arm on the throttle shaft. The throttle shaft must be turned against the stop screw (I) for this adjustment.
- (5) Valve (B) must be in the wide open position (counter-clockwise).
- (6) Turn the adjusting nut (K) until the modulator stem (L) just starts to move at 18 - 22 pounds rising pressure. As the adjusting nut (K) is turned up (clockwise) the tension is increased on the spring (O), requiring a higher pressure to move the modulator stem (L). The movement must be checked on a rising suction pressure obtained by throttling the suction valve (V) until the pressure is below 18 pounds, then opening the valve again.
- (7) With the engine running at the proper minimum speed (as set in paragraph 2) and with a suction pressure of 18 pounds, tentatively adjust the length of the eye bolt (C) until the slack in the governor spring (E) is just taken up. The pin (N) should be out for this adjustment.
- (8) Now adjust the length of the governor rod (J) so it just reaches (less $1/16$ inch) the governor arm (R) when the engine is running at the minimum speed setting corresponding to 18 - 22 pounds suction pressure. By making the length $1/16$ inch short, the screw (I) on the carburetor will be assured of hitting the stop each time the suction pressure is 18 pounds or less.
- (9) Run the engine a few minutes with as much load on the evaporator as possible so as to create a high suction pressure (not over 40 pounds). Then read the radiator fan speed or engine speed and compare with the speed indicated on the curve for that suction pressure. If the speed does not check within plus or minus 50 RPM., change the governor spring adjustment screw (C) in the direction needed.
- (10) Recheck the minimum speed at 18 - 22 pounds suction pressure. The carburetor arm should be against the stop screw (I). If not, shorten the governor rod (J) the amount necessary, but no more.

ICE-ENGINE UNIT FAILS TO START

If the Ice-Engine fails to crank, check (See SK-611-B and SK-655):

1. Starting fuse "O."
2. Control circuit fuse "P."
3. Battery voltage (between terminals "13" and "14").
4. Starting contactor "D."
5. Protective switches "F," "G," and "H."
6. Vacuum switch "L." Short out terminals "2" and "7."

If Ice-Engine cranks but will not start, check:

1. Fuel pressures.
2. Ignition. If no spark at spark plugs, check for ground on magneto by removing the ground wire from the magneto. Also see "Ignition" under "OPERATING DIFFICULTIES" in Part 1.
3. Improper fuel mixture adjustment on the carburetor.
4. If choking of air intake to carburetor starts the engine, it indicates a defective shut-off regulator.
5. Air in the fuel line.
6. Carburetor venturi dirty, restricting flow.

AIR CONDENSING UNIT MOTORS FAIL TO START (See SK-611-B and SK-655)

If air condensing unit motors fail to start, check:

1. Air condensing motor fuses "Q" at the panel.
2. Panel voltage between terminals "13" and "16."
3. Panel voltage between terminals "13" and "18" and "13" and "19."
4. Voltage at air condenser motor receptacle.
5. Shunt field resistor located in junction box near motor receptacles.
6. Motor brushes.

SUB-COOLER MOTOR FAILS TO START (See SK-611-B and SK-655)

If Sub-Cooler Motor fails to start, check:

1. Sub-Cooler motor fuses "R" at panel.
2. Refrigerant pressure switch in Sub-Cooler.
3. Panel voltage between "13" and "17."
4. Voltage at Sub-Cooler motor receptacle.
5. Motor brushes.

TABULATED DATAENGINE

Model	FCX
Bore (inches)	3-3/8
Stroke (inches)	4
Cylinders	4
Displacement (cu. in.)	143
Oil Capacity, without Filter (quarts)	4
Oil Pressure - (lbs. per sq. in.)	15 - 35
Oil, Summer Operation S.A.E. No.	30
Winter Operation S.A.E. No.	10
Water Capacity - Engine and Radiator only (gallons)	4
Valve Tappet Clearances Cold - Exhaust (inches)008
Intake (inches)006
Firing Order	1-3-4-2
Spark Advance, degrees ahead of dead center on flywheel	12°
Intake Valve opens, degrees after dead center on flywheel	5°
Spark Plugs (4) - Part No. Y-6635	18 mm

COMPRESSOR

Part Number	Y-6875-A
Oil Capacity - Use only SAE #60 automotive oil in sealed cans - (pints)	7
Speed ratio condenser fan to engine	1.82 to 1

STARTER-GENERATOR

Voltage (D.C.)	32
K.W.	2
Field Poles	6
Number of brushes	6

AIR CONDENSING UNIT

Model	RAC
H.P. each Motor (Two motors)	1/2
Volts	32
Amperes	16
R.P.M.	1725

SUB-COOLER

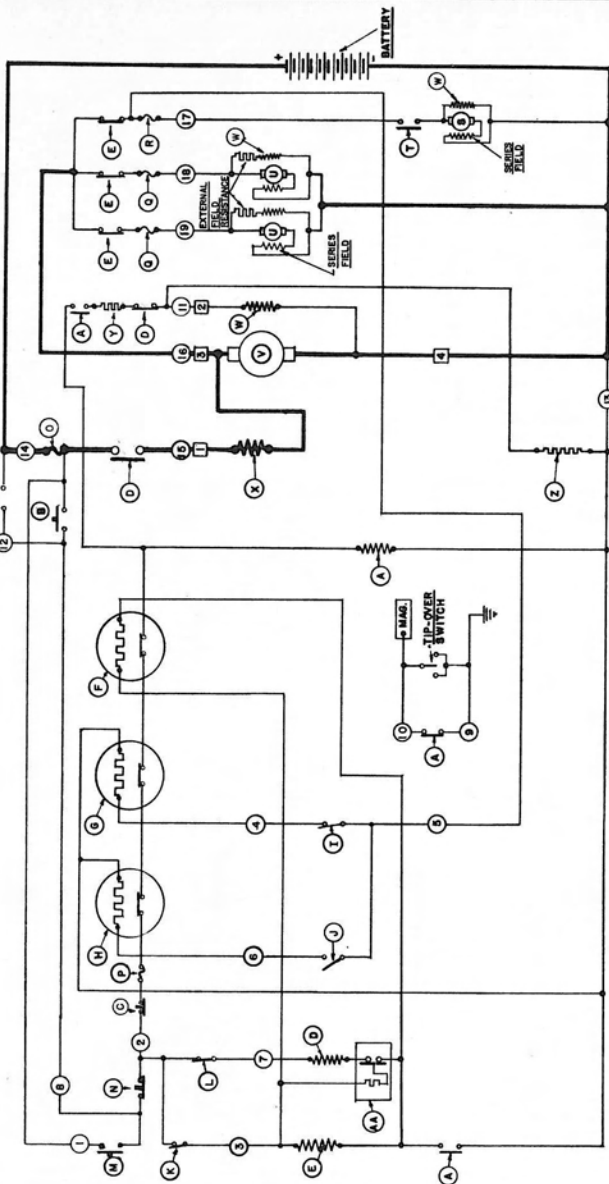
H.P. Motor	1/2
Volts	32
Amperes	16
Speed	1725

GENERAL

Weight Ice-Engine (lbs.)	1200
Receiver Capacity, Freon (lbs.)	50
Fuel Receiver Capacity, Propane (23.6 gal.)	100 lbs.
High Pressure Switch, set to stop engine at (lbs.)	290
High Pressure Switch, set to start engine at (lbs.)	270
Low Pressure Switch, set to stop engine below (lbs.)..	7-1/2
Low Pressure Switch, set to start engine above (lbs.) ...	15
Starter Crank Limit Switch, trips out in (minutes)	3 ^o
Oil-Heat Switch closes above	220-230 ^o
or below oil pressure of ...	4-6 lbs.
Oil-Heat Switch, opens below	210-220 ^o
or above oil pressure of ..	8-10 lbs.
Modulated Control - Minimum engine speed	
at 20 lbs. suction pressure	800
at 40 lbs. suction pressure	1400

8-119-XS

THERMOSTAT
RELAY



- A RELAY AA INTERMITTENT STARTING SWITCH
B STOP SWITCH ON PANEL
C STOP SWITCH ON PANEL
D STARTING CONTACTOR
E CONDENSER FUSES
F CRANK LIMIT SWITCH
G OIL-HEAT STOP SWITCH
H LOW PRESSURE STOP SWITCH
I HIGH PRESSURE STOP SWITCH
J VACUUM SWITCH
K VACUUM SWITCH (HIGH VACUUM)
L VACUUM SWITCH (HIGH VACUUM)
M START SWITCH ON UNIT
N STOP SWITCH ON UNIT
O STARTING FUSE -
P CONTROL CIRCUIT FUSE
Q CONDENSER FUSES
R SUB-COOLER MOTOR
S SUB-COOLER PRESSURE SWITCH
T CONDENSER MOTOR
U CONDENSER MOTOR
V SHUNT FIELD
W STARTING FIELD
X FIELD DISCHARGE
Y FIELD DISCHARGE
Z FIELD DISCHARGE

- 1 CIRCLES WITH NUMBERS INDICATE
TERMINALS ON PANEL
NUMBERS 1 TO 10 ARE ALSO IN
10-WIRE PLUG
2 SQUARES WITH NUMBERS INDICATE
2-WIRE PLUG

LINE DIAGRAM FOR MODEL E-6000-ERU ICE-ENGINE WIRING

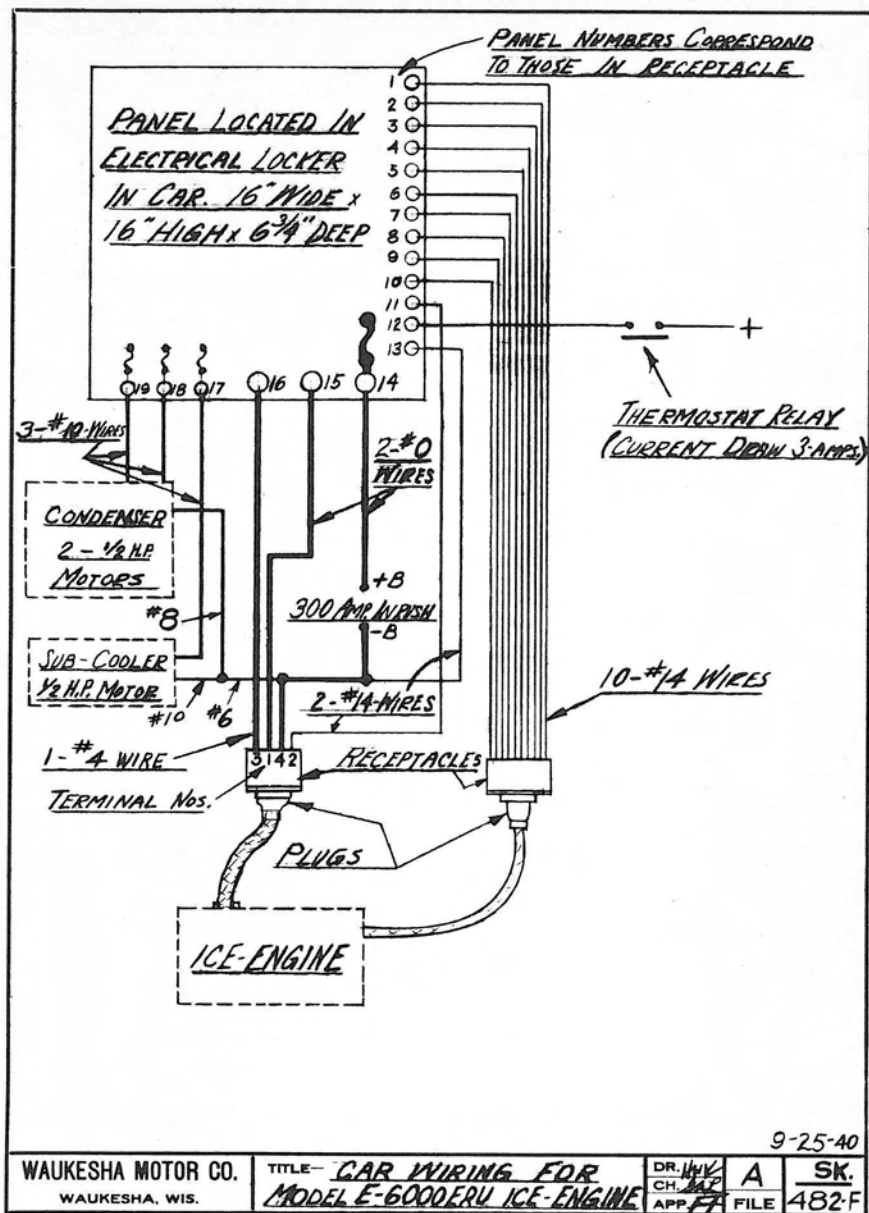
USE IN CONJUNCTION WITH 8K-685

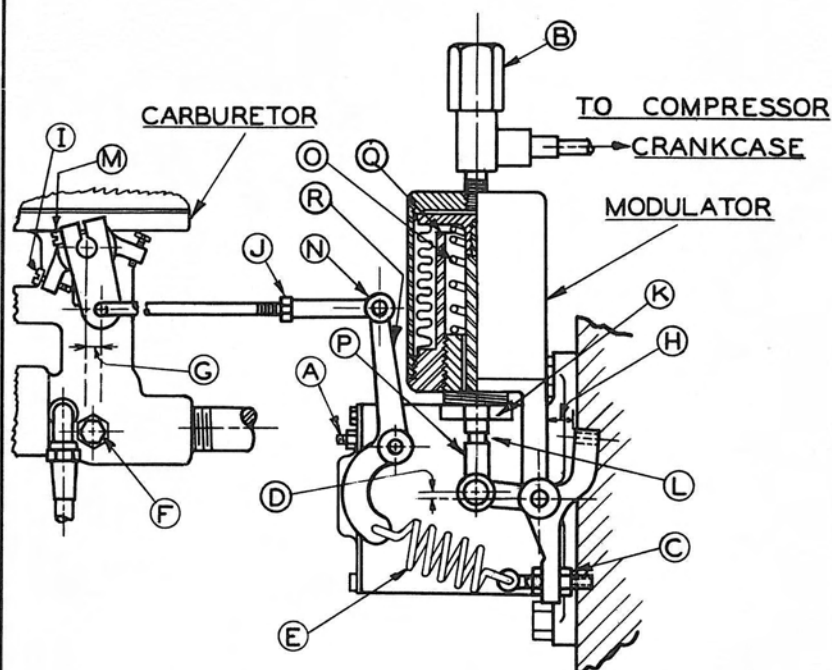
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2	1-15-40	W. J. HARRIS	W. J. HARRIS
3	1-15-40	W. J. HARRIS	W. J. HARRIS

WILCOX MOTOR CO.
WAUKESHA, WIS.

REVISED 2-26-41

SK-611-B





MODULATED ENGINE SPEED CONTROL

WAUKESHA MOTOR CO.
WAUKESHA, WIS.

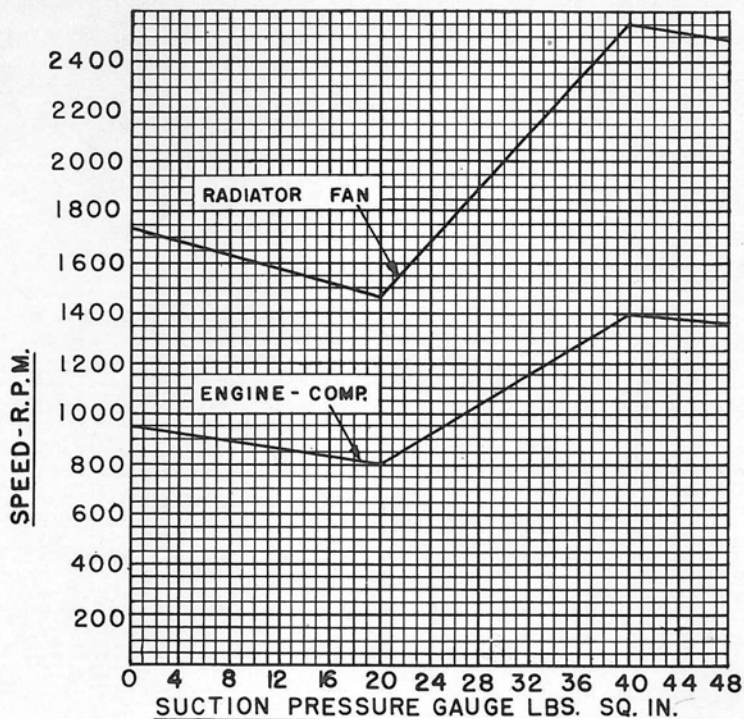
TITLE—MODULATED
CONTROL

DRW. E. C.
CH. 3-8-37
APP. 7/10/37

A
FILE

SK
238

979 XS



ON ALL FRACTIONAL MACHINE DIMENSIONS
ALLOW $\pm .010$ UNLESS OTHERWISE SPECIFIED
REF. DWG.

MODELS--

DRAWN D.D.T.

TRACED 4-3-41

CHECKED

APPROVED

A

FILE

WAUKESHA MOTOR CO.
WAUKESHA, WIS.

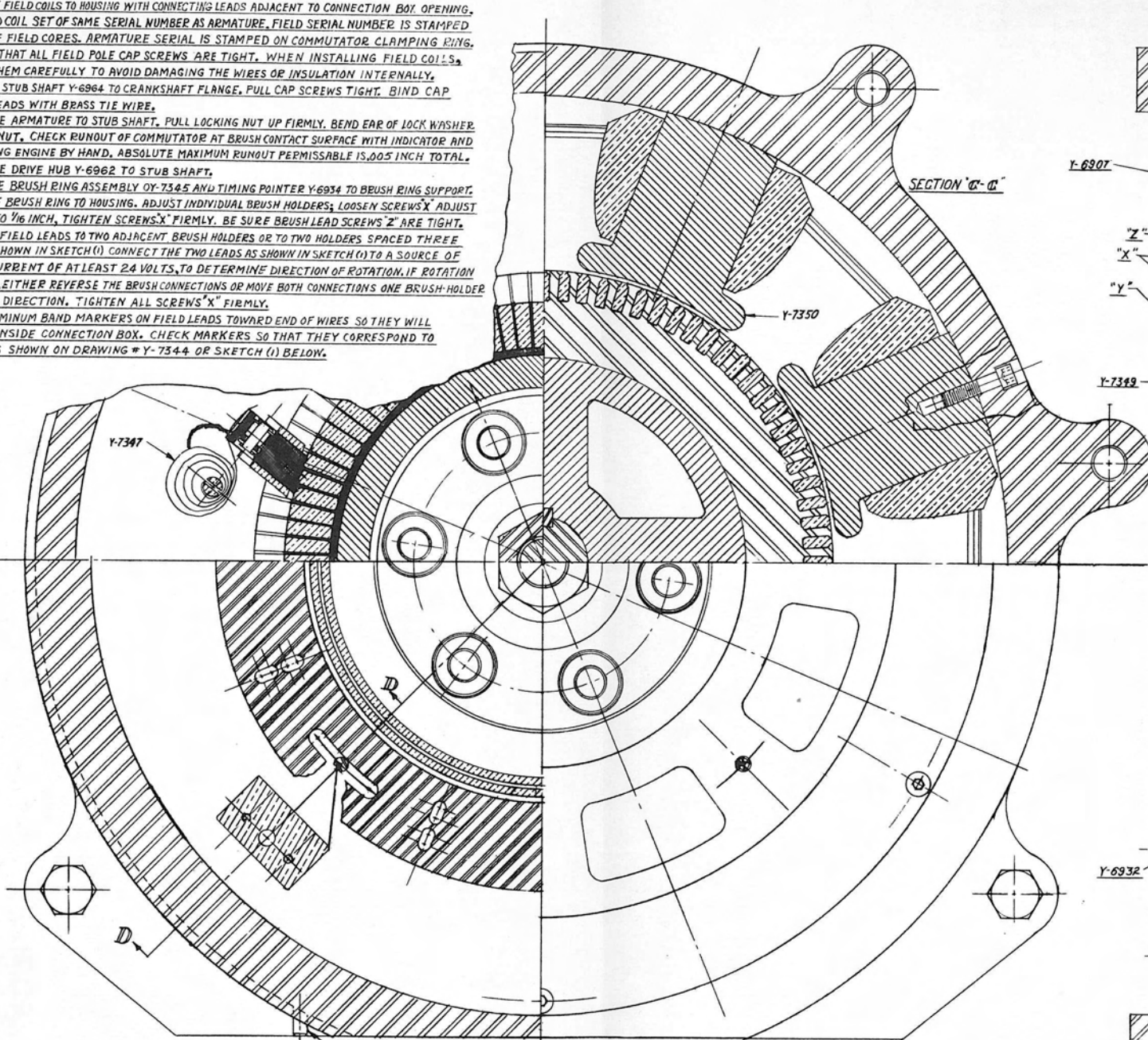
SK-676

PART NO.

LS9-XS

ASSEMBLY NOTES

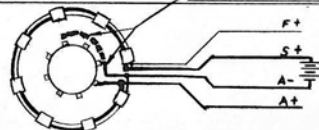
- I ASSEMBLE FIELD COILS TO HOUSING WITH CONNECTING LEADS ADJACENT TO CONNECTION BOX OPENING. USE FIELD COIL SET OF SAME SERIAL NUMBER AS ARMATURE. FIELD SERIAL NUMBER IS STAMPED ON END OF FIELD COILS. ARMATURE SERIAL IS STAMPED ON COMMUTATOR CLAMPING RING. BE SURE THAT ALL FIELD POLE CAP SCREWS ARE TIGHT. WHEN INSTALLING FIELD COILS, HANDLE THEM CAREFULLY TO AVOID DAMAGING THE WIRES OR INSULATION INTERNALLY.
- II ASSEMBLE STUB SHAFT Y-6964 TO CRANKSHAFT FLANGE. PULL CAP SCREWS TIGHT. BIND CAP SCREW HEADS WITH BRASS TIE WIRE.
- III ASSEMBLE ARMATURE TO STUB SHAFT. PULL LOCKING NUT UP FIRMLY. BEND EAR OF LOCK WASHER TO HOLD NUT. CHECK RUNOUT OF COMMUTATOR AT BRUSH CONTACT SURFACE WITH INDICATOR AND BY TURNING ENGINE BY HAND. ABSOLUTE MAXIMUM RUNOUT PERMISSIBLE IS .005 INCH TOTAL.
- IV ASSEMBLE DRIVE HUB Y-6962 TO STUB SHAFT.
- V ASSEMBLE BRUSH RING ASSEMBLY OY-7345 AND TIMING POINTER Y-6934 TO BRUSH RING SUPPORT.
- VI ASSEMBLE BRUSH RING TO HOUSING. ADJUST INDIVIDUAL BRUSH HOLDERS. LOOSEN SCREWS "X" ADJUST SPACE "Y" TO 1/16 INCH. TIGHTEN SCREWS "X" FIRMLY. BE SURE BRUSH LEAD SCREWS "Z" ARE TIGHT.
- VII CONNECT FIELD LEADS TO TWO ADJACENT BRUSH HOLDERS OR TO TWO HOLDERS SPACED THREE APART AS SHOWN IN SKETCH (I) CONNECT THE TWO LEADS AS SHOWN IN SKETCH (I) TO A SOURCE OF DIRECT CURRENT OF AT LEAST 24 VOLTS, TO DETERMINE DIRECTION OF ROTATION. IF ROTATION IS WRONG, EITHER REVERSE THE BRUSH CONNECTIONS OR MOVE BOTH CONNECTIONS ONE BRUSH HOLDER IN EITHER DIRECTION. TIGHTEN ALL SCREWS "X" FIRMLY.
- VIII MOVE ALUMINUM BAND MARKERS ON FIELD LEADS TOWARD END OF WIRES SO THEY WILL APPEAR INSIDE CONNECTION BOX. CHECK MARKERS SO THAT THEY CORRESPOND TO MARKINGS SHOWN ON DRAWING # Y-7344 OR SKETCH (I) BELOW.



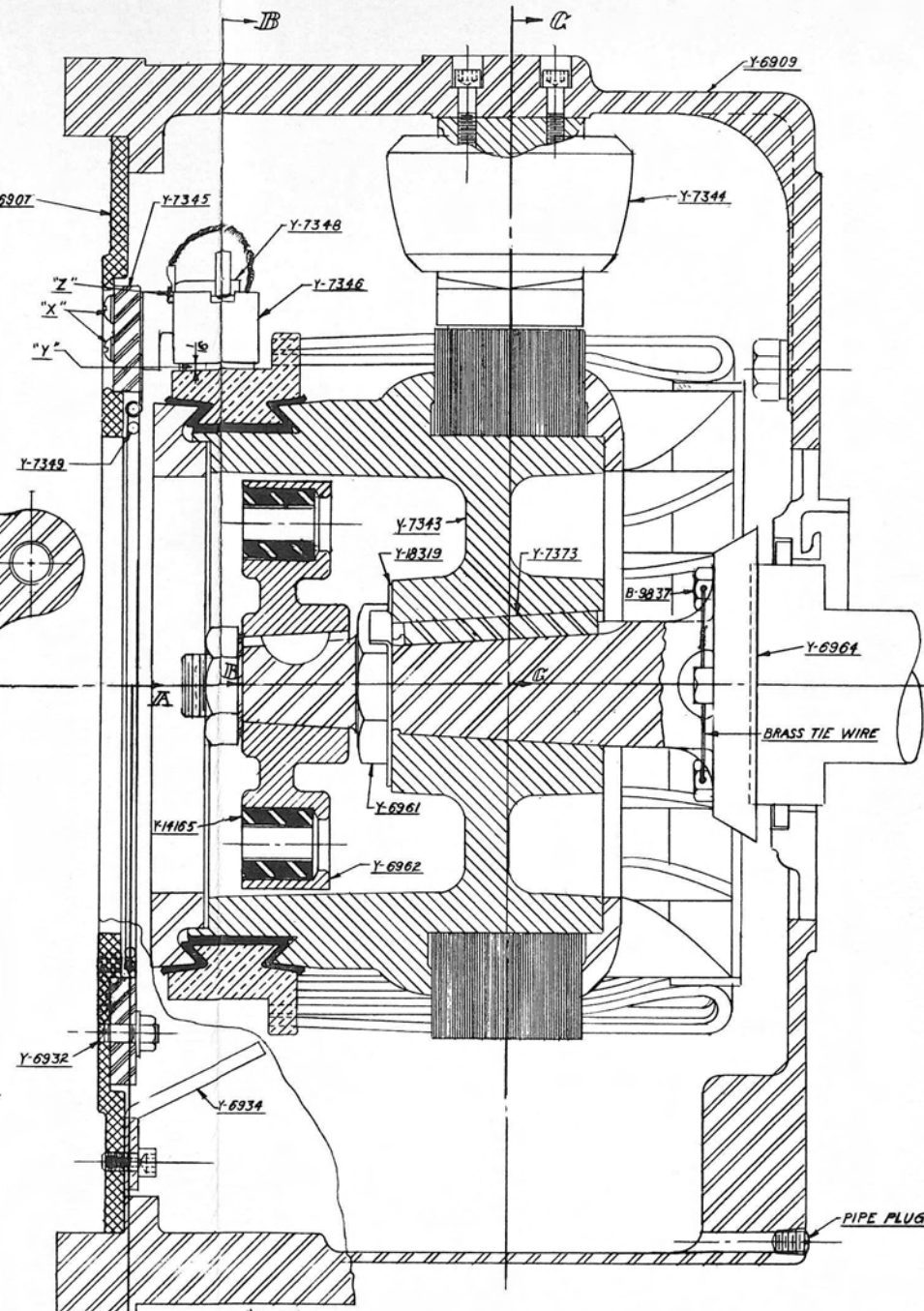
SECTION A-A

Y-6935

EITHER CONNECTION



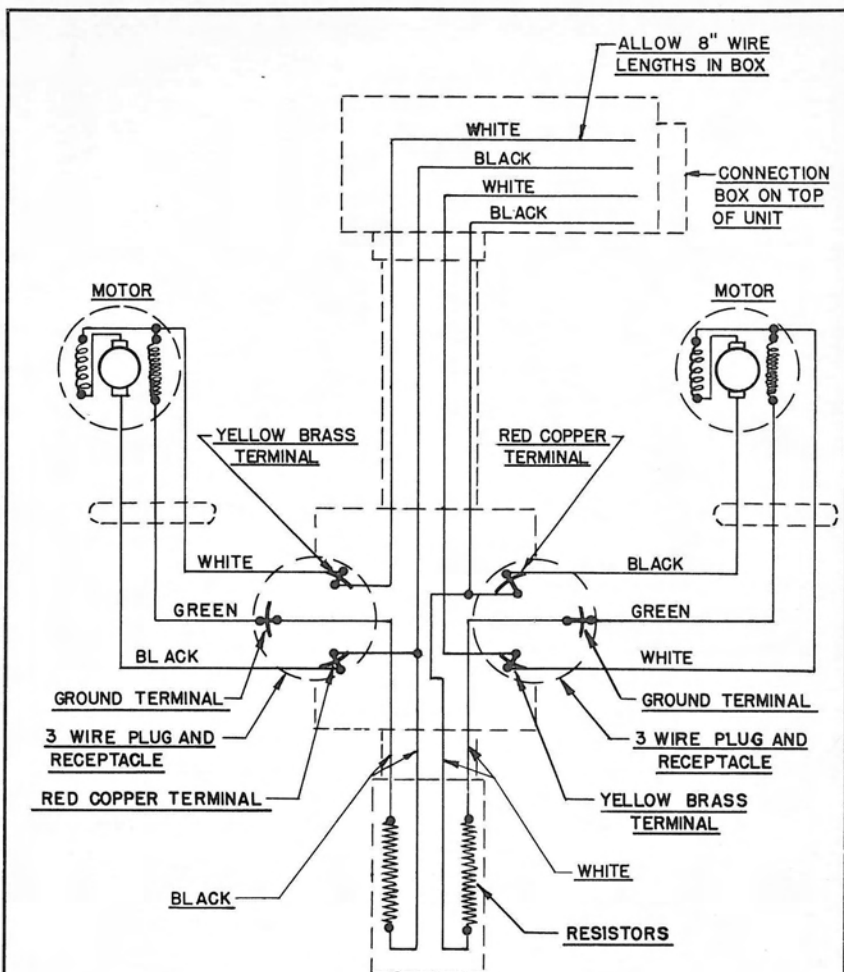
SKETCH (I)



SECTION D-D

ASSEMBLY INSTRUCTIONS FOR STREAMLINE STARTER-GENERATOR

MODEL F-6000 ERU	DRAWN KWP	TRACED 9-10-40	CHECKED JAT	APPROVED JAT	FILE	WAUKESHA MOTOR CO. WAUKESHA, WIS.	SK-657 PART NO.
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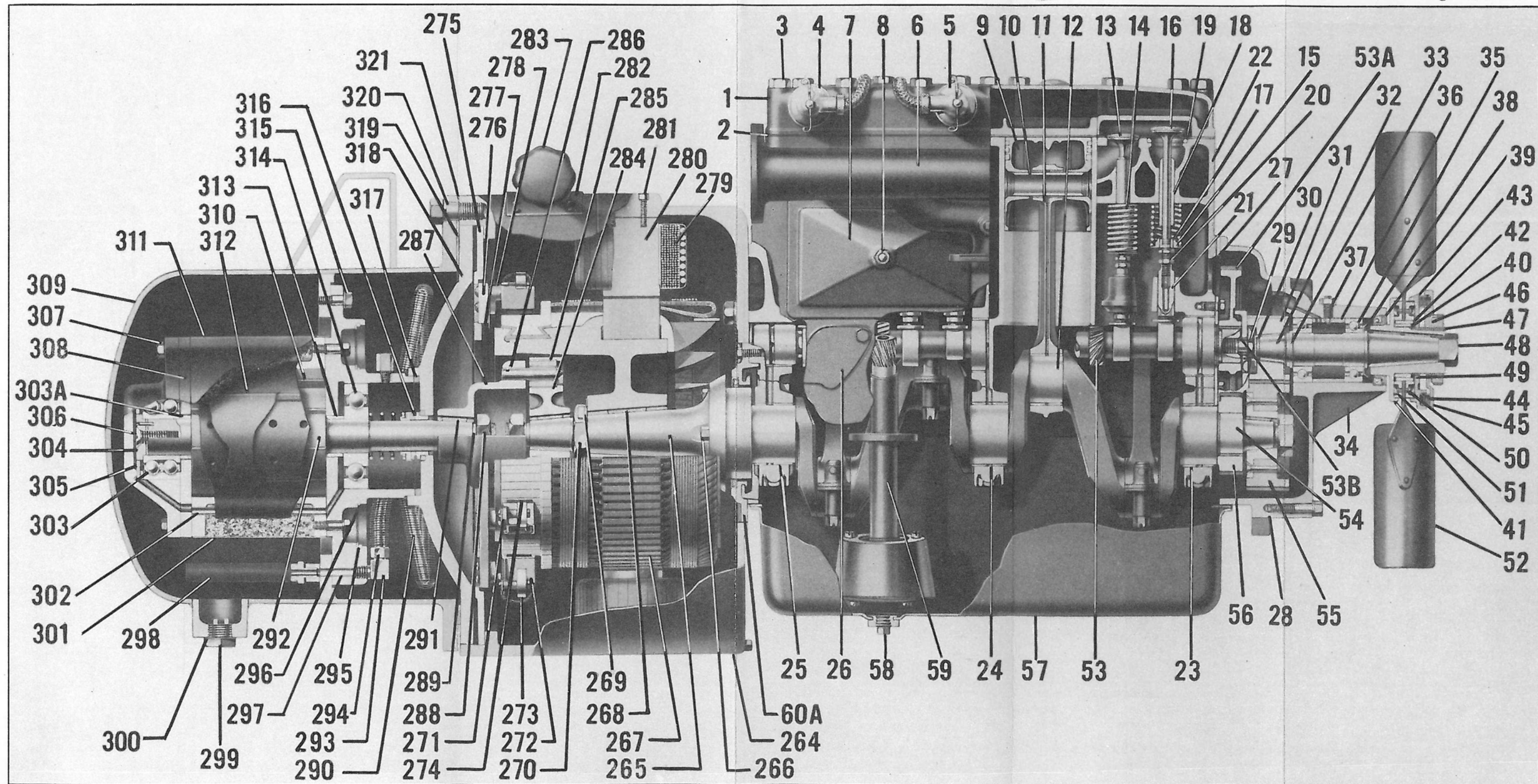


NOTE:
SOLDER ALL WIRES ON RESISTORS
AND RECEPTACLE TERMINALS.

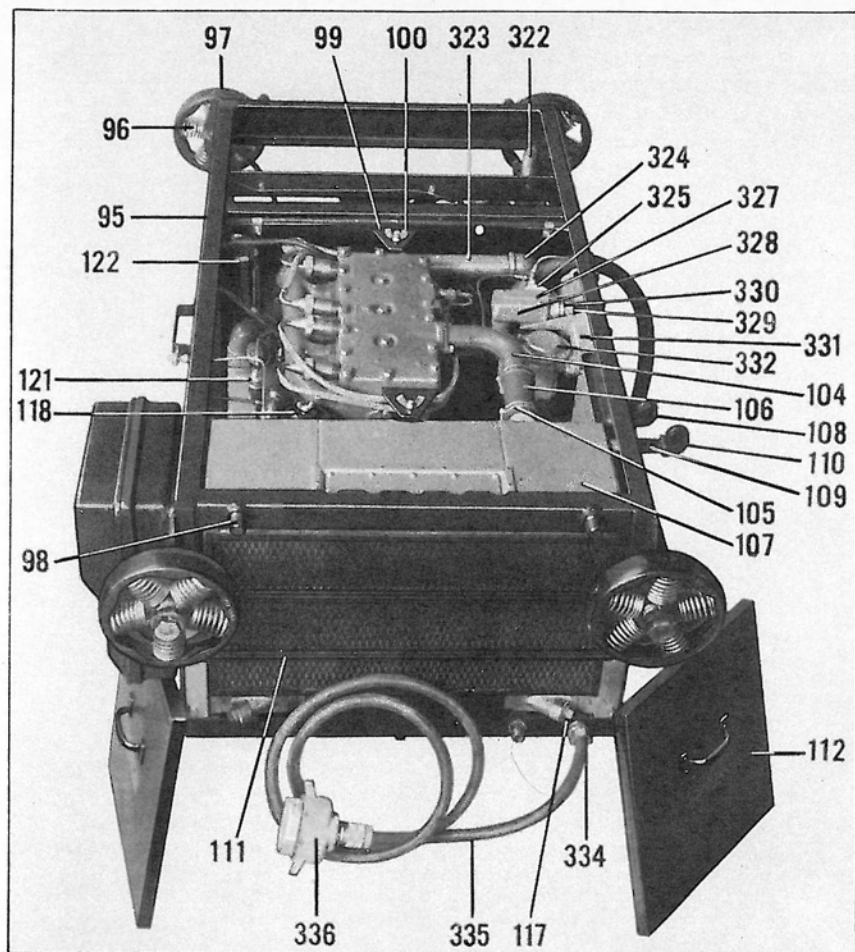
WAUKESHA MOTOR CO.
 WAUKESHA, WIS.

TITLE—
 AIR CONDENSER WIRING

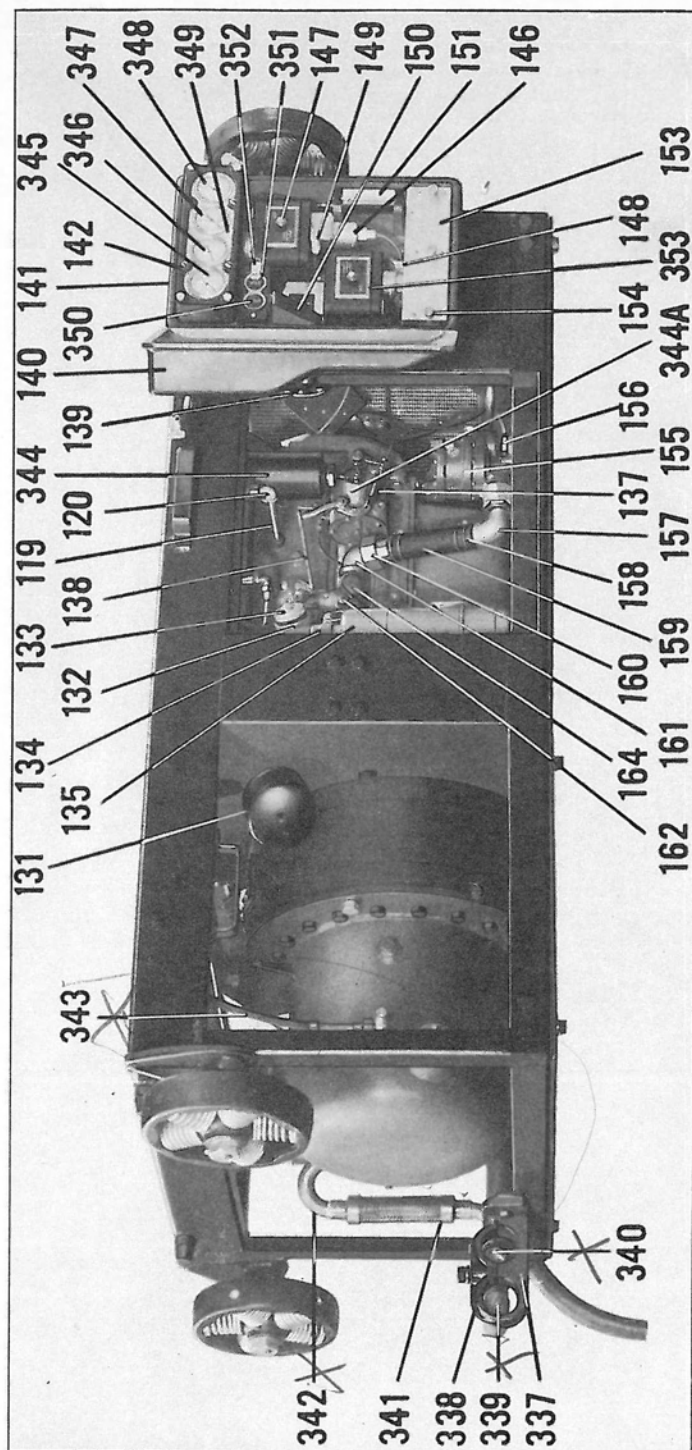
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CH. 11	FILE	632
APP.		



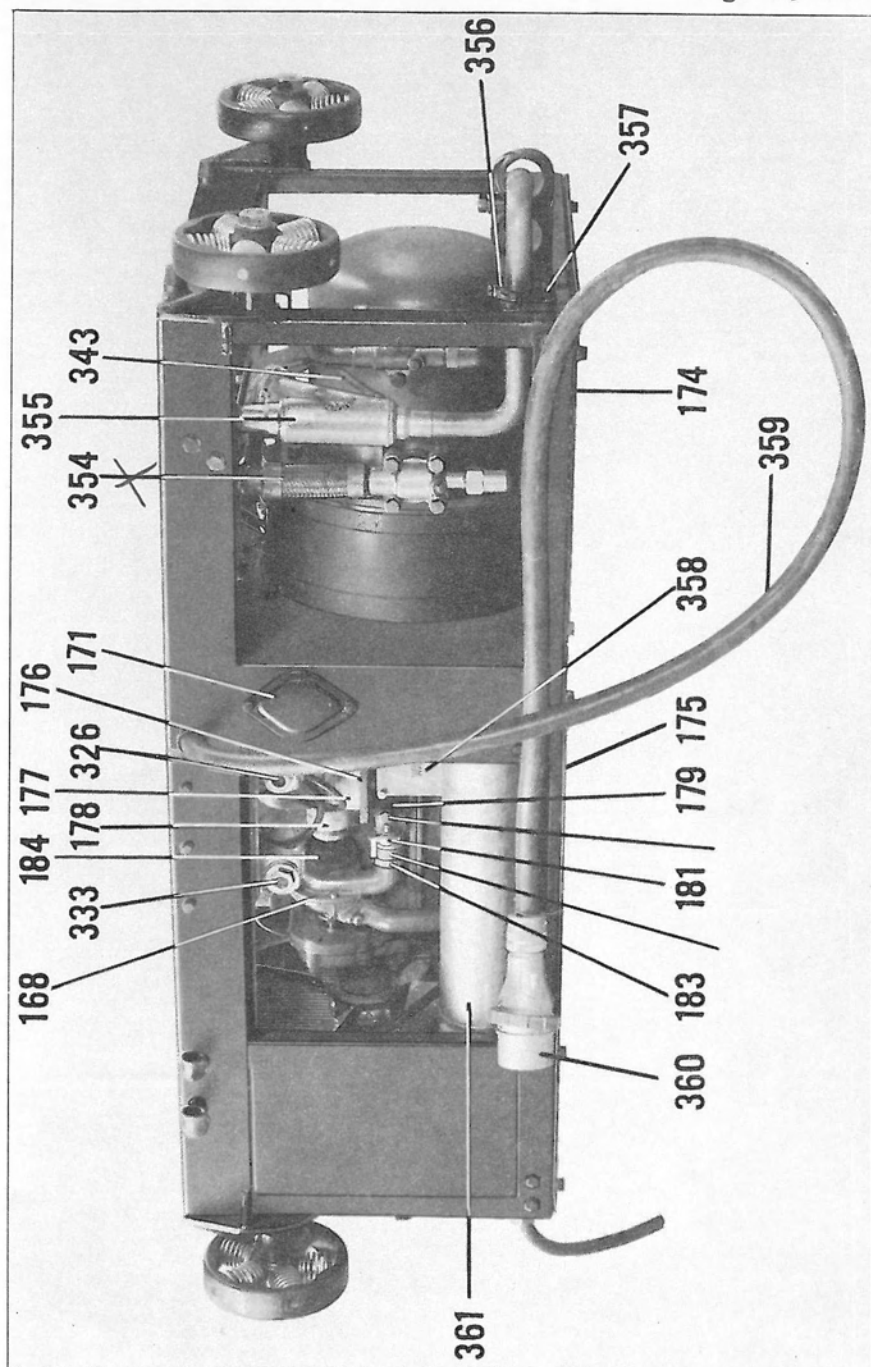
ICE-ENGINE CROSS SECTION



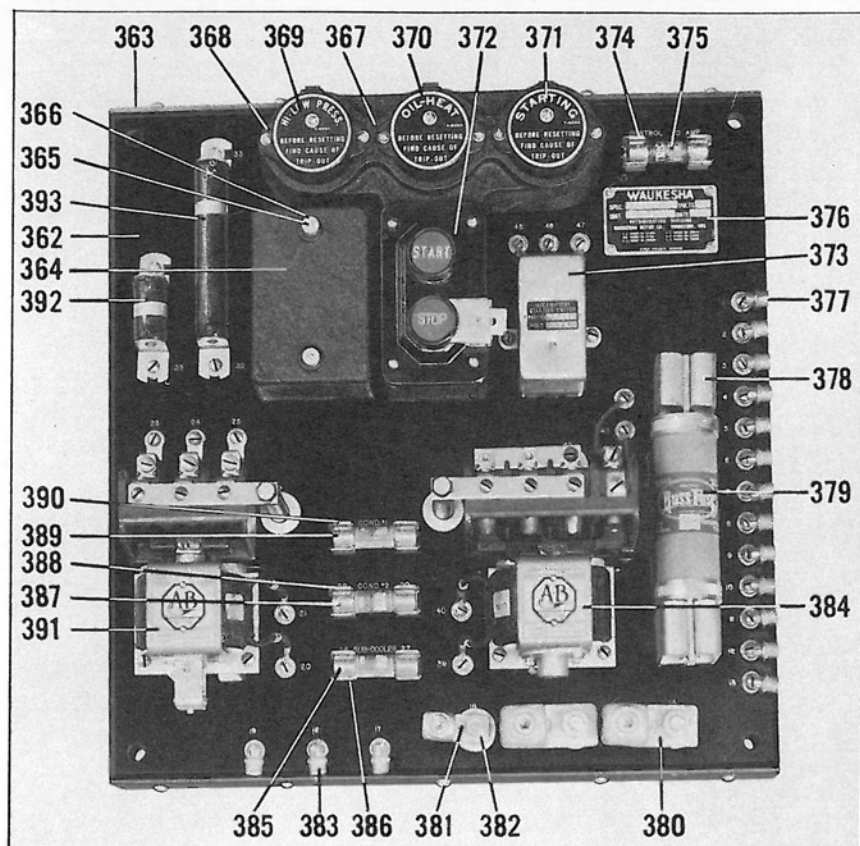
TOP VIEW ICE-ENGINE UNIT



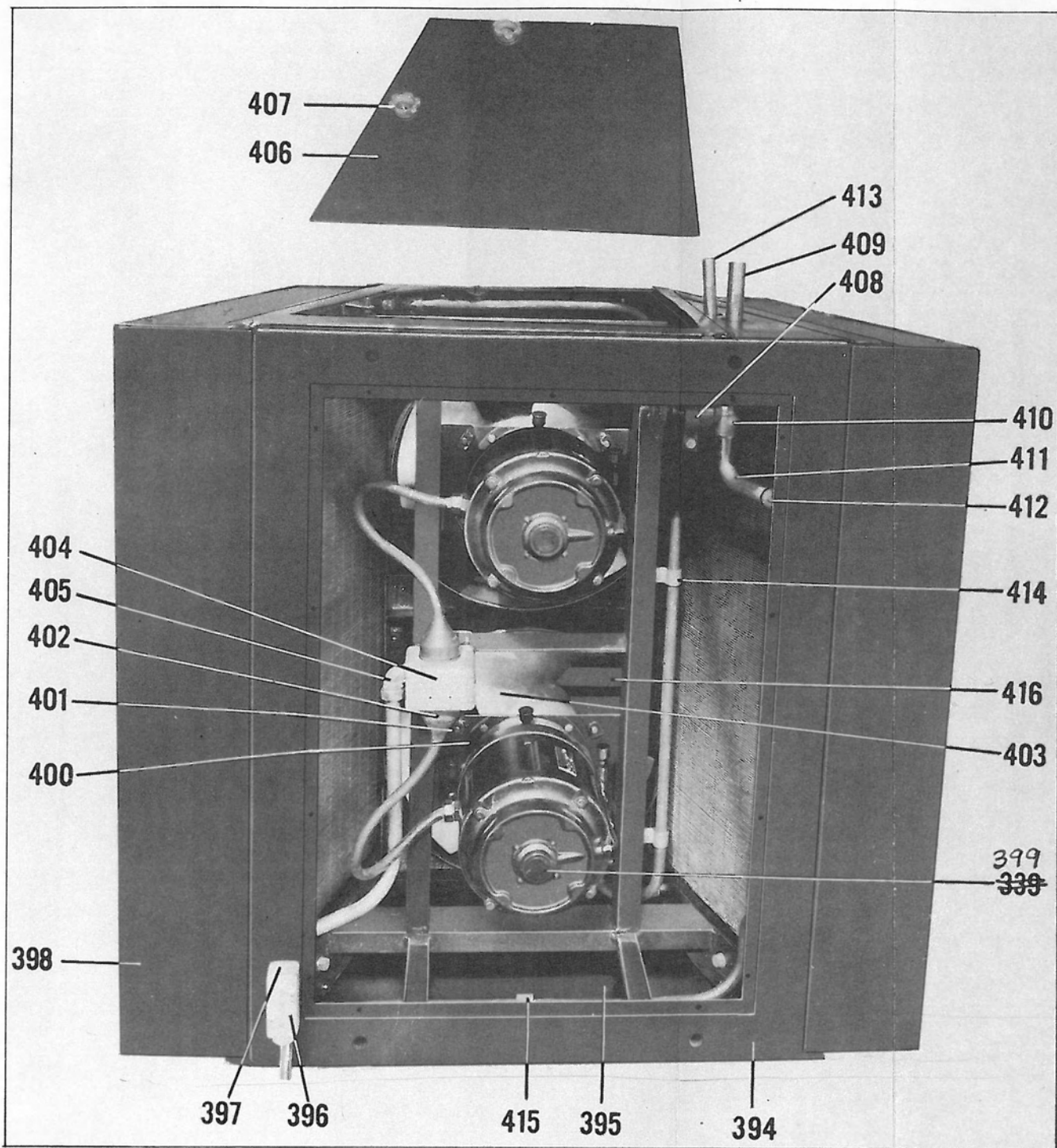
CARBURETOR SIDE VIEW OF ICE-ENGINE UNIT



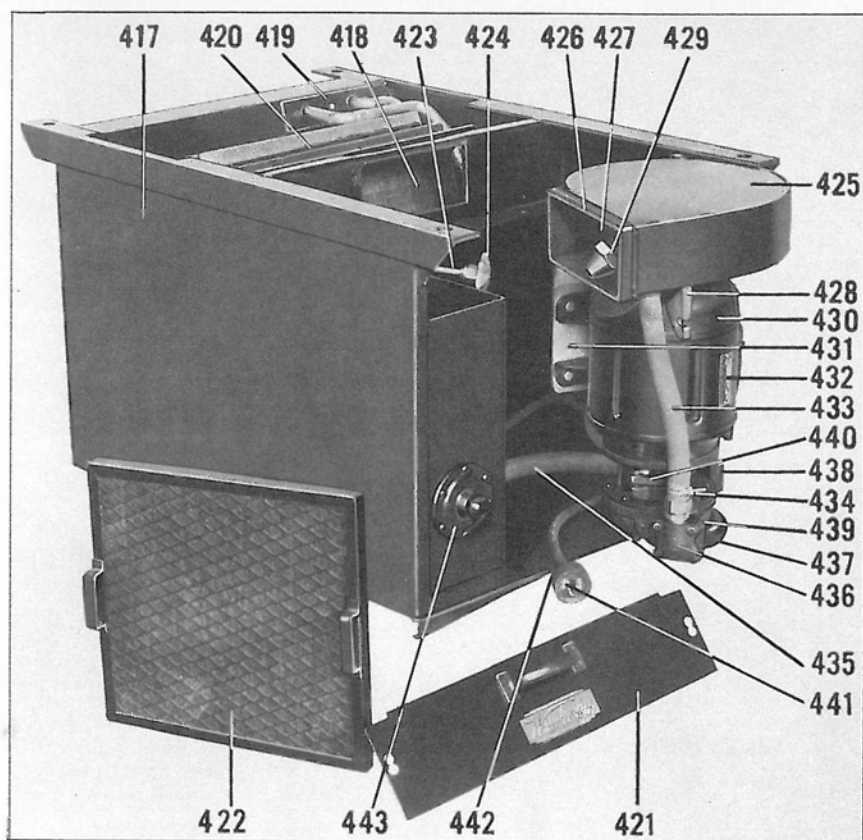
MAGNETO SIDE VIEW OF ICE-ENGINE UNIT



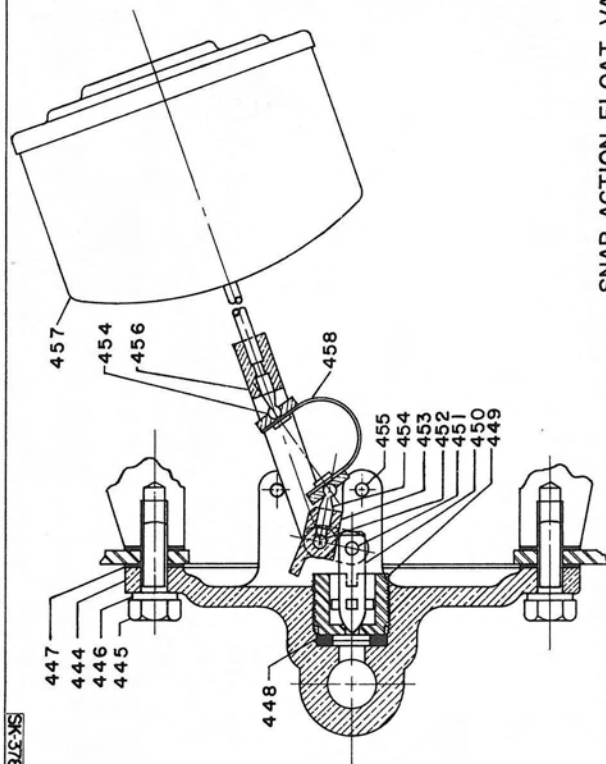
CONTROL PANEL FOR ICE-ENGINE



AIR CONDENSER UNIT



SUB-COOLER UNIT



SNAP ACTION FLOAT VALVE ASSEMBLY

SK-378-B

USE ALL PRACTICAL MACHINE DIMENSIONS
 AND PRACTICAL TOLERANCES
 AND FINISHES

DESIGNED BY TUBNEY

TRACER 3-25-41

DATE

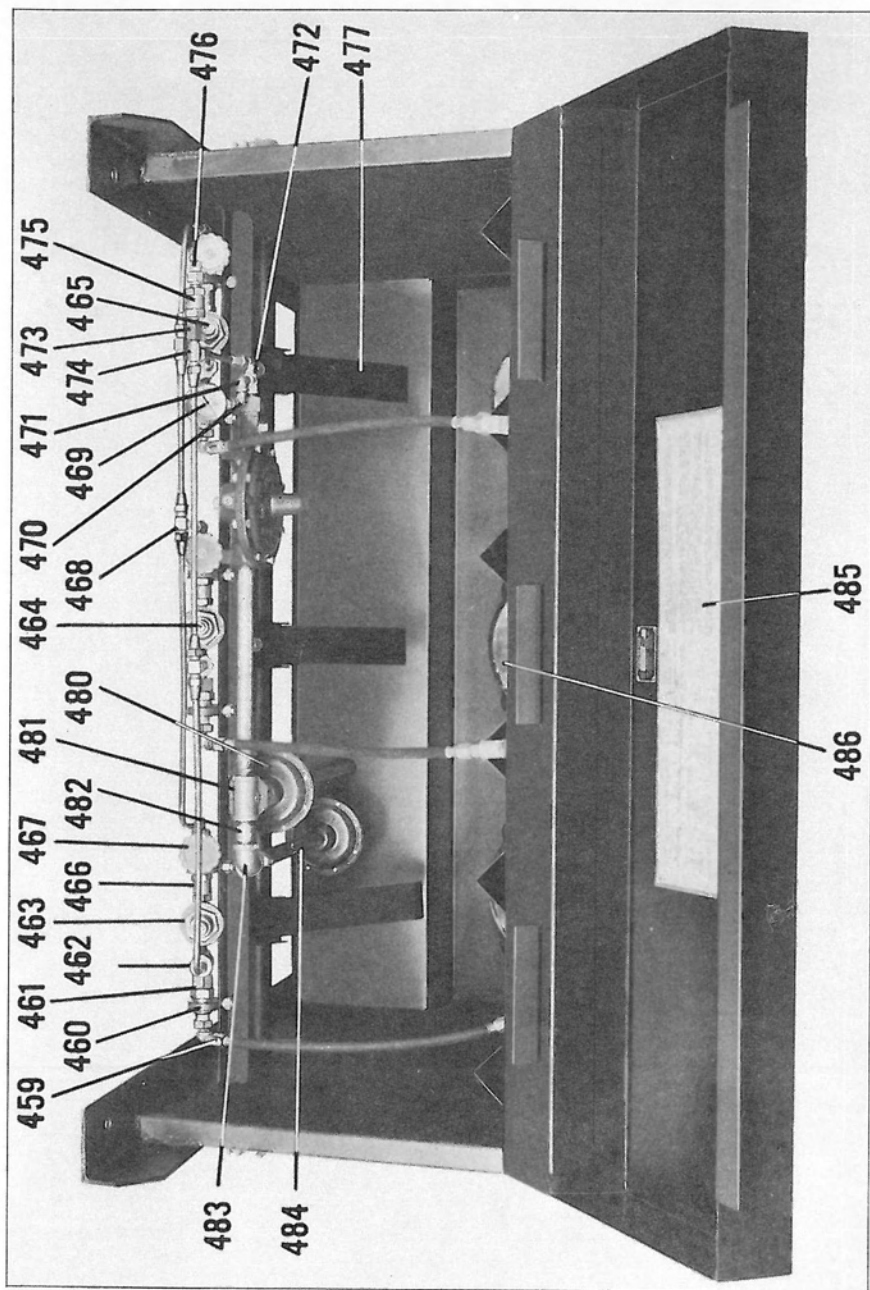
APPROVED

C WAUKESHA MOTOR CO.

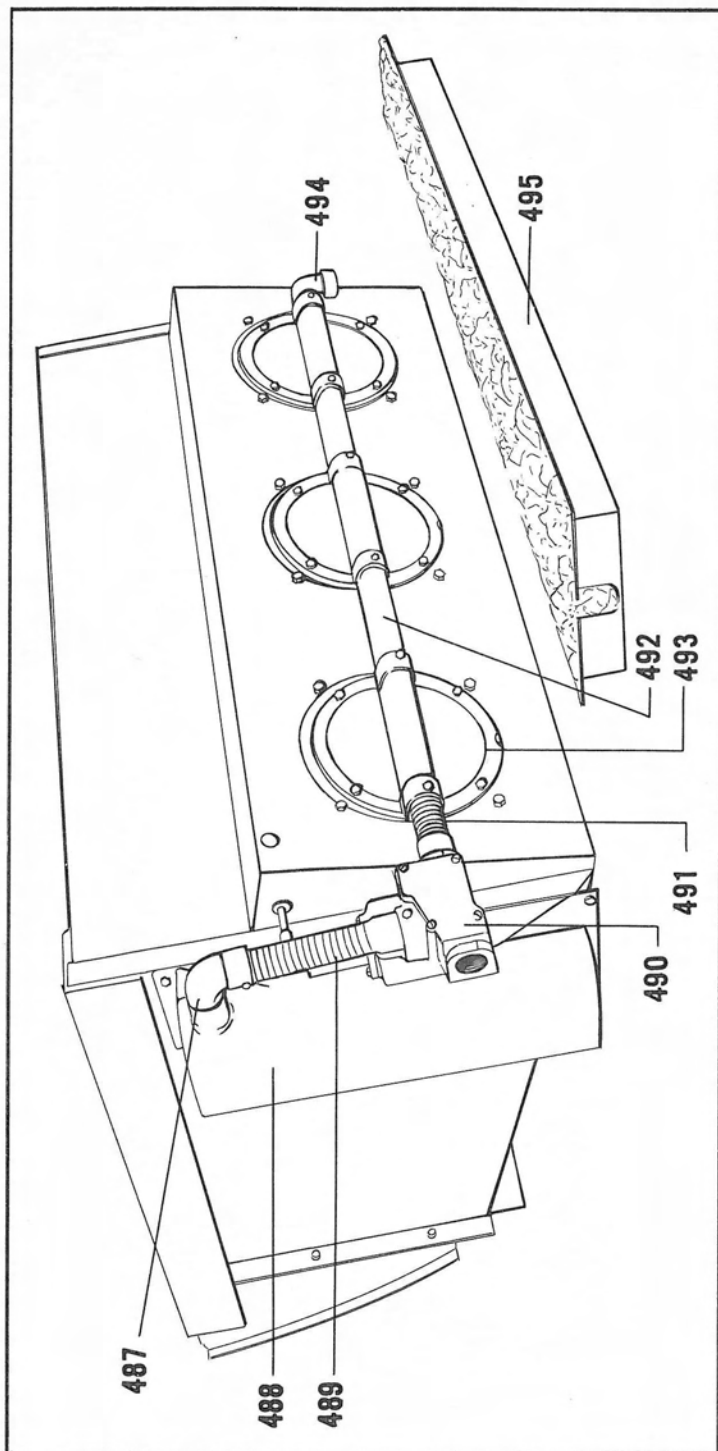
WAUKESHA, WIS.

FILE

SK-378-B



FRONT VIEW OF 3 CYLINDER FUEL CABINET



REAR VIEW OF 3 CYLINDER FUEL CABINET (HEATER TYPE)

SERVICE PARTS LIST

For All Units

PART 3

REFERENCE

NUMBER	PART NO.	REQUIRED	NAME
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CYLINDER HEAD ASSEMBLY

1	68602A	1	Cylinder Head
2	68000-C	1	Cylinder Head Gasket
3	B-10188	16	Cylinder Hd. Cap Screw
	BD-10	2	Cylinder Head Stud
		2	7/16-20 Hex Nuts
	Y-6635	4	Spark Plugs
4	Y-7485-D	1	#4 Spark Plug Shielding Assembly
5	Y-7485-C	1	#3 Spark Plug Shielding Assembly
	Y-7485-B	1	#2 Spark Plug Shielding Assembly
	Y-7485-A	1	#1 Spark Plug Shielding Assembly
	78282-D	2	Sq. Hd. Pipe Plug 3/8" (Side)
	78280-A	1	Slotted Hd. Pipe Plug (Top)
	080448	1	set Magneto Cables

MANIFOLD ASSEMBLY

6	68942	1	Combination Manifold
	BD-127	2	Manifold Gasket
	BD-120	6	Manifold Stud
		6	3/8-24 Hex Nut
	B-221	2	Manifold Stud Washer

VALVE DOOR AND METERINGVALVE ASSEMBLY

7	BD-195	1	Valve Door (Rear)
	BD-196	2	Valve Door Gasket
8	BD-194	2	Valve Cover Stud
		2	3/8-24 Hex Nuts
	BD-190	2	Valve Cover Stud Gasket
	BD-195-G	1	Valve Door (Front)
	Y-14428	1	Metering Valve
	63599	1	1/8 Compression Tee Fitting (Assembled to Manifold)
	B-4083	1	3-Way Elbow
	B-1686	1	Flare Tube Elbow
	OY-18326	1	Metering Valve Tube Assembly
	Y-6853	1	Street Elbow (1/8" Galv.)
	Y-7489	1	Pipe Nipple (1/8" x 4-1/2" Lg.)

REFERENCE

NUMBER	PART NO.	REQUIRED	NAME
<u>PISTON AND CONNECTING ROD ASSEMBLY</u>			
9	080441	4	Piston with Pin
	80441	4	Piston
	80464	8	Piston Ring (Comp.)
	80465	4	Piston Ring (70)
	24405	4	Piston Ring (85)
10	80442	4	Piston Pin
	37030	8	Piston Pin Retaining Ring
11	0068007	4	Connecting Rod Assembly with Bearings
	068007	4	Connecting Rod Assembly less Bearings
12	68010-A	8	Connecting Rod Bearings
	B-10337-A	8	Connecting Rod Shims
		8	Cotter Pins 3/32 x 3/4 Lg.

CRANKCASE AND VALVE ASSEMBLY

13	68036	4	Valve (Intake) -
14	68035-A	8	Valve Spring
15	B-9793	8	Valve Spring Retainer
16	68136	4	Valve (Exhaust) -
17	B-9792	8 pr.	Valve Spring Tapers
18	68009	8	Valve Guide
19	75923	4	Valve Insert (Exhaust)
20	BC-70	8	Valve Tappet Adjust. Screw
		8	5/16-24 Half Nuts
21	BD-56-A	8	Valve Tappets
22	0068320-S	1	Crankcase Assembly with Camshaft and main Bearings
	068320-S	1	Crankcase Assembly with Camshaft Bushings, less main Bearings
23	68122-A	2	Main Brg. Bushing (Front)
24	68118-C	2	Main Brg. Bushing (Center)
25	68121-B	2	Main Brg. Bushing (Rear)
	B-10291-A	2	Shim
	B-10292-A	2	Shim
	B-10293-A	2	Shim
	78280-A	2	Slotted Hd. Pipe Plug 1/8"
	BD-7	3	Main Brg. Cap Screw Lock
26	B-3527	1	Fuel Pump Cover
	B-3605	2	Fuel Pump Cover Gasket
		2	5/16-18 x 5/8" Cap Screw
		2	5/16 Lock Washers

REFERENCE

NUMBER

PART NO.

REQUIRED

NAME

GEAR COVER ASSEMBLY

27	BE-803	1	Timing Gear Plate
	BD-78-A	1	Timing Gear Plate Gasket
		3	Cap Screws 3/8-16 x 5/8 Lg.
		3	#1220 Shakeproof Lock Washers
		5	Cap Screws 3/8-16 x 2" Lg. (Gear Cover to Plate)
		5	Lock Washers 3/8
28	Y-6911-A	1	Gear Cover
	BE-806	1	Gear Cover Gasket
		2	Taper Pin #6 x 3/4"
29	B-5004	1	Fan Drive Gear Nut
30	BD-98	1	Fan Drive Gear Nut Lock
31	Y-6912-B	1	Fan Drive Gear
32	Y-6901-A	1	Radiator Fan Drive Shaft
		1	#9 Woodruff Key
		2	#15 Woodruff Key
33	B-4148	1	Snap Ring
	Y-7549	3	Fan Shaft Shim
34	Y-7431	1	Fan Support Cover
	Y-7434	1	Fan Support Cover Gasket
		2	#6 x 1-3/4 Lg. Taper Pins
		9	Hex Hd. Cap Screws 3/8-16 x 1-3/4 Lg.
		9	3/8 Lock Washers
35	Y-14480	2	Ball Bearings
36	Y-7320	1	Ball Bearing Spacer
37	Y-14516	1	Special Lock Screw
		1	3/8-16 Hex Jam Nut
38	Y-14474	1	Fan Shaft Oil Thrower
39	Y-14479	1	Fan Hub Seal
40	OY-7432	1	Fan Hub Assembly
41	Y-7432	1	Fan Hub
42	Y-14558-A	1	Fan Drive Sleeve
43	Y-14561-B	1	Thrust Washer
44	B-7441	12	Springs
45	Y-14559-C	1	Spring Retainer
46	Y-6570	1	Lock Washer
47	Y-6571	1	Lock Nut
48		1	3/4 Jam Nut
	Y-7433	1	Nut Lock
49	Y-7447	1	Bushing (Fan)
50	Y-14557-D	1	Fan Drive Washer
51	Y-7459	4	Tubular Rivets
	Y-18153-A	8	Washers
52	Y-7446	1	Fan
	OY-7446	1	Fan Assembly (Includes Fan, Blade, Bush., Drive Washer, Rivets & Washers Assembled)

REFERENCE

NUMBER	PART NO.	REQUIRED	NAME
<u>CAMSHAFT PARTS</u>			
53	68123-A	1	Camshaft
	B-1231	1	Camshaft Lock Screw
	B-779-A	1	Camshaft Lock Plate
	B-780-A	1	Camshaft Screw Lock
53-A	BD-80-A	1	Camshaft Gear
	BD-85	1	Camshaft Thrust Plate
	BD-86	1	Camshaft Thrust Plate Lock
		2	5/16-18 x 5/8 Lg. Cap Screw
		1	Hi-Pro Key #606
	68050	1	Camshaft Bushing (Center)
	68053	1	Camshaft Bushing (Rear)
	68027	1	Camshaft Bushing (Front)
	BD-72-A	1	Idler Gear Stud
	B-740	1	Idler Gear Stud Washer
	B-926	6	Idler Gear Shims
	B-741	1	Idler Gear Screw Lock
	B-2605	1	Castle Nut
		1	1/8 x 1" Cotter Pin
		1	3/8-16 x 5/8 Lg. Cap Screw
53-B	BD-71-A	1	Idler Gear
	BD-76	1	Idler Gear Bushing
	B-363	1	Washer

CRANKSHAFT ASSEMBLY

54	BD-14-P	1	Crankshaft
55	OY-6965-C	1	Crankshaft Fan Drive Gear Assembly
		1	7/8-14 Hex Jam Nut
	Y-14489	1	Crankshaft Nut Lock
56	68012	1	Crankshaft Gear
		1	Woodruff Key #9
		1	Woodruff Key Letter "A"

OIL PAN ASSEMBLY

57	68414	1	Oil Pan
	BD-583	5	Cork Retaining Clips (Front)
	BD-584	1	Cork Retaining Clip (Rear)
	BD-191	1	Oil Pan Gasket (Right)
	BD-192	1	Oil Pan Gasket (Left)
	BD-193-A	2	Oil Pan Gasket
		18	5/16-18 x 3/4" Cap Screw
		18	5/16" Lock Washer
58	78282-D	1	Pipe Plug 3/8"

REFERENCE

<u>NUMBER</u>	<u>PART NO.</u>	<u>REQUIRED</u>	<u>NAME</u>
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OIL PUMP ASSEMBLY

59	0068280	1	Oil Pump Assembly
	68280	1	Oil Pump Body
	98051	1	Oil Pump Gear
	37081-A	1	Drive Gear
	37085	1	Driven Gear
	37083	1	Idler Shaft
	BD-359	1	Oil Pump Gasket
	BD-358	1	Oil Pump Cover
		1	#2 Woodruff Key
	B-9420	1	Snap Ring
	68184	1	Drive Shaft
		4	Fill. Hd. Cap Screw 1/4"-20 x 1/2"
		2	Hex Hd. Cap Screws 5/16"-18 x 3/4"
		2	Lock Washers 5/16"
	BD-360	1	Oil Pump Baffle
	BD-361	1	Oil Pump Baffle Gasket
	B-9612	3	Fill. Head Machine Screw
		3	3/16" Lock Washers
	BD-355	1	Oil Pump Screen
	BD-366	1	Oil Pump Screen Wire

FLYWHEEL HOUSING ASSEMBLY

60	Y-18002	1	Flywheel Housing
	B-10358	1	Flywheel Housing Gasket
	B-9512	8	1/2"-13 x 1-1/4 Cap Screws
	B-7563	8	Shakeproof Lock Washers #1124
	78280-A	1	Slotted Hd. Pipe Plug 1/8"
60-A	BD-364-A	1	Main Brg. Closure Plate
	BD-368-A	1	Main Brg. Closure Plate Gasket
		3	5/16"-18 x 3/4" Cap Screw
	B-10568	3	5/16" Lock Washers
	BD-366	1	Crankshaft Oil Seal (Rear)
	BD-367	1	Crankshaft Oil Seal Cup
	78280-A	1	Pipe Plug (Wick Hole)

FLYWHEEL ASSEMBLY

61	68013-C	1	Flywheel
	B-9824	2	Dowel Pins (Shaft to fly-wheel)
	BD-13	1	Crankshaft Oil Thrower (Rear)

REFERENCE

NUMBER	PART NO.	REQUIRED	NAME
<u>DRIVE ASSEMBLY</u>			
62	0Y-18365	1	Pilot Bushing
		1	S.A.E. Jam Nut 1-1/4"-12 Cad. Plated
63	Y-18364	6	Drive Bushings
64	Y-18353-A	6	Drive Pins
	Y-18354	6	Allen Hd. Set Screws
65	Y-6531	1	Special Lock Washer
66		1	"G" Woodruff Key
67	81473-1	1	Armature
68	514F469	1	Frame Cover
69	9514E12	1	Enclosure Cover
<u>GENERATOR ASSEMBLY</u>			
70	9573F17	4	Brush Holder Assembly
	573E258	4	Brush
	573E42	1	Brush Holder Rocker
	573E237	8	Insulating Washers
	518H508	8	Insulating Bushings
	518H12	4	Strip Connectors
	L86239	2	B. H. Cross Connectors
	17H6	4	Brush Holder Springs
71	514E212	1	Fan Guard
		4	5/16"-18 x 5/8" Hex Hd. Cap Screws
		4	5/16" Shakeproof Washers
72	514E218	1	Screen
73	514E214	1	Louvre Plate
		8	#10-24 - 1/2" Round Head Machine Screw
		8	#10 Lock Washers
74	520H428	1	Special Pipe Plug
75	574F516	1	Fan
76	574H362	1	Fan Support
77	N-08	1	Lock Nut
	W-08	1	Lock Washer
78		1	Woodruff Key in Shaft
79	335212	2	Oil Retainer
80		4	5/16"-18 x 2" Fillister Head Screw
81		4	3/8"-16 x 1-1/4" Hex Hd. Cap Screws
82		4	3/8"-16 x 1-3/4" Hex Hd. Cap Screw
83		4	3/8"-16 Hex Nuts
84	572A26	1	Front Head
85	573E257	4	Brush Holder Stud

REFERENCE NUMBER	PART NO.	REQUIRED	NAME
86	532F37	1	Enclosure Cover Assembly Handle
87		4	1/2"-13 x 1-1/4" Hex Head Cap Screw
88	84114-1	4	Field Coil
89		7	1/2"-13 x 2-1/4" Hex Head Cap Screws
90	84115-1	4	Inter-Pole Coil
91		5	5/8"-11 x 2" Hex Head Cap Screws
92	9571A-5	1	Field Ring Assembly
93	Y-6567	1	Ball Bearing
94	Y-18352	1	Coupling
<u>ENGINE-GENERATOR UNIT PARTS</u>			
95	OY-6926-A	1	Engine-Generator Frame
	Y-6925	1	Front Engine Support Plate
		6	Hex Hd. Cap Screws 3/8-16 x 3/4 - Cad. Pl.
		6	Lock Washers 3/8 - Cad. Pl.
		6	Hex Nuts 3/8-16 - Cad. Pl.
		2	Hex Hd. Cap Screws) 3/8-16 x 1" Lg. Cad. Pl.)
		2	Wrought Washers 3/8) Cad. Pl.)
		2	Lock Washers 3/8 Cad. Pl.) (Above for Engine Support)
		5	Hex Hd. Cap Screws 5/8-11) x 1" Lg. Cad. Pl.)
		5	Lock Washer 5/8 - Cad. Pl.) (Above for Flywheel Housing Support)
	OY-6615-C	4	Spring Wheels
96	Y-6636-D	20	Spring
	Y-6975	40	Spring Support
	Y-6616-B	4	Wheel Hub
97	Y-6615-A	4	Wheel Rim
		20	Allen Hd. Cap Screws 3/8-16 x 1/2 Lg. - Cad. Pl.
	Y-6979	8	Bushing
	Y-6978	20	Stud
	Y-6125-A	4	Wheel Washer
	Y-6035	4	Jam Nut
		4	Cotter Pin 1/8 x 2" Cad. Pl.
98	Y-6975	4	End Bumper
99	OY-6920	2	Top Cover Bracket
		2	Hex Hd. Cap Screw 1/2-13 x 1-1/4 Lg. - Cad. Pl.

Part 3

REFERENCE

NUMBER	PART NO.	REQUIRED	NAME
		4	Hex Hd. Cap Screw 3/8-16 x 3/4 - Cad. Pl.
		4	Lock Washer 3/8 - Cad. Pl.
		2	Hex Nuts 3/8-16 - Cad. Pl.
100	Y-6403	2	Wing Nuts
	Y-6921	1	Engine Compartment Cover
	OY-18485-C	1	Resistor
101	Y-18343	9	Resistor Support
	Y-18337	9	Spacer
	Y-18368	9	Asbestos Gasket
102		9	Hex Hd. Cap Screws 3/8-16 x 2" Lg. - Cad. Pl.
		9	3/8 Iron Washer - Cad. Pl.
	Y-18344-A	1	Resistor Grid
	Y-18345-C	1	Resistor Frame
	Y-18340	3	Insulator Washer
	Y-18341	3	Insulator Bushing
	Y-18339	1	Terminal Post
	Y-18369	2	Resistor Terminal
	Y-18370	3	Nut
		5	3/8 Lock Washer
		5	Hex Brass or Everdur Nuts 3/8-16
	Y-18338	1	Bus Bar
	Y-18493	2	Terminal Lug
103	Y-18346	1	Cover
		4	Rd. Hd. Parker Kalon Type "Z" Screws #12 x 3/8 Lg. Cad. Pl.
	Y-6222	2	Nipple
	106026	2	Lock Nut
104	Y-6916	1	Top Water Manifold
105	Y-7465	2	Hose Clamp (Top)
106	Y-7234	1	Hose (Top)
107	Y-6913-A	1	Radiator
		6	Hex Hd. Parker Kalon 3/8 x 5/8 Cad. Pl.
108	Y-7235	1	3/4" St. Elbow
	B-205	2	1/4" Pet Cock
109	65423-P	1	Nipple 3/4 x 4-1/2 Lg.
110	Y-11119	1	3/4 Elbow
	B-9633	2	Half Union 1/2 M.P. x 5/8 Tube
	Y-6279	2	Half Union 1/4 Flare x 1/4 M.P.
	OY-7560	1	Expansion Tank Radiator Tube
	OY-7430-C	1	Radiator Vent Tube
111	OY-6914	1	Radiator Screen Assembly
112	OY-6922	2	Side Door
	Y-6071	2	Door Pull
	Y-46	2	Name Transfer
	Y-6708	2	Door Clamping Spring

REFERENCE NUMBER	PART NO.	REQUIRED	NAME
		2	3/8 x 5/8 Hex Hd. Parker Kalon - Cad. Pl.
113	Y-6968-C	1	Cord Grip 1"
114	Y-18169-A	1	#16-7 Wire Tirex
115	OY-7355-B	1	Plug Assembly
	Y-14386	2	Tubing Clamp
		2	1/4-20 x 1/2 Hex Hd. Cap Screws - Cad. Pl.
		2	1/4-20 Hex Nuts - Cad. Pl.
		2	1/4 Lock Washers
116	Y-11089	2	1/2 Mall. Iron Elbow
	Y-7482	1	Nipple 1/2 x 3-1/2 Lg. Galv.
	Y-6899	1	Fuel Line Support Bushing
117	Y-6537	3	Pipe Plug
118	78589	1	Oil Bath Breather
	OY-7325	1	Oil Bath Breather Stud
	Y-7324-A	1	Oil Bath Breather Adapter
119	Y-7489	1	Pipe Nipple 1/8 x 4-1/2 Lg.
120	Y-6501	1	Street Elbow
121	Y-14428	1	Metering Valve
	63599	1	Compression Tee Fitting (Assembled to Manifold)
	B-4083	1	Three-Way Elbow
	B-1686	1	Flare Tube Elbow
	OY-18326	1	Metering Valve Tube Assembly
122	Y-6838	1	Oil Filter
	HD-5648-75	1	Oil Filter Element
		4	3/8-16 x 1-1/4 Lg. Hex Hd. Cap Screws - Cad. Pl.
		4	3/8 Lock Washers
	B-4094	1	Half Union
	B-4083	1	Three-Way Elbow
	B-4092	2	Flare Nuts
		1	Copper Tube 1/4 x 8" Lg.
123	Y-18058	1	Pipe Nipple
124	Y-6235	1	Pipe Elbow
125	Y-18113	1	Pipe Nipple
126	OY-18461	1	Exhaust Pipe Brkt. Assembly
		3	Hex Hd. Cap Screws 3/8-16 x 5/8 Lg. Cad. Pl.
		3	Lock Washers 3/8" - Cad. Pl.
		3	Hex Nuts 3/8-16 - Cad. Pl.
127	101023-X	1	Pipe Nipple
128	Y-7500	1	Union Elbow
129	Y-7499	1	Pipe Nipple
	Y-6235	1	Pipe Elbow
	Y-7498	1	Pipe Nipple
	Y-6917	1	Exhaust Pipe Flange
	B-9825	1	Exhaust Pipe Flange Gasket

Part 3

REFERENCE

NUMBER	PART NO.	REQUIRED	NAME
	Y-9162	2	Hex Nuts
	#1220	2	Shakeproof Lock Washer Cad. Pl.
		2	Hex Hd. Cap Screws 3/8-16 x 1-3/4 - Cad. Pl.
130	Y-7329	1	Stator Cleaner
131	Y-7304	1	Air Cleaner Inlet Tube
	Y-18455	1	Rubber Grommet
132	Y-7483	1	Oil Filler and Air Cleaner Adapter
	B-3605	1	Gasket
	B-2047	1	Stud
	63701	1	Stud
		2	5/16 Lock Washer
		2	5/16-24 Hex Nut - Cad. Pl.
133	Y-7072	1	Oil Filler Cap
	Y-7074	1	Oil Filler Neck
134	Y-7305	1	Air Cleaner Inlet Elbow
		1	Hex Hd. Cap Screw 1/4-20 x 1-1/4
		1	Parker Kalon Hex Hd. Screw #14 x 1/2 Lg. - Cad. Pl.
135	Y-7487	1	Air Cleaner
	B-4855	1	Air Cleaner Gasket
	Y-6577-A	1	Air Cleaner Hose
	Y-6502	2	Hose Clamp
136	K-198-A	1	Governor Assembly
	B-6114-E	1	Governor Housing
	BE-809	1	Governor Housing Gasket
	B-6115-C	1	Governor Housing Cover
	B-6117	1	Governor Housing Gasket
	B-6145	1	Governor Shaft
	B-6146	2	Ball Brg.
	B-6090	1	Thrust Ball Brg.
	B-6127	1	Governor Weight Carrier
	B-6101-A	2	Governor Weights
	B-6255	1	Governor Shifter
	B-6122	2	Governor Weight Shafts
	B-4028	2	Groov Pins
	B-6124	1	Governor Shifter Lever
	B-6126-B	1	Governor Lever Shaft
	B-6123-B	1	Governor Lever
		1	#00 x 3/4 Taper Pin
	B-7355	1	Bumper Screw
	B-7356	1	Bumper Spring
		1	5/16-24 Hex Nut
		6	#10-32 x 1/2 Fill. Hd. Screw
		6	#10 Lock Washers

REFERENCE NUMBER	PART NO.	REQUIRED	NAME
	B-6162	1	Governor Spring Bracket
	B-391	1	Stud
		1	Hex Nut 5/16-24
		1	5/16 Lock Washer
137	B-6298	1	Governor Spring
	B-6163	1	Adjusting Screw
	B-6164	1	Adjusting Nut
	B-6125	1	Governor Gear
		1	#3 Woodruff Key
	B-5456	1	Groov Pin
138	B-6118	1	Governor Rod
	B-6121	1	Governor Rod End
	B-6119	1	Rod End Pin
		1	1/16 x 1/2 Cotter Pin
	B-6274	1	Snap Ring
	B-536	1	Expansion Plug
	B-6316	1	Oil Seal Retainer
	B-6315	1	Oil Seal Washer
	B-6169	1	Groov Pin
	B-5071	3	Groov Pin
139	Y-6161-A	1	Control Box Knob
	B-7695	1	Copper Asbestos Gasket
	B-9578	1	Snap Ring
140	Y-6944-A	1	Control Box Cover
	Y-18167	1	Name Plate
		4	Rd. Hd. Parker Kalon Type "Z"
			#4 x 3/16 - Cad. Pl.
141	Y-6945-A	1	Control Box
		3	Hex Hd. Parker Kalon Cap
			Screw - Type "Z" 3/8 x
			3/4 Cad. Pl.
		1	Hex Hd. Cap Screw 3/8-16 x
			1" Lg. Cad. Pl.
	#1220	1	Shakeproof Lock Washer
	Y-6287-E	1	Cover Gasket
	Y-6968-C	1	Cord Grip
	Y-6867-A	1	Cord Grip
	78283-J	1	Cord Grip
142	Y-7334	1	Panel Support
		4	Hex Hd. Cap Screw 1/4-20 x
			2-1/2 Lg. - Cad. Pl.
	#1214	4	Shakeproof Lock Washer
143	Y-12029	1	Vacuum Gauge
	Y-6438	1	Adapter
		1	Copper Tube 1/8 O.D. x 1/16
			I.D. x 54" Lg.
	Y-14212-D	1	Auto Duct 36" Lg.
144	Y-7540	1	Oil Gauge
	Y-6438	1	Adapter

Part 3

REFERENCE

NUMBER	PART NO.	REQUIRED	NAME
		1	Copper Tube 1/8 O.D. x 1/16 I.D. x 4" Lg.
	Y-7445	1	Tubing Clamp
		2	Rd. Hd. Mach. Screws 10-24 x 3/8 Lg. Cad. Pl.
145	#1210	2	Shakeproof Lock Washer Cad. Pl.
	Y-7437	1	2-Meter Panel
		4	Countersunk oval Hd. Machine Screws #10-32 x 1/4 Lg. Cad. Pl.
146	#1510	4	Shakeproof Lock Washers
	Y-6977	1	Combination Oil Pressure and Water Temperature Switch
147	Type "H"	1	Contact for Y-6977
	Y-7443	1	Switch Cover
	Y-7504	1	Switch Mounting Plate
		4	Flat Hd. Mach. Screw #8-32 x 1/4 Lg. Cad. Pl.
	#1508	4	Shakeproof Lock Washer Cad. Pl.
		4	Rd. Hd. Mach. Screw #10-24 x 3/8 Lg. Cad. Pl.
	#1210	4	Shakeproof Lock Washer Cad. Pl.
	63599	1	Compression Tee Fitting
	B-1686	1	Half Union Elbow
	B-4092	2	Flare Nuts 1/4
		1	Copper Tube 1/4 O.D. x (.035) wall 42" Lg.
	B-6456-J	1	7/32 I.D. Loom 33-1/2 Lg.
	Y-6249	1	Chase Nipple 1/2"
	Y-6250	1	Lock Nut
	Y-18479-E	2	Wire
	Y-18473	2	Lugs
	Y-7555	2	Tubing Clip
148	Y-6968-A	1	Cord Grip
149	Y-6201	1	Stud
150	Y-6847	1	Tip-Over Switch
	Y-18473-B	1	Shakeproof Terminal
	Y-18479	1	#16-Wire 18" Lg.
		2	Rd. Hd. Mach. Screws #8-32 x 1-1/4 Lg. Cad. Pl.
151	50048-B	1	Manometer
		2	Cone Point Slotted Hd. Set Screws 1/4-20 x 1/2 Cad. Pl.
	Y-6438	1	Adapter
		1	Copper Tube 1/8 O.D. x 1/16 I.D. x 32" Lg.
	Y-14212-F	1	Auto Duct 13" Lg.
	Y-14212-L	1	Auto Duct 9" Lg.
	Y-18458	1	Knock-Out Switch Box
152	OY-18149-B	1	Push Button Switch Assembly

REFERENCE NUMBER	PART NO.	REQUIRED	NAME
		2	Rd. Hd. Machine Screws #10-24 x 3/8 Lg. Cad. Pl.
	#1210	2	Shakeproof Lock Washers
	Y-6249	1	Chase Nipple
	Y-6250	1	Lock Nut
	Y-18479-F	3	#16-Wire 10" Lg.
	Y-18473-B	3	Shakeproof Terminal
153	OY-7333	1	Terminal Cover
	Y-7338	1	Terminal Strip
	#1208	20	Shakeproof Lock Washer
	Y-7442	3	Special Bolt
	#1214	3	Shakeproof Lock Washer
	Y-7335	14	Wedge-On Lug (Short)
	Y-7336	1	Wedge-On Lug (Long)
154	Y-18256	3	Cover Nuts
155	50573-C	1	Regulator
		2	Hex Hd. Cap Screws 5/16-18 x 3/4 Lg. Cad. Pl.
		2	Lock Washers 5/16 Cad. Pl.
156	Y-11087	1	Reducing Bushing 1 to 1/2 Galv.
	Y-6818	1	Close Nipple
	Y-6761	1	Regulator Strainer
	Y-18103	1	Nipple 1/2 x 9" Lg.
	Y-6736	1	Female Union Elbow - Galv.
	Y-6737-A	1	Pipe Nipple 1/2" x 14-7/8" Galv.
157	Y-7235	1	Street Elbow
158	Y-6503	2	Hose Clamp
159	Y-18099	1	Carburetor Hose
160	Y-6741	1	Female Union Elbow
	Y-6232	2	3/4 Nipple
161	Y-7238	1	Close Nipple
162	51034-B	1	Carburetor
	B-365	2	Carburetor Gasket
	B-2047	2	Carburetor Studs
		2	5/16 Lock Washer
		2	5/16-24 Nuts
		2	Cotter Pin 1/16 x 1 1/2 Lg.
163	Y-18485	1	Generator Cable Support
		2	Hex Hd. Cap Screw 1/2-13 x 3/4 Lg. Cad. Pl.
		2	1/2" Lock Washer Cad. Pl.
	Y-6222	4	Chase Nipple 3/4"
	106026	4	Lock Nut 3/4"
	Y-6249	1	Chase Nipple 1/2"
	Y-6250	1	Lock Nut 1/2"
164	073163	1	Oil Level Gauge
	B-2666	1	Oil Gauge Bushing

Part 3

REFERENCE

NUMBER	PART NO.	REQUIRED	NAME
165	Y-7465	2	Hose Clamps (Bottom)
166	Y-7234	1	Hose (Bottom)
167	Y-6927	1	Water Pump Inlet Elbow
	B-2692	1	Water Pump Inlet Elbow Gskt.
		2	Hex Hd. Cap Screws 3/8-16 x 1" Lg.
		2	Lock Washers 3/8"
168	068160-A	1	Water Pump Assembly
	68160-A	1	Body
	68161-A	1	Cover
	B-7718-A	1	Gasket
	B-7717	1	Stuffing Nut (Left Hand Thread)
169	B-577	1	Grease Cup
170	B-7721	1	Stuffing Nut (R. H. Thread)
	B-7716	4	Packing
	B-1883	2	Dowels
	B-7715	1	Bushing
	B-7750	1	Bushing
	B-6202	1	Dowel
	63573	1	Oil Seal
	B-6840	1	Dowel
	68056	1	Shaft
		1	#13 Woodruff Key
		1	#3 - 1-1/2 Taper Pin
	BD-97-B	1	Magneto Gear
	68163	1	Vane
	BD-98	1	Lock
	BD-90	1	Nut
	B-3593	1	Gland
		4	Fill. Hd. Cap Screws 5/16"- 18 x 5/8"
171	Y-6224	1	Cover
		2	Hex Hd. Cap Screws 3/8-16 x 3/4 Lg. Cad. Pl.
		2	Hex Nuts 3/8-16 Cad. Pl.
		2	3/8 Lock Washers
172	Y-18200-A	1	Terminal Connector
173	Y-18187-A	1	Grounding Cable
174	OY-7360	1	Bottom Screen Assembly (Rear)
175	OY-7359	1	Bottom Screen Assembly (Front)
	Y-7461	12	Hex Hd. Cap Screw
	Y-7462	12	Lock Washers
176	68267	1	Magneto Bracket
		4	Hex Hd. Cap Screws 3/8-16 x 1-1/4 Lg.
		4	Hex Hd. Cap Screws 3/8-16 x 1" Lg.
		8	Lock Washers 3/8"
		2	Taper Pins #4 x 3/4"

REFERENCE NUMBER	PART NO.	REQUIRED	NAME
177	Y-6179-A	1	Magneto Complete
	ES-51444	1	Housing Only
	ES-51301	2	Timing Slot Covers
	ES-7616	2	Timing Slot Cover Gaskets
	ES-17394	4	Timing Slot Cover Screws
	ES-23149	4	Lock Washers for ES-17394
	ES-51270	4	Seal for ES-17394
	ES-7524	2	Felt Washer (Rear Brg.)
	ES-51266	1	Felt Retaining Cap
	ES-51237	2	Oil Hole Plug
	ES-3722	3	Rear Brg. Removal Hole Plug Screw
	ES-51224	1	Ground Term. Group Complete
	ES-51287	1	Ground Term. Connector Plate
	ES-53367	2	Ground Term. Connector Plate Screw
	ES-23149	2	Lock Washers for ES-53367
	ES-515	2	Ground Terminal Hex Nut
	ES-3055	1	Lock Washer for ES-515
	ES-2635	1	Ground Terminal Lug
	ES-51439	1	Front Cover with Gasket and Dowel Pins
	ES-51254	1	Front Cover Gasket
	ES-51255	2	Front Cover Dowel Pin
	ES-1212	6	Front Cover Screw
	ES-23149	6	Lock Washer for ES-1212
	ES-6135	6	Seal for ES-1212
	ES-35207	1	Distributor Brg. Oil Hole Screw
	ES-51454	1	Distributor Block Complete
	ES-51664	4	Dist. Block Carbon Brush and Spring
	ES-51459	1	Dist. Block High Tension Coil Spring
	ES-51267	1	Distributor Block Gasket
	Y-6893	4	Thumb Nut
	ES-63643	2	Distributor Block Attaching Screws
	ES-23149	2	Lock Washers for ES-63643
	ES-51436	1	Dist. Block Center Brush and Cap
	ES-51218	1	Dist. Disc Complete
	ES-51230	1	Distributor Gear
	ES-51252	1	Distributor Gear Spacing Washer
	ES-51253	1	Dist. Shaft Ball Bearing
	ES-72	1	Distributor Shaft Key
	ES-29411	1	Dist. Shaft Plain Washer
	ES-18309	1	Dist. Shaft Screw
	ES-3055	1	Lock Washer for ES-18309

REFERENCE

NUMBER	PART NO.	REQUIRED	NAME
	ES-51271	1	Safety Cap Disc
	ES-51336	1	Cam
	ES-51251	1	Breaker Terminal Group
	ES-51244	1	Breaker Term. Slotted Nut
	ES-23149	1	Lock Washer for ES-51244
	ES-51231	1	Breaker Base Plate
	ES-35251	2	Breaker Base Plate Screws (Bottom)
	ES-51226	1	Breaker Bar and Fixed Con- tact Set
	ES-51274	1	Breaker Bar
	ES-16640	1	Breaker Bar Spring Screw
	ES-3794	1	Lock Washer for ES-16640
	ES-51275	1	Contact Brkt. with Contact
	ES-51272	1	Contact Brkt. Pivot Screw (Shouldered)
	ES-53367	1	Contact Brkt. Holding Screw (Short)
	ES-35252	1	Contact Bracket Holding Screw (Long - Top)
	ES-51273	1	Lock Washer for ES-35252
	ES-51286	1	Primary Lead Assembly
	ES-51256	1	Breaker Stud Insulator
	ES-51432	1	High Tension Coil Complete
	ES-51233	1	Coil Clamp
	ES-16756	2	Coil Clamp Spring
	ES-23149	2	Lock Washer for ES-16756
	ES-7593	1	Coil Top Insulator
	ES-7595	1	Coil Bottom Insulator
	ES-51441	1	Condenser Assembly
	ES-51285	1	Condenser Lead Assembly
	ES-62	1	Condenser Nut
	ES-23149	1	Lock Washer for ES-62
	ES-51202	1	Rotor
	ES-73	1	Drive Key
	ES-51234	2	Ball Bearing Complete
	ES-51435	2	Brg. Grease Sealing Ring
	ES-63399	1	Shim .002 (Approx.)
	ES-63400	1	Shim .003 (Approx.)
	ES-51209	1	Front Brg. Plate only
	ES-30398	3	Front Brg. Plate Screws
	ES-3055	3	Lock Washers for ES-30398
	ES-7524	1	Front Brg. Felt Washer
	ES-51229	1	Pinion Gear
	ES-72	1	Pinion Gear Key
	ES-18309	1	Pinion Gear Screw
	ES-29411	1	Pinion Gear Plain Washer
	ES-3055	1	Lock Washer for ES-18309
	ES-51236	1	Magnet only
	ES-7572	1	Magnet Screw
	ES-29555	1	Lock Washer for ES-7572

REFERENCE NUMBER	PART NO.	REQUIRED	NAME
	ES-7535	1	Magnet Seal
178	ES-7381	1	Complete Starter R. H. 15 Deg. Lag. Angle
	ES-7386	1	Rotating Unit Assembly Complete
	ES-7370	1	Drive Member Spring Case Only
	ES-7333	1	Magneto Member Assembly
	ES-7323	1	Stop Pin Plate & Attach. Screw
	ES-7340	3	Stop Pin Plate Attaching Screws
	ES-7362	1	Felt Seal Holder and Seal with attaching screws
	ES-35207	2	Felt Seal Holder Screws
	ES-16319	2	Lock Washers for ES-35207
	ES-7352	1	Spring Assembly with Felt and Stop Pins
	ES-7366	2	Spring Stop Pins
	ES-7349	2	Stop Lever
	ES-7350	2	Stop Lever Metal Washer
	ES-7351	2	Stop Lever Snap Rings
	ES-7348	1	Magneto Member Brg. Felt
	ES-7343	1	Notched Washer
	ES-30537	1	Shaft Lock Washer
	ES-7344	1	Shaft Nut
179	B-7720-A	1	Water Inlet Elbow
	BD-197-A	1	Water Inlet Elbow Gasket
180	B-7722	1	Water Inlet Elbow Screw
181	B-5563	1	Drain Cock
182	1944	1	Hose Connection
183	65697	2	Hose Clamps
	OB-10758	1	Copper Tube (Pump to Case)
	78282-C	1	Sq. Hd. Pipe Plug (Inlet Elbow)
	78280-B	1	Slotted Hd. Pipe Plug (Inlet Elbow)
184	Y-6409	1	Magneto Impulse Dust Shield
	OY-7488	2	Magneto Cable Support Bracket Assembly
	Y-7488	2	Magneto Cable Support Brkt.
		2	Hex Hd. Cap Screws 1/4-20 x 1" - Cad. Pl.
		1	Hex Hd. Cap Screw 1/4-20 x 7/8 - Cad. Pl.
		3	Lock Washers 1/4" Cad. Pl.
	Y-7492	3	Magneto Cable Support Clamp
	B-9322	3	Spacer
	Y-18479-A	1	#16-Wire 6 ft. Lg.)
	Y-6427	1	Wedge-On Lug) To
	Y-6456-Q	1	Loom) Magneto
	Y-6246	2	Wire Clip

Part 3

REFERENCE

NUMBER	PART NO.	REQUIRED	NAME
		2	Parker Kalon Hex Hd. Screw #14 x 3/8 - Cad. Pl.
Y-6247		2	Wire Clip
		2	Hex Hd. Cap Screw 1/4-20 x 5/8 Lg. Cad. Pl.
		2	Lock Washers 1/4 Cad. Pl.
		2	Hex Nuts 1/4-20 - Cad. Pl.
OY-18179		1	Terminal Block Assembly
Y-18179		1	Terminal Block Support
Y-18192		1	Terminal Block
		4	Allen Hd. Cap Screws 5/16- 18 x 1"
		2	Allen Hd. Cap Screws 5/16- 18 x 1-1/2
Y-18231		2	Stud
		2	Hex Nuts 5/8-18
		2	Lock Washers 5/8
Y-18199		2	Wedge-On Terminal
Y-18493		1	Terminal Connector
Y-18508		1	Terminal Connector
Y-18493-A		1	Terminal Connector
Y-18508-A		1	Terminal Connector
Y-18493-B		1	Terminal Connector
Y-18508-A		1	Terminal Connector
Y-18200-A		1	Terminal Connector
#1120		1	Shakeproof Lock Washer - Cad. Pl.
		3	Everdur Hex Nuts 3/8-16
		3	Everdur Jam Nuts 3/8-16
		3	Everdur Washers 3/8 Bolt size 7/8 O.D.
Y-18225		1	Terminal Bolt (1/2)
Y-18226		1	Terminal Bolt (7/16)
Y-18227		1	Terminal Bolt (3/8)
Y-18228		1	Terminal Bolt (5/16)
		1	Everdur Hex Nut 5/16-18
		1	Everdur Jam Nut 5/16-18
		1	Everdur Washer 5/16 Bolt size 11/16 O.D.
		3 oz.	Red Sealing Compound
OY-7352-A		1	Receptacle Assembly
Y-7352		1	Box
Y-7353		1	Receptacle Housing
Y-7354-A		1	Receptacle (8-Pole)
Y-6157-A		1	Fuel Hose
Y-7404		1	Fuel Hose Spring Clip
		1	Parker Kalon Hex Hd. Screw 3/8 x 5/8 - Cad. Pl.
OY-6639		1	Radiator Filler Body Assembly

REFERENCE

NUMBER	PART NO.	REQUIRED	NAME
	Y-6639	1	Radiator Filler Body
	Y-6656	1	Radiator Filler Body Cap
	Y-9091	4	3/4 Male Hose Nipples
	Y-9135-A	4	Expansion Tank Hose Washer
	OY-7402	1	Expansion Tank Hose Assembly
	Y-7402-A	2	Expansion Tank Hose
	Y-9092	4	Hose Coupling
	Y-9129	4	Hose Clamp
	Y-7450	8	Expansion Tank Hose Clamps
		4	Hex Hd. Cap Screws 1/4-20 x 3/4 Lg. Cad. Pl.
	#1114	4	Shakeproof Lock Washer
		4	Hex Nuts 1/4-20 Cad. Pl.
	Y-7388	2	Wheel Stops
	Y-7506	2	Cap Screws
		2	Hex Nuts 5/8-11 Cad. Pl.
		4	Hex Hd. Cap Screws 1/2-13 x 2" Lg. Cad. Pl.
		4	Lock Washers 1/2 Cad. Pl.
	OY-18059	1	Flexible Exhaust Connection
	OY-18468	1	Flex. Exhaust Connection
			Support
		4	Hex Hd. Cap Screws 3/8-16 x 3/4 Lg. Cad. Pl.
		4	Lock Washers 3/8 - Cad. Pl.
185	Y-18168-B	1	Panel
	Y-18167	1	Name Plate
	Y-18372-A	1	Warning Tag
		4	Parker Kalon Screws #4 x 3/8 Type "Z" - Cad. Pl.
	OY-18267	2	Panel Support Assembly
		10	Rd. Hd. Machine Screws #8-32 x 5/16 Lg.
		4	Rd. Hd. Machine Screws #10-32 x 5/16 Lg.
	#1210	2	Shakeproof Lock Washers - Cad. Pl.
	Y-18145	2	Mounting Terminal
	Y-18259	10	Mounting Terminal
186	Y-18251	1	Timer Cover
	Y-18254	4	Gasket
	Y-18252	1	Timer Glass
	Y-18253	6	Clips
		6	Flat Hd. Mach. Screws #6-32 x 3/8 Lg. Cad. Pl.
	#1106	6	Shakeproof Lock Washer Cad.Pl.
		6	Hex Nuts #6-32 Cad. Pl.
	Y-18216	1	Automatic Timer Base

Part 3

REFERENCE

NUMBER	PART NO.	REQUIRED	NAME
		3	Rd. Hd. Machine Screw #10-24 x 3/4 Lg. Cad. Pl.
	#1210	3	Shakeproof Lock Washers
187	Y-18214	1	Solenoid Support
	Y-18229	1	Solenoid
		4	Flat Hd. Mach. Screws #8-32 x 5/8 Cad. Pl.
	#1508	4	Shakeproof Lock Washers Cad. Pl.
		2	Rd. Hd. Mach. Screws #8-32 x 1/2 Lg.
	#1208	2	Shakeproof Lock Washer
188	Y-18273	1	Bumper Spring
189	Y-18249	1	Timer Plunger
		2	Brass Washer .200 I.D. x 7/16 O.D. x .036 Thick
	Y-18233	1	Guide Cap
		2	Rd. Hd. Machine Screws #8-32 x 3/8 Lg. Cad. Pl.
	#1208	2	Shakeproof Lock Washers - Cad. Pl.
190	Y-18211	1	Timer Pawl
	Y-18248	1	Pawl Spring
	Y-18275	1	Spring Pin (Short)
	Y-18176	1	Pawl Spring Pin
	Y-18215	1	Pivot Pin
		2	Cotter Pin 1/16 x 1/2 Lg. Cad. Pl.
191	Y-18208	1	Two-Point Timing Cam (Summer)
	Y-18355	1	8-Point Timing Cam (Winter)
	Y-18222	1	Bushing
192	Y-18246	1	Timer Shaft
		1	Castle Nut 3/8-24 - Cad. Pl.
		1	Cotter Pin 3/32 x 1" Lg. Cad. Pl.
	Y-18236	1	Felt Washer
		1	Brass Washer 9/16 I.D. x 1-1/4 O.D. x .091 Thick
	Y-18247	1	Drag Spring
		1	Cotter Pin 3/32 x 3/4 Lg. Cad. Pl.
	Y-18211	1	Timer Pawl
	Y-18212	1	Pawl Support Pin
		1	Cotter Pin 1/16 x 1/2 Lg. Cad. Pl.
		2	Brass Washers .200 I.D. x 7/16 O.D. x .036 Thick
	Y-18248	1	Pawl Spring
	Y-18276	1	Spring Pin (Long)

REFERENCE NUMBER	PART NO.	REQUIRED	NAME
193	Y-18176	1	Pawl Spring Pin
	Y-18219	1	Micro Switch
	Y-18234	1	Switch Support
		1	Rd. Hd. Mach. Screw #6-32 x 7/8 Lg. (Brass)
		1	Rd. Hd. Machine Screw #6- 32 x 1-1/4 Lg. (Brass)
	#1206	2	Shakeproof Lock Washer Cad. Pl.
		1	Fillister Hd. Mach. Screw 6-32 x 5/8 Lg. (Brass)
		1	Brass Hex Nut #6-32
	Y-18334-C	1	Lead Wire (7-1/2" Lg.)
	Y-18334-B	1	Lead Wire (3" Lg.)
	Y-18250	2	Terminal Lug
194	18255	2	Stud
195	Y-18256	2	Cover Nut
196	OY-18149-C	1	Push Button Switch Assembly
	Y-18149	1	Push Button Switch
	Y-18150-C	1	Push Button Switch Cover
	OY-18335	3	Lead Wire Assembly
		4	Rd. Hd. Mach. Screws #6-32 x 1/2 Lg. Cad. Pl.
197	Y-18330	1	Switch Support
198	Y-6146-A	1	Crank Limit Switch
	OY-18335-A	4	Lead Wire Assembly
		1	Fillister Hd. Mach. Screws #6-32 x 5/16 Lg. Cad. Pl.
	Y-6311	1	3-Min. Thermal Element
	Y-6895	1	Name Plate (Oil-Heat)
		2	Rd. Hd. Machine Screws #6- 32 x 1/2 Lg. Cad. Pl.
	#1206	2	Shakeproof Lock Washers - Cad. Pl.
	Y-18260	1	Control Relay Cover
	Y-18191	1	Control Relay Gasket
	Y-18261	2	Cover Spacer
199	Y-18146	1	Control Relay
	50-A	1	Coil Assembly
	1286	2	Front Contact Brackets
	1619	1	Back Contact Bracket
	825	1	Tension Spring
	425	6	Compression Springs
		1	L.H. Yoke Assembly (Front Contacts)
		1	Center Yoke Assembly (Back Contacts)
		1	R. H. Yoke Assembly (Front Contacts)

Part 3

REFERENCE NUMBER	PART NO.	REQUIRED	NAME
200	Y-18262	2	Cover Stud
201	Y-18263	2	Relay Cover Nut
	Y-18180	8	Brass Stud
		34	Brass Hex Nut 6-32
		24	Brass Washer #6-.146 I.D. x 5/16 O.D.
202	Y-6660	1	Intermittent Starting Switch
	OY-18333	3	Lead Wire Assembly
	Y-18135	43	Terminal Support
		86	Rd. Hd. Mach. Screw 8-32 x 5/16 Lg. Electro Tinned
		4	Rd. Hd. Mach. Screw #10-32 x 5/16 Lg. Electro Tinned
	#1210	2	Shakeproof Lock Washer Cad. Plated
203	Y-18154	13	Terminal Lug
204	Y-18121	1	Starting Contactor
	Y-18335	2	Lead Assembly
	Y-18322	1	Insulating Tube
	Y-18323	1	Insulating Tube
	Y-18324	1	Insulating Block
		4	Hex Hd. Cap Screw 1/4-20 x 3/4 Lg. - Cad. Pl.
		4	1/4 Lock Washer - Cad. Pl.
	Y-18170	1	Bus Bar
	Y-18171	1	Bus Bar
	Y-18162	3	Bronze Nut 3/8-16 Electro Tinned
205	OY-18138	1	Timing Relay Assembly
		4	Hex Hd. Cap Screws 1/4-20 x 3/4 Lg. Cad. Pl.
		4	Lock Washers 1/4 - Cad. Pl.
	Y-18139	1	Timing Relay (3 Min.)
	P-462534	1	Contact for Y-18139
	P-187-1-112	1	Coil for Y-18139
	P-462025	1	Iron Circuit
	P-57-16-24	2	Rubber Washers
	P-74-4-19	1	Retaining Clip
	P-462327	1	Cap
	Y-18138	1	Timing Relay (5-Sec.)
	P-462533	1	Contact
	P-187-1-107	1	Coil
	P-462028	1	Iron Circuit
	P-57-16-24	2	Rubber Washers
	P-74-4-19	1	Retaining Clip
206	Y-18159	2	Fuse Clip (200-A)
207	Y-18158-A	1	Fuse
		1	150-Amp. Bus "D" Fuse Link
	Y-18175	1	Bus Bar

REFERENCE NUMBER	PART NO.	REQUIRED	NAME
	Y-18160	2	Bronze Cap Screws 3/8-16 x 1-1/2 Lg. (Electro Tinned)
	Y-18162	2	Bronze Hex Nuts 3/8-16 (Electro Tinned)
	Y-18163	2	Bronze Lock Washers 3/8 Cad. Pl.
208	Y-18206-A	4	Connector Lug
209	Y-18321	1	Insulator
	#1120	1	Shakeproof L. W. Cad. Pl.
	Y-18165	4	Bronze Hex Hd. Cap Screws 3/8-16 x 1-3/4 Lg. Electro Tinned
	Y-18161	4	Copper Washer 3/8 Cad. Pl.
	Y-18163	4	Bronze Lock Washer 3/8 - Cad. Pl.
	Y-18166	8	Everdur Hex Jam Nuts - 3/8-16 - Cad. Pl.
	Y-18348	30 Ft.	Rockbestos Wire
	Y-18422	2	Sherman Lugs
210	Y-18136	1	Low Current Relay
	CH-640-57	1	Contact Lever Assembly
	CH-831-775-A	1	Contact Button
	CH-969-922-J	1	Tension Spring
	CH-9-153-2	1	Coil
	Y-18172	1	Bus Bar
	Y-18173	1	Bus Bar
	Y-18162	2	Bronze Nuts 3/8-16 - Electro Tinned
211	Y-18157-A	2	Fuse Clip
212	Y-18156	1	Fuse (10 Amp.)
213	Y-18469	1	Load Relay Panel
214	OY-18267	2	Panel Support Assembly
		10	Rd. Hd. Mach. Screw #10-24 x 3/4 Lg. Cad. Pl.
	#1210	10	Shakeproof L. W. - Cad. Pl.
215	Y-18206-A	2	Connector Lug
	Y-18259	4	Mounting Terminal
216	Y-18165	2	Bronze Hex Hd. Cap Screw 3/8-16 x 1-3/4 Lg. - Electro Tinned
	Y-18161	2	Copper Washer 3/8 - Cad. Pl.
	Y-18163	2	Bronze Lock Washer 3/8 - Cad. Pl.
217	Y-18166	4	Everdur Hex Jam Nut 3/8-16 Cad. Pl.
218	Y-18136	1	Low Current Relay
	CH-640-57	1	Contact Lever Assembly
	CH-831-775-A	1	Contact Button
	CH-969-922-J	1	Tension Spring
	CH-9153-2	1	Coil

Part 3

REFERENCE

NUMBER	PART NO.	REQUIRED	NAME
	Y-18172	2	Bus Bar
	Y-18162	2	Bronze Nuts 3/8-16 (Electro Tinned)
219	Y-18486	1	Name Plate
		2	Parker Kalon Screws #4 x 3/8
220	Y-18470	1	Timing Relay
		4	Hex Hd. Cap Screws 1/4-20 x 3/4 Cad. Pl.
		4	Lock Washers 1/4 Cad. Pl.
221	P-463128	1	Contact
	P-462028	1	Iron Circuit
	P-187-1-107	1	Coil
	P-462327	1	Cap
	P-74-4-19	1	Retaining Clip
	P-57-16-24	2	Rubber Washer
222	Y-18135	7	Terminal Support
		14	Rd. Hd. Mach. Screw #8-32 x 5/16 Lg. Electro Tinned
223	Y-18154	3	Wedge-On Terminal
	Y-18348	2 1/2	Feet #14 Rockbestos Wire
224	Y-6162-B	1	Regulator (5 oz.)
	BB-5800-A9	1	Diaphragm
	BB-1175-16	1	Seat Disc
	BB-5800-6	1	Spring
225	Y-6401	4	Excess Flow Valves
	BB-2779-9	1	Diaphragm
	BB-2779-6	1	Seat Disc
	BB-2779-13	1	Spring
226	Y-6169-B	6	Fuel Hose
	OY-6998-A	2	Type R.H. Fuel Manifold Assembly (10 lbs.)
	OY-6998-B	2	Type R.H. Fuel Manifold Assembly (20 lbs.)
	OY-6998-C	2	Type R.H. Fuel Manifold Assembly (30 lbs.)
227	Y-6163-A	2	Regulator (Set at 10 lbs.)
228	Y-6218	12	Regulator Assembly Clamps
		12	Hex. Hd. Cap Screws 3/8-16 x 2-1/2" Lg. Cad. Pl.
		12	Hex Nuts 3/8-16 Cad. Pl.
		12	3/8 Lock Washers
229	Y-6167-B	6	Check Valves
	BB-2885-6	1	Seat Disc
	BB-2885-8	1	Spring
230	Y-6869	6	Tee Type Check Valve
	Y-6280-A	6	Flare Tube Cap Nuts
231	Y-6545	6	Brass Nipple 1/4 x 1-1/4 Lg.
232	Y-6163-E	2	Regulator (Set at 20 Lbs.)
	BB-1147-16	1	Seat Disc

REFERENCE

NUMBER	PART NO.	REQUIRED	NAME
	BB-1147-9	1	Diaphragm
	BB-1147-23	1	Diaphragm Washer
	BB-1147-21	1	Back Cap Washer
233	Y-6578	7	Excess Flow Valves (Small)
234	Y-6166	6	Special Globe Valve
	BB-2651-9R	1	Seat Disc
	BB-2852-4	3	Diaphragm
235	Y-7494	2	Short Nipple (1/4 Brass)
236	Y-6543	2	Tee 1/4 x 1/4 x 1/4 F.P.T.
237	78201-E	2	Nipple 1/4 x 5" (Brass)
	Y-7495	2	Elbow 1/4 F.P.T. (Brass)
	Y-6544	2	45° St. Elbow (1/4 Brass)
238	Y-6168-A	2	Pressure Gauge
239	Y-6163-B	2	Regulator (Set at 30 Lbs.)
240	B-5528	26	Flare Nuts
241	B-1687	6	Half Union Elbow
242	B-10455	5	Flare Tube Tee
243	Y-6162-A	1	Regulator - 3 Oz.
244	Y-6997	1	Female Coupling 3/8 Flare x 1/4 F.P.
245	Y-6990	1	1/4 Female Coupling
246	Y-6900	1	Tee 3/8 Flare x 1/4 M.P. x 3/8 Flare
		1	3/8 Copper Tube 22-1/2" Lg.
		1	3/8 Copper Tube 12-7/8" Lg.
		2	3/8 Copper Tube 4-1/4" Lg.
		1	3/8 Copper Tube 19-1/8" Lg.
		2	3/8 Copper Tube 2-7/8" Lg.
		1	3/8 Copper Tube 14-7/8" Lg.
		1	3/8 Copper Tube 22" Lg.
		1	3/8 Copper Tube 18" Lg.
		2	3/8 Copper Tube 5" Lg.
247	B-5528	3	Flare Nut
248	Y-6542	1	Close Nipple
250	B-5526	2	Half Union
251	78202-C	1	St. Elbow 1/4 Brass
252	B-3763	5	Expansion Plug
253	Y-7364	6	Heating Pad
254	Y-7370	6	Clean-Out Door Cover
255	Y-7371	6	Clean-Out Door Gasket
	#1214	36	Shakeproof Lock Washer
		36	Hex Hd. Cap Screws 1/4- 20 x 5/8 - Cad. Pl.
256	Y-18332	1	Muffler
257	Y-6169-C	3	Fuel Hose
258	Y-7365	5	Drain Plug
259	Y-7367	6	Drain Plug Gasket
260	Y-7366	1	Exhaust Plug
261	Y-7369	3	Elbow

Part 3

REFERENCE

NUMBER	PART NO.	REQUIRED	NAME
		3	Hex Hd. Parker Kalon Cap
			Screws #14 x 1/2 Cad. Pl.
262	OY-18207-C	1	By-Pass Valve
	Y-18207-A	1	By-Pass Valve Body
	Y-18210	1	By-Pass Valve Body Cover
		4	Rd. Hd. Mach. Screw 1/4-20 x
			7/8 Lg. Cad. Pl.
	#1214	4	Shakeproof Washers Cad. Pl.
	OY-18464	1	By-Pass Valve Tube Assembly (T)
		1	#14 x 1/2 Parker Kalon Hex
			Hd. Screw
	OY-18463	1	By-Pass Valve Tube Assembly
			(Side)
		1	#14 x 1/2 Parker Kalon Hex
			Hd. Screw
	Y-18223	1✓	By-Pass Valve Butterfly
	B-5071	2	Groov Pin
	Y-18224	1✓	Butterfly Shaft
	Y-18232	1✓	Shaft Lever
		1	Hex Hd. Cap Screw 1/4-20 x
			1/2 Lg. Cad. Pl.
	#1114	1	Shakeproof Lock Washer Cad. Pl.
	Y-18241	1	Rear Cover Gasket
	Y-18242-A	1	Rear Cover
		4	Rd. Hd. Mach. Screw 1/4-20
			x 3/4 Lg. (Cad. Pl.)
	#1214	4	Shakeproof Lock Washer
	Y-18237	6	By-Pass Valve Sylphon Support
			Gasket
	OY-18235-B	1	By-Pass Valve Sylphon Support
			Assembly
	Y-18356	1	By-Pass Valve Spring Support
	Y-18357	1	By-Pass Valve Spring Support
			Gasket
	#1214	4	Shakeproof Lock Washer
	Y-18460	1	Spring Cylinder
	Y-18361	1	Connector Link
	Y-18218	1	Yoke End Pin
		1	Cotter Pin 1/16 x 1/2 Lg.
			Cad. Pl.
	Y-18362	1	Spring Control Stud
	Y-18360	1	Spring Guide
		1	Hex Jam Nut 3/8-16 (Brass)
	#1120	1	Shakeproof Lock Washer
	Y-18220	1	Valve Spring
	Y-18359	1	Spring Cover
	78282-C	1	Pipe Plug
	Y-7369	2	Elbow

REFERENCE NUMBER	PART NO.	REQUIRED	NAME
		2	Hex Hd. Parker Kalon #14 x 1/2 (Cad. Pl.)
263	Y-7368	2	Heater Connecting Pipe
264	Y-6909	1	Housing (Starter-Generator)
265	Y-6964	1	Stub Shaft
266	B-9837	4	Cap Screws
		1	Soft Brass Wire 12"
267	Y-7343	1	Starter-Generator Armature
268	Y-7373	1	Key
269	Y-18319	1	Nut Lock Washer
270	Y-6961	1	Nut
271	OY-7345	1	Brush Ring Assembly
272	Y-7346	8	Starter-Generator Brush Holder
273	Y-7347	8	Starter-Generator Brush Holder Spring
274	Y-7348	8	Starter-Generator Brushes
275	Y-6907	1	Brush Ring Support
	OY-6907	1	Brush Ring Support Assembly (Includes: (1 Y-6907 Ring Support (1 Y-6932 Support Pin (1 Y-6933 Timer Locating Pin
276	Y-7345	1	Brush Ring
277	Y-7349	1	Brush Connecting Ring
	Y-7372	8	#10-32 x 1/4" Hex Hd. Mech. Screw - Cad. Pl.
		16	Rd. Hd. Brass Mach. Screw #10-32 x 3/4"
		16	Washers Brass #10
278	Y-6932	4	Brush Ring Support Pin
	Y-6933	2	Timer Pointer Locating Pin
		4	Washers 1/4" Cad. Pl.
		4	Hex Nuts 1/4"-20 Cad. Pl.
	Y-6934	1	Timing Pointer
		1	1/4-20 x 1/2" Allen Head Set Screw Cad. Pl.
		1	#1214 Shakeproof Lock Washer Cad. Pl.
		6	Allen Head Screw 1/4-20 x 3/4" - Cad. Pl.
	#1214	6	Shakeproof Lock Washer Cad.Pl.
279	Y-7344	1	Field Coil Assembly
280	Y-7350	8	Field Poles
281		16	Allen Head Cap Screws 1/4-20 x 1" - Cad. Pl.
282	OY-6942	1	Cover Band Assembly (Right)

Part 3

REFERENCE

NUMBER	PART NO.	REQUIRED	NAME
	Y-7375	1	Cover Band Gasket
	OY-6943	1	Cover Band Assembly - Left
	Y-7375	1	Cover Band Gasket
283	Y-6939	1	Clamp Knob
	Y-9090	1	Eye Bolt
	Y-6938	1	Clamp Rod Pin
	Y-6935	4	Cover Band Support Pin
284	Y-6962	1	Drive Hub
285	Y-14165	6	Drive Bushings
		1	#15 Woodruff Key
	#1134	1	Shakeproof Lock Washer Cad.Pl.
		1	7/8" - 14 Hex Jam Nut Cad. Pl.
	Y-6875-A	1	7-1/2 Ton Rotary Freon Compressor
		2	5/8-11 x 1-1/4 Hex Head Cap Screws - Cad. Pl.
		5	5/8-11 x 1-1/2 Hex Head Cap Screws - Cad. Pl.
		7	5/8 Lock Washers - Cad. Pl.
		2	5/8-11 Hex Nuts - Cad. Pl.
286	Y-6376	6	Drive Pins
287	Y-6963	1	Coupling Hub
288		1	7/8"-14 Nut
289	#1134	1	Shakeproof Lock Washer
290		1	Copper Finned Tube 3/8-36"
291		1	#15 Woodruff Key
292		1	Rotor
293		2	400 x 6 Fitting
294		2	100 x 6 Nut
295	3W11809	1	Snap Ring - Outer
	3W11810	1	Snap Ring - Inner
296	3W11808	1	Inlet Port Screen
	3W11811	1	Inlet Port Baffle
297	3W11807	1	Bearing Cover Gasket
298	3W11519	1	Oil Screen
299	144-B	1	Magnetic Drain Plug
300	X1026T32	1	Copper Washer
301	#32/60-5"	10 ft.	Woven Copper Wire Mesh
302		1	Copper Tubing 5/16"-5"
303	MRC-5307	1	Ball Bearing (Rear)
303-A	3W11527	1	Ball Bearing Spacer
304	3W11528	1	Bearing Washer
305	3W11804	1	Rear Bearing Washer
306		1	1/2"-1-1/4" Flat Hd. Mach. Screw
		4	1/4-1/2" Cup Pt. Hol. Hd. Set Screw
307		8	3/8-1-1/2" Rear Bearing Cover Cap Screw
308	3R-7675-T	1	Cylinder Assembly

REFERENCE NUMBER	PART NO.	REQUIRED	NAME
		1	3/8" Hex Hd. Pipe Plug (Tinned)
309	3H5688	1	Shell
	Y-14448	1	Operating Instruction Transfer
310	3W11802	10	Rotor Vanes
311	3W11806	1	Oil Separator Cover
		1	4-3/4 - 2-1/4 Bronze Screen 60 Mesh
		4	1/4 x 3/8" Button Hd. Screw
		4	1/4" Lock Washers
312	3W11805	1	Discharge Port Cover
313	3W11812	1	Front Bearing Spacer
314	407-M	1	Ball Bearing
315		12	3/8 x 1" Hex Hd. Cap Screw
	X1026T26	12	Copper Washers
316	3W11817	1	Shaft Seal
317	3W11803	1	Front Cover Packing Ring
318	3R7677	1	Front Cover
319	3W11813	2	Front Cover Gasket
320		20	1/2" x 1" Hex Hd. Cap Screw
321	Y-7548	1	Compressor Spacer
	3W2237	1	Sight Glass
	3W2236	1	Sight Glass Nut
	3W11852	2	Sight Glass Gasket
	3W11853	1	Sight Glass Follower Washer
	3W11821	1	Check Valve Body
	X1026T39	1	Check Valve Body Gasket
	3W6941	1	Check Valve Stem
	#466	1	Check Valve Spring
	3W11822	1	Check Valve Upper Seat Washer
	3W11823	1	Check Valve Lower Seat Washer
	3W11824	1	Check Valve Seat
		1	1/4" Elastic Stop Nut
		2	1/8" Hex Hd. Pipe Plug (Tinned)
	3W11825	1	Suction Valve Flange
	685-S	1	Suction Shut-Off Valve
		4	1/2" x 3" Cap Screw
	3W6946	1	Discharge Valve Flange
	#6302	1	Discharge Shut-Off Valve
	X1026T33	1	Discharge Valve Gasket
		2	1/2" x 2-1/2" Cap Screw
	3W6785	1	Name Plate
322	Y-7468	1	1-3/8 Return Bend
	Y-7406	1	Suction Strainer Clamp
	Y-7405	1	Suction Strainer Support

REFERENCE

NUMBER	PART NO.	REQUIRED	NAME
		2	Hex Hd. Cap Screws 1/2-13 x 3/4 Lg. Cad. Pl.
		2	Lock Washers 1/2 Cad. Pl.
		2	Hex Hd. Cap Screws 3/8-16 x 1-3/4 Lg. Cad. Pl.
		2	Lock Washers 3/8 Cad. Pl.
323	Y-7466	1	Pipe Nipple 1-1/2 x 15" Lg.
	Y-6918	1	Exhaust Pipe Elbow (To Manifold)
	B-9825	1	Exhaust Pipe Flange Gskt.
	Y-9162	2	Hex Nuts (Everdur)
	#1220	2	Shakeproof Lock Washer
		2	Hex Hd. Cap Screws 3/8-16 x 1-1/4 Lg. Cad. Pl.
324	Y-6235	1	Pipe Elbow 1-1/2"
	Y-7467	1	Pipe Nipple 1-1/2" x 11" Lg.
	Y-7561	1	Exhaust Pipe Shield
		2	Parker Kalon Hex Hd. Cap Screw #14 x 1/2 Lg. Cad. Pl.
325	OY-7517	1	Vacuum Switch Assembly (Low Vacuum)
	Y-7515	1	Vacuum Switch Body
	Y-7514	1	Vacuum Chamber
	Y-6752	1	Vacuum Switch Diaphragm
		10	Rd. Hd. Mach. Screw #10- 24 x 1/2 Lg. Cad. Pl.
	#1210	10	Shakeproof Lock Washer Cad. Pl.
	Y-7511	1	Diaphragm Rod
	Y-6760	2	Cup Washer
		1	Hex Nut 1/4 Cad. Pl.
	#1114	1	Shakeproof Lock Washer Cad. Pl.
	Y-7510	1	Take-up Screw
	Y-7513	1	Pin
	Y-7516	1	Clamp
	Y-7512	1	Wire Arm
		1	Rd. Hd. Mach. Screw #8- 32 x 1" Cad. Pl.
	Y-7508	1	Low Vacuum Switch Spring
		1	Flat Hd. Screw #6-32 x 1-1/4 Lg. Cad. Pl.
	Y-7517	1	Switch
		2	Rd. Hd. Mach. Screw #10-32 x 7/8 Lg. Cad. Pl.
	Y-7522	1	Cover
	Y-7523	1	Gasket
		4	Hex Hd. Cap Screws 1/4-20 x 3/4 Lg. Cad. Pl.

REFERENCE NUMBER	PART NO.	REQUIRED	NAME
326	#1214	4	Shakeproof Lock Washer Cad. Pl.
	OY-6781	1	Vacuum Switch Breather Cap Assembly
	Y-6781	1	Vacuum Switch Breather Cap
	Y-6789	2	Breather Screen
	B-9748	1	Snap Ring
	63347	1	Breather Cap Gasket
	327 Y-7352	1	Connection Box Cover
	328 Y-7394	1	Connection Box
		2	Hex Hd. Cap Screws 1/4-20 x 5/8 - Cad. Pl.
	#1214	2	Shakeproof Lock Washer
329	Y-6778-G	1	#16-3 Wire 90" Lg. Tirex
330	Y-6968-D	1	Cord Grip
	Y-6246	2	Wire Clip
		2	Parker Kalon Hex Hd. Cap Screw #14 x 3/8 Cad. Pl.
	Y-6785-C	2	#16-2 Wire Tirex (20" Lg.)
	Y-6427	7	#16 Wedge-On Terminals
		3	Brass Rd. Hd. Mach. Screws #10-24 x 3/8 Lg.
		3	Brass Hex Nuts #10-24
	#1110	2	Shakeproof Lock Washer Cad. Pl.
	Y-6968-E	1	Cord Grip (2-Cables)
	Y-6867	2	Cord Grip
331	B-4083	1	3-Way Elbow
	B-4094	1	Half Union
	OY-7524	1	Vacuum Line
	B-4092	2	Flare Nuts
		1	Copper Tube 1/4 O.D. x .035 Wall x 70" Lg.
	Y-7379	1	Double Vacuum Switch Brkt.
		7	Hex Hd. Cap Screws 3/8-16 x 1" Lg. Cad. Pl.
		7	Lock Washers 3/8 - Cad. Pl.
	332 OY-7517-A	1	Vacuum Switch Assembly (High Vacuum)
	Y-7515	1	Vacuum Switch Body
332	Y-7514	1	Vacuum Chamber
	Y-6752	1	Vacuum Switch Diaphragm
		10	Rd. Hd. Mach. Screws #10-24 x 1/2 Lg. - Cad. Pl.
	#1210	10	Shakeproof Lock Washers
	Y-7511	1	Diaphragm Rod
	Y-6760	2	Cup Washer
		1	Hex Nut 1/4 - Cad. Pl.
	#1114	1	Shakeproof Lock Washer Cad. Pl.

Part 3

REFERENCE NUMBER	PART NO.	REQUIRED	NAME
	Y-7509	1	Adjustment Screw
	Y-7516	1	Clamp
	Y-7512	1	Wire Arm
		1	Rd. Hd. Mach. Screw 8-32 x 1" Lg. Cad. Pl.
	Y-7507-A	1	Vacuum Switch Spring
		1	Flat Hd. Mach. Screw #6- 32 x 1-1/4 Lg. Cad. Pl.
	Y-7517	1	Switch
		2	Rd. Hd. Mach. Screws #10-32 x 7/8 Lg. Cad. Pl.
	Y-7522	1	Cover
	Y-7523	1	Gasket
		4	Hex Hd. Cap Screws 1/4-20 x 3/4 Lg. Cad. Pl.
	#1214	4	Shakeproof Lock Washer Cad. Pl.
333	OY-6781	1	Vacuum Switch Breather Assem.
	Y-6781	1	Vacuum Switch Breather Cap
	Y-6789	2	Breather Screen
	B-9748	1	Snap Ring
	63347	1	Breather Cap Gasket
334	Y-6968	1	Cord Grip
335	Y-7420	1	#16-10 Wire Tirex 12 ft. Lg.
336	Y-7471	1	Control Plug
	Y-6807-B	1	Cable Clamp
		1	Hex Hd. Cap Screw 1/4-20 x 5/8 Lg. Cad. Pl.
		1	Lock Washer 1/4 Cad. Pl.
		1	Hex Nut 1/4-20 Cad. Pl.
337	Y-7410	1	Flex. Tubing Support
338	Y-7412	1	Flex. Tubing Support Clamp
		2	Hex Hd. Cap Screws 1/2-13 x 1" Cad. Pl.
		2	Lock Washers 1/2 - Cad. Pl.
		1	Hex Hd. Cap Screw 5/8-11 x 2-1/2 Lg. Cad. Pl.
		1	Lock Washer 5/8 - Cad. Pl.
339	Y-7472	1	Suction Line Tube
	Y-6478	2	1-3/8 Sweat Tube Plug
340	Y-7475	1	Discharge Line Tube
341	Y-14508	1	Flex. Discharge Line
342	Y-7473	1	Special Return Bend
343	Y-7527	2	Flex. Gauge Connection
	Y-6246	2	Wire Clips
	Y-6327	2	Wire Clips
		4	Hex Hd. Cap Screws 1/4-20 x 5/8 Lg. Cad. Pl.
		4	Hex Nuts 1/4-20 Cad. Pl.

REFERENCE NUMBER	PART NO.	REQUIRED	NAME
	#1114	4	Shakeproof Lock Washers
			Cad. Pl.
		1	Copper Tube 1/4 O.D. x (.035)
			Wall x 54" Lg.
		1	Copper Tube 1/4 O.D. x (.035)
			Wall x 38" Lg.
	Y-6207	2	Rubber Grommet
	Y-6739	2	Sweat Tube Tee
	Y-14246	2	Tubing Clamps
	Y-7531	1	Plug
	Y-7528	1	Pipe Extension 3/8
	Y-7526	1	Angle Valve
	Y-7529	1	Half Union Elbow
	Y-7566	1	Half Union
344	OY-6458-C	1	Modulated Control Assembly
	OY-7425	1	Low Pressure Modulator Bel-
			lows Assembly
	Y-6459-A	1	Modulated Control Cylinder
	Y-6460	1	Modulated Control Head
	Y-6792-A	1	Modulated Control Rod
	Y-7521	1	Low Pressure Modulator Spring
			(High Rate)
	Y-7565	1	Spacer
	Y-6461	1	Modulated Control Adjusting
			Nut
	B-7974-A	1	Felt Washer
	B-7973	1	Felt Washer Retainer
	Y-6791	1	Governor Spring Lever
	Y-6466	1	Shoulder Screw
	Y-6468	1	Angle Valve
344-A	K-464	1	Governor Assembly
	B-6114-E	1	Governor Housing
	BE-809	1	Governor Housing Gasket
	B-6115-C	1	Governor Housing Cover
	B-6117	1	Governor Housing Cover Gskt.
	B-6145	1	Governor Shaft
	B-6146	2	Ball Bearing
	B-6090	1	Thrust Ball Bearing
	B-6127	1	Governor Weight - Carrier
	B-6101-F	2	Governor Weights
	B-6255	1	Governor Shifter
	B-6122	2	Governor Weight Shaft
	B-4028	2	Groov Pin
	B-6169	1	Groov Pin
	B-6124	1	Governor Shifter Lever
	B-6126-B	1	Governor Lever Shaft
	B-6518	1	Governor Lever
	B-5071	3	Groov Pin
	B-7355	1	Bumper Screw

Part 3

REFERENCE

NUMBER	PART NO.	REQUIRED	NAME
	B-7356	1	Bumper Spring
		1	Hex Nut 5/16-24
		5	#10-32 x 1/2 Fillister Hd. Screw
		5	3/16 Lock Washer
		1	#00 x 3/4 Taper Pin
	B-6125	1	Governor Gear
		1	#3 Woodruff Key
	B-5456	1	Groov Pin
	B-6121	1	Governor Rod End
	B-6119	1	Governor Rod End Pin
		1	1/16 x 1/2 Cotter Pin
	B-6118	1	Governor Rod
	B-6274	1	Snap Ring
		1	#10-32 Hex Nut
	B-536	1	Expansion Plug
	B-6316	1	Oil Seal Retainer
	B-6315	1	Oil Seal Washer
345	Y-14125	1	Head Pressure Gauge
	Y-14217	1	Special Pipe Plug
		1	Copper tube 1/8 O.D. x 1/16 I.D. 20" Lg.
	Y-14212-L	1	Auto Duct 9" Lg.
346	Y-7258	1	Compound Gauge
	Y-14217	1	Special Pipe Plug
		1	Copper tube 1/8 O.D. x 1/16 I.D. 20" Lg.
	Y-14212-L	1	Auto Duct 9" Lg.
347	Y-12029	1	Vacuum Gauge
	Y-6438	1	Adapter
		1	Copper Tube 1/8 O.D. x 1/16 I.D. x 54" Lg.
	Y-14212-D	1	Auto Duct 36" Lg.
348	Y-7540	1	Oil Gauge
	Y-6438	1	Adapter
		1	Copper Tube 1/8 O.D. x 1/16 I.D. x 4" Lg.
	Y-7445	1	Tubing Clamp
		2	Rd. Hd. Mach. Screw #10-24 x 3/8 Lg. Cad. Pl.
	#1210	2	Shakeproof Lock Washer Cad. Pl.
		2	Rd. Hd. Mach. Screw #10-24 x 1/4 Lg. Cad. Pl.
	#1210	2	Shakeproof Lock Washer Cad. Pl.
349	Y-7438	1	4-Meter Panel
		4	Countersunk Oval Hd. Machine Screw #10-32 x 1/4 Cad. Pl.

REFERENCE NUMBER	PART NO.	REQUIRED	NAME
350	#1510	4	Shakeproof Lock Washer
	Y-7439	1	Push Button Switch
	Y-18473-B	3	Shakeproof Terminal
	Y-7441	1	Switch Support
		2	Hex. Head Cap Screw 1/4-20 x 3/4 lg. Cad. Pl.
	#1214	2	Shakeproof Lock Washer
	Y-6247	1	Tubing Clip (3/8)
		2	Flat Head Machine Screw #6-32 x 1/4 lg. Cad. Pl.
		1	Switch Cover
		1	Round Head Machine Screw #6-32 x 7/8 lg. Cad. Pl.
351	Y-7440		
352	Y-7337	1	Locking Attach. Assembly
		1	Flat Head Machine Screw #6-32 x 1" lg. Cad. Pl.
353	Y-6779-A	1	#16 - 4-Wire Tirex 23" lg.
	Y-7332	1	High-Low Pressure Switch
	Y-7504	1	Switch Mounting Plate
		4	Flat Head Machine Screw #8-32 x 1/4 lg. Cad. Pl.
	#1210	4	Shakeproof Lock Washer Cad. Pl.
	#1508	1	Shakeproof Lock Washer Cad. Pl.
		4	Round Head Machine Screws #10-24 x 3/8 Cad. Pl.
	Y-6438	2	Adapter
		1	Copper Tube 1/8 O.D. x 1/16 I.D. x 6" lg. High Pressure
		1	Copper Tube 1/8 O.D. x 1/16 I.D. x 24" lg. Low Pressure
354	Y-14212-A	1	Autoduct 15" lg.
	Y-6249	1	Chase Nipple
	Y-6250	1	Lock Nut (1/2)
	Y-18479-D	2	#16 Rubber Covered Wire 12" Lg.
	Y-18473	2	Shakeproof Terminal
	Y-6968-A	1	Cord Grip
	Y-6474-B	1	1-3/8 Flexible Suction Line
		2	Copper Tube 1-3/8 O.D. x (.065) Wall x 2-1/4 lg.
355	Y-6398	1	Suction Line Strainer
356	Y-7490	1	Suction Discharge Line Tube Clamp
357	Y-7491	1	Suction Discharge Line Tube Bracket
		2	Hex. Head Cap Screw 3/8-16 x 7/8 Lg. Cad. Pl.

Part 3

REFERENCE

NUMBER	PART NO.	REQUIRED	NAME
358	Y-7309	2	Lock Washer 3/8 Cad. Pl.
		1	Hex. Head Cap Screw 3/8-16 x 1-3/4 lg. Cad. Pl.
	Y-7310	1	Junction Box Cover
		1	Junction Box Cover Gasket
		4	Hex. Head Cap Screw 1/4-20 x 7/8 lg. Cad. Pl.
		4	Shakeproof Lock Washers
	#1214	1	Junction Box
	Y-7308	1	Junction Box Mounting Gasket
	Y-7311	1	Wrought Pipe Close Nipple
	Y-7272	1	Bushing
	Y-18277-B	2	Hex. Head Cap Screw 5/16-18 x 1" lg. Cad. Pl.
		2	Shakeproof Lock Washer Cad. Pl.
	#1218	1	Cord Grip (1-1/2 Pipe)
	Y-7474	4	Sherman Soldering Lug
	Y-6490	2	Round Head Machine Screw 5/16-18 x 1/2 lg. Cad. Pl.
		2	Shakeproof Lock Washer Cad. Pl.
	#1120	2	Hex. Nut 5/16-18 Cad. Pl.
	Y-5356	2	Sherman Solder Lugs
		1	Round Head Machine Screw 1/4-20 x 1/2 lg. Cad. Pl.
	#1114	1	Shakeproof Lock Washer
	Y-5357	1	Hex. Nut 1/4-20 Cad. Pl.
		2	Sherman Lug
		1	Round Head Machine Screw #10-24 x 3/8 lg. Cad. Pl.
		1	Shakeproof Lock Washer Cad. Pl.
	#1110	1	Hex. Nut #10-24 Cad. Pl.
359	Y-7419	1	Special 4-Wire Cable
360	OY-7387	1	Power Plug Assembly
	Y-7387	1	Power Plug
	Y-7452	2	Plug Terminal
	Y-7452-A	1	Plug Terminal
	Y-7452-B	1	Plug Terminal
361	Y-18332	1	Muffler
		4	Parker Kalon Hex. Head Cap Screw #3/8 x 5/8 lg. Cad. Pl.

LOOSE PARTS FOR ICE-ENGINE UNIT

Y-6113-C	1	Refrigerant Receiver
Y-6404	2	Receiver Valve
	2	Tag - Form M-1141

REFERENCE

NUMBER	PART NO.	REQUIRED	NAME
	Y-6419-B	2	1-3/8 Flexible Metal Tubing
	Y-6405	1	Sweat Tube Elbow
	Y-7409	1	Flexible Tubing Strap
	Y-6492-A	1	Flexible Tubing Strap Clamp
		1	Hex. Head Cap Screw 3/8-16 x 2-1/4 lg. Cad. Pl.
		1	Hex Nut 3/8-16 Cad. Pl.
		1	Lock Washer Cad. Pl. (3/8)
	Y-7411	1	Flexible Tubing Support
	Y-7412	1	Flexible Tubing Support Clamp
		2	Hex. Head Cap Screw 1/2-13 x 1" lg. Cad. Pl.
		2	Lock Washer 1/2 Cad. Pl.
		1	Hex. Head Cap Screw 5/8-11 x 2-1/2 lg. Cad. Pl.
		1	Lock Washer 5/8 Cad. Pl.
	Y-6157-A	1	Fuel Hose
	Y-7404	1	Fuel Hose Spring Clip
		1	Parker Kalon Hex. Cap Screw 3/8 x 5/8 lg. Cad. Pl.
	Y-6203	1	Temperature Switch
	Y-6852	1	Angle Valve (Purge)
	Y-6280	1	Flare Tube Cap Nut
	OY-6639	1	Radiator Filler Cap Assembly
	Y-6639	1	Radiator Filler Body
	Y-6656	1	Radiator Filler Cap
	Y-9091	4	3/4 Hose Nipple
	Y-9135-A	4	3/4 Hose Washer
	OY-7402	1	Expansion Tank Dual Hose Assembly
	Y-7402-A	2	Expansion Tank Hose
	Y-9092	4	Hose Coupling (Female)
	Y-9129	4	Hose Clamp
	Y-7450	8	Expansion Tank Hose Clamp
		4	Hex. Head Cap Screw 1/4-20 x 3/4 lg. Cad. Pl.
	#1114	4	Shakeproof Lock Washer
		4	Hex Nuts 1/4-20 Cad. Pl.
	Y-7388	2	Wheel Stop
	Y-7506	2	Cap Screw
		2	Hex. Nut 5/8-11 Cad. Pl.
		4	Hex. Head Cap Screw 1/2-13 x 2" lg. Cad. Pl.
		4	Lock Washer 1/2" Cad. Pl.
	OY-7386	1	Power Receptacle Assembly
	Y-7386	1	Power Receptacle
	Y-7455	1	Receptacle Base
	Y-7457	2	Cover
	Y-7456	2	Gasket

Part 3

REFERENCE

NUMBER	PART NO.	REQUIRED	NAME
		8	Hex. Head Cap Screw 1/4-20 x 5/8 lg. Cad. Pl.
	#1214	8	Shakeproof Lock Washer Cad. Pl.
	Y-7453	2	Terminal Post
	Y-7453-A	2	Terminal Post
	Y-7454	2	Terminal Post
	Y-7454-A	1	Terminal Post
	Y-7454-B	1	Terminal Post
	Y-7463	4	Hex Nut 1/4-20 (Everdur)
	Y-7464	4	Shakeproof Lock Washer #1814 Bronze
	78283-J	1	1/2 Pipe Plug Ctsk.
	OY-7469	1	Control Receptacle Assembly
	Y-7469	1	Control Receptacle
	Y-7470	1	Control Receptacle Base
	78283-J	1	1/2 Pipe Plug (Ctsk.)
362	Y-7307	1	Control Panel
363	OY-18264	1	Control Panel Support
		10	Round Head Machine Screw #10-24 x 3/4 lg. Cad. Pl.
	#1210	10	Shakeproof Lock Washer Cad. Pl.
	Y-18135	41	Terminal Support
	Y-18145	15	Mounting Terminal
	Y-18259	8	Mounting Terminal
		82	Round Head Machine Screw #8-32 x 5/16 lg. (Electro Tin)
		30	Round Head Machine Screw #10-32 x 5/16 lg. (Electro Tin)
	#1210	15	Shakeproof Lock Washer
364	Y-18260	1	Control Relay Cover
	Y-18191	1	Relay Cover Gasket
	Y-18261	2	Cover Spacer
365	Y-18262	2	Cover Stud
366	Y-18263	2	Relay Cover Nut
	Y-18146	1	Control Relay Assembly
	Y-18180	8	Brass Studs
		34	Brass Hex. Nut #6-32
		24	Brass Washer #6 (.146 I.D. x 5/16 O.D.)
367	Y-7306	1	Switch Support
		4	Round Head Machine Screw #6-32 x 1" Cad. Pl.
	#1206	4	Shakeproof Lock Washer Cad. Pl.
368	Y-6146-A	3	Crank Limit Switch
		3	Fillister Head Machine Screw #6-32 x 5/16 lg. Cad. Pl.

REFERENCE NUMBER	PART NO.	REQUIRED	NAME
		6	Round Head Machine Screw #6- 32 x 1/2 lg. Cad. Pl.
	#1206	6	Shakeproof Lock Washer Cad. Pl.
	Y-6311	1	3-min. Thermal Element
	Y-6311-A	2	1-1/2 min. Thermal Element
369	Y-6954	1	Name Plate (High-Low Pressure)
370	Y-6895	1	Name Plate (Oil-Heat)
371	Y-6894	1	Name Plate (Starting)
	OY-18335-A	12	Terminal Lug Assembly
372	OY-18149-C	1	Push Button Switch Assembly
	Y-18149	1	Push Button Switch
	Y-18150-C	1	Push Button Switch Cover
		4	Round Head Machine Screw #6- 32 x 1/2 lg. Cad. Pl.
	OY-18355	4	Lead Wire Assembly
373	Y-6660	1	Intermittent Starting Switch
		2	Round Head Machine Screw #10- 24 x 1/2 lg. Cad. Pl.
	#1210	2	Shakeproof Lock Washer Cad. Pl.
	Y-18333	3	Lead Assembly
374	Y-18157-A	2	Fuse Clip
375	Y-18156	1	Fuse (10-amp.)
376	Y-7497	1	Name Plate
		4	Parker Kalon Screw #4 x 3/8 Type Z Cad. Pl.
377	Y-18154	13	Terminal Lugs
378	Y-18159	2	Fuse Clips
379	Y-18183-A	1	Fuse
	Y-7479	1	Bus Bar (#42 to Fuse)
	Y-18160	2	Bronze Cap Screw
	Y-18162	2	Bronze Hex. Nuts 3/8-16
	Y-18163	2	Bronze Lock Washer 3/8 Cad. Pl.
	Y-7478	1	Bus Bar (Fuse to #14)
	Y-18165	1	Bronze Hex. Head Cap Screw
380	Y-18206-A	2	Connector Lug
381	Y-7496	1	Terminal Lug
382	Y-18161	3	Terminal Washer
	Y-7463-A	1	Everdur Hex. Nut 1/4-20 Cad. Pl.
	Y-7493	1	Bronze Lock Washer 1/4
383	Y-18154-A	3	Wedge-On Terminal
384	Y-7477	1	Starting Contactor
	RT-3053	1	Coil
	X-33552	3	Movable Contact
	X-33519	3	Contact - Stationary

Part 3

REFERENCE NUMBER	PART NO.	REQUIRED	NAME
	X-35163	3	Contact - Stationary
	X-43454	1	Plunger
		4	Round Head Machine Screw #10-24 x 5/8 Cad. Pl.
	#1210	4	Shakeproof Lock Washer Cad. Pl.
	Y-18175	1	Bus Bar #41 to #15 Terminal
	Y-18165	1	Bronze Hex. Head Cap Screw 3/8-16 x 1-3/4 lg.
	Y-18161	2	Copper Washer 3/8 Cad. Pl.
	Y-18163	1	Bronze Lock Washer 3/8 Cad. Pl.
	Y-18166	2	Everdur Hex. Jam Nuts 3/8- 16 Cad. Pl.
	Y-18348	9"	#14 Rockbestos Wire
385	Y-7501	1	Fusetron (20 amp.)
386	Y-18157-A	2	Fuse Clip
387	Y-7501	1	Fusetron (20 amp.)
388	Y-18157-A	2	Fuse Clip
389	Y-7501	1	Fusetron (20 amp.)
390	Y-18157-A	2	Fuse Clip
391	Y-7451	1	Condenser Contactor
	RT-3094	1	Coil
	X-33552	3	Contacts (Movable)
	X-33519	3	Contacts (Stationary)
	X-35163	3	Contacts (Stationary)
	X-73566	1	Plunger
		4	Round Head Machine Screws #10- 24 x 5/8 Cad. Pl.
	#1210	4	Shakeproof Lock Washer Cad. Pl.
	Y-7481	3	Connector Link
	Y-7480	1	Bus Bar (#22 to #16)
	Y-18161	3	Washer
	Y-7449	1	Terminal Bolt (For #16 Terminal)
	Y-18162	1	Bronze Nut 3/8-16 (Electro Tin)
	Y-18372-B	1	Warning Tag
		2	#4 x 3/16 Parker Kalon Type Z Round Head Screw Cad. Pl.
392	Y-18155	1	Resistor (150 ohm)
393	Y-18480-A	1	Resistor (5.3 ohm)
	Y-18348	35 ft.	#14 Rockbestos Wire
	Y-7502	41 ft.	#10 Rockbestos Wire
394	Y-9168-A	1	Condenser Frame Assembly
395	Y-9177-A	1	End Cover
		12	Parker Kalon Hex. Hd. Screws #14 x 3/8 Cad. Pl.
	Y-9170	1	Top Cover

REFERENCE NUMBER	PART NO.	REQUIRED	NAME
		14	Parker Kalon Hex. Hd. Screws #14 x 3/8 Cad. Pl.
396	Y-9229	1	Cover (Unilet)
397	Y-9198	1	Unilet 3/4"
	Y-9228	1	Adapter 3/4
		1	Parker Kalon Hex. Hd. Screw #14 x 3/8 Cad. Pl.
398	Y-9167	2	Condenser
		18	Hex. Hd. Cap Screws 1/2-13 x 5/8 lg. Cad. Pl.
		18	Lock Washer 1/2 Cad. Pl.
	Y-9254	2	Air Condenser Guard
		32	Parker Kalon Hex. Head Screw #14 x 1/2 Cad. Pl.
	OY-9195	2	Condenser Fan Motor Assembly
399	Y-9195	2	Condenser Fan Motor
	Y-9150	1	Ball Bearing (Front)
	SKF-5204-R	1	Ball Bearing (Back)
	HD-7226	1	Rotor Assembly including Shaft
	HC-7168	4	Brushes
		2	Stator Coils
400	OY-9200	2	Bonded Rubber Mountings
401	Y-9251	8	Cap Screw
402	Y-9233	2	Rubber Cover
	Y-9232	2	3-Wire Plug
		8	Cap Screws 3/8-16 x 7/8 Cad. Pl.
		8	3/8 Lock Washer Cad. Pl.
403	Y-9239	2	Condenser Fan
		4	Hex. Nuts 5/8-18 Cad. Pl.
	Y-9250	2	Washer
404	Y-9197	1	Outlet Box
	Y-9226	1	Outlet Box Cover
		4	Parker Kalon Rd. Hd. Type Z #10 x 3/4 Cad. Pl.
	Y-9231	2	3-Wire Receptacle
		4	Flat Hd. Mach. Screws #6-32 x 3/8 Cad. Pl.
405	Y-9227	1	Elbow
	106026	1	Lock Nut 3/4 Cad. Pl.
		2	Parker Kalon Hex. Hd. Screws #14 x 3/8 Cad. Pl.
	Y-9208	1	Motor Connecting Conduit
	Y-9230	2	#14 Rubber Covered Wire (White)
	Y-6775-B	2	#14 Rubber Covered Wire (Black)
	Y-9255	2	#10 Rubber Covered Wire (White)

REFERENCE

NUMBER	PART NO.	REQUIRED	NAME
	Y-9256	2	#10 Rubber Covered Wire (Black)
406	OY-9215	1	Door Assembly
	Y-9215	1	Door
407	Y-14082-A	2	Door Knob
	B-931	2	Washer
	B-9578	2	Snap Ring
408	Y-9245	1	Valve Bracket
		2	Hex. Hd. Cap Screws 3/8-16 x 2-1/2 Cad. Pl.
		2	Hex. Hd. Cap Screws 3/8-16 x 7/8 Cad. Pl.
	#1220	4	Shakeproof Lock Washer
409	Y-9243	1	Nipple
410	Y-9240	1	Packless Valve
411	Y-9216	1	Inlet Elbow
412	Y-9217	1	Tee 3/4 x 3/4 x 1"
	Y-9222	1	Hot Gas Line
	Y-9244	1	3/4 Hot Gas Elbow
	Y-9246	1	3/4 Liquid Elbow
	Y-6727	1	Sweat Tee
	Y-9220	1	Liquid Line (Long)
	Y-7241	1	Wrought Street Elbow
413	Y-9221	1	Liquid Line (Short)
414	Y-6807	4	Tubing Clamp
415	Y-6807-B	1	Clamp 7/8"
		5	Parker Kalon Hex. Hd. Scr. #14 x 1/2" Cad. Pl.
	Y-6968-B	1	Cord Grip (1" Pipe)
	Y-18436-A	1	Cord Grip (1-1/4 Pipe)
	Y-7497	1	Name Plate
		4	#4 x 3/16 P.K. Rd. Hd. Screws Type "Z"
416	Y-9209	2	Cond. Fan Shroud Assembly
		16	Hex. Hd. Cap Screws 3/8-16 x 5/8 Cad. Pl.
		16	3/8" Plain Washer Cad. Pl.
	Y-9210	1	Condenser Channel Ring
		10	Hex. Hd. Cap Screws 3/8-16 x 5/8 Cad. Pl.
		10	3/8 Lock Washer
	Y-9211	1	Resistance Box
	Y-9212-A	2	Resistance Support
	Y-9213	1	Resistance Box Cover
	Y-6249	1	Chase Nipple 1/2"
	Y-6250	1	Lock Nut 1/2"
		1	Parker Kalon Hex. Hd. #14 x 3/8 Cad. Pl.
	Y-9234	2	Resistor

REFERENCE		PART NO.	REQUIRED	NAME
NUMBER				
	Y-9235		4	Mica Washer
	Y-9236		4	Centering Washer
			2	Rd. Hd. Mach. Screw #8-32 x 2-1/2 Cad. Pl.
			2	Hex. Nuts #8-32 Cad. Pl.
	#1108		2	Shakeproof Lock Washer
417	OY-9179-A		1	Sub-Cooler Tank
	Y-9206		1	Protection Plate (Bottom)
			8	Hex. Head Cap Screw 3/8-16 x 3/4 lg. Cad. Pl.
			8	Lock Washer 3/8 Cad. Pl.
418	Y-9165		1	2" Countersunk Pipe Plug
	Y-9030-B		1	Sub-Cooler Coil
			2	Hex. Head Parker Kalon Cap Screw #14 x 3/8 lg. Cad. Pl.
	Y-14202		4	Everdur Cap Screws 3/8-16 x 3/4 lg.
	Y-9162		4	Everdur Hex Nut 3/8-16
	Y-9163		4	Everdur Lock Washer 3/8
	Y-9238-A		1	Refrigerant Outlet Tube
	Y-9237-A		1	Sub-Cooler Outlet Elbow
	Y-9238-B		1	Refrigerant Inlet Tube
	Y-9237-B		1	Sub-Cooler Inlet Elbow
419	Y-9181		1	Refrigerant Line Plate
	Y-9182		1	Refrigerant Line Gasket
			3	Parker Kalon Hex. Head Screw #14 x 1/2 lg. Cad. Pl.
	Y-9191		1	Refrigerant Line Support
			3	Parker Kalon Hex. Head Screw #14 x 1/2 lg. Cad. Pl.
			2	Hex. Head Cap Screw 1/4-20 x 1" lg. Cad. Pl.
			2	Lock Washer 1/4 Cad. Pl.
420	Y-9189		1	Air Stream Deflector
			2	Parker Kalon Hex. Head Screw #14 x 3/8 lg. Cad. Pl.
			2	Wrought Washer 1/4 Cad. Pl.
	Y-9194		1	Eliminator
	Y-9180-A		1	Air Outlet Grille
			8	Parker Kalon Hex. Head Screw #14 x 5/8 lg. Cad. Pl.
	Y-9183		1	Top Cover
			14	Parker Kalon Hex. Head Cap Screw #14 x 1/2 lg. Cad. Pl.
421	Y-9184		1	Front Cover
			2	Hex. Head Cap Screw 3/8-16 x 5/8 lg. Cad. Pl.
	Y-46		1	Name Transfer
	Y-6071		1	Door Pull

Part 3

REFERENCE

NUMBER	PART NO.	REQUIRED	NAME
		4	Countersunk Head Rivets 3/16 x 3/8 lg.
422	OY-9042	1	Air Filter Assembly
	Y-9205	2	Support Channel
		4	Hex. Head Cap Screw 3/4-10 x 1-1/2 lg. Cad. Pl.
		4	Standard S.A.E. Washer 3/4 Cad. Pl.
		4	Lock Washer 3/4 Cad. Pl.
		4	Hex. Nut 3/4-10 Cad. Pl.
	Y-9223	1	Sub-Cooler Strainer
423	Y-9090	1	Sub-Cooler Eye Bolt
	Y-9131	1	Eye Bolt Hinge Pin Cad. Pl.
		1	S.A.E. Cotter Pin 3/32 x 1/2 lg. Cad. Pl.
424	Y-9048	1	Sub-Cooler Lock Knob
425	Y-9192	1	Fan Housing
426	Y-6287-F	1	Fan Housing Gasket
427	Y-9055	1	Blower Wheel
428	Y-9175	1	Inlet Ring and Fan Housing Support
		4	Hex. Head Cap Screws 5/16-18 x 5/8 lg. Cad. Pl.
	#1218	4	Shakeproof Lock Washer Cad. Pl.
		3	Hex. Head Cap Screws 3/8-16 x 1" lg. Cad. Pl.
		3	Lock Washers Cad. Pl. 3/8"
429	Y-9050	1	Spray Nozzle
	Y-9172	1	Spray Nozzle Support
	Y-9126	1	Spray Nozzle Hose Coupling
		2	Hex. Head Cap Screws 3/8-16 x 5/8 Cad. Pl.
		2	Lock Washer 3/8 Cad. Pl.
430	Y-9190	1	Sub-Cooler Motor
	HD-7247	1	Rotor (Shaft Included)
	HC-7168	4	Brushes
	SKF-6204Z	1	Ball Bearing (Front)
	Y-9150	1	Ball Bearing (Rear)
		2	Stator Coils
		4	Hex. Head Cap Screw 3/8-16 x 3/4 Cad. Pl.
		4	Lock Washer 3/8 Cad. Pl.
431	Y-9174	1	Hinge (Movable)
	Y-9173-A	1	Hinge (Stationary)
	Y-9156	2	Cushion Mounting
	Y-9241	2	Cushion Hinge Pin
	Y-9242	2	Hinge Pin Bushing
		4	3/8-16 x 1-1/8 lg. Hex. Head Cap Screw Cad. Pl.

REFERENCE

NUMBER	PART NO.	REQUIRED	NAME
		4	3/8-16 Hex. Nuts Cad. Pl.
		4	3/8 Lock Washers
		6	3/8-16 x 1-1/4 Hex. Head Cap Screws Cad. Pl.
		6	3/8-16 Hex. Nuts Cad. Pl.
		6	3/8 Lock Washer Cad. Pl.
432	Y-9164	1	Name Plate
		4	#4 x 3/16 Round Head Parker Kalon Type "Z" Cad. Pl.
433	Y-9128-A	1	Sub-Cooler Discharge Hose
	Y-9135	1	3/4 Hose Washer
434	Y-9129	1	Hose Clamp (Large)
	Y-9129-A	1	Hose Clamp (Small)
	Y-9091	1	3/4 Male Hose Nipple
	Y-9092	1	Hose Coupling (Female End)
435	Y-9127	1	Sub-Cooler Suction Hose
	Y-9129	1	Hose Clamp (Large)
	Y-9129-A	1	Hose Clamp (Small)
	Y-9092	1	Hose Coupling (Female End)
	Y-9135	1	Hose Washer
	Y-9091	1	Male Hose Nipple
436	Y-9049	1	90° Flanged Elbow
	Y-9034	1	Gasket
437	Y-9178	1	Water Pump Inlet Elbow
	Y-9034	1	Gasket
	73448-A	4	Copper Washer
		2	1/4-20 x 3/4 Hex. Head Cap Screws Cad. Pl.
		2	1/4-20 x 1-1/8 Hex. Head Cap Screws Cad. Pl.
		2	1/4-20 x 1-1/4 Hex. Head Cap Screws Cad. Pl.
		2	1/4-20 x 2 Hex. Head Cap Screws Cad. Pl.
		4	1/4-20 Hex Nuts Cad. Pl.
		4	1/4 Lock Washers Cad. Pl.
438	Y-9031	1	Water Pump Body
439	Y-9032	1	Water Pump Body Cover
		8	1/4-20 x 3/4 lg. Hex. Head Cap Screw Cad. Pl.
	73448-A	8	Copper Washer
	78282-B	1	1/8 Pipe Plug (Sq. Head)
	B-5911	1	Angle Drain Cock
	Y-9035	1	Water Pump Body Gasket
	Y-9132	1	Sub-Cooler Pump Impeller
		1	Allen Head Set Screw 5/16-18 x 3/8 Cad. Pl.
440	Y-9037	1	Split-Flange (Male)
	Y-9038	1	Split Flange (Female)

REFERENCE NUMBER	PART NO.	REQUIRED	NAME
		2	3/8-16 x 1-1/4 Hex. Head Cap Screw Cad. Pl.
		2	Plain Washer 3/8 Cad. Pl.
	Y-9142	1	Pump Packing
441	Y-9098	1	Twistlock Cap
442	Y-9100	1	Short Rubber Cover
	Y-9099	1	Receptacle Cover
	Y-6139	1	Outlet Box
		2	Parker Kalon Round Head Type "Z" #10 x 3/8 Cad. Pl.
	78206-G	1	Street Elbow
	78212-H	1	Reducing Bushing
	Y-9224	1	Steel Tube Adapter
	Y-9225	1	Thinwall Connector
	Y-9214	1	1/2" Conduit
	Y-9198	1	Unilet
	Y-9229	1	Cover
		1	Parker Kalon Hex. Head Screw #14 x 3/8 Cad. Pl.
	OY-9140	1	Pressure Switch Assembly
	Y-6468	1	Angle Valve
		1	Piece Copper Tubing 1/4 O.D. x 50" lg.
	Y-188	1	1/4 Flare Nut
	Y-9155	1	Rubber Grommet
	Y-9028	1	Pressure Switch
	Y-9138	1	Pressure Switch Bracket
		2	#8-32 x 1/4 Round Head Machine Screw Cad. Pl.
	#1208	2	Shakeproof Lock Washer
		2	Hex. Head Cap Screw 3/8-16 x 3/4 Cad. Pl.
		2	Hex. Nuts 3/8-16 Cad. Pl.
		2	Lock Washers 3/8 Cad. Pl.
	Y-9139	1	#12 Two-Wire Cable 30" lg.
	Y-6867-C	1	Cord Grip
	Y-6250	1	Straight Squeeze Connector
	Y-6327	1	Tubing Clip
		1	Round Head Machine Screw #10- 24 x 1/2 Cad. Pl.
		1	Hex. Nut #10-24 Cad. Pl.
	#1210	1	Shakeproof Lock Washer
	Y-18124-B	1	Float Valve Chamber
443	OY-14106-D	1	Float Valve Assembly
444	Y-14106-B	1	Float Valve Body
445		6	Hex. Head Cap Screw 1/4-20 x 3/4 lg. Cad. Pl.
446	B-4188	6	Copper Washer
		2	Flat Head Cap Screw #10-24 x 1/2 lg. Cad. Pl.

REFERENCE

NUMBER	PART NO.	REQUIRED	NAME
447	Y-14113	1	Float Valve Gasket
448	BD-190	2	Copper Washer
449	Y-14108-B	1	Needle Valve Seat
450	OY-14421-A	1	Needle Valve Assembly
451	Y-14114-A	1	Needle Valve Pivot Pin
452	Y-14097-A	1	Float Valve Yoke Shaft
453	Y-14107	1	Needle Valve Lever
454	Y-14109-A	2	Needle Valve Spring Pivot
455	Y-14105-A	2	Travel Limiting Pin
456	Y-14104	1	Float Valve Yoke
457	Y-14112-A	1	Float
458	OY-14383-A	1	Float Valve Spring Assembly
		1	1/4 Pipe Plug (Square Head)

MOUNTING TRACK

OY-7391	1	Mounting Track (R.H.)
OY-7390	1	Mounting Track (L.H.)
Y-7361	8	Shear Rubber Mounting
	32	Hex. Head Cap Screw 1/2-13 x 3/4 Cad. Pl.
	32	Lock Washer 1/2 Cad. Pl.
Y-7389	4	Rubber Bumper Plate
	8	Hex. Head Cap Screw 3/8-16 x 1/2 Cad. Pl.
	8	Plain Washer 3/8 Cad. Pl.
OY-7392	2	Track Extension
Y-7404	2	Spring Clip
	2	Parker Kalon Hex. Head Cap Screw 3/8 x 1/2 Cad. Pl.
Y-7413	2	Spring Clip Bracket
	4	Flat Head Cap Screw 3/8-16 x 1" Cad. Pl.
Y-7408-A	4	Elastic Stop Nut
	4	Plain Washer 3/8 Cad. Pl.
Y-7393	2	Track Extension Support
Y-7484	6	Track Extension Support Washer
	2	Cotter Pin 5/16 x 2" Cad. Pl.
Y-7397	2	Track Extension Bracket Clamp
	4	Flat Head Cap Screw 1/2-13 x 1-1/2 Cad. Pl.
Y-7408-B	4	Elastic Stop Nut
	4	Plain Washer 1/2 Cad. Pl.
OY-7398	2	Track Extension Handle Assembly
Y-7398	2	Track Extension Pin

REFERENCE

NUMBER	PART NO.	REQUIRED	NAME
	Y-7399	2	Track Extension Pin Handle
	Y-7400	4	Washer
	Y-7401	2	Lock Pin
	Y-7179-A	2	Chain
		2	Round Head Screw #8-32 x 3/8 lg. Cad. Pl.
	Y-7407	2	Spring
		2	Round Head Screw #8-32 x 3/8 Cad. Pl.
459	Y-6169-B	3	High Pressure Fuel Hose
460	Y-6218	6	Regulator Assembly Clamps
		6	Hex. Head Cap Screws 3/8-16 x 2-1/2 lg. Cad. Pl.
		6	Hex. Nuts 3/8-16 Cad. Pl.
		6	Lock Washers 3/8
461	Y-6167-B	3	Check Valve
	Y-6545	3	Close Nipple (Brass)
	BB-2885-6	1	Seat Disc
	BB-2885-8	1	Spring
462	Y-6869	3	Tee Type Check Valve
463	Y-6163-A	1	Regulator (10#)
464	Y-6163-E	1	Regulator (20#)
465	Y-6163-B	1	Regulator (30#)
	BB-1147-16	1	Seat Disc
	BB-1147-9	1	Diaphragm
	BB-1147-23	1	Diaphragm Washer
	BB-1147-21	1	Back Cap Washer
466	Y-6578	3	Excess Flow Valve (Small)
467	Y-6166	3	Special Globe Valve
	BB-2651-GR	1	Seat Disc
	BB-2852-4	1	Diaphragm
468	B-10455	3	Flare Tube Tee
469	Y-6168-A	1	Pressure Gauge
470	78202-C	1	Elbow
471	78202-C	1	Elbow
472	Y-6543	1	Tee
	Y-6542	1	Close Nipple
473	Y-6990	1	Female Coupling (Used when cabinets include heaters)
474	Y-6900	1	Tee (Used when cabinets in- clude heaters)
475	Y-6578	1	Excess Flow Valve (Used when cabinets include heaters)
476	Y-6897	1	Female Coupling (Used when cabinets include heaters)
	Y-7090	1	Rubber Grommet (Used when cabinets include heaters)
	Y-6247	2	Wire Clips (Used when cabinets include heaters)

REFERENCE

NUMBER	PART NO.	REQUIRED	NAME
		2	Round Head Machine Screw 1/4-20 x 1/2 (Used when cabinets include heaters)
		2	Hex. Nuts 1/4-20 Cad. Pl. (Used when cabinets include heaters)
		2	Lock Washers 1/4 Cad. Pl. (Used when cabinets include heaters)
		2	Copper Tube 3/8 O.D. x (.035) wall x 3" lg.
		1	Copper Tube 3/8 O.D. x (.035) wall x 3-1/2" lg.
		1	Copper Tube 3/8 O.D. x (.035) wall x 5-1/4 lg.
		1	Copper Tube 3/8 O.D. x (.035) wall x 8" lg.
		1	Copper Tube 3/8 O.D. x (.035) wall x 11" lg.
		1	Copper Tube 3/8 O.D. x (.035) wall x 15-1/2" lg.
		2	Copper Tube 3/8 O.D. x (.035) wall x 21-1/2" lg.
		1	Copper Tube 3/8 O.D. x (.035) wall x 45" lg.
477	Y-6528	3	Fuel Cylinder Clamp Spring
		3	Hex. Head Cap Screw 1/2-13 x 1" lg. Cad. Pl.
		3	Hex. Nuts 1/2-13 Cad. Pl.
		3	Lock Washers 1/2" Cad. Pl.
478	Y-6162	1	Regulator
	BB-5800-A-9	1	Diaphragm
	BB-1175-16	1	Seat Disc
	BB-5800-6	1	Spring
		2	Hex. Head Cap Screw 5/16-18 x 5/8 lg. Cad. Pl.
	#1218	2	Shakeproof Lock Washer Cad. Pl.
479	Y-6603	1	Pipe Nipple
480	Y-6401	2	Excess Flow Valve
	BB-2779-9	1	Diaphragm
	BB-2779-6	1	Seat Disc
	BB-2779-13	1	Spring
481	Y-6538	1	Tee
482	Y-9146	1	Nipple
483	Y-11119	1	Elbow
484	OY-6598-A	1	Pipe Nipple Assembly (Long)
	OY-6597	1	Pipe Nipple Assembly (Short)
485	OY-6872-A	1	Tank Instruction Holder (Fuel Cabinet with Heaters)

REFERENCE

NUMBER	PART NO.	REQUIRED	NAME
	OY-6813	1	Tank Instruction Holder
		6	Parker Kalon Round Head Screw
		6	Type "Z" #4 x 3/16 Cad. Pl.
			#4 Plain Washer Cad. Pl.
	Y-7497	1	Name Plate
		4	Parker Kalon Type "Z" #4 x 3/16
			Round Head
	Y-6382	2	Hood Fastener
	Y-6220	2	Hood Fastener Clip
	Y-46	1	Name Transfer
486	Y-6854	3	Heating Pads
487	Y-6873	1	Exhaust Outlet Elbow
488	Y-6860	1	Muffler
		4	Parker Kalon Cap Screws 3/8 x
			5/8 Cad. Pl.
489	OY-18244	1	By-Pass Valve Tube
490	OY-18207-B	1	Exhaust By-Pass Valve Assembly
	Y-18207-A	1	Exhaust By-Pass Valve
	Y-18210	1	Exhaust By-Pass Valve Cover
	Y-18223	1	By-Pass Valve Butterfly
	B-5071	2	Groov Pin
	Y-18224	1	By-Pass Valve Butterfly Shaft
	Y-18232	1	By-Pass Valve Butterfly Lever
	Y-18241	1	By-Pass Valve Rear Cover
			Gasket
	Y-18242-A	1	By-Pass Valve Rear Cover
	Y-18237	6	By-Pass Valve Sylphon Support
			Gasket
	OY-18235-B	1	By-Pass Bellows Support
			Assembly
	OY-18366	1	By-Pass Valve Spring Cylinder
			Support Assembly
	B-5526	1	Half Union
	B-5528	1	Flare Nut
491	OY-18245	1	By-Pass Valve Tube Assembly
			(Side)
		1	Parker Kalon Hex. Head Cap
			Screw #14 x 1/2 Cad. Pl.
492	Y-6857	2	Exhaust Heater Pipe
493	Y-6855-A	3	Heating Pad Cover
	78283-C	2	1" Countersunk Pipe Plug
	Y-6856	3	Heating Pad Cover Gaskets
	Y-11085	1	Nipple
	Y-18012	12	Hex. Head Cap Screws 3/8-16
			x 1"
		12	Hex. Head Cap Screws 3/8-16
			x 3/4
		24	Lock Washer 3/8" Cad. Pl.
		6	Parker Kalon Hex. Head #14 x
			1/2" Cad. Pl.

REFERENCE NUMBER	PART NO.	REQUIRED	NAME
494	Y-6873-B	1	Exhaust Inlet Elbow
		2	Parker Kalon Hex. Head Cap Screw #14 x 1/2" Cad. Pl.
495	Y-6878	1	Heater Pad Shield
	Y-7339	4	Washer (Under Cover - Bottom)
		12	Parker Kalon Hex. Head #14 x 1/2 Cad. Pl.
		12 lbs.	Rock Wool (Loose)
	Y-6558-A	1	Fuel Cylinder Valve
	BB-2651-9R	1	Seat Disc
	BB-3713-4	1	Diaphragm
	BB-2885-6	1	Check Disc

OY-18179 GEN. TERMINAL BLOCK

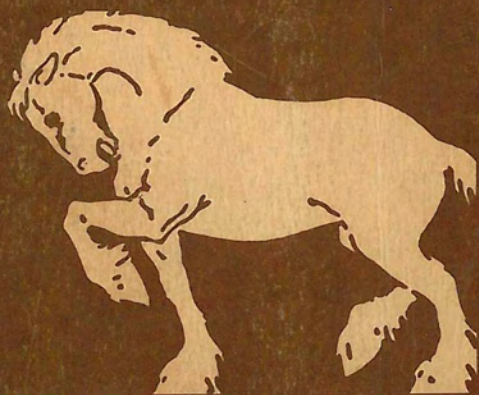
OY-7355-B 8-POLE PLUG ASSEMBLY

OY-7352-A 8-POLE RECEPT

Y-18168-B Eng.-gen. control panel.

AIR CONDENSER MODEL B-9000 RAC
SK-662

SUB-COOLER MODEL E-9000 RSCH
OY-9203 (DWG No.)



WADKESHA