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WISCONSIN

Air Cooled

HEAVY DUTY ENGINES

INSTRUCTION BOOK AND PARTS LIST

MODEL VF4

ISSUE MM 231

WORLD'S LARGEST BUILDERS OF HEAVY DUTY AIR COOLED ENGINES

IMPORTANT

Since there is a right way, and many wrong ways to operate an engine, it is important that this manual be read carefully before you start your engine. This will avoid unnecessary delays and expense which might be caused by improper operation.

The various bearing surfaces in a new engine have not been glazed, as they will be with continued operation, and it is in this period of "running in", that special care must be exercised, otherwise the highly desired glaze will never be obtained. A new bearing surface that has once been damaged by carelessness will be ruined forever.

THEREFORE READ INSTRUCTIONS CAREFULLY

A copy of this manual is sent out with each engine. All points of operation and maintenance have been covered as carefully as possible but if further information is required, inquiries sent to the factory will receive prompt attention.

When writing the factory **ALWAYS GIVE THE MODEL AND SERIAL NUMBER** of engine referred to.

Extra copies of this manual are \$1.00 each.

WISCONSIN MOTOR CORPORATION
MILWAUKEE 14, WISCONSIN

BOOK OF INSTRUCTIONS

WISCONSIN FOUR CYLINDER ENGINES



MODEL VE4

3" Bore

3¼" Stroke

91.9 cu. in. Disp.

MODEL VF4

3¼" Bore

3¼" Stroke

107.7 cu. in. Disp.



NOTE: The letter "I" suffixed to the engine model designates that the engine has Cast Iron Pistons.

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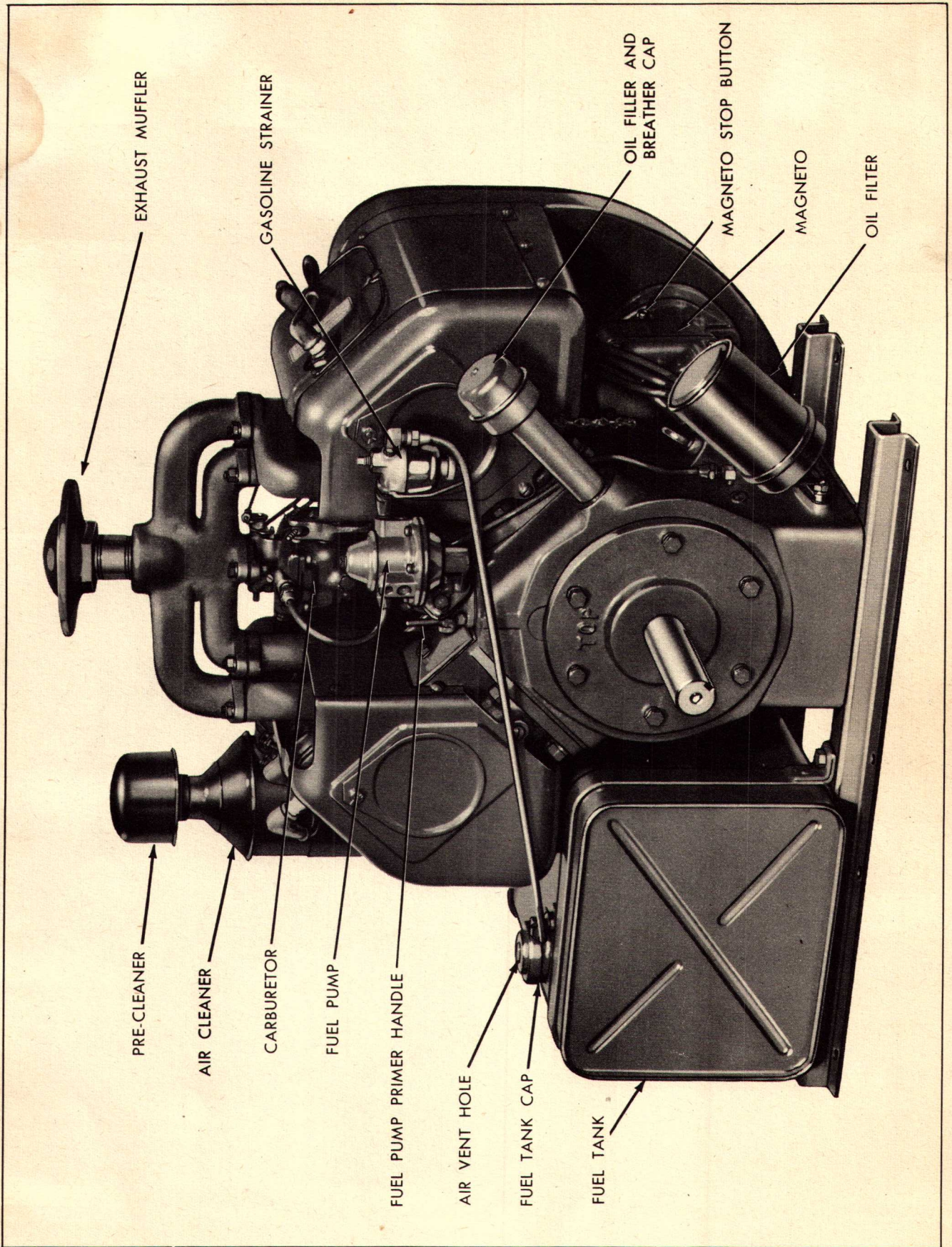


Fig. 1

TAKE-OFF (Side Mount Tank) VIEW OF ENGINE

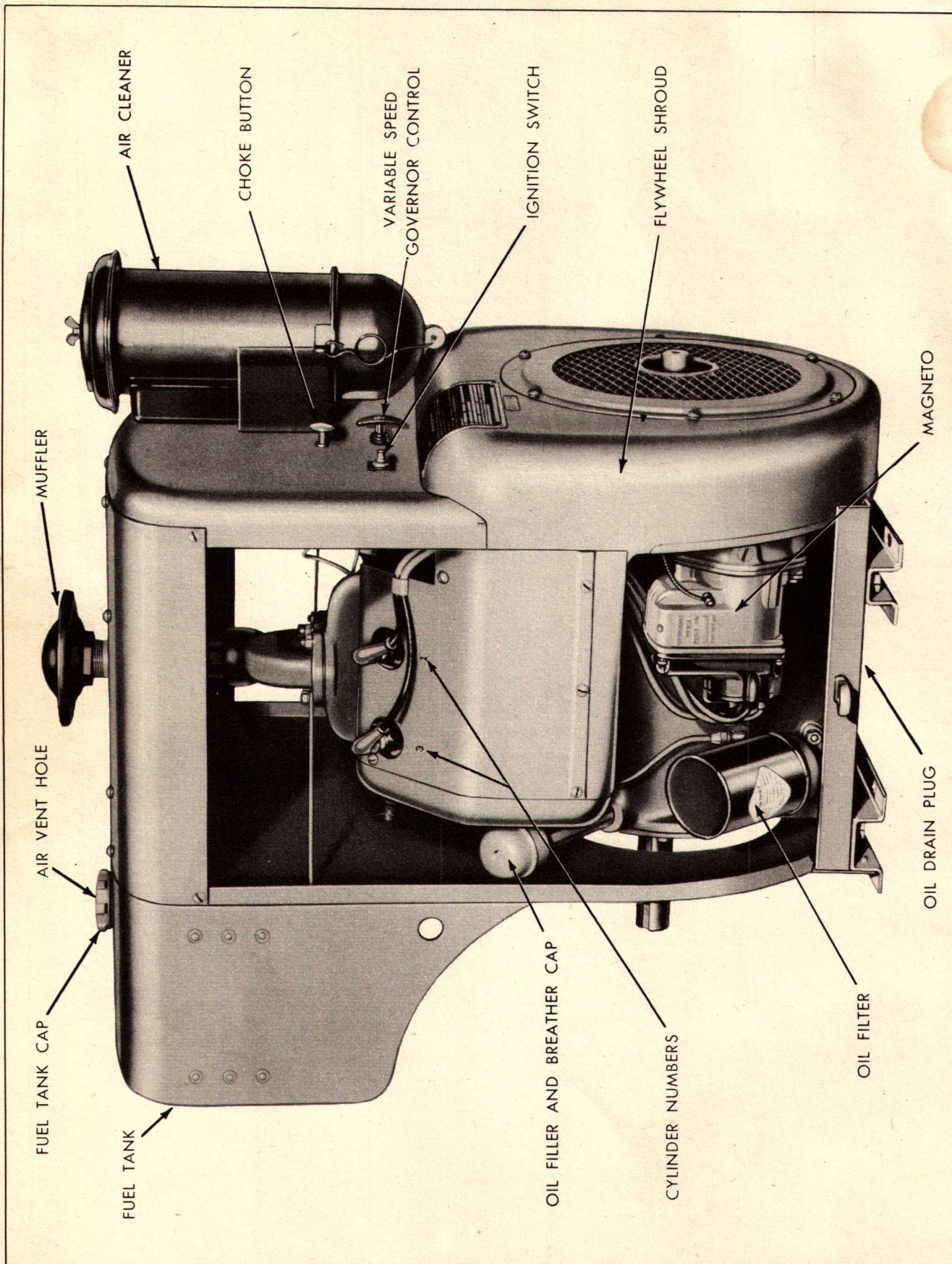


Fig. 2

POWER UNIT FAN END VIEW OF ENGINE

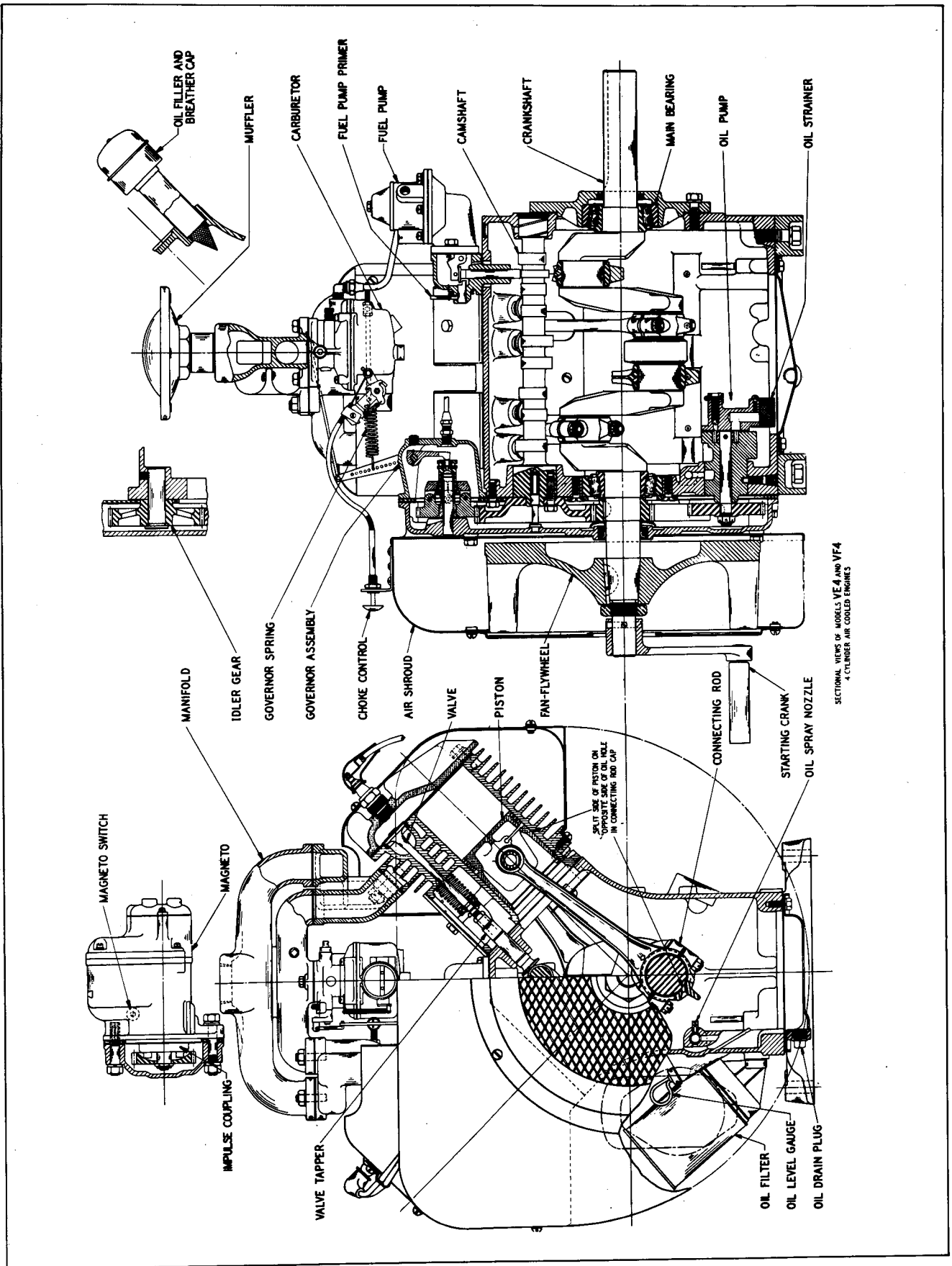


Fig. 3

CROSS SECTION OF ENGINE

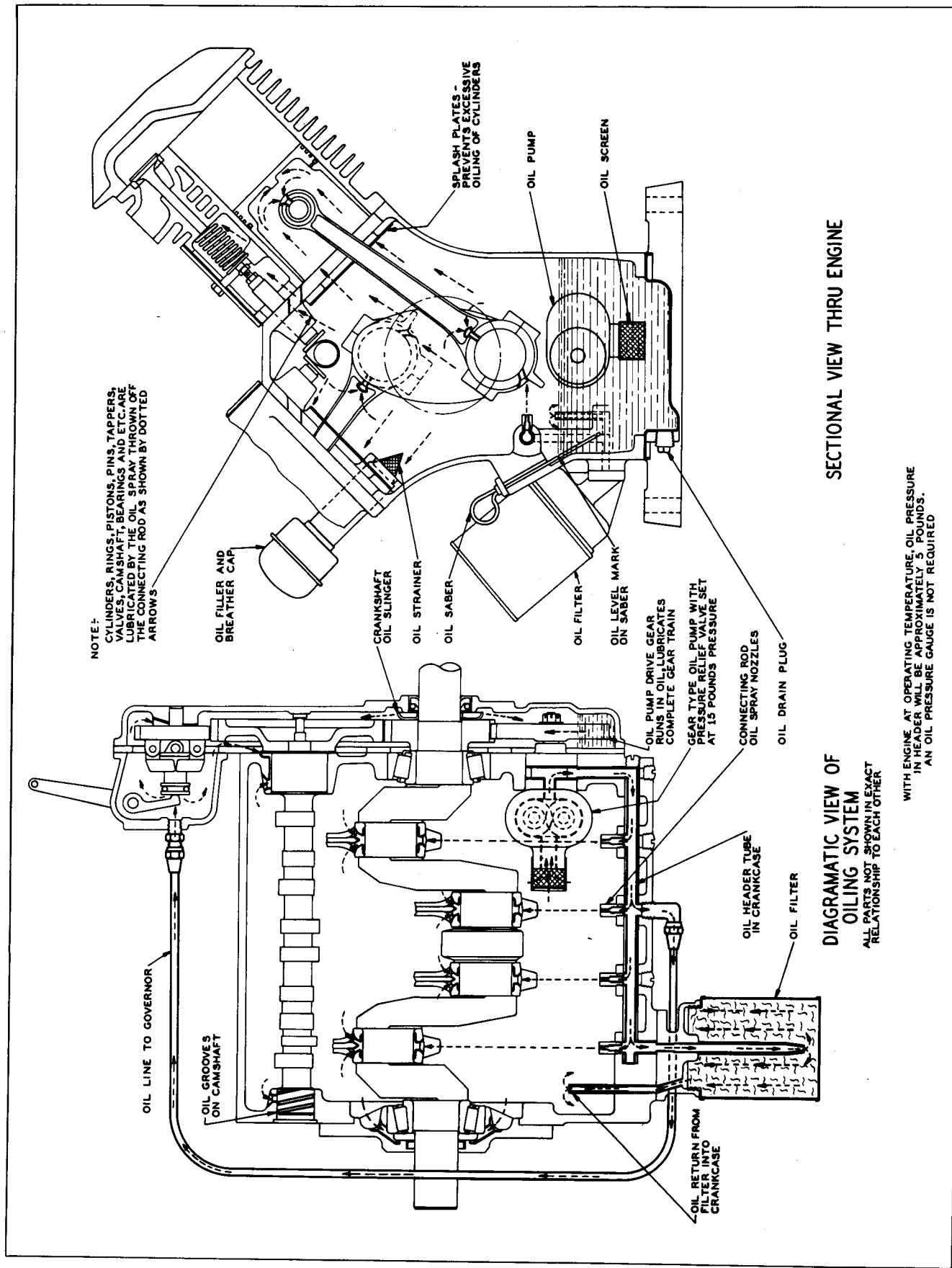


Fig. 4

OILING SYSTEM — LUBRICATION CHART

GENERAL INFORMATION

WISCONSIN heavy duty air cooled engines are of the most approved design, built in a modern factory, equipped with the latest machinery available. Only the best materials, most suitable for the particular part, are used. During production every part is subjected to the most rigid inspection, as are also the completely assembled engines. After assembly every engine is operated on its own power, for several hours, on a dynamometer. All adjustments are carefully made so that each engine will be in perfect operating condition when it leaves the factory.

Back of the Wisconsin Motor Corporation is forty years of engineering experience in the design of gasoline engines for every conceivable type of service. The performance of these engines is proof of the long satisfactory service you too can expect from your engine.

Like all fine machinery an engine must be given regular care and operated in accordance with instructions.

KEEP THIS BOOK HANDY AT ALL TIMES, FAMILIARIZE YOURSELF WITH THE OPERATING INSTRUCTIONS.

GENERAL DESIGN

WISCONSIN engines are of the four cycle type, in which each of the four operations of suction, compression, expansion and exhaust requires a complete stroke.

This gives one power stroke per cylinder for each two revolutions of the crankshaft.

COOLING

Cooling is accomplished by a flow of air, circulated over the cylinders and heads of the engine, by a combination fan-flywheel encased in a sheet metal shroud. The air is divided and directed by ducts and baffle plates to insure uniform cooling of all parts. NEVER OPERATE AN ENGINE WITH ANY PART OF THE SHROUDING REMOVED, BECAUSE THIS WILL RETARD THE AIR COOLING.

CARBURETOR

The proper combustible mixture of gasoline and air is furnished by a balanced carburetor, giving correct fuel to air ratios for all speeds and loads.

IGNITION

The spark for ignition of the fuel mixture is furnished by a high tension magneto driven off the timing gears at crankshaft speed. The magneto is fitted with an impulse coupling, which makes possible a powerful spark for easy starting. Also, the impulse coupling automatically retards the timing of the spark for starting, thus eliminating danger of a kick back from the engine when starting. When electric starter and generator is furnished, battery ignition is used. See page 12.

LUBRICATION

A gear type pump supplies oil to four nozzles which direct oil streams against fins on the connecting rod caps. Part of the oil enters the rod bearing through holes in the rods, and the balance of the oil forms a spray or mist which lubricates the cylinders and all other parts of the engine. See Fig. 4.

GOVERNOR

A governor of the centrifugal flyball type controls the engine speed by varying the throttle opening to suit the load imposed upon the engine.

ROTATION

The rotation of the crankshaft is clockwise when viewing the flywheel or starting end of the engine. This gives counter clockwise rotation when viewing the power take off end of the crankshaft.

HORSE POWER

R.P.M.	VE4	VF4
1400	13.0	15.0
1600	15.0	17.5
1800	17.0	19.5
2000	19.0	21.0
2200	20.5	23.0
2400	21.5	25.0
2600	22.0	—

The horse power given in the above chart is for an atmospheric temperature of 60° Fahrenheit, at sea level, and at a Barometric pressure of 29.92 inches of mercury.

For each inch lower Barometer reading deduct 3% from above horsepower.

For each 10° higher temperature there will be a reduction in horsepower of 1%.

For each 1000 ft. altitude above sea level there will be a reduction in horsepower of 3%.

The friction in new engines cannot be reduced to the ultimate minimum during the regular block test, but the engines are guaranteed to develop at least 85 per cent of maximum power when shipped from the factory. The power will increase, as friction is reduced, during a few days of operation.

INSTRUCTIONS FOR STARTING AND OPERATING

Some of these engines are furnished with a house, as shown in Fig. 2, while others are furnished without a house, as shown in Fig. 1.

ON ENGINES WITH A HOUSE THE SIDE DOORS SHOULD ALWAYS BE REMOVED WHEN OPERATING. This is to give better circulation of air for cooling the engine.

LUBRICATION

Before starting the engine, fill the oil base with good gasoline engine oil. Fill through the breather pipe UP TO "FULL" LINE ON OIL GAUGE SABRE, see Fig. 4. On most of these engines the sabre is on the magneto side, except when some accessories interfere then it is located on the opposite side.

Too much emphasis cannot be given to the matter of oil selection. High grade oil of the body suited to the requirements of your engine is the most important single item in the economical operation of the unit, yet it is the cheapest item of operating cost. Select your oil solely on quality and suitability — never on price — for no one thing is so sure to bring about unsatisfactory performance and unnecessary expense as incorrect lubrication.

High-grade, highly refined oils corresponding in body to the S.A.E. (Society of Automotive Engineers) Viscosity Numbers listed in the following chart will prove economical and assure long engine life.

IMPORTANT: S.A.E. Viscosity Numbers classify oils in terms of body only, without consideration of quality or character, therefore we list certain grades of MOBIL-OIL as typical examples of lubricants possessing the qualities we believe desirable

in oils for WISCONSIN engines. We plainly state that these grades of MOBIL-OILS are listed because of their recognized quality and world-wide distribution. THERE ARE OTHER HIGH QUALITY OILS ON THE MARKET THAT ARE EQUALLY SATISFACTORY FOR WISCONSIN ENGINES.

GRADE OF OIL

Season or Temperature	Grade of Oil	Example
Spring, Summer or Autumn +120°F. to +40°F.	SAE 30	Mobiloil "A"
Winter +40°F. to +5°F.	SAE 20	Mobiloil "Arctic"
Winter +5°F to -20°F	SAE 10W	Mobiloil "Arctic Special"
Crankcase Capacity		4 Qts.

Follow summer recommendations in winter if engine is housed in warm building.

CHECK OIL LEVEL EVERY 8 HOURS OF OPERATION.

THE OLD OIL SHOULD BE DRAINED AND FRESH OIL ADDED AFTER EVERY 50 HOURS OF OPERATION.

To drain oil remove drain plug. See Fig. 4. Oil should be drained while engine is hot, as it will then flow more freely.

At engine operating temperature the oil pressure will be about 4 to 5 pounds per square inch. Due to this low pressure system an oil pressure gauge is not required. When the engine is cold the pressure will be higher and a relief valve is fitted to the oil pump so that under these conditions the maximum pressure will be limited to 15 pounds.

OIL FILTER

A by-pass type oil filter is furnished on these engines, see Fig. 4, except in a few cases where the use of other accessories prevents the fitting of the oil filter. The oil filtering element should be replaced after every 300 hours of operation. See Fig. 5.

AIR CLEANER

The air cleaner is an essential accessory, filtering the air entering the carburetor, and thereby prolonging the life of the engine.

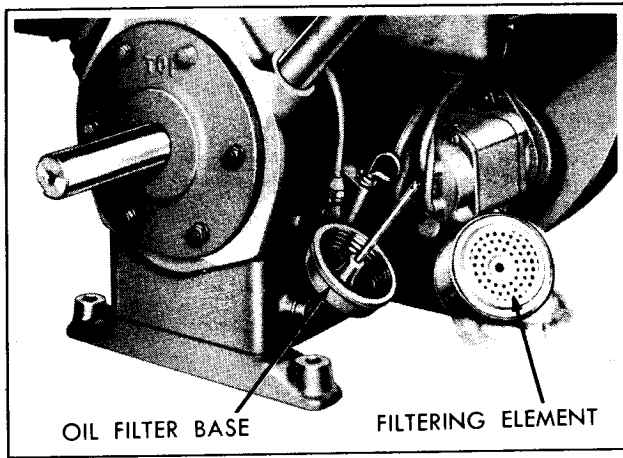


Fig. 5

Remove the bowl from the air cleaner. See Fig. 6 and Fig. 7. Fill bowl to oil level line with the same grade of oil as used in the crankcase. Detailed instructions are printed on the Air Cleaner.

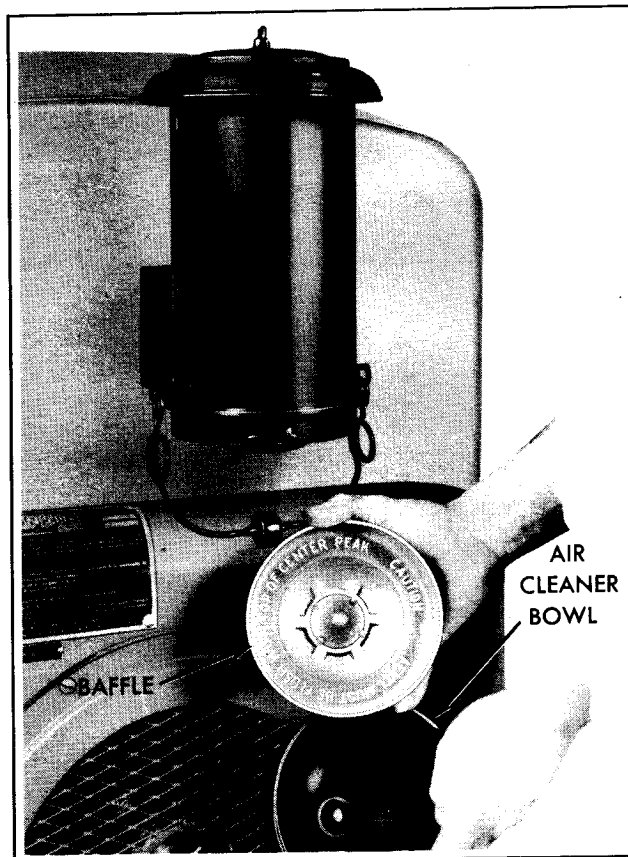


Fig. 6

The air cleaners must be serviced frequently, depending on the dust conditions where the engines are operated. When the oil in the bowl becomes dirty it should be removed and replaced with new oil. This servicing will vary from a few days of operation in comparatively clean conditions to twice a day in dusty conditions.

OPERATING THE ENGINE UNDER DUSTY CONDITIONS WITHOUT OIL IN THE AIR CLEANER OR WITH DIRTY OIL, MAY WEAR OUT CYLINDERS, PISTONS, RINGS AND BEARINGS IN A FEW DAYS TIME, AND RESULT IN COSTLY REPAIRS.

When a collector type precleaner is used on top of air cleaner the glass jar should be emptied of accumulated dirt frequently as it collects, depending on dust conditions. See Fig. 7. DO NOT USE OIL OR WATER IN GLASS PRECLEANER JAR. THIS SHOULD BE KEPT DRY.

Daily attention to the air cleaner is one of the most important considerations in prolonging engine life.

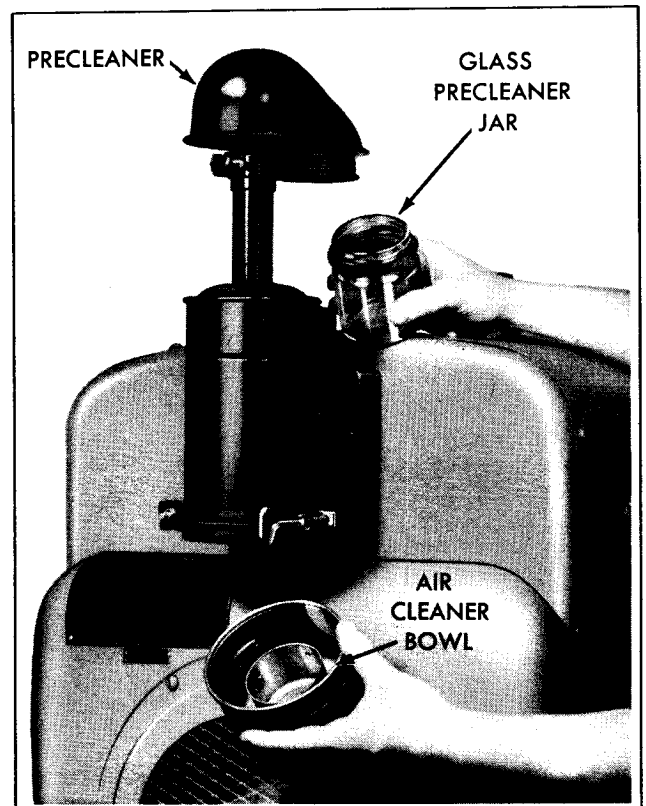


Fig. 7

FUEL

These engines are furnished either with gravity feed tanks mounted above the level of the carburetor, or with side mount tanks or tanks mounted below the engine. In the latter two cases, fuel pumps are furnished on the engines, to pump the fuel up to the carburetor.

The fuel tank should be filled with a good quality of gasoline free from dirt and water. Some of the poorer grades of gasoline contain gum which will deposit on valve stems, piston rings, and in various small passages in the carburetor and thus cause

serious trouble in operating, and in fact might prevent the engine from operating at all.

THE GASOLINE MUST HAVE AN OCTANE RATING OF AT LEAST 70.

Fuel with a lower octane rating will cause detonation, and if operation is continued under this condition severe damage will result to the engine. The cylinders and pistons will be scored, head gaskets blown out, bearings will be damaged, etc.

Be sure to open the gasoline shut off valve below the fuel tank when gravity feed tanks are used. Also be sure air vent hole in fuel tank cap is open, otherwise gas cannot flow to carburetor.

GASOLINE STRAINER

The gasoline strainer on the bottom of the fuel tank is very necessary to prevent sediment, dirt and water from entering the carburetor and causing trouble or even complete stoppage of the engine. This strainer has a glass bowl and should be inspected frequently, and cleaned if dirt or water is present. To remove bowl, first shut off fuel valve, then loosen the knurled nut below bowl and swing the wire bail to one side. After cleaning bowl and screen, replace the parts, being sure the gasket is in good condition; otherwise use a new gasket. See Fig. 8.

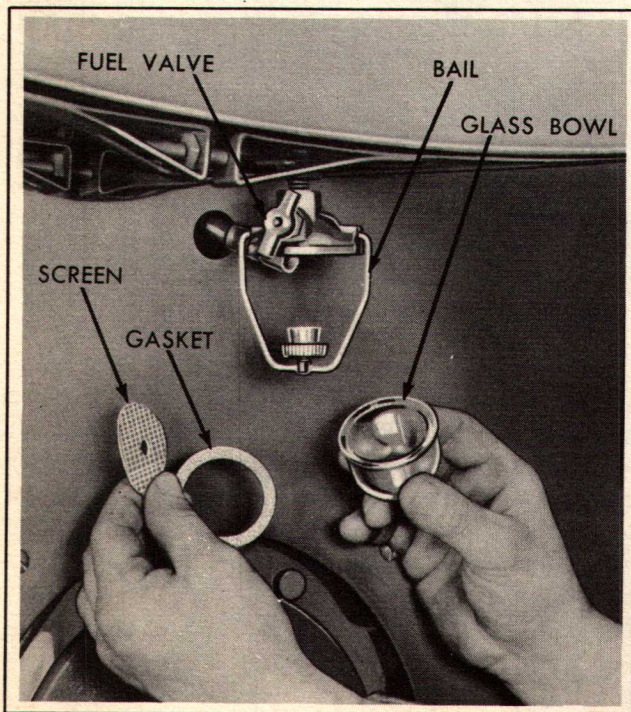


Fig. 8

FUEL PUMP

On engines equipped with fuel pumps, when starting the first time, or when engines have been out of operation for a while, the hand primer lever on the fuel pump should be used before attempting to start, so that fuel may be pumped into the dry carburetor, otherwise starting would be very difficult. When priming by hand lever, a distinct resistance of the fuel pump diaphragm should be felt. If this is not the case the engine should be turned over a revolution so that the fuel pump cam will be rotated from its upper position which would prevent hand priming. This hand lever should be given about 20 to 30 strokes, depending on how much fuel, if any, there is in the carburetor float chamber. See Fig. 9. When the carburetor is full the hand primer lever will move more easily.

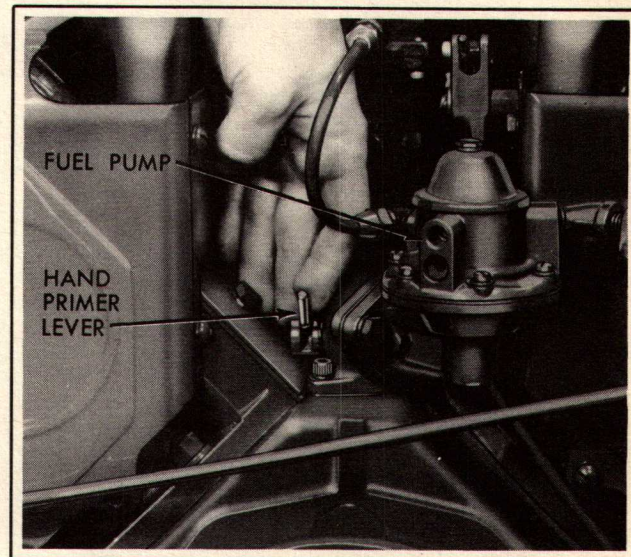


Fig. 9

CHOKE

Before starting a cold engine close the choke on the carburetor by pulling out the choke button at the flywheel end of the engine. See Fig. 2. When the engine is started the choke should be opened gradually as the engine warms up. More choking is necessary when starting in cold weather than in warm. If the engine is warm, very little choking is necessary. The operator will soon gain experience in how much choking is necessary. The choke button should always be pushed in after the engine is warmed up.

The choke is closed when button is pulled out, and open when button is pushed in.

CARBURETOR

The main metering jet in the carburetor is of the fixed type, that is, it requires no adjustment. The idle needle should be adjusted for best low speed operation, while carburetor throttle is closed by hand. For illustrations and more information see Carburetor Manufacturer's Instruction Bulletin in back of this book.

IGNITION SWITCH

Magneto ignition is standard on these engines with a push button type switch on the side of the magneto which is always in the "on" or running position, except when depressed for stopping the engine. See Fig. 1.

On engines with a house, the ignition switch is on the outside of the house at the flywheel end. See Fig. 2. To run engine with magneto ignition, this switch is pushed in; with battery ignition, it is pulled out.

MAGNETO

Magnetos are properly adjusted before leaving factory. The breaker points on the Fairbanks Morse Magneto should have an opening of .012 inch at full separation. If the spark becomes weak after continued operation it may be necessary to readjust these points. To do this first remove the end cover on the magneto. See Fig. 10. The crankshaft should then be rotated with the starting crank, (this also rotates the

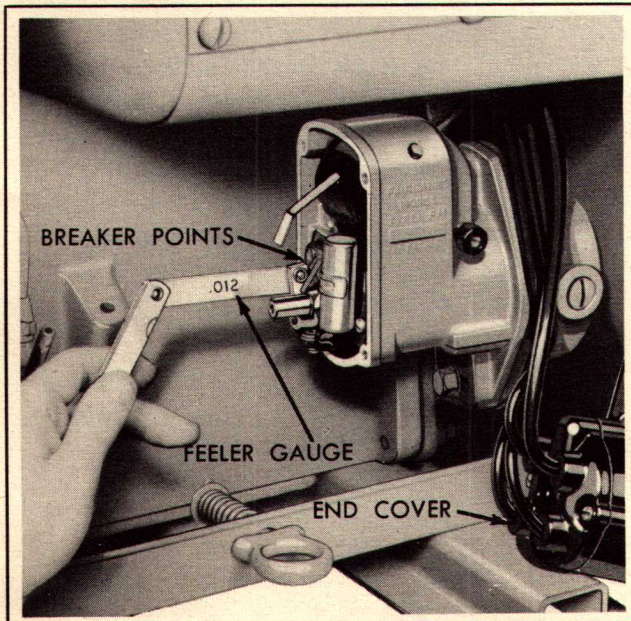


Fig. 10

Magneto), until the breaker points are wide open. The opening or gap should then be measured with a feeler gauge and if necessary reset as shown in Fig. 10. To readjust points first loosen the lock-screw on the

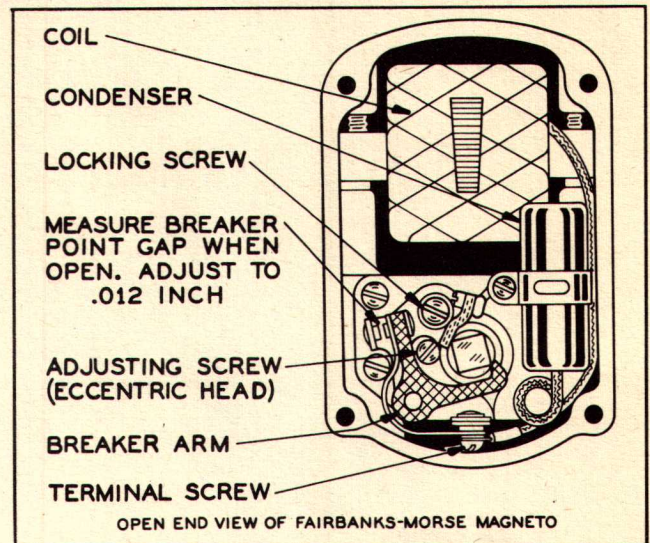


Fig. 11

breaker point plate, then turn eccentric adjusting screw right or left until proper gap is attained, then be sure to retighten lock-screw. All of these parts are shown in Fig. 11. After tightening lock-screw, recheck breaker point gap, to make sure it has not changed. If it is found that the breaker points have become rough, they should be smoothed with a breaker point file before the above adjustments are made. Then replace magneto end cover carefully so that it will seal properly. Do not force cover screws too tightly otherwise cover may crack. For further information see Magneto Manufacturer's Maintenance Manual in back of this book.

MAGNETO IGNITION SPARK

If difficulty is experienced in starting the engine or if engine misses firing, the strength of the ignition spark may be tested by removing the ignition cable from the spark plug and holding the terminal $\frac{1}{8}$ inch away from the cylinder head shroud, as shown in Fig. 12. Turn the engine over slowly by the starting crank as shown.

When the impulse coupling on the magneto snaps there should be a good spark at the ignition cable terminal. If there is a weak spark, or none at all, first check breaker point opening as mentioned in preceding paragraph under "Magneto". If this does

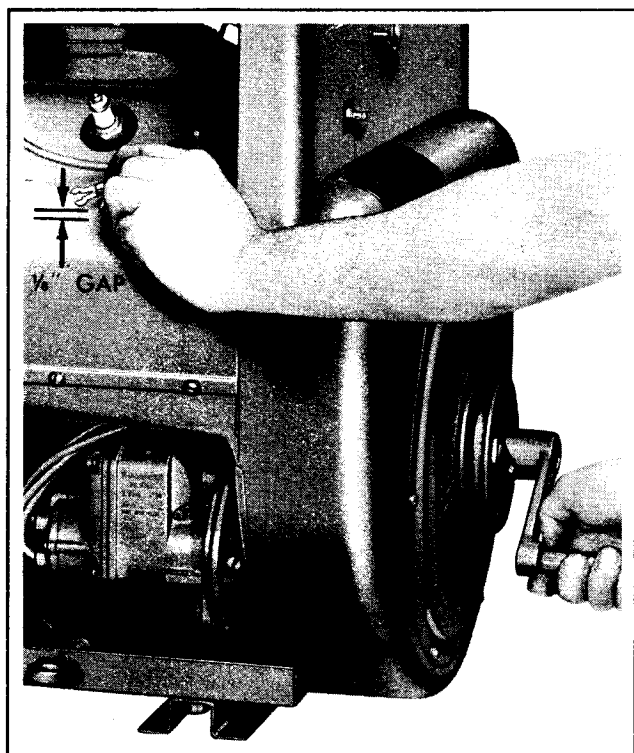


Fig. 12

not remedy the trouble, it may be necessary to install a new condenser. See Magneto Manufacturer's Maintenance Manual in back of this book.

MAGNETO TIMING

The magneto is properly timed at the factory, but if for any reason it is necessary to retime the magneto, the following instructions will be helpful.

First remove the screen over the flywheel air intake opening by taking out the six screws holding the screen in place. This will expose the timing marks on flywheel shroud for timing magneto. See Timing Diagram, Fig. 13.

Next remove the spark plug from No. 1 cylinder. Then turn engine over slowly with the starting crank until the compression in this cylinder blows the air out of the spark plug hole.

The flywheel is marked with the letters DC near one of the air circulating vanes. This vane is further identified by a mark cast on the end. See Diagram, Fig. 13. When the air blows out of the No. 1 spark plug hole, continue turning the starting crank until the edge of the marked vane on flywheel is on line with the mark on shroud as shown on Timing Diagram. Then leave flywheel in this

position. (At this point No. 1 and No. 4 cranks are vertical. The keyway at take-off end of crankshaft is also on top.)

The magneto should then be fitted to the engine so that the marked tooth on the magneto gear is visible through the opening in timing gear housing as shown on Timing Diagram, Fig. 13. The distributor cap on the magneto is numbered from 1 to 4. The leads from the magneto should be connected to spark plug of like numbers.

When magneto is properly timed the impulse coupling will snap when keyway in crankshaft is in line with cylinders. This can be checked by turning crankshaft over slowly by hand. This check can only be made on installations where keyway is not covered by other parts of equipment.

The proper spark advance is 27°.

The magneto rotates at crank shaft speed in clockwise direction when viewing driving gear end of magneto.

BATTERY IGNITION DISTRIBUTOR

When these engines are furnished with electric starters and generators, battery ignition is used, instead of magneto ignition. The ignition timer and distributor are mounted on the end of the generator.

The distributor rotates at engine speed in counterclockwise direction when viewed from above.

The proper spark advance for normal speeds is 27° the same as for magneto ignition. The distributor has an automatic advance of 15° so that at very low speeds, (below 500 R.P.M.) there would be an ignition advance of 12° before top dead center position of the piston.

The distributor is of course properly timed at the factory, but the following instructions are given as a help in retiming if this becomes necessary for any reason.

First remove the screen over the flywheel air intake opening by taking out the six screws holding the screen in place. This will expose the timing marks on the flywheel shroud, also the vane on flywheel, marked by an "X" and the letters D.C. See Fig. 14. Then remove the spark plug from No. 1 cylinder and turn engine over slowly, by the starting crank until the compression blows the air out of the spark plug hole.

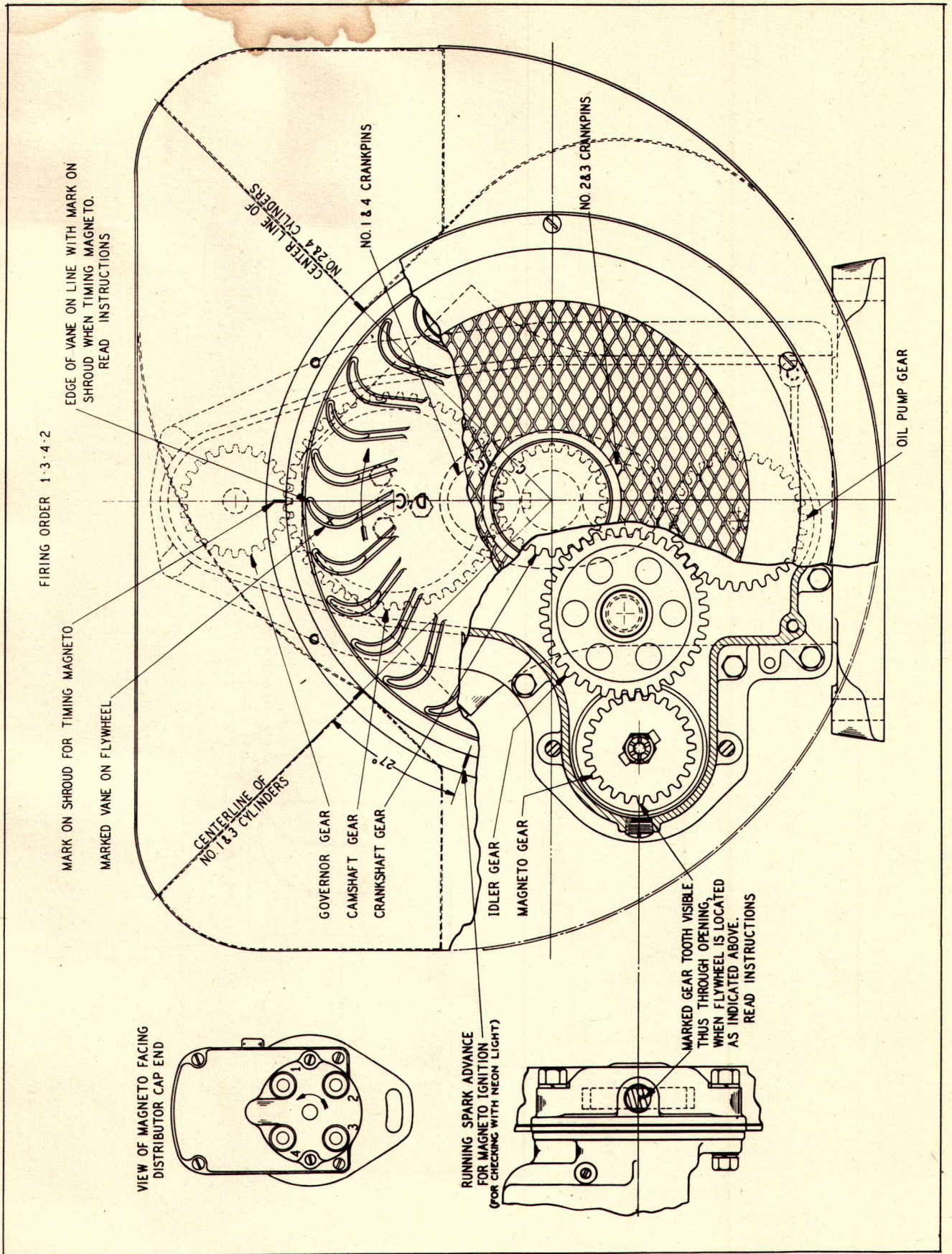


Fig. 13

MAGNETO TIMING DIAGRAM

ENGINE FIRING ORDER 1-3-4-2

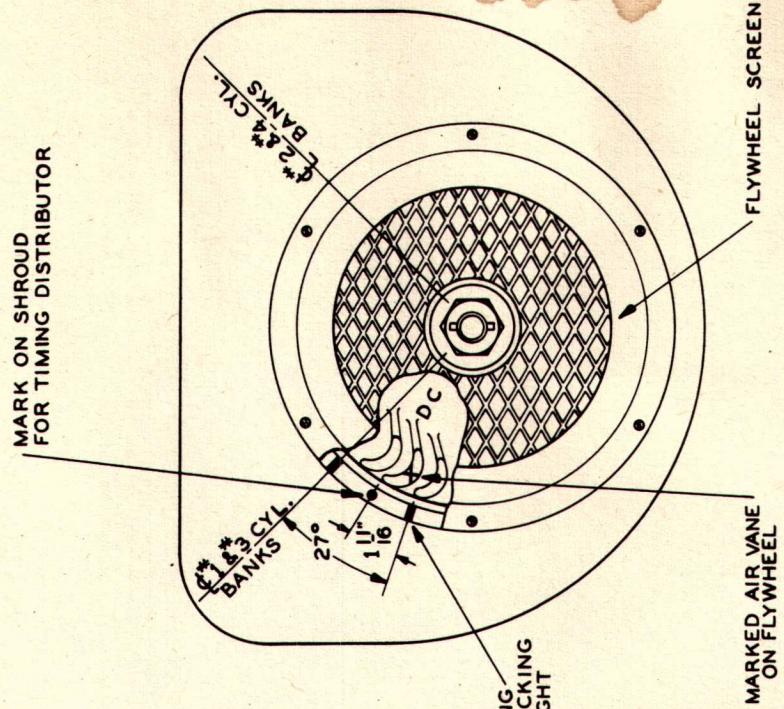
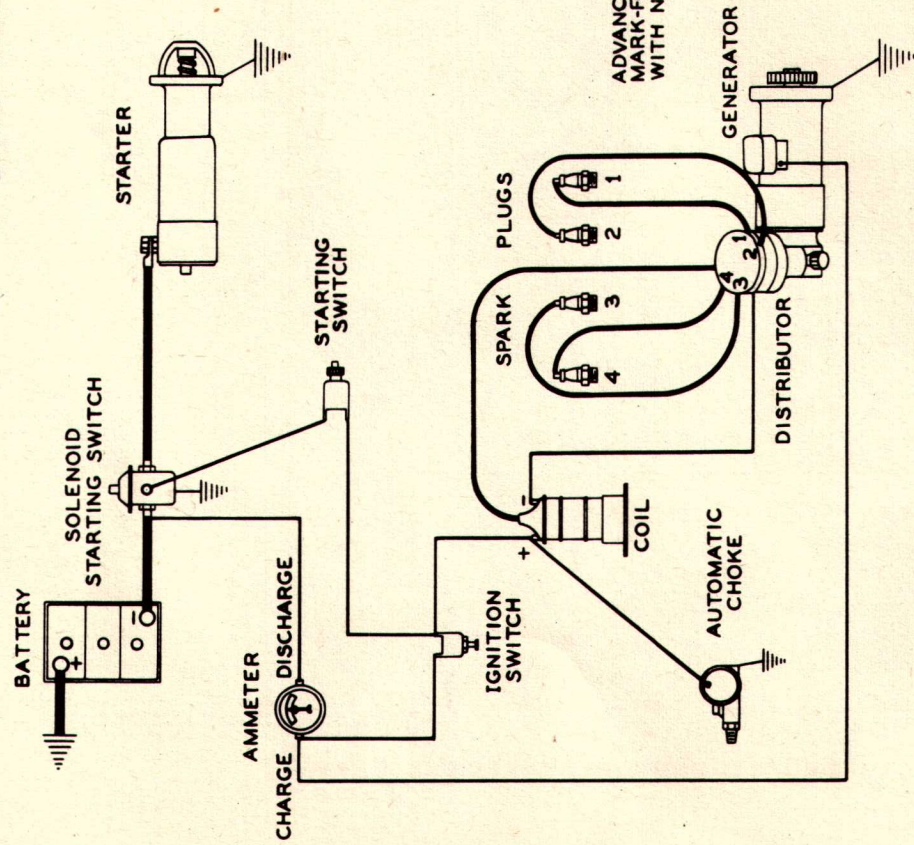


Fig. 14

BATTERY IGNITION — WIRING AND TIMING DIAGRAM

Continue turning starting crank until the leading edge of the marked vane on flywheel is in line with the center punch mark on the flywheel shroud. See Fig. 14.

Remove upper half of distributor body by disengaging snap springs.

The distributor rotor should then line up with center of the notches in the distributor housing. See Fig. 15.

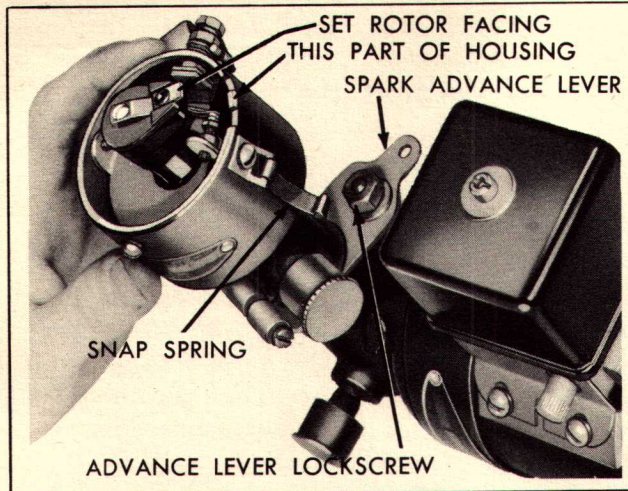


Fig. 15

If the rotor is not in this position withdraw entire distributor from the generator, and re-engage the gears at the bottom of distributor in a new position so rotor will be located properly. The spark advance lever should now be locked firmly in position by the advance lever lockscrew. See Fig. 15, as a manual spark advance is not used with these engines.

With the distributor clamp screw loose, see Fig. 16, first turn the distributor body slightly in a counter clockwise direction until the breaker points are firmly closed. Then turn the distributor body in a clockwise direction until the breaker points are just beginning to open. At this point a slight resistance can be felt as the breaker point cam strikes the breaker point arm. The distributor clamp screw should then be tightened, so the distributor will be held firmly in this position. The maximum breaker point should be .018 to .022 inches. This opening should be checked before the distributor body is set, otherwise any adjustment made to the breaker point opening will change the ignition advance adjustment. If care is exercised in the above operations the spark timing should be accurate enough for satisfactory operation.

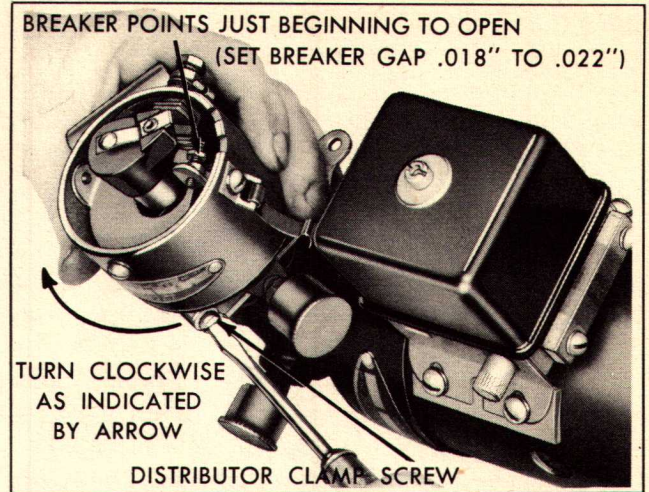


Fig. 16

If it is desired to recheck the ignition timing with a neon lamp, this may be done as follows:-

Connect the neon lamp in series with the No. 1 spark plug ignition cable. Chalk the end of the marked vane on the flywheel, using white chalk. Then with the engine operating at normal speed, allow the flash from the neon lamp to illuminate the whitened vane. At the time of the flash, the leading edge of the vane should line up with the "running spark advance mark" on the flywheel housing. See Fig. 14.

The four ignition cables from the distributor should be connected to the same number spark plug as the number on the distributor. See Fig. 17. The center cable from the distributor is connected to the ignition coil.

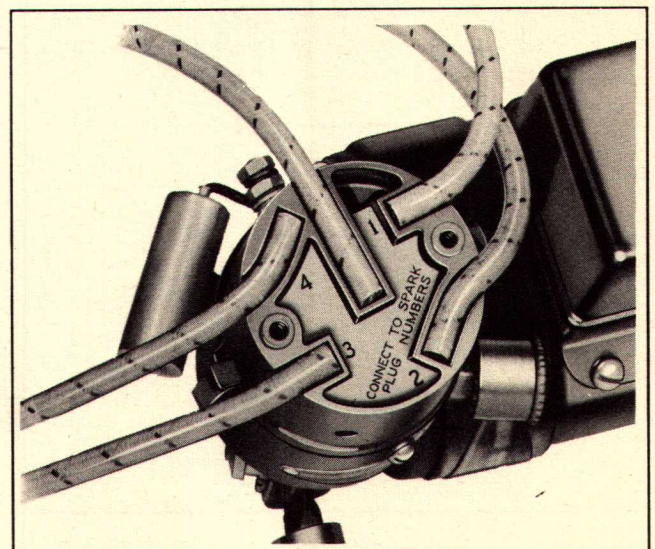


Fig. 17

The grease cup on the distributor should be given one turn every 64 hours of operation. Use a high melting point grease. Do not over lubricate, otherwise grease will enter the generator and the distributor and may cause trouble.

FIRING ORDER

The firing order of the cylinder is 1-3-4-2. Number 1 cylinder is the one nearest to the flywheel in the left bank of cylinders, when viewed from the flywheel end of the engine. Number 3 cylinder is the other cylinder in this bank. Number 2 cylinder is the one nearest to the flywheel in the right bank of cylinders and Number 4 is the other cylinder in this bank. The cylinders are numbered from 1 to 4 on the air shroud near the spark plugs. See Fig. 2. The flywheel end of the engine is designated the front end, and the power take-off end, the rear end of the engine.

As these engines are of the V type, the interval between firing of the cylinders is as follows:—Crankshaft rotation between firing of cylinders No. 1 and No. 3 is 180° ; between No. 3 and No. 4 is 270° ; between No. 4 and No. 2 is 180° and between No. 2 and No. 1 is 90° .

SPARK PLUGS

The spark plug gap should be twenty-five thousandths (.025) of an inch, and plugs should be kept clean both inside and out. See Fig. 18. If the porcelain insulator is cracked replace with a new plug of correct heat range, like Champion No. 8 Com., AC #85 or equal. The spark thread is 18 millimeter. Be sure to use a good gasket under the spark plug.

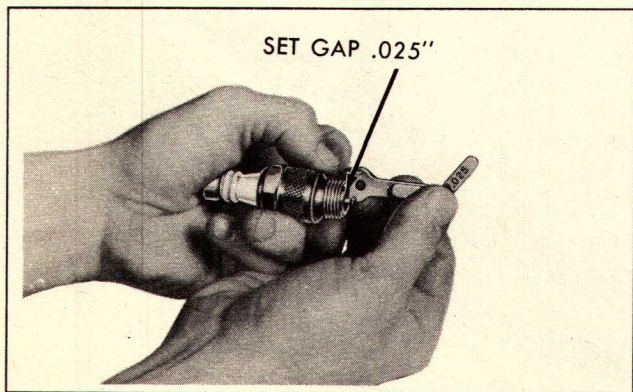


Fig. 18

ELECTRIC STARTER

The electric starter is an optional accessory, furnished only upon request when engine is purchased. The starter and generator cannot be mounted in the field unless provisions were made when engine was purchased. The starter and generator are products of the Electric Auto-Lite Company, Toledo, Ohio, and it is recommended that all repairs for this accessory be done through their authorized Service Stations. For wiring diagram, see Fig. 14. Battery is not furnished by engine manufacturer.

STARTING

The engine, less electric starter, is started by applying the crank as shown in Fig. 3 and pulling up briskly on the crank in a clockwise direction. DO NOT attempt to spin the engine with the starting crank. If the engine does not start on the first pull up of the crank re-engage the crank and repeat the operation.

RESTORING COMPRESSION

On a new engine or on one which has been out of operation for some time the oil may have drained off the cylinder so that compression will be weak. This may cause difficulty in starting. To remedy this condition, remove the spark plugs and pour about a fluid ounce of crankcase oil through the spark plug hole into each cylinder.

Turn the engine over several times with the starting crank to distribute the oil over the cylinder wall. Then replace the spark plugs and compression should be satisfactory.

TO STOP ENGINE

Engines, less house, have a stop button on the side of the magneto. On these, to stop engine, depress stop button and hold down until engine stops. See Fig. 1. Others with house have an ignition switch on front panel of house as shown in Fig. 2. On these, to stop engine with magneto ignition, pull out the switch; with battery ignition, push in the switch.

SPECIAL INSTRUCTIONS FOR AGRICULTURAL ENGINES

KEEP YOUR ENGINE CLEAN

This engine is cooled by blasts of air which must be allowed to circulate all around the engine cylinders and cylinder heads in order to properly cool the engine and thereby keep it in good running condition. If dust or chaff is allowed to collect in the cylinder shrouding or in the V between the cylinders it will retard the flow of air and cause the engine to overheat.

In the Figs. 19 and 20, we are pointing out the few necessary cleaning precautions which must be followed to insure satisfactory engine performance and engine life.

- 1 Remove these covers frequently and clean out all dust and chaff—Be sure to replace covers.
- 2 Open these covers frequently and clean out all dust and chaff—Be sure to close covers.
- 3 Keep this space between cylinders free of dust and chaff.
- 4 Read instructions on this air cleaner regarding its care—This is important.
- 5 Do not allow shrouding to become damaged or badly dented as this will retard air flow.

NEVER OPERATE ENGINE WITH AIR SHROUDING REMOVED BECAUSE THIS WILL RETARD THE AIR COOLING.

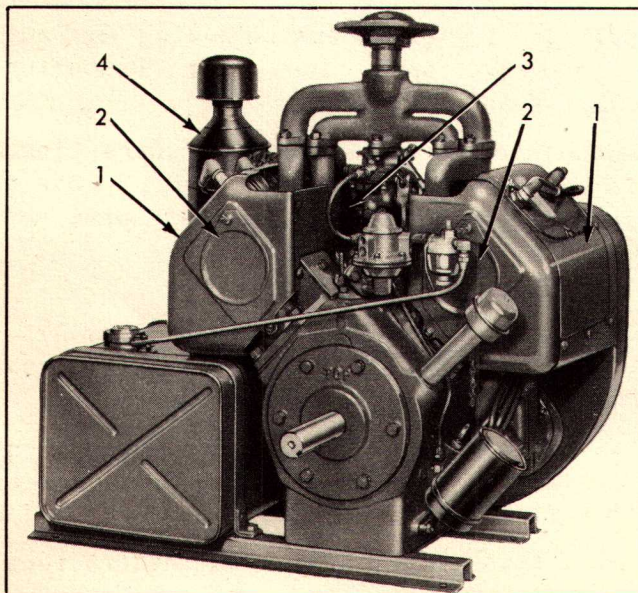


Fig. 19

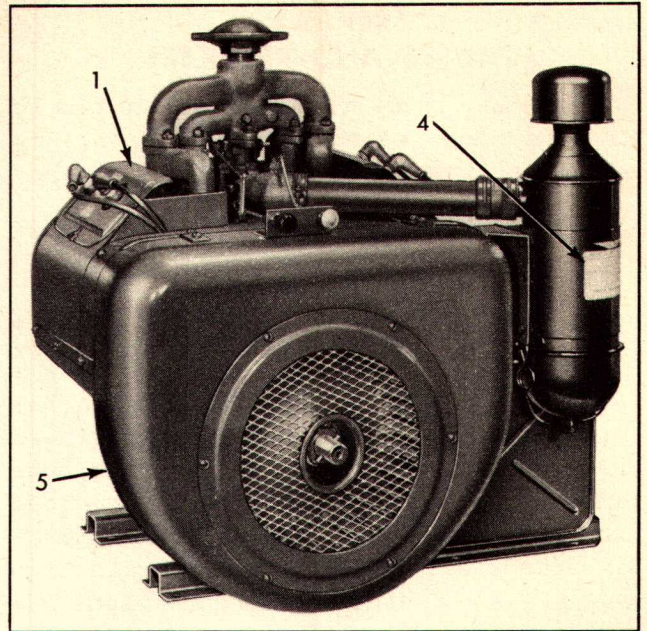


Fig. 20

SAFETY PRECAUTIONS

Never fill fuel tank while engine is in operation or hot, as danger from fire would be incurred.

Never operate engine in a closed building unless the exhaust is piped outside. Exhaust from an engine contains carbon monoxide, a poisonous, odorless and invisible gas, which if breathed into the lungs would cause serious illness and possible death.

Never make adjustments on any kind of machinery while it is connected to the engine, without first removing the ignition cables from the spark plug. Turning over the machinery by hand during adjusting or cleaning might start the engine and the machinery with it causing serious injury to the operator.

ALWAYS KEEP ALL PARTS OF THE ENGINE CLEAN. THIS WILL PROLONG ENGINE LIFE, AND GIVE MORE SATISFACTORY OPERATION.

EVERY 4 TO 8 HOURS Depending on dust conditions, check air cleaner and change oil. See page 8.

EVERY 8 HOURS Check crankcase oil level. Keep filled to FULL mark on oil gauge sabre, but no more. See Fig. 4.

EVERY 50 HOURS Drain crankcase and refill with fresh oil. See Lubrication. Pages 6 and 8.

EVERY 300 HOURS Replace oil filter element. See Page 8.

TROUBLES CAUSES AND REMEDIES

Three prime requisites are essential to starting and maintaining satisfactory operation of gasoline engines. They are:

1. A PROPER FUEL MIXTURE in the cylinder.
2. GOOD COMPRESSION in the cylinder.
3. GOOD SPARK, PROPERLY TIMED, to ignite the mixture.

If all three of these conditions do not exist, the engine cannot be started. There are other factors which will contribute to hard starting; such as, too heavy a load for the engine to turn over at a low starting speed, a long exhaust pipe with high back pressure, etc. These conditions may affect the starting, but do not necessarily mean that the engine is improperly adjusted.

As a guide to locating any difficulties which might arise the following causes are listed under the three headings: FUEL MIXTURE—COMPRESSION—IGNITION.

In each case the causes of trouble are given in the order in which they are most apt to occur. In many cases the remedy is apparent, and in such cases no further remedies are suggested.

STARTING DIFFICULTIES

FUEL MIXTURE

No fuel in tank or fuel shut off valve closed.

Fuel pump diaphragm worn out, so pump does not supply carburetor with fuel.

Carburetor not choked sufficiently, especially if engine is cold. See "Choke" Page 10.

Water, dirt, or gum in gasoline interfering with free flow of fuel to carburetor.

Poor grade or stale gasoline that will not vaporize sufficiently to form the proper fuel mixture.

Carburetor flooded, caused by too much choking especially if engine is hot. See "Choke" Page 10.

Dirt or gum holding float needle valve in carburetor open. This condition would be indicated if fuel continues to drip

from carburetor with engine standing idle. Often tapping the float chamber of the carburetor very lightly with the wood handle of a screw driver or similar instrument will remedy this trouble. Do not strike carburetor with any metal tools, it may be damaged. Also if the mixture in the cylinder, due to flooding, is not too rich to start the engine, starting should be tried, as it will usually correct the trouble. In this case the choke should be left open.

If, due to flooding, too much fuel should have entered the cylinder in attempting to start the engine, the mixture will most likely be too rich to burn. In that case the spark plugs should be removed from the cylinders and the engine then turned over several times with the starting crank, so the rich mixture will be blown out through the spark plug holes. The choke on the carburetor should of course be left open during this procedure. The plugs should then be replaced and starting tried again.

To test for clogged fuel line, loosen fuel line nut at carburetor slightly. If line is open, fuel should drip out at loosened nut.

COMPRESSION

If the engine has proper compression, considerable resistance will be encountered in the pull on the starting crank. If this resistance is not encountered compression is faulty. Following are some reasons for poor compression:—

Cylinder dry due to engine having been out of use for some time. See "Restoring Compression" Page 16.

Loose spark plugs or broken spark plug. In this case a hissing noise will be heard in cranking engine, due to escaping gas mixture on compression stroke.

Damaged cylinder head gasket or loose cylinder head. This will likewise cause hissing noise on compression stroke.

Valve stuck open due to carbon or gum on valve stem. To clean valve stems, see "Valves" Page 25.

Valve tappets adjusted with insufficient clearance under valve stems. See "Valve Tapper Adjustment" Page 26.

Piston rings stuck in piston due to carbon accumulation. If rings are stuck very tight this will necessitate removing piston and connecting rod assembly and cleaning parts. See "Piston and Connecting Rod" Page 23.

Scored cylinders. This will require re-boring of the cylinders and fitting with new pistons and rings. If scored too severely an entirely new cylinder block may be necessary.

IGNITION

See "Magneto Ignition Spark" Page 11, or "Battery Ignition Distributor" Page 12. No spark may also be attributed to the following:--

Ignition cable disconnected from magneto or spark plugs.

Broken ignition cables, causing short circuits.

Ignition cables wet or soaked.

Spark plug insulators broken.

Spark plugs wet or dirty.

Spark plug point gap wrong. Should be .025".

Condensation on spark plug electrodes.

Magneto or Distributor breaker points pitted or fused.

Magneto or Distributor breaker arm sticking.

Magneto or Distributor condenser leaking or grounded.

Spark timing wrong. See "Magneto Timing" Page 12, or "Battery Ignition Distributor" Page 12.

ENGINE MISSES

Spark plug gap incorrect. Should be .025".

Worn and leaking ignition cables.

Weak spark. See "Magneto Ignition Spark" Page 11, or "Battery Ignition Distributor" Page 12.

Loose connections at ignition cable.

Magneto or Distributor breaker points pitted or worn.

Water in gasoline.

Poor compression. See "Compression" Page 16.

ENGINE SURGES OR GALLOPS

Carburetor flooding.

Governor spring hooked into wrong hole in lever. See "Governor" Page 27. Governor rod incorrectly adjusted. See "Governor" Page 26.

ENGINE STOPS

Fuel tank empty.

Water, dirt or gum in gasoline.

Gasoline vaporized in fuel lines due to excessive heat around engine (Vapor Lock).

Vapor lock in fuel lines or carburetor due to using winter gas (too volatile) in hot weather.

Air vent hole in fuel tank cap plugged. Engine scored or stuck due to lack of oil.

Ignition troubles. See "Ignition" on this page.

ENGINE OVERHEATS

Crankcase oil supply low. Replenish immediately.

Ignition spark timed wrong. See "Magneto Timing" Page 12, or "Battery Ignition Distributor" Page 12.

Low grade of gasoline.

Engine overloaded.

Restricted cooling air circulation.

Part of air shroud removed from engine.

Dirt between cooling fins on cylinder or head.

Engine operated in confined space where cooling air is continually recirculated, consequently becoming too hot.

Carbon in engine.

Dirty or incorrect grade of crankcase oil.

Restricted exhaust.

Engine operated while detonating due to low octane gasoline or heavy load at low speed.

ENGINE KNOCKS

Poor grade of gasoline or of low octane rating. Octane rating must be at least 70.

Engine operating under heavy load at low speed.

Carbon or lead deposits in cylinder head.

Spark advanced too far. See "Ignition Timing" Page 12, or "Battery Ignition Distributor" Page 12.

Loose or burnt out connecting rod bearing.

Engine overheated due to causes under previous heading.

Worn or loose piston pin.

ENGINE BACKFIRES THROUGH CARBURETOR

Water or dirt in gasoline.

Engine cold.

Poor grade of gasoline.

Sticky inlet valves. See "Valves" Page 25.

Overheated valves.

Spark plugs too hot. See "Spark plug" Page 16.

Hot carbon particles in engine.

DISASSEMBLING AND REASSEMBLING ENGINES

Engine repairs should be made only by a mechanic who has had experience in such work. When disassembling the engine it is advisable to have several boxes available so that parts belonging to certain groups can be kept together, such as, for instance, the cylinder head bolts, etc. Bolts of various lengths are used in the engine, therefore great care must be exercised in reassembly so the right bolts will be used in the various places, otherwise damage may result.

While the engine is partly or fully dismantled all of the parts should be thoroughly cleaned. Remove all accumulated dirt between the fins.

If it is desired to disassemble the engine the following order should be substantially adhered to. As disassembly progresses, the order may be altered somewhat if desired, as will be self-evident to the mechanic. Reassembly of the engine should be made in the reverse order.

ACCESSORIES

The Air Cleaner, Magneto, and if an electric starter and generator are used these should be removed first.

SHEET METAL HOUSE

With engines enclosed in a sheet metal house, the top cover or canopy of the house should be removed by taking out the screws holding it to the end panels. For removing end panels see following paragraphs.

FLYWHEEL

It is necessary that the flywheel be removed next. After the flywheel screen has been removed, the flywheel nut should be taken off as shown in Fig. 21. Then as shown

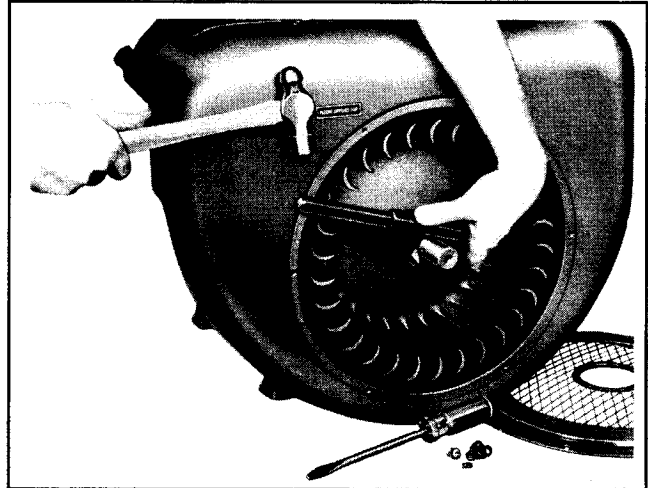


Fig. 21

in Fig. 22 the flywheel can be removed from the crankshaft by tapping the end of the crankshaft with a babbitt hammer. Do not use a hard hammer as it would ruin the crankshaft and bearings.

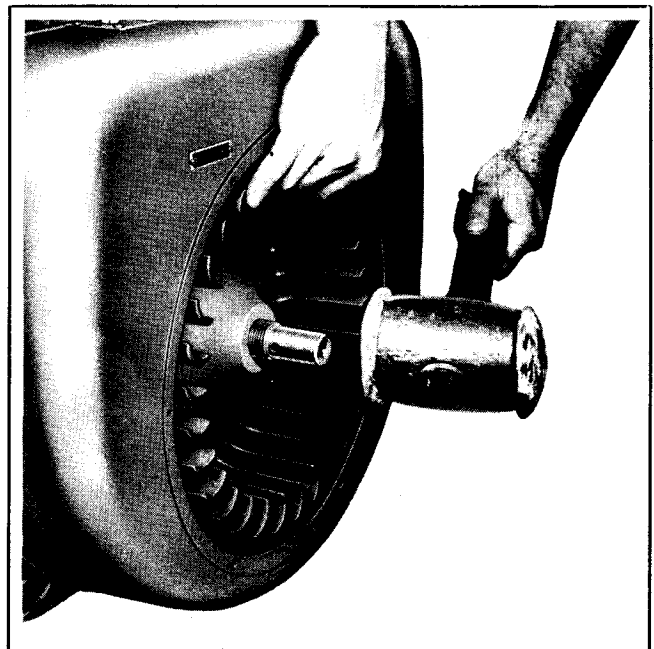


Fig. 22

AIR SHROUDING

To disassemble air shrouding, (see Figs. 23 to 25) first remove cylinder head covers and the screws mounting the flywheel shroud to lower cylinder shrouds and cylinder heat deflectors, then remove the screws holding the flywheel shroud to gear cover. When

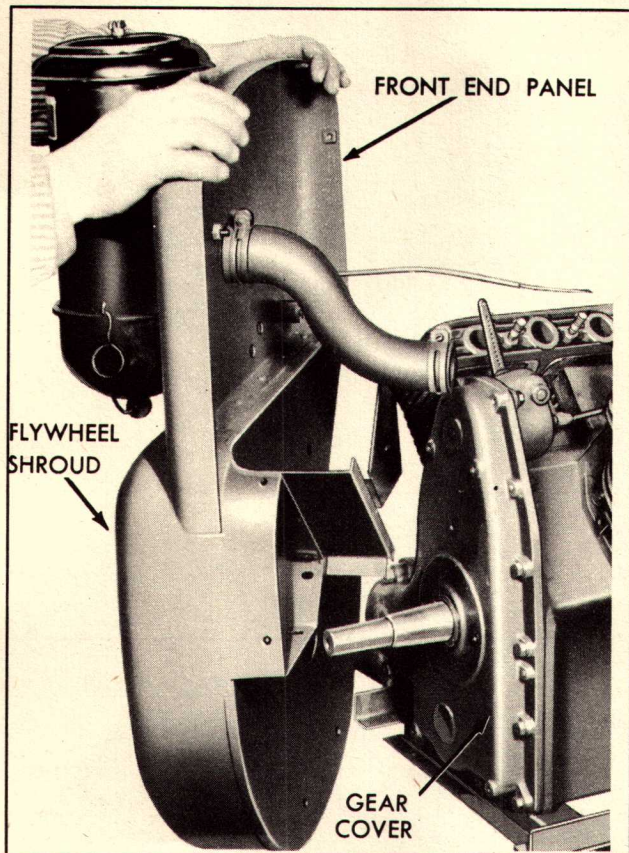


Fig. 23

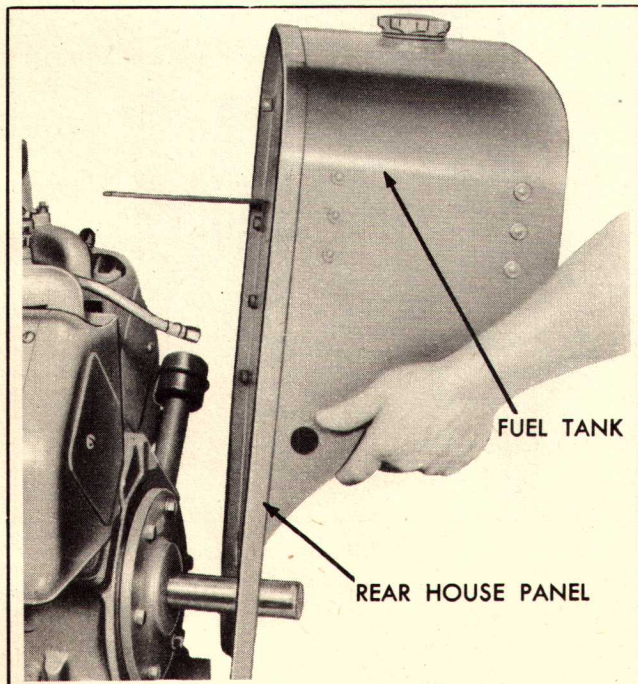


Fig. 24

complete engine house is disassembled, remove the front end panel as shown in Fig. 23 together with flywheel shroud and the rear end panel, see Fig. 24, complete with fuel tank. Balance of shrouding can now be readily removed.

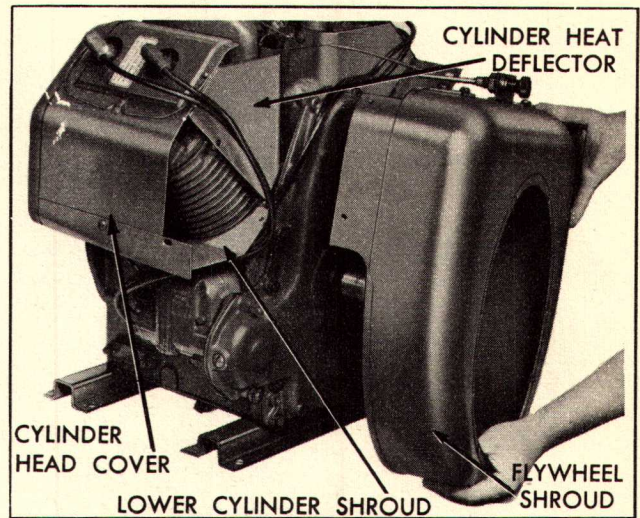


Fig. 25

GAS TANK

If a side mount gasoline tank is used this should be removed next. See Fig. 26.

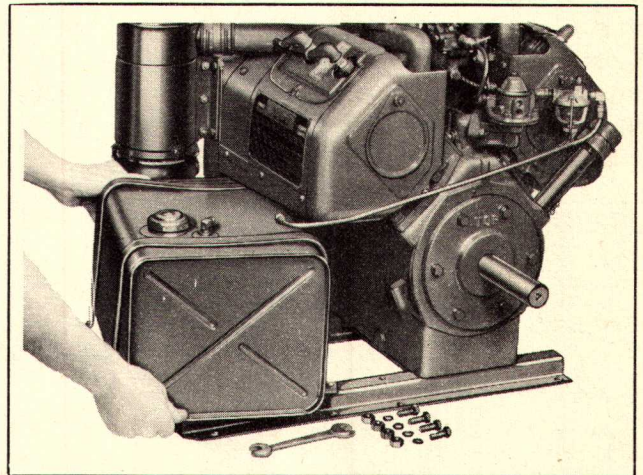


Fig. 26

CARBURETOR AND MANIFOLDS

The carburetor and manifolds can then be removed in sections as shown in Fig. 27.

CYLINDER HEAD

The cylinder head must be removed if it is necessary to regrind valves, or to do work on the piston rings or connecting rod. All of the cylinder head bolts are plainly in view and can be easily removed. Bolts of different lengths are used but these can be properly reassembled according to the various lengths of cylinder head bosses.



Fig. 27

Before reassembling the cylinder head, all carbon and lead deposits should be removed. It is recommended that a new cylinder head gasket be used on reassembly as the old gasket will be compressed and hard so that it may not seal properly. See Fig. 28.

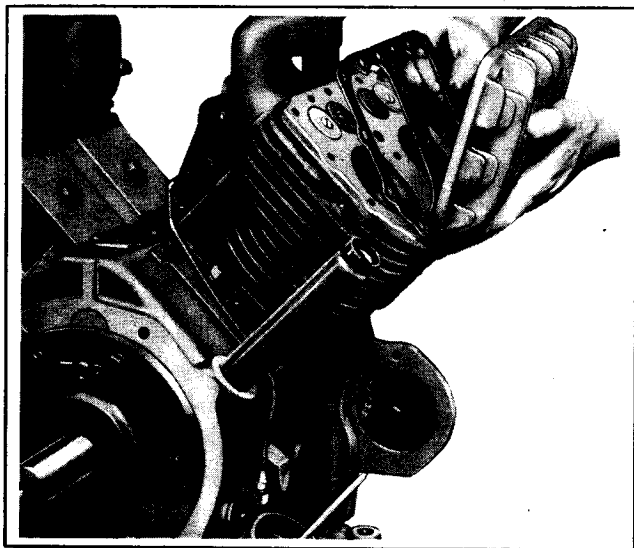


Fig. 28

GEAR COVER

Disengage the governor linkage as described on page 26 before removing gear cover, since the same mounting bolts for governor housing and gear cover are used.

Remove gear cover bolts and drive out two dowel pins as shown in Fig. 29. The cover

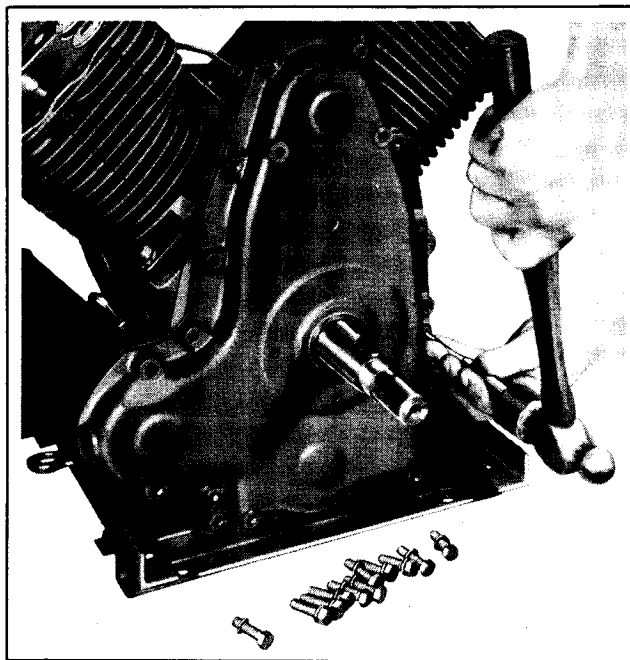


Fig. 29

can then be removed exposing the timing gears as shown in Fig. 30.

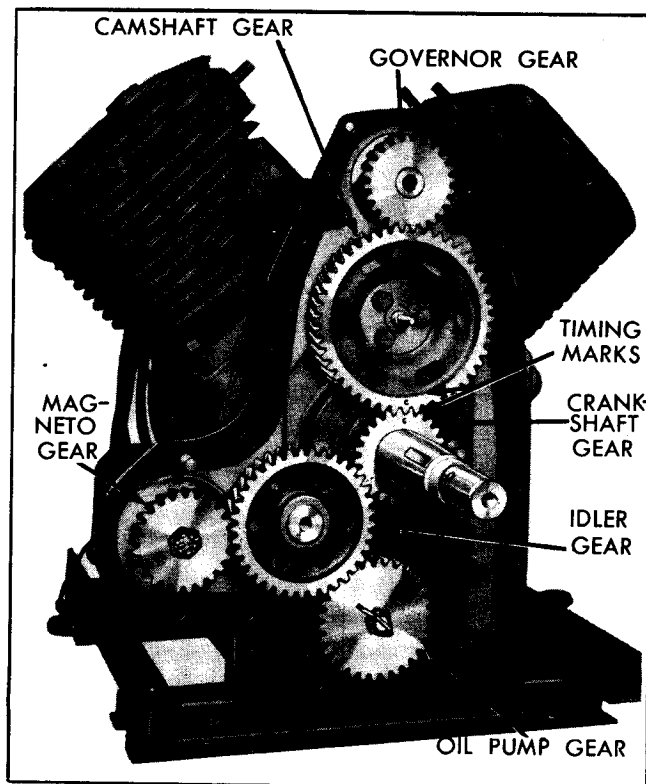


Fig. 30

OIL PAN

The engine can then be inverted so that the supports and oil pan can be removed. See Fig. 31.

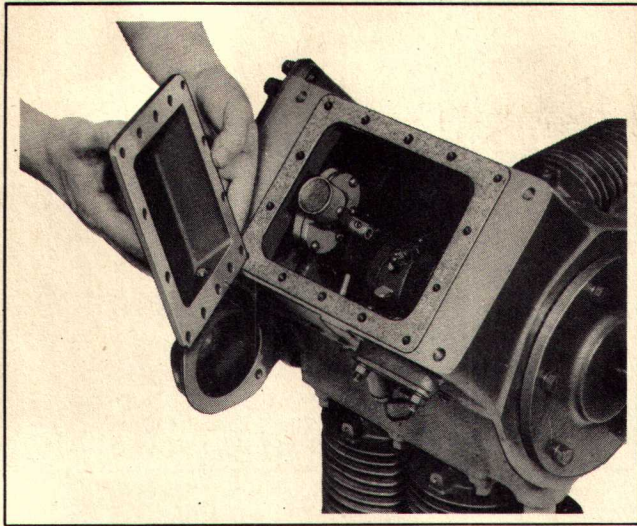


Fig. 31

OIL PUMP

To remove oil pump, first take out the slotted pipe plug, and then the oil pump lock-screw as shown in Fig. 32. Remove

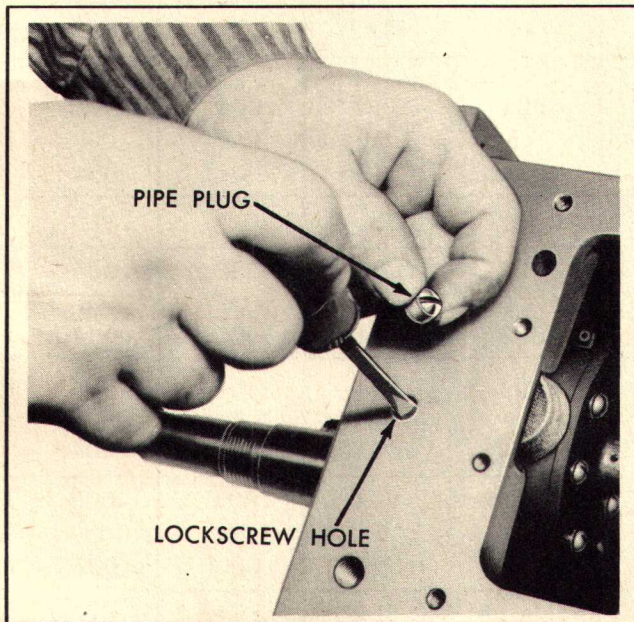


Fig. 32

cotter pin and nut holding oil pump driving gear to shaft. Then, with soft brass rod or punch, drive shaft through gear as shown in Fig. 33. The oil pump can then be withdrawn toward center of crankcase.

PISTONS AND CONNECTING RODS

After removal of the oil pump, all of the connecting rod bolts will be accessible. The nuts should be removed from the bolts, then by tapping the ends of the bolts lightly, being careful not to mar the threads, the connecting rod caps can be freed from

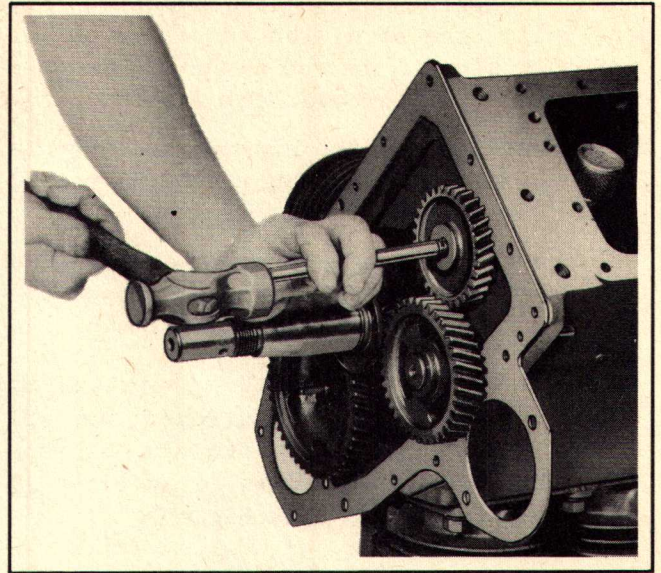


Fig. 33

the bolts. Be very careful that all shims will be kept in their places. After the caps are removed the nuts should be immediately put back on the bolts so none of the shims will be displaced. The connecting rods with the pistons can now be pushed through the cylinders. The caps should now be put back on the rods. Always be sure the caps are replaced in the exact position as when removed, according to the numbers stamped on the side of the rod and cap. See Fig. 34.

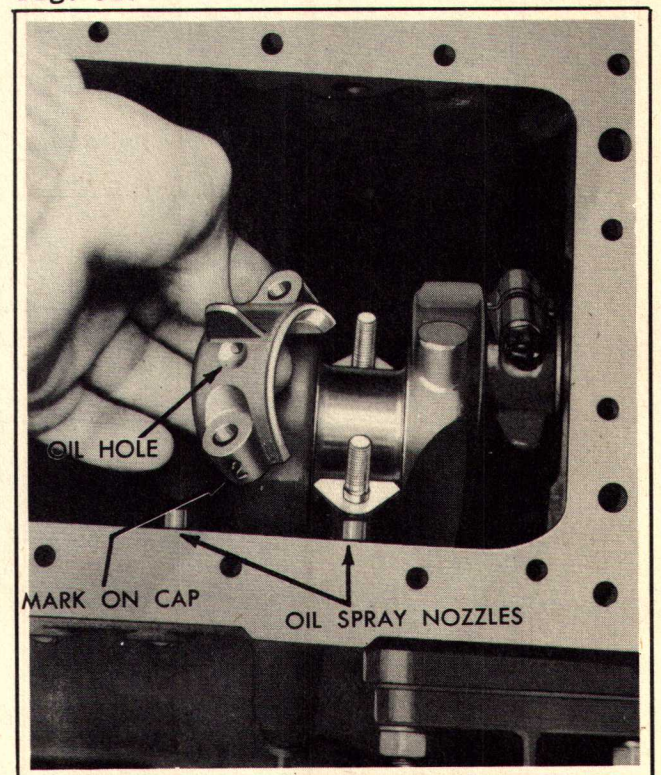


Fig. 34

When assembling piston to connecting rod, the split side of piston should be on the opposite side of the rod to the oil hole in the connecting rod cap. See Fig. 3.

When reassembling the engine, be sure the oil hole in the connecting rod cap is toward the oil spray nozzle. See Fig. 34.

Be sure the pistons are put back into the same bore from which they were removed.

PISTON RINGS — IMPORTANT

Rings should be assembled to pistons as shown in Fig. 35. The scraper and oil rings must be assembled to the pistons with the scraper edge down, otherwise oil pumping will result. See Fig. 36.



Fig. 35

PISTON, RING AND ROD CLEARANCES

MODELS		VE4	VE4I	VF4	VF4I
Piston to Cylinder at Piston Skirt		.004 to .0045	.003 to .0035	.004 to .0045	.0035 to .004
Piston Ring Gap		.015	.015	.015	.015
Piston Ring Side Clearance in Grooves	Top Ring	.002 to .0035	.003 to .0045	.002 to .0035	.003 to .0045
	2nd Ring	.001 to .0025	.002 to .0035	.001 to .0025	.003 to .0045
	Scraper Ring	.001 to .0025	.001 to .0025	.001 to .0025	.002 to .0035
	Oil Ring	.0025 to .004	.0025 to .004	.0025 to .004	.0025 to .004
Rod to Shaft	Diameter	.001 to .002	.001 to .002	.001 to .002	.001 to .002
	Side	.004 to .010	.004 to .010	.004 to .010	.004 to .010
Piston Pin to Connecting Rod Bushing		.0005 to .001	.0005 to .001	.0005 to .001	.0005 to .001

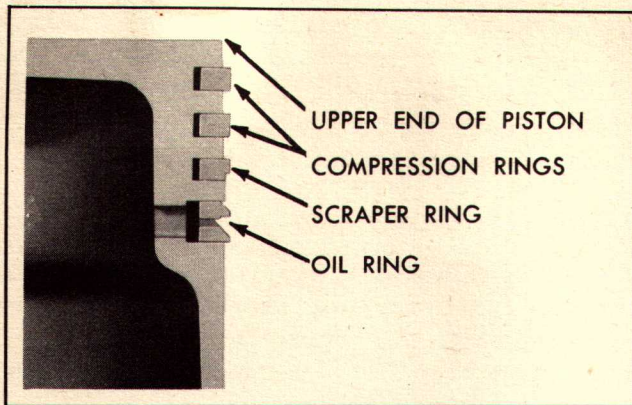


Fig. 36

CYLINDERS

The cylinders can now be removed from the crankcase if necessary. In reassembling, put the blocks back on the same side from which they were removed. Clean all dirt and other deposits from fins before reassembling. If the cylinders are worn more than .005 inch over size, they should be reground and fitted with oversize pistons and rings.

VALVES

Remove valve taper inspection plate. Compress valve springs with a valve lifter. The valve spring retainer locks should then be removed from the valve stems. The valves can then be withdrawn from the top of the cylinder block. See Fig. 37. The valves,

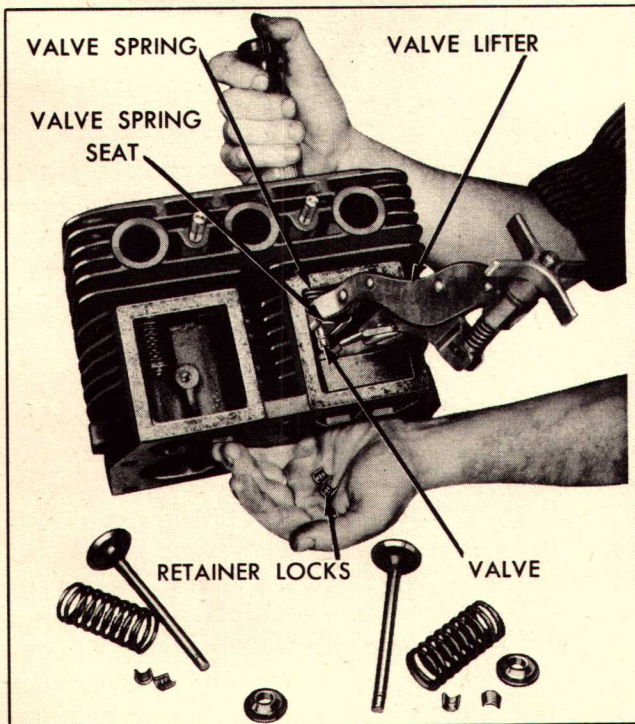


Fig. 37

valve seats, ports and guides in the cylinder block, should be cleaned of all carbon and gum deposits.

The valve seats should be reground to a good seat by spreading a small quantity of fine valve grinding compound on the valve and then rubbing the valve on its seat by a back and forth motion with a screw driver (vacuum cup tool if valves do not have a slot) or a reciprocating advancing valve grinding tool. Occasionally rotate valve to another position during the grinding operation so seat will be ground true. See Fig. 38. A uniform seat about $3/32$ "

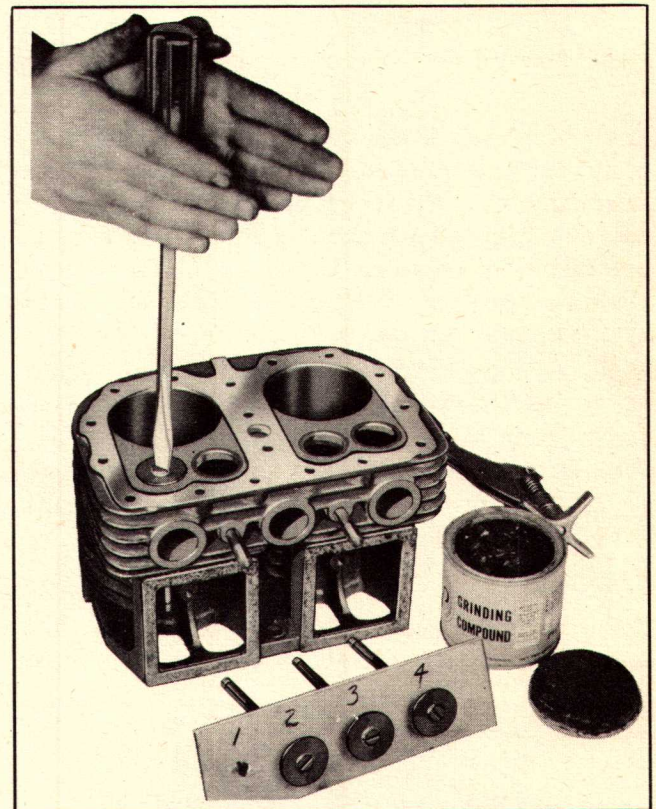


Fig. 38

wide should show entirely around the valves. All grinding compound should be carefully washed off the valves and cylinder block with gasoline or kerosene. The valve stems should have a clearance of .003" to .005" in the guides.

CRANKSHAFT

To remove the crankshaft, first remove the four bolts in the bearing retainer plate on end of engine opposite flywheel. This plate can then be pried off, and crankshaft removed from that end of crankcase. Be sure to keep shims in place. See Fig. 39.

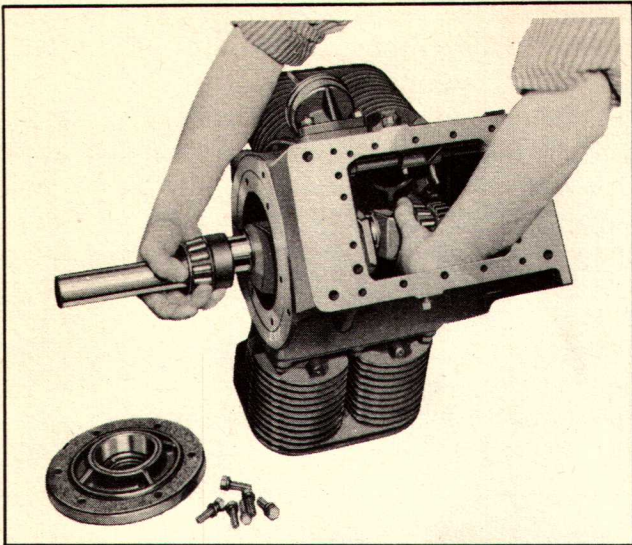


Fig. 39

The shims are used to give the proper end play to the Timken main bearings on the crankshaft. This end play should be .002 to .004 inch when engine is cold. There is practically no wear in these Timken bearings so that no readjustment is necessary after proper assembly.

When reassembling crankshaft, the punch marks on the crankshaft gear and the camshaft gear must be matched (See Fig. 30), otherwise engine will not operate properly, or if timing is off considerably, engine will not run at all.

CAMSHAFT

The camshaft can be withdrawn from the fly-wheel end of the engine. See Fig. 40. When

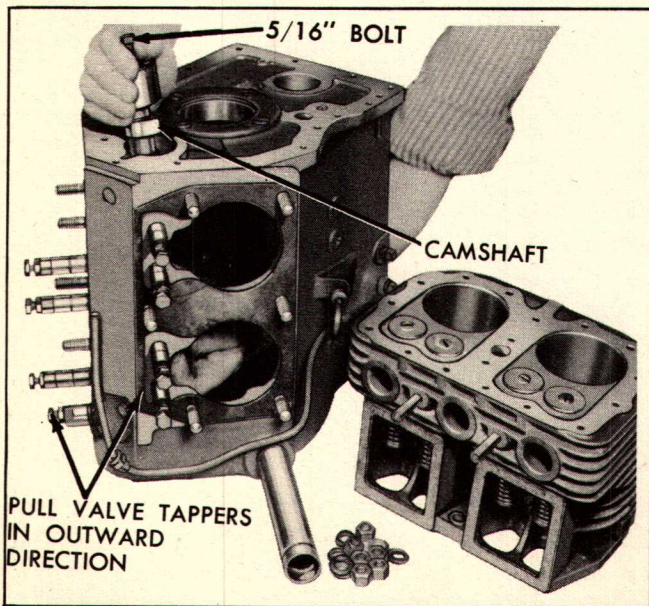


Fig. 40

replacing, be sure the spring and plunger are in place in the end of the camshaft, as these hold the camshaft in position end-wise. These parts are shown in the sectional view of the engine, Fig. 3.

VALVE TAPPERS

The valve tappers will drop out when the camshaft is removed. In reassembly, the tappers must of course be inserted in proper position in the crankcase before the camshaft is reassembled.

After the cylinders have been reassembled to crankcase the tappers should be adjusted to a clearance of .010 to .012 inch. See Fig. 41.

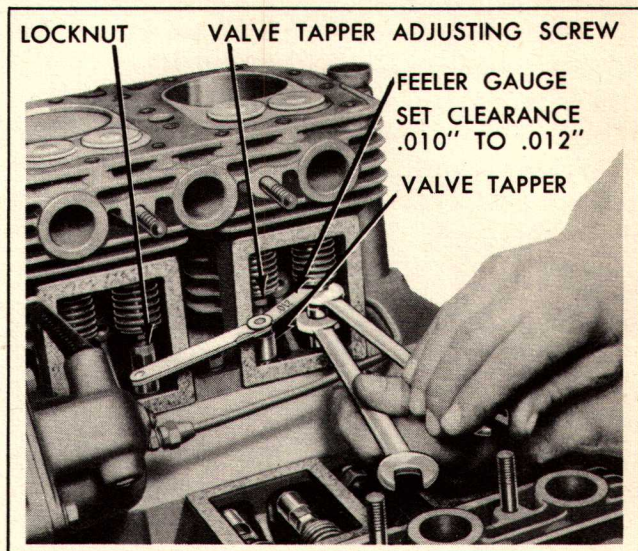


Fig. 41

GOVERNOR

The centrifugal flyball governor rotates on a stationary pin driven into the upper part of the timing gear cover, and the governor is driven off the camshaft gear at crankshaft speed.

The flyweights are hinged to lugs on the gear. Hardened pins on the flyweights bear against the flanged sliding sleeve, moving it back and forth as the flyweights move in or out. The motion of the sleeve is transmitted through a ball thrust bearing to the governor lever, which in turn is connected to the carburetor throttle lever. A spring connected to the governor lever tends to hold the governor flyweights to their inner position, also to hold the carburetor throttle open. As the engine speed increases the centrifugal force in the flyweights acts against the spring and closes

the throttle to a point where the engine speed will be maintained practically constant under varying load conditions. This speed can be varied to suit conditions by adjusting the governor spring to suit.

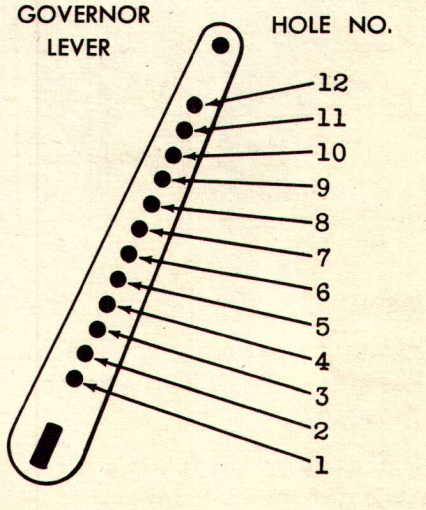
The connecting link between the governor and carburetor must be adjusted to the proper length otherwise the governor action will be faulty. With the engine at rest the governor spring will hold the flyweights "in", and the connecting link must be of such length as to hold the carburetor throttle wide open at that point. The accuracy of this adjustment can be tested by disconnecting the link from the governor lever, and then pushing the link toward the carburetor as far as it will go. This will open the throttle wide. The bent end of the link should then exactly register with the hole in the governor lever. If it does not, the link should be screwed into or out of the swivel block on the carburetor lever, until the above mentioned registry is attained. The link should then be again connected to the governor lever. If this adjustment is not made accurately the governor may cause the engine speed to surge or

otherwise be unsatisfactory.

The governor can be disassembled from the engine by first removing the governor housing, after which the entire governor can be withdrawn from the stationary pin. The construction of the governor can be best seen from the sectional drawing of the engine, Fig. 3.

The governor lever is furnished with 12 holes, as shown in the following table, for attaching the governor spring. It is very important that the spring is hooked into the proper hole to suit the speed at which the engine is operated. A table is given herewith showing the full load and no load speeds of the engine and the hole corresponding thereto. The full load speed will be from 150 to 125 revolutions less than the no load speed. As an example, if the engine is to be operated at 2150 revolutions per minute without load, the spring should be hooked into the 8th hole in the governor lever and the spring tension adjusted by means of the adjusting screw on the spring to run 2150 revolutions per minute. The speed at full load will then be approximately 2000 revolutions per minute.

LOAD R.P.M.	NO LOAD R.P.M.	Hole NO.
1400	1525	4
1500	1650	5
1600	1725	5
1700	1850	6
1800	1950	7
1900	2025	7
2000	2150	8
2100	2225	8
2200	2350	9
2300	2425	9
2400	2550	10
2500	2625	10
2600	2750	11



CLUTCH AND REDUCTION GEARS

FOR MODELS VE4 AND VF4 ENGINES

CLUTCH

The clutch furnished with Models VE4 and VF4 engines is of the disc type running in oil. Use the same grade of oil in the clutch as is used in the crankcase of the engine. The oil should be filled through the inspection plate opening, to the height of the oil level plug. Approximately a pint of oil is required. See Fig. 42

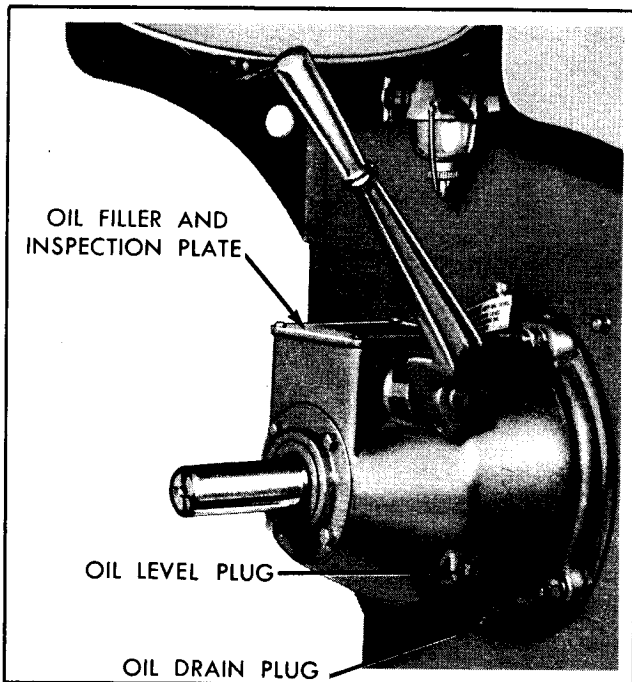


Fig. 42

CLUTCH ADJUSTMENT

If the clutch begins to slip it should be readjusted, otherwise it would become overheated and damaged.

First remove the clutch inspection plate. This will expose the notched adjusting collar. Release clutch engaging lever. Turn adjusting collar in clockwise direction with a screw driver or similar instrument. See Fig. 43. The collar should be turned one notch at a time until a definite pressure is felt on the clutch lever when clutch is being engaged. Then replace inspection plate, being careful that the gasket fits properly and is not broken.

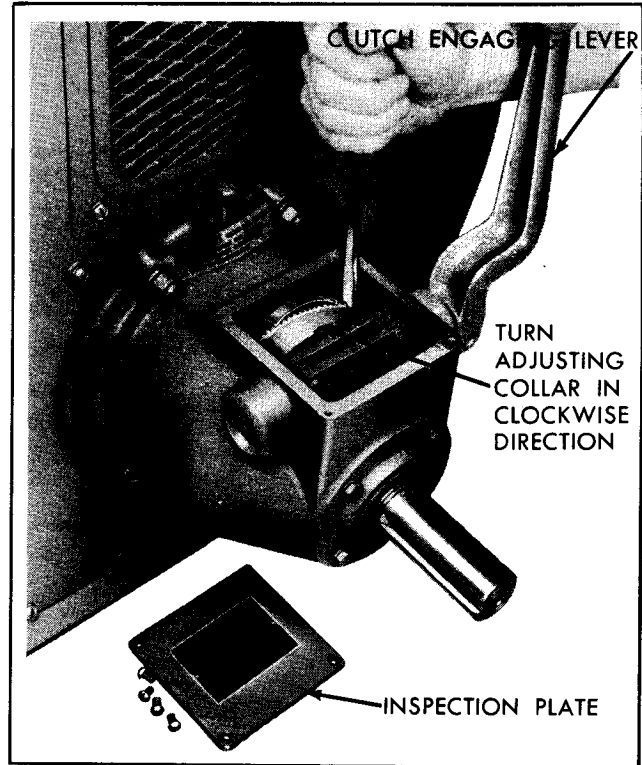


Fig. 43

On the clutch reduction gears, there is no inspection plate directly over the clutch. A pipe plug is furnished however and the clutch adjustment is made through the pipe plug hole. See Fig. 44.

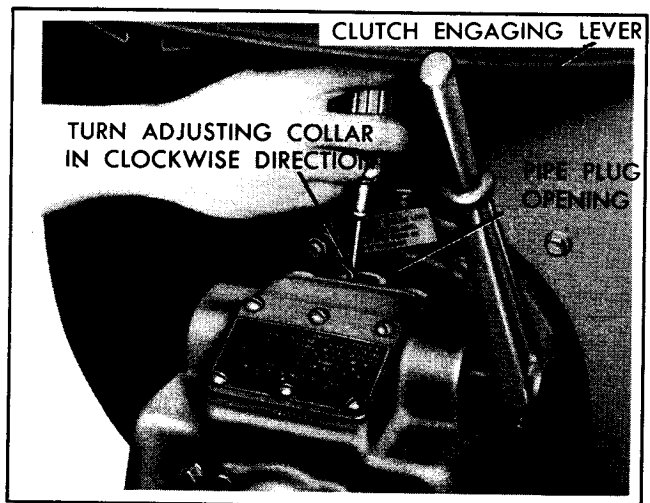


Fig. 44

REDUCTION GEARS

Reduction gears are furnished with several different ratios, some with spur gears, others with chains. All are of the same general design, except that some are furnished with clutches, others without. These reduction gears require the same grade of oil as is used in the crankcase of the engine. For various installations these gears are assembled to the engines in various positions. Several plugs are furnished on these reduction gears so that the lubrication may be properly taken care of regardless of the position of installation. For instance, there will always be one plug on top to be used for filling oil. There

will always be one plug below for draining oil, and there will be one plug on the side, slightly above the bottom, to be used as an oil level plug. See Fig. 45.

The oil should always be filled when the engine is at rest. When the oil becomes dirty it should be drained while the engine is hot and fresh oil added. The frequency at which these oil changes should be made depends entirely on the kind of service in which these gears are used, but even with light service the change should be made at least once every five hundred hours of operation, adding sufficient oil between changes to keep the oil up to the oil level plug.

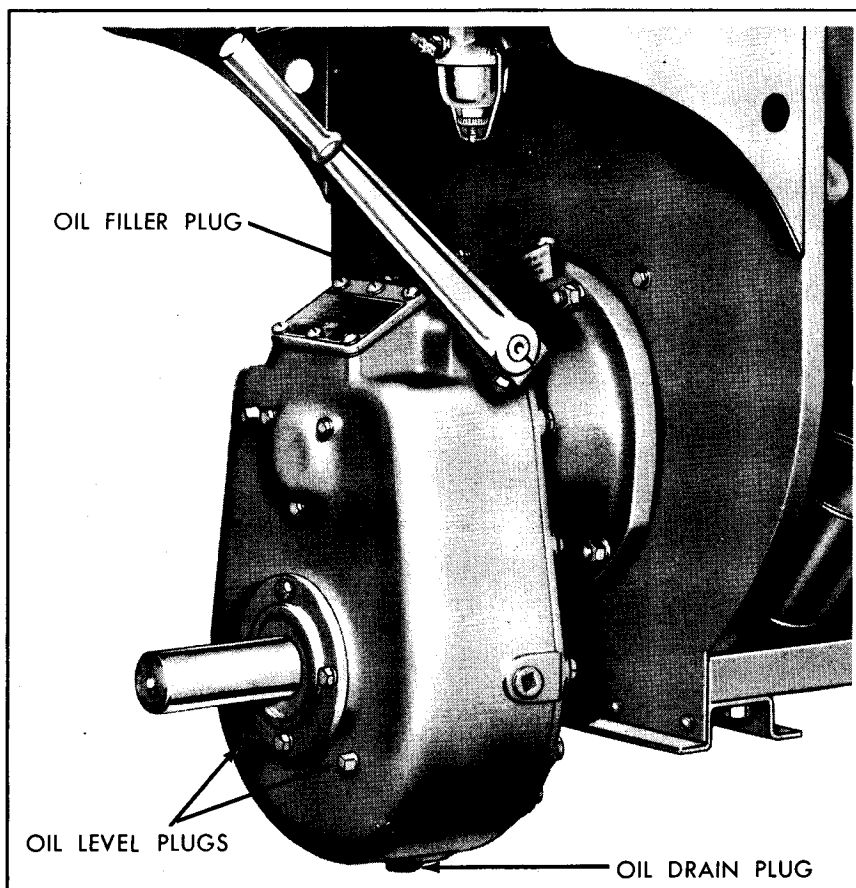


Fig. 45

SPECIAL INSTRUCTIONS FOR LAYING UP ENGINE FOR WINTER

When the season's work is completed, the following instructions should be carried out very carefully to protect the engine over winter.

The outside of the engine, including the cooling fins on the cylinders and heads, should be thoroughly cleaned of all dirt and other deposits.

The air cleaner at the carburetor intake should be thoroughly cleaned of all oil and accumulated dust and sediment removed from the oil cup at the bottom of the cleaner.

To protect the cylinders, pistons, rings, and valves and keep them from rusting and sticking, a half and half mixture of kerosene and good gas engine oil, (the same kind of oil as used in the crankcase of the engine), should be injected into the pet cock on the intake manifold while the engine is warm and running at moderate speed. About a quarter of a pint is necessary on a four cylinder engine, or enough so that a heavy bluish smoke will appear at the exhaust. The ignition switch should then be shut off and the engine stopped. This operation will give a coating of oil on the above mentioned parts, protecting them from the atmosphere.

On engines where there is no pet cock on the intake manifold, the kerosene and oil mixture may be injected into the air intake on the carburetor while the engine is running, so the mixture will be drawn into the engine. The air cleaner connection will of course have to be disconnected from the carburetor to do this.

All old used oil should be drained from the crankcase while the engine is warm, as the oil will then flow much more freely than when cold.

All exposed unpainted metal parts should be coated with grease or heavy oil.

Before starting the engine again the next season, the crankcase drain plug should again be removed, so that any condensation, which may have collected during the winter, may be drained before new crankcase oil is added.

A good plan, and one that is recommended, is to remove the crankcase bottom cover or oil base in the spring before starting the engine for the new season, and scrubbing off all sediment which may have collected there.

When replacing the bottom cover, a new gasket should be used.

BE SURE TO FILL THE CRANKCASE WITH A GOOD QUALITY OF CRANKCASE OIL TO THE HIGH LEVEL POINT, BEFORE STARTING THE ENGINE. DO NOT USE ANY OIL HEAVIER THAN SAE NO. 30. ALSO BE SURE TO PUT OIL TO THE PROPER LEVEL IN THE AIR CLEANER.

It is also recommended to use new spark plugs at the beginning of the new season, especially if the engine has given considerable service.

It is highly recommended that machines be stored inside a building through the winter. If this is not possible, the engine should be protected from snow and ice by a proper covering.

REPAIR PARTS PRICE LIST

READ THESE INSTRUCTIONS BEFORE ORDERING PARTS

THE MODEL, SPEC AND SERIAL NUMBER OF YOUR ENGINE,
SHOWN ON THE NAME PLATE ATTACHED TO THE AIR SHROUD,
MUST BE GIVEN WHEN ORDERING PARTS



TO INSURE PROMPT AND ACCURATE SERVICE, THE FOLLOWING
INFORMATION MUST BE GIVEN.

1. State exactly quantity of each part and part number.
2. State definitely whether parts are to be shipped by express, freight or parcel post.
3. Prices shown are F.O.B. Milwaukee and subject to change without notice.

SERVICE FACILITIES

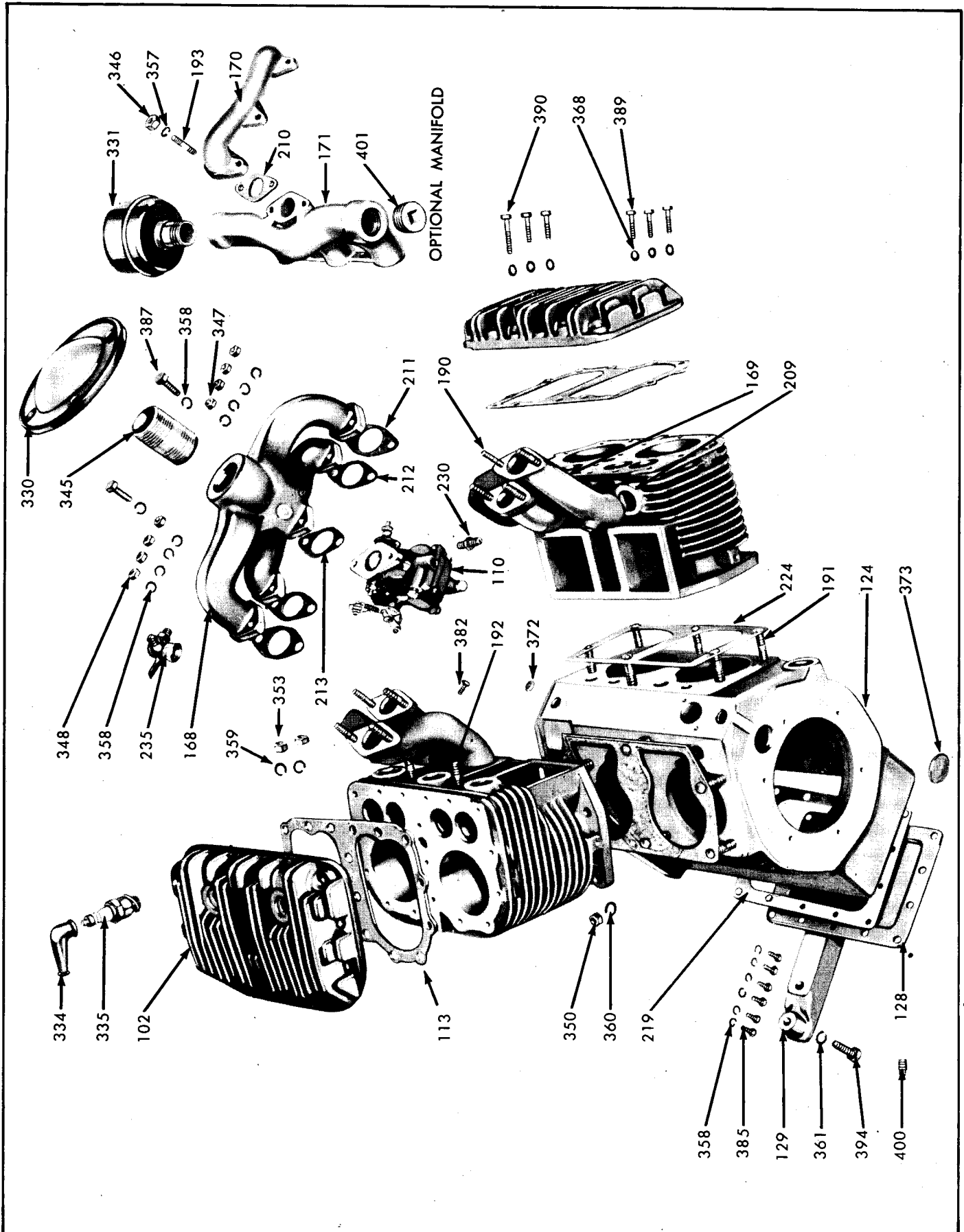
Approved engine service stations, located throughout the U. S. and foreign countries, have been carefully selected by the **WISCONSIN MOTOR CORPORATION** in order to assure complete and efficient repair and inspection service to owners of Wisconsin Air-Cooled Engines. These service stations, equipped and trained for complete engine repair, also stock parts to facilitate immediate delivery for all Wisconsin Air-Cooled Engines.

A DIRECTORY OF SERVICE STATIONS CAN BE FOUND IN THE BACK OF THIS MANUAL.

PARTS RETURNED FOR CREDIT

Before returning any parts, write a letter to the company from whom the parts were purchased, giving an exact list and description of the materials, why you wish to return them, whether for repairs, credit, or replacement, and also the model, specification and serial numbers of the engine from which the parts were taken. If authority is granted for their return, transportation charges must be prepaid and sender's name marked on the outside of the box or package.

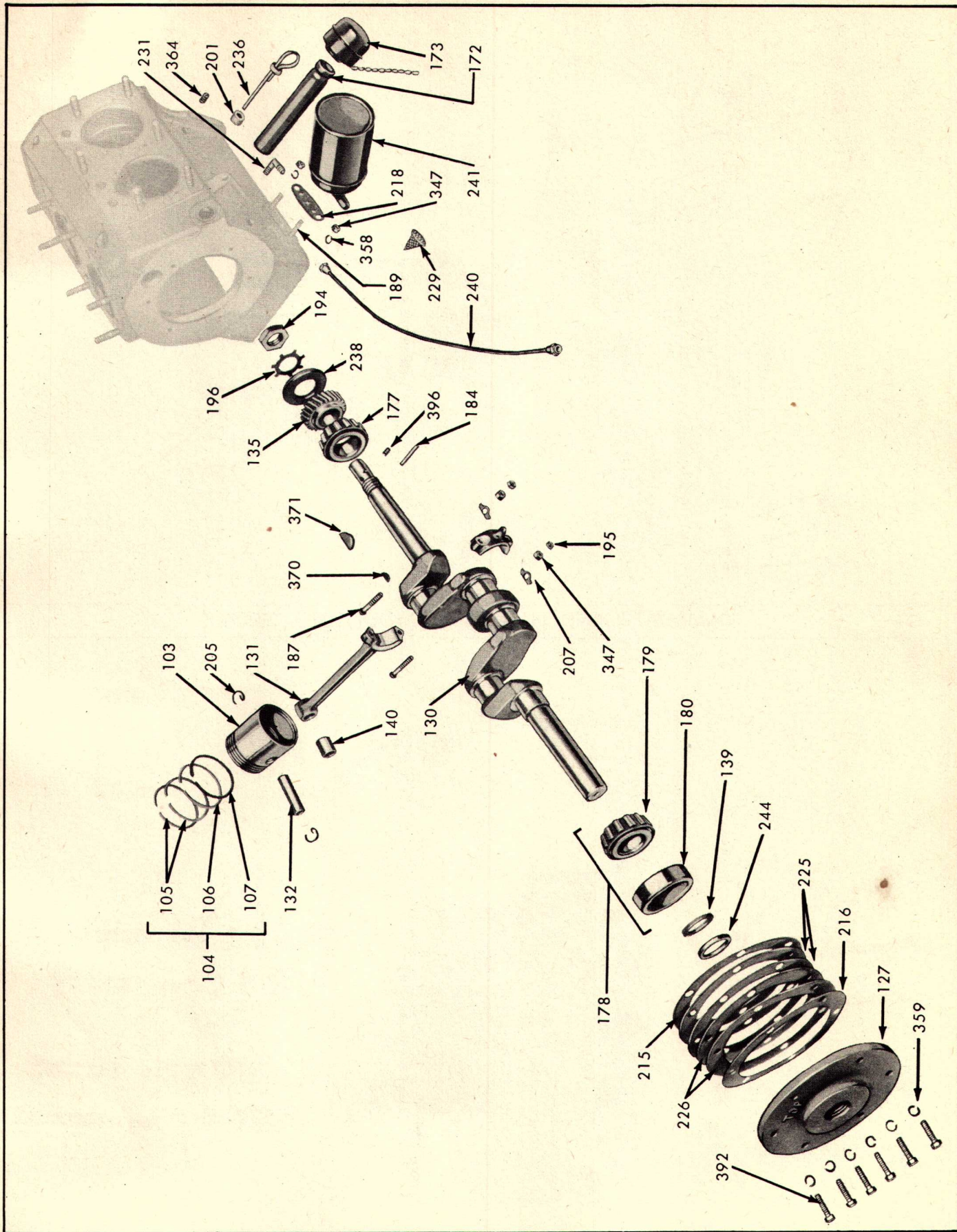
PARTS FOR MODELS VE4 AND VF4 ENGINES



MANIFOLD AND CRANKCASE GROUP

Parts are identified by reference number. See parts list for correct part number.

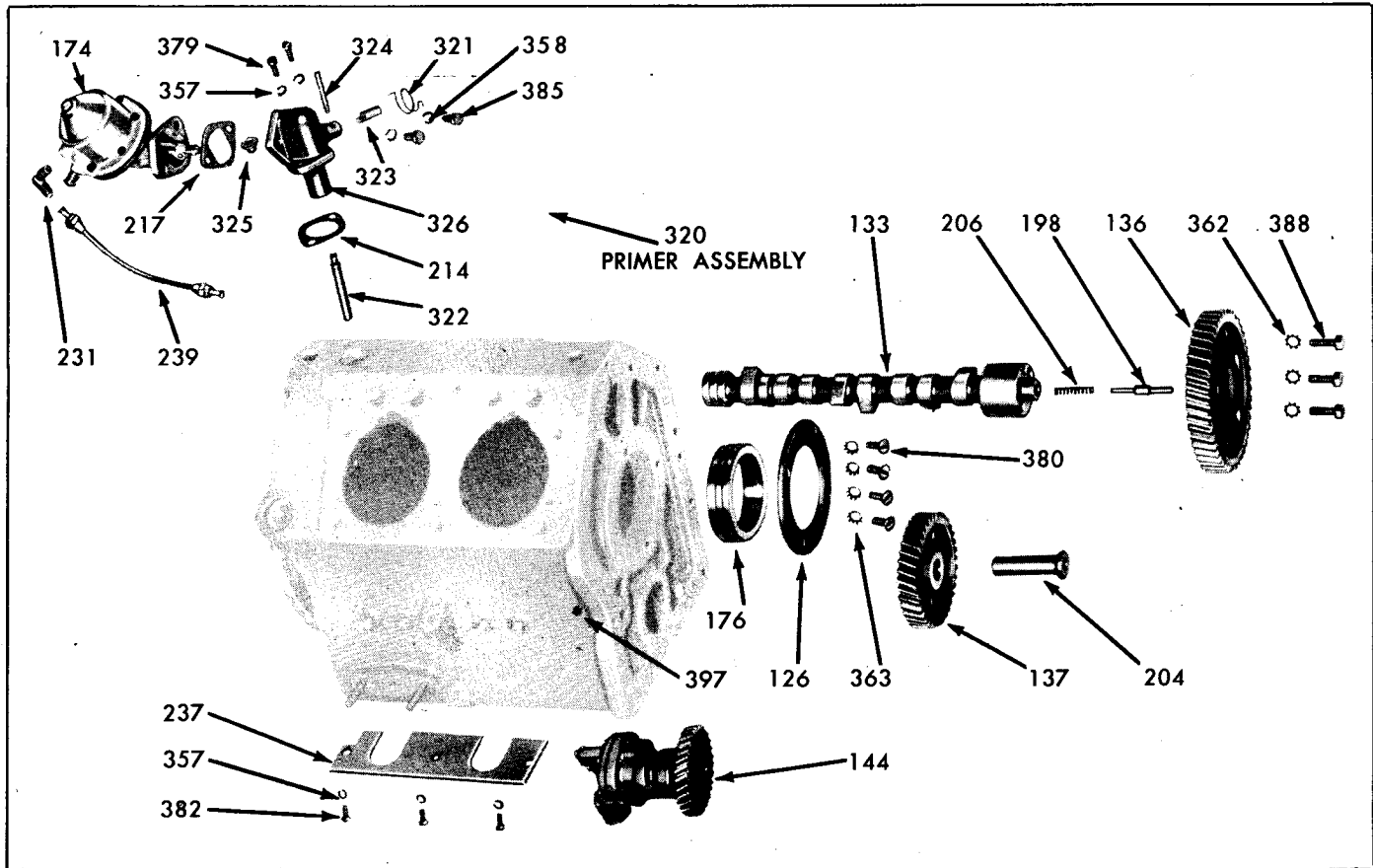
PARTS FOR MODELS VE4 AND VF4 ENGINES



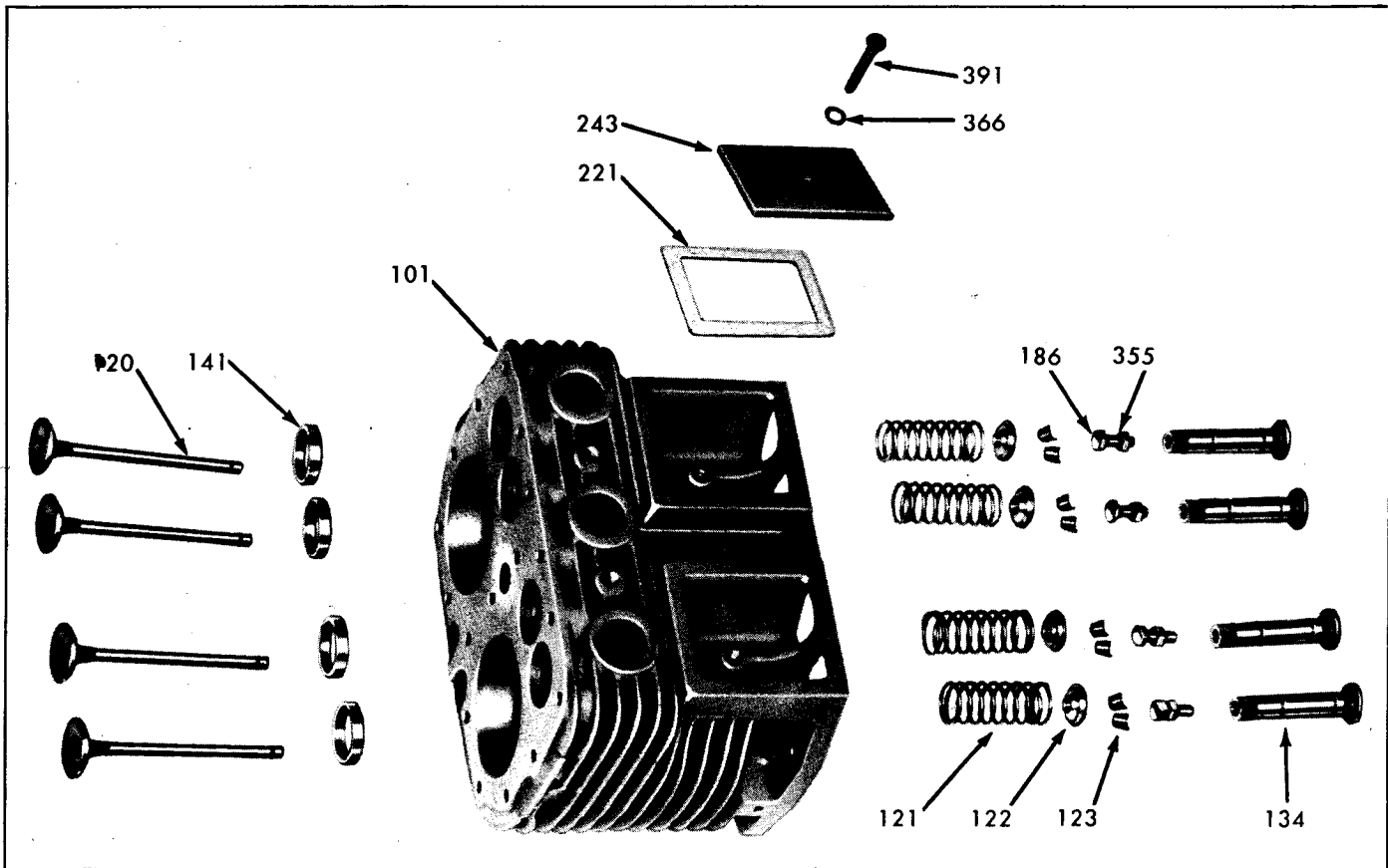
CRANKSHAFT, PISTON AND CONNECTING ROD GROUP

Parts are identified by reference number. See parts list for correct part number.

PARTS FOR MODELS VE4 AND VF4 ENGINES



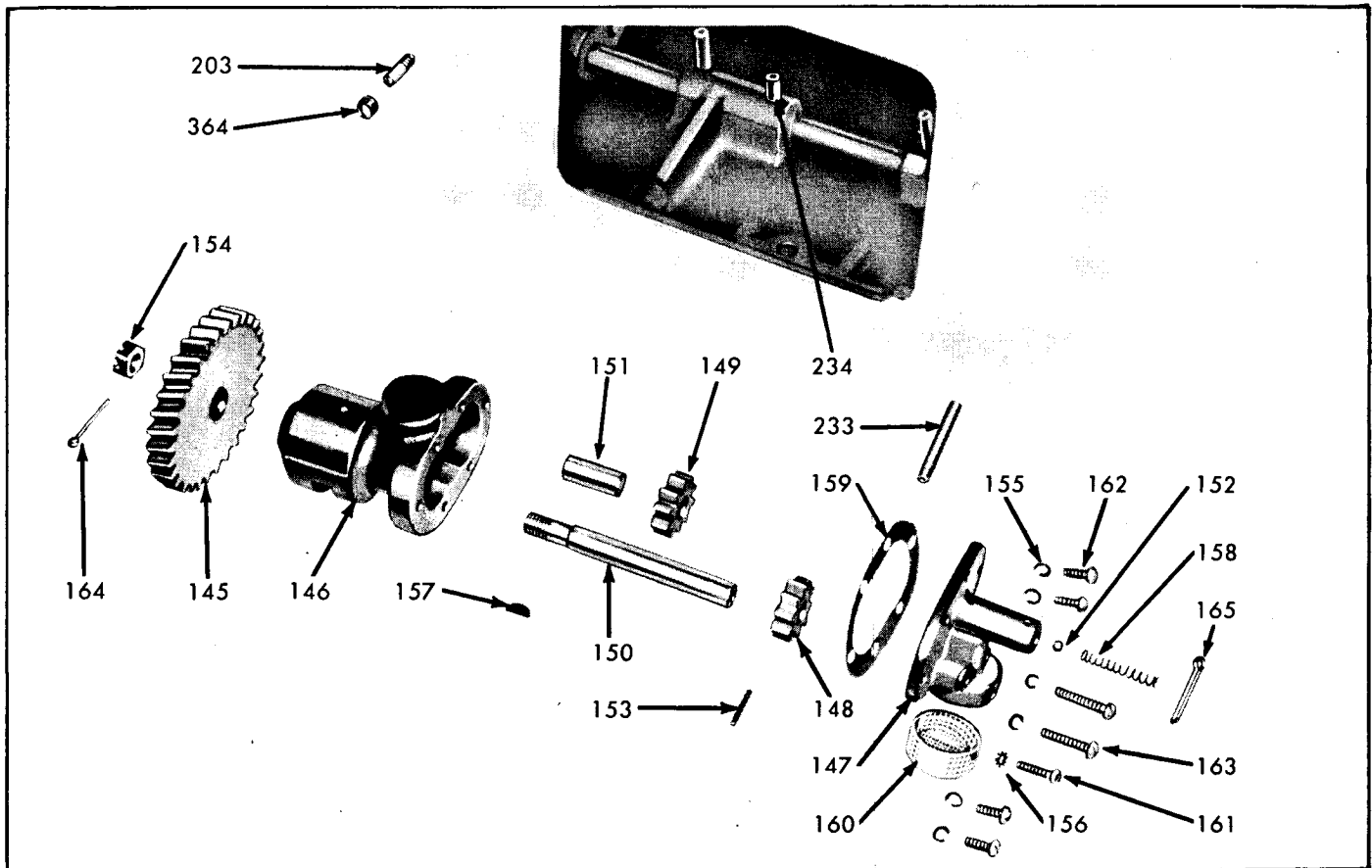
CAMSHAFT AND FUEL PUMP MOUNTING GROUP



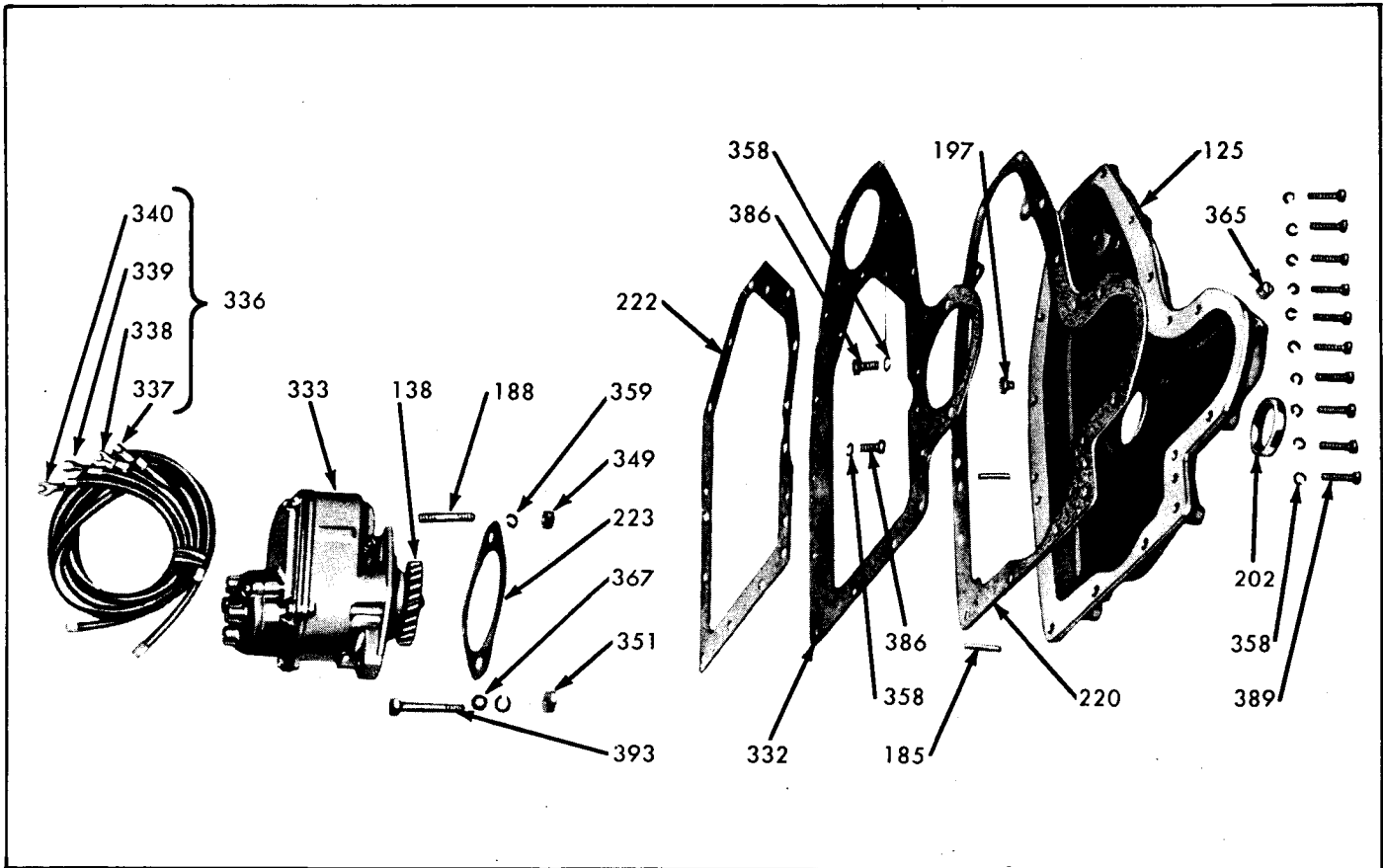
CYLINDER BLOCK ASSEMBLY

Parts are identified by reference number. See parts list for correct part number.

PARTS FOR MODELS VE4 AND VF4 ENGINES



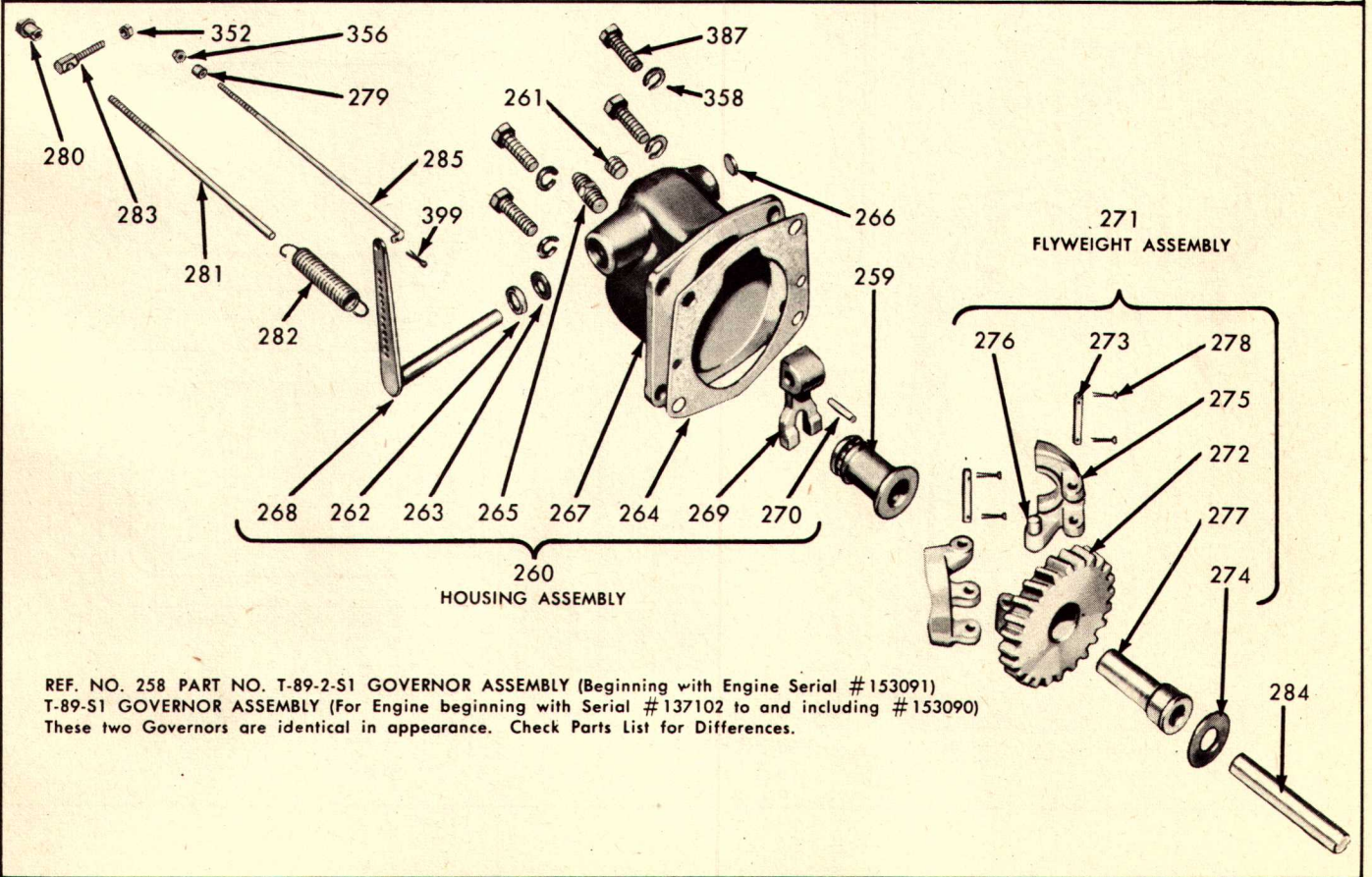
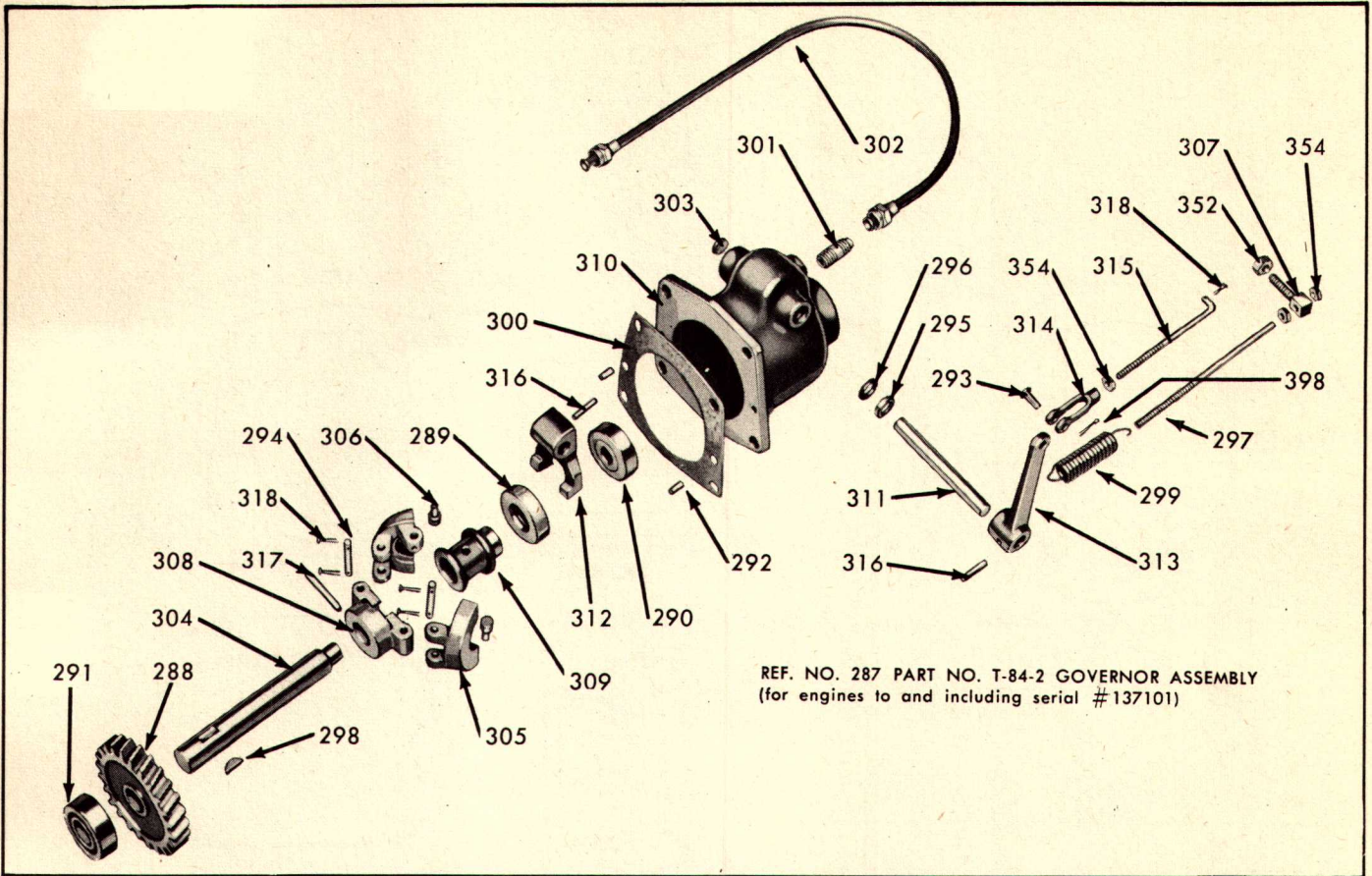
OIL PUMP ASSEMBLY



MAGNETO AND GEAR COVER GROUP

Parts are identified by reference number. See parts list for correct part number.

PARTS FOR MODELS VE4 AND VF4 ENGINES



GOVERNOR ASSEMBLY

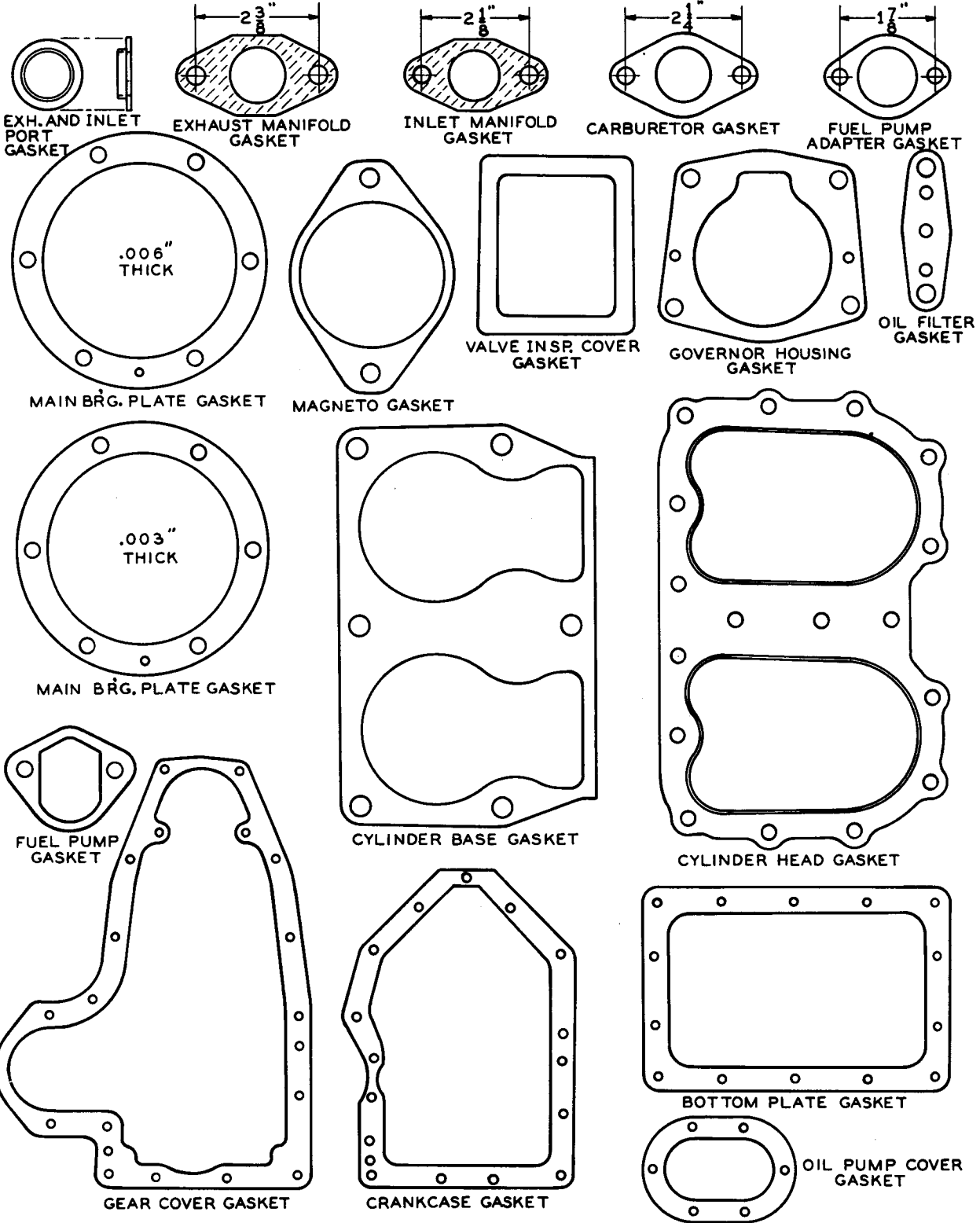
Parts are identified by reference number. See parts list for correct part number.

GASKET SET

REF N° 112

PART N° Q-10-B FOR VE4 ENGINE

PART N° Q-12-B FOR VF4 ENGINE



PARTS PRICE LIST
MODEL VF4—3" x 3¼"—4 CYLINDER STANDARD ENGINE

REF. NO.	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				LBS.	OZ.	
101	AA-85-S1	CYLINDER BLOCK ASSEMBLY—COMPLETE . . . Consisting of 1 AA-85 Cylinder block 4 AE-75-B Inlet and exhaust valves 4 AF-49-A Valve Springs 4 AG-26 Valve spring seats 4 AH-9 Seat locks 4 HG-201 Valve seat inserts 2 PC-369 Studs 2 PH-14-A Washers 2 QD-612-A Gaskets 2 SA-68 Plates 2 XD-22 Screws	2	31		\$33.92
	AA-85-S2	CYLINDER BLOCK WITH VALVE SEAT INSERTS Consisting of: 1 AA-85 Cylinder Block 4 HG-201 Valve seat inserts 2 PC-369 Studs		27		25.30
102	AB-80-E	CYLINDER HEAD	2	3	13	6.90
103	DB-187B-2	PISTON—STANDARD, ALUMINUM Pistons are also furnished .005", .010", .020", and .030" oversize	4		12	3.79
		SEMI-FINISHED PISTON				3.33
		NOTE: The suffix letter "I" in the Model "VE4I" designates cast iron pistons				
		DB-199 PISTON, CAST IRON When ordering a complete set of 4 pistons, order DB-187B-2 aluminum pistons		1	1	4.60
104	DR-12	PISTON RING SET—STANDARD Consisting of:	1		10	5.20
105	DC-163	Compression ring	8		1	.29
106	DC-163-1	Scraper ring	4		1	.36
107	DC-109	Oil ring	4		1	.36
		Piston rings and ring sets are also furnished .005", .010", .020", and .030" oversize				Same price

(continued)

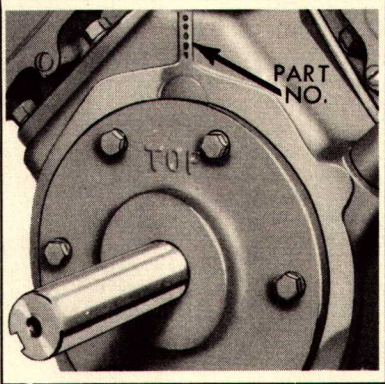
Order parts from nearest SERVICE STATION shown in directory following parts list.
IMPORTANT: Always give Model, Specification and Serial Numbers shown on name plate.

PARTS PRICE LIST
MODEL VF4—3" x 3 1/4"—4 CYLINDER STANDARD ENGINE

REF. NO.	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				LBS.	OZ.	
110	L-48	CARBURETOR—ZENITH MODEL 161-7, #0-10034.	1	2	15	\$ 18.97
		L-45-11 CARBURETOR—STROMBERG UC-7/8, #426026.....		3	8	18.97
		L-49 CARBURETOR—MARVEL-SCHEBLER #TSX-148.....		3	8	18.97
<p>NOTE: The VE4 engine is equipped with either a Zenith, Stromberg or Marvel-Schebler carburetor as shown above. See carburetor bulletins in back of manual for service replacement parts list.</p>						
112	Q-10-B	GASKET SET..... Consisting of: 6 QB-75 1 QD-595-A 2 QB-78 1 QD-610-A 2 QB-79 1 QD-611 1 QC-58-A 4 QD-612-A 1 QD-67 2 QD-613-B 2 QD-527-A 1 QD-614 1 QD-527-B 1 QD-615-A 1 QD-535 1 QD-616 1 QD-538-A 2 QD-617	1		8	2.92
113	QD-613-B	GASKET—CYLINDER HEAD.....	2		4	.36

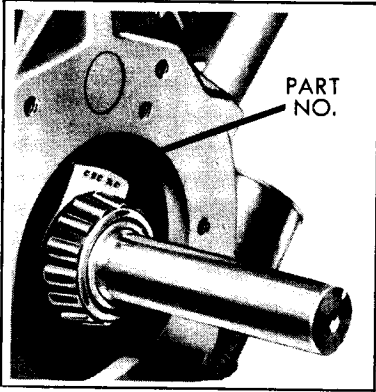
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PARTS INTERCHANGEABLE ON MODELS VE4 AND VF4

REF. NO.	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				LBS.	OZ.	
120	AE-75-B	VALVE—INLET AND EXHAUST	8		4	\$ 1.39
121	AF-49-A	VALVE SPRING	8		2	.23
122	AG-26	SEAT—VALVE SPRING	8		1	.17
123	AH-9	LOCK—VALVE SPRING SEAT	8pr		1	pr. .04
124	See Fig. 1	<p>CRANKCASE ASSEMBLY</p> <p>Consisting of:</p> <ul style="list-style-type: none"> 1 Crankcase 1 LJ-300-A Oil filler tube 2 PC-112 Studs 12 PC-337 Studs 7 PF-18 Pipe plugs 1 RC-91 Oil filler screen 1 RF-1128 Pipe 4 RF-1143 Spray nozzles 2 SA-26 Plugs 1 SA-58 Plug <p>NOTE: The part number of the crankcase is stamped on the case in the location shown in Fig. 1. ORDER BY THIS NUMBER and by giving the Model, Specification and Serial Number of the engine.</p>	1	60		35.65
						
		Fig. 1				
125	BD-100-C-2-S1	<p>GEAR COVER ASSEMBLY (BEGINNING WITH ENGINE SERIAL #153091)</p> <p>Consisting of:</p> <ul style="list-style-type: none"> 1 BD-100-C-2 Gear Cover 1 PF-25 Plug 1 PF-52 Button 1 PH-299 Oil seal 1 TC-388-1 Governor shaft <p>BD-100-C-4-S1 GEAR COVER ASSEMBLY (For engines to and including Serial #137101)</p> <p>BD-100-C-S1 GEAR COVER ASSEMBLY (Beginning with engine Serial #137102 to and including #153090)</p>	1	12		8.39
			1	12		8.05
			1	12		8.39
126	BG-209	PLATE BEARING RETAINER FLYWHEEL END	1		10	.75

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PARTS INTERCHANGEABLE ON MODELS VE4 AND VF4

REF. NO.	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				LBS.	OZ.	
127	BG-210-S1	MAIN BEARING PLATE ASSEMBLY TAKE-OFF END Consisting of: 1 BG-210 Bearing plate 1 HF-261 Cork Seal 1 SD-43 Cork retainer	1	7	2	\$ 3.33
128	BH-141-A	CRANKCASE BOTTOM COVER PLATE	1	1	8	1.49
129	BK-65	ENGINE SUPPORT	2	1	13	1.26
130	See Fig. 2	CRANKSHAFT ASSEMBLY	1	27		43.70
		Consisting of: 1 Crankshaft 1 GA-36-A Gear 1 ME-76 Bearing assembly 1 ME-114 Bearing assembly 1 PL-53 Key				
		<p>NOTE: The part number of the crankshaft will be found stamped on the cheek facing the take-off end of the shaft as illustrated in Fig. 2. ORDER BY THIS NUMBER and by giving the Model, Specification and Serial Number of the engine.</p>				
						
		Fig. 2				
131	DA-51-B-S1	CONNECTING ROD ASSEMBLY (Beginning with engine Serial #677075)..... Consisting of: 1 DA 51-B Connecting rod (Not furnished separately) 1 HG-157-A Bushing 2 PB-148 Bolts 2 PD-10 Nuts 2 PD-181 Palnuts 2 QA-114 Shims	4	1	7	6.67
		DA-51-A-S1 CONNECTING ROD (For engines to and including Serial #677074)..... Consisting of: 1 DA-51-A Connecting rod (Not furnished separately) 1 HG-157-A Bushing 2 PB-148 Bolts 2 PD-148 Nuts 2 QA-108-A Shims 2 XI-1 Cotter pins	4	1	7	6.67

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PARTS INTERCHANGEABLE ON MODELS VE4 AND VF4

REF. NO.	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				LBS.	OZ.	
		NOTE: DA-51-B-S1 and DA-51-A-S1 connecting rods are interchangeable and either one is used for service. Allowance on connecting rods in which bearings have been burned out, but which are otherwise complete, and in condition to be rebabbitted..... Connecting rods are also furnished .010", .020", and .030" undersize.....				\$3.39 Same price
132	DE-65	PISTON PIN—STANDARD..... Piston pins are also furnished .005", .010", .020" and .030" oversize.....	4	3		.57 Same price
133	EA-102	CAMSHAFT.....	1	3	8	5.75
134	FA-40-B	VALVE TAPPER.....	8	4		.83
135	GA-36-A	GEAR—CRANKSHAFT.....	1		14	2.53
136	GB-45-A	GEAR—CAMSHAFT.....	1	2	2	4.02
137	GC-27-B-1	GEAR—IDLER.....	1	1	6	3.33
138	GD-93-C	GEAR—MAGNETO.....	1		9	2.46
139	HF-261	SEAL—MAIN BEARING OIL—TAKE-OFF END....	1		1	.06
140	HG-157-A-1	BUSHING—PISTON PIN.....	4		1	.39
141	HG-201	INSERT—VALVE SEAT.....	8		1	.39
144	K-95-D	OIL PUMP ASSEMBLY..... This pump supersedes K-95 and K-95-A oil pump and is interchangeable. Parts shown with an engine serial number are not interchangeable and must be ordered accordingly. Consisting of:	1	3	13	14.49
145		GD-94-C OIL PUMP DRIVE GEAR.....	1		11	2.53
146		KA-61-A-1 BODY (Beginning with engine Serial #596951).....	1	1	15	5.17
		KA-61-A (Beginning with engine Serial #80147 to and including #596950).....	1	1	15	5.17
		KA-61 (To and including Serial #80146).....	1	1	15	5.17

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PARTS INTERCHANGEABLE ON MODELS VE4 AND VF4

REF. NO.	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				LBS.	OZ.	
147		KB-42 COVER (Beginning with engine Serial #596951) ..	1		11	\$ 1.35
		KB-39 (To and including Serial #596950)	1		6	.69
148		KC-56-1 DRIVER GEAR	1		1	.92
		KC-54-1 (Beginning with engine Serial #80147) Replaced by KC-56-1, interchangeable				
		KC-54 (To and including Serial #80146)	1		1	.92
149		KC-56-2 DRIVEN GEAR	1		1	.92
		KC-55-1 (Beginning with engine Serial #80147) Replaced by KC-56-2, interchangeable				
		KC-55 (To and including Serial #80146)	1		1	.92
150		KD-121 DRIVE SHAFT	1		4	.64
151		KD-122 STUB SHAFT	1		2	.16
152		ME-60 CHECK BALL, 1/4" DIA. STEEL	1		1	.03
153		PA-64 PIN, 1/8" DIA. x 3/4" LONG STEEL STRAIGHT	1		1	.03
154		PD-100-1 GEAR MOUNTING NUT	1		1	.11
155		PE-14 LOCKWASHER FOR COVER, #10 POSITIVE	6		1	.03
156		PE-45 LOCKWASHER FOR SCREEN, #10 EX- TERNAL	1		1	.03
157		PL-137 KEY, #1 WOODRUFF	1		1	.03
158		PM-111 SPRING FOR RELIEF VALVE	1		1	.03
159		QD-535 COVER GASKET	1		1	.03
160		RD-112-2 SCREEN (Beginning with engine Serial #596951)	1		1	.43
		RD-119 (To and including Serial #596950)	1		1	.18
161		XA-7 SCREW FOR SCREEN, #10-32 THREAD x 3/8" LONG STEEL ROUND HEAD	1		1	.03
162		XA-8 SCREW FOR COVER, #10-32 THREAD x 1/2" LONG STEEL ROUND HEAD	4		1	.03
163		XA-56 SCREW FOR COVER, #10-32 THREAD x 1 1/4" LONG STEEL ROUND HEAD	2		1	.06
164		XI-9 COTTER PIN FOR NUT. 3/32" x 1" LONG STEEL	1		1	.03
165		XI-16 COTTER PIN FOR VALVE, 1/8" x 1" LONG STEEL	1		1	.03
168	LD-227	MANIFOLD—UPPER BRANCH	1	6	1	4.60
169	LD-228	MANIFOLD—LOWER BRANCH	2	3	12	3.45
		Optional manifold with double exhaust outlet. (Furnished as standard equipment on engines to and in- cluding Serial #85815)				
170		LC-261-A INLET MANIFOLD	1	2		1.38
171		LD-226 EXHAUST MANIFOLD	2	4	8	3.68

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PARTS INTERCHANGEABLE ON MODELS VE4 AND VF4

REF. NO.	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				LBS.	OZ.	
172	LJ-300-A	TUBE—OIL FILLER	1		6	\$.32
173	LO-60-1	CAP—OIL FILLER AND BREATHER	1		6	.59
174	LP-38	FUEL PUMP, AC #1537421	1	1	11	10.35
		For all repairs contact AC Company, Flint, Mich. or their nearest service station.				
175	ME-71	MAIN BEARING ASSEMBLY—FLYWHEEL END..	1	1	14	6.81
		Consisting of:				
176		1 ME-69-1 Bearing cup—Timken #414			12	2.41
177		1 ME-71-1 Bearing cone—Timken #420		1	2	4.40
178	ME-114	MAIN BEARING ASSEMBLY—TAKE-OFF END...	1	3		6.09
		Consisting of:				
179		1 ME-114-1 Bearing cone—Timken #3382		2	4	3.91
180		1 ME-114-2 Bearing cup—Timken #3328			12	2.18
181	NC-140	FLYWHEEL—STANDARD	1	30		8.05
		NC-140-1 FLYWHEEL for engine with electric starter..	1	31		11.73
		Includes:				
		GH-44 Ring gear	1		13	2.99
		XE-17 Set screw, 1/4"—20 x 3/8" long, headless	3		1	.06
184	PA-239	PIN—STARTING CRANK	1		1	.03
185	PA-291	PIN—GEAR COVER DOWEL	2		1	.03
186	PB-147	SCREW—VALVE TAPPER ADJUSTING	8		1	.13
187	PB-148	BOLT—CONNECTING ROD	8		1	.13
188	PC-110	STUD—MAGNETO MOUNTING	1		1	.16
189	PC-112	STUD—OIL FILTER MOUNTING	2		1	.11
190	PC-171	STUD—LOWER TO UPPER MANIFOLD MOUNTING	8		1	.11
191	PC-337	STUD—CYLINDER BLOCK TO CRANKCASE MOUNTING	12		2	.20

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PARTS INTERCHANGEABLE ON MODELS VE4 AND VF4

REF. NO.	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				LBS.	OZ.	
192	PC-369	STUD—MANIFOLD TO CYLINDER BLOCK MOUNTING.....	4		1	\$.16
193	PC-405	STUD—INLET TO EXHAUST MANIFOLD..... For engines with LC-261-A and LD-226 manifolds.	4		1	.11
194	PD-123	NUT—FLYWHEEL MOUNTING.....	1		2	.43
195	PD-181	PALNUT—CONNECTING ROD BOLT, 5/16"-24..... NOTE: PD-181 palnut and PD-10, 5/16"-24 plain nut replace PD-148 slotted nut and cotter pin.	8		1	.03
196	PE-66	WASHER—FLYWHEEL LOCK.....	1		1	.04
197	PF-52	BUTTON—CAMSHAFT THRUST PLUNGER.....	1		1	.04
198	PF-101	PLUNGER—CAMSHAFT THRUST.....	1		1	.92
199	PG-314	CLIP—SPARK PLUG IGNITION CABLE.....	2		1	.09
200	PG-319-A	BRACKET—CHOKE CONTROL.....	1		2	.11
201	PH-245	WASHER—OIL LEVEL GAUGE CORK.....	1		1	.09
202	PH-299	OIL SEAL—CRANKSHAFT—FLYWHEEL END....	1		2	.92
203	PI-143-A	LOCKSCREW—OIL PUMP (Beginning with engine Serial #145636).....	1		1	.32
		PI-143 LOCKSCREW (To and including engine Serial #145635).....	1		1	.32
204	PJ-105	STUD—IDLER GEAR.....	1		5	2.07
205	PK-52	RING—PISTON PIN RETAINING.....	8		1	.11
206	PM-108	SPRING—CAMSHAFT THRUST PLUNGER.....	1		1	.52
207	QA-114	SHIM—CONNECTING ROD, .002" THICK..... (Beginning with engine Serial #677075, for DA-51-B-S1 connecting rod)	8		1	.04
		QA-108-A CONNECTING ROD SHIM, 1/8" THICK.. (To and including engine Serial #677074 for DA-51-A-S1 connecting rod).	8		1	.13

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PARTS INTERCHANGEABLE ON MODELS VE4 AND VF4

REF. NO.	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				LBS.	OZ.	
209	QB-75	GASKET—MANIFOLD TO CYLINDER BLOCK...	6		1	\$.13
210	QB-77	GASKET—INLET MANIFOLD, UPPER TO LOWER BRANCH. For engines with LC-261-A and LD-226 manifolds.	2		1	.03
211	QB-78	GASKET—EXHAUST MANIFOLD, UPPER TO LOWER BRANCH.....	2		1	.03
212	QB-79	GASKET—INLET MANIFOLD, UPPER TO LOWER BRANCH.....	2		1	.03
213	QC-58-A	GASKET—CARBURETOR FLANGE.....	1		1	.06
214	QD-67	GASKET—FUEL PUMP ADAPTER.....	1		1	.03
215	QD-527-A	GASKET—MAIN BEARING PLATE, .006" THICK..	2		1	.06
216	QD-527-B	GASKET—MAIN BEARING PLATE, .003" THICK..	1		1	.06
217	QD-538-A	GASKET—FUEL PUMP MOUNTING.....	1		1	.11
218	QD-595-A	GASKET—OIL FILTER MOUNTING.....	1		1	.03
219	QD-610-A	GASKET—CRANKCASE BOTTOM COVER PLATE	1		1	.13
220	QD-611	GASKET—GEAR COVER.....	1		1	.18
221	QD-612-A	GASKET—VALVE INSPECTION COVER PLATE..	4		1	.03
222	QD-614	GASKET—GEAR COVER SPACER TO CRANKCASE	1		1	.11
223	QD-616	GASKET—MAGNETO FLANGE.....	1		1	.04
224	QD-617	GASKET—CYLINDER BASE.....	2		1	.06
225	QF-33	SHIM—MAIN BEARING PLATE, .006" THICK....	2		1	.36
226	QF-33-A	SHIM—MAIN BEARING PLATE, .013" THICK....	2		1	.36
229	RC-91	SCREEN—OIL FILLER.....	1		1	.25

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PARTS INTERCHANGEABLE ON MODELS VE4 AND VF4

REF. NO.	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				LBS.	OZ.	
230	RF-269	FITTING—CARBURETOR FUEL LINE STRAIGHT	1		2	\$.11
231	RF-270	ELBOW—FUEL LINE..... 1—for fuel pump 1—for oil line to governor, in crankcase.	2		2	.34
233	RF-1128	PIPE—OIL FILTER OUTLET, IN CRANKCASE...	1		1	.23
234	RF-1143	NOZZLE—OIL SPRAY, SHORT (Beginning with engine Serial #615486)..... Previous to engine #615486 the following nozzles were used: RF-1121 LONG NOZZLES, FOR #1 AND #3 CYLINDER RODS..... RF-1143 SHORT NOZZLES, FOR #2 AND #4 CYLINDER RODS.....	4 2 2		1 1 1	.18 .46 .18
235	RG-12	PRIMING CUP—INLET MANIFOLD.....	1		2	.77
236	RJ-143	OIL LEVEL GAUGE WITH PH-245 CORK.....	1		2	.55
237	RK-167	PLATE—CRANKCASE SPLASH.....	2		3	.09
238	RK-170	SLING—CRANKCASE OIL.....	1		2	.06
239	RM-850-1	FUEL LINE—TUBING WITH NUTS, PUMP TO CARBURETOR.....	1		2	.57
240	RM-980	OIL LINE—TUBING WITH NUTS, CRANKCASE TO GOVERNOR.....	1		3	.69
241	RV-27-A	OIL FILTER—MICHIANA #18667..... NOTE: See illustration in back of parts list for service replacement parts of oil filter.	1	1	13	4.37
243	SA-68	PLATE—VALVE INSPECTION COVER.....	4		9	.09
244	SD-43	RETAINER—MAIN BEARING OIL SEAL CORK..	1		1	.09
245	SD-115-N	ENGINE INSTRUCTION AND NAME PLATE..... When ordering name plate, give Model, Specification Number and Serial Number for correct stamping.	1		1	.29
246	SE-20-B-3	SCREEN—FLYWHEEL SHROUD.....	1	1	2	2.09

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PARTS INTERCHANGEABLE ON MODELS VE4 AND VF4

REF. NO.	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				LBS.	OZ.	
247	SE-74	FLYWHEEL SHROUD, FOR STANDARD ENGINE AND POWER UNIT	1	11		\$ 8.05
		SE-74-A (With pad for mounting electric starter)	1	11	6	14.49
		SE-74-D (With pad for mounting air filter)	1	11	8	9.54
		SE-74-G (With pads for air filter and starter mounting)	1	11	14	13.80
248	SE-75-B	LOWER CYLINDER SHROUD—RIGHT HAND SIDE	1		14	1.33
249	SE-76-B	LOWER CYLINDER SHROUD—LEFT HAND SIDE	1		12	1.26
250	SE-77-A	CYLINDER HEAT DEFLECTOR—LEFT HAND SIDE	1		11	1.03
251	SE-77-B	CYLINDER HEAT DEFLECTOR—RIGHT HAND SIDE	1		14	1.03
252	SE-78-A	CYLINDER HEAD SHROUD—RIGHT HAND SIDE	1		14	.80
253	SE-79-A	CYLINDER HEAD SHROUD—LEFT HAND SIDE	1	1		.78
254	SE-80	COVER—FLYWHEEL SHROUD SIDE	1		4	.20
255	SE-82-B	REAR SHROUD COVER—LEFT HAND SIDE	1		15	1.44
256	SE-83-B	REAR SHROUD COVER—RIGHT HAND SIDE	1		15	1.44
258	T-89-2-S1	GOVERNOR ASSEMBLY (Beginning with engine Serial #153091)	1	3	3	12.42
		Consisting of:				
259		TC-391 Thrust sleeve and bearing	1		2	1.61
260		TC-395-S-1 Housing assembly	1	2	2	5.75
		Includes:				
261		PF-18 Pipe plug— $\frac{1}{8}$ " slotted	1		1	.06
262		PF-118 Cross shaft seal retainer	1		1	.03
263		PH-318-A Cross shaft seal	1		1	.04
264		QD-615-A Housing gasket	1		1	.03
265		RF-269-2 Straight fitting	1		1	.13
266		SA-52 Plug— $\frac{1}{2}$ " expansion	1		1	.06
267		TC-395 Housing	1	1	14	2.53
268		TC-398 Cross shaft and lever	1		2	.29
269		VB-151 Yoke	1		3	.50
270		XH-1 Pin for yoke—#0 x $\frac{3}{4}$ " long taper	1		1	.03

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PARTS INTERCHANGEABLE ON MODELS VE4 AND VF4

REF. NO.	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				LBS.	OZ.	
271		TC-405 FLYWEIGHT ASSEMBLY	1	1		\$ 5.06
		Includes:				
272		GD-100-A Gear	1		7	2.30
273		PA-265 Flyweight fulcrum pin	2		1	.33
274		PH-313-A Bushing washer	1		1	.04
275		TC-322-A Flyweight	2		3	.25
276		TC-328 Thrust pin	2		1	.25
277		TC-389-1 Gear bushing	1		2	.59
278		XI-33 Flyweight cotter pin	4		1	.03
		The following governor linkage parts are not included in the T-89-2-S1 governor assembly.				
279		HF-381 Control rod spacer	1		1	.11
280		PD-173-A Governor adjusting screw nut	1		1	.59
281		PI-115-F Governor adjusting screw	1		3	.62
282		PM-76 Governor spring	1		1	.44
283		TC-367 Adjusting screw pin	1		1	.50
284		TC-388-1 Governor drive shaft	1		3	.41
285		VE-464 Governor control rod	1		1	.34
	T-89-S1	GOVERNOR ASSEMBLY (Beginning with engine Serial #137102 to and including #153090)	1	3	3	12.42
		This governor is the same as T-89-2-S1 with the following exceptions:				
		TC-405-1 Flyweight assembly in place of TC-405		1		5.06
		TC-389 Gear bushing in place of TC-389-1			2	.59
		TC-388 Governor drive shaft in place of TC-388-1			3	.41
287	T-84-2	GOVERNOR ASSEMBLY (To and including engine Serial #137101)	1	6		21.27
		Consisting of:				
288		GD-95-A Governor gear	1		9	1.49
289		ME-100 Thrust bearing Nice #5774	1		6	1.26
290		ME-111 Housing bearing Nice #120	1		6	1.84
291		ME-112 Shaft bearing Nice #123	1		6	1.84
292		PA-294 Housing dowel pin	2		1	.03
293		PA-251 Yoke pin	1		1	.05
294		PA-265 Flyweight fulcrum pin	2		1	.33
295		PF-118 Cross shaft seal retainer	1		1	.03
296		PH-318 Cross shaft seal	1		1	.04
297		PI-115-B Adjusting screw	1		2	.57
298		PL-21 Gear key—Woodruff #3	1		1	.03
299		PM-76 Governor spring	1		1	.44
300		QD-615 Housing gasket	1		1	.03
301		RF-269-2 Straight fitting	1		1	.13
302		RM-980 Oil line to crankcase	1		4	.69
303		SA-52 Plug- 1/2" expansion	1		1	.06
304		TA-112 Drive shaft	1		6	.50

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PARTS INTERCHANGEABLE ON MODELS VE4 AND VF4

REF. NO.	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				LBS.	OZ.	
305		TC-322-A Flyweight	2		3	\$.25
306		TC-328 Thrust pin	2		1	.25
307		TC-330 Adjusting screw pin	1		1	.50
308		TC-346-B Flyweight hub	1		4	.32
309		TC-348 Thrust sleeve	1		2	1.03
310		TC-363 Housing	1	2		2.07
311		TC-364 Cross shaft	1		2	.13
312		VB-98A-2 Yoke	1		2	1.26
313		VB-132 Lever (Give engine serial number when ordering)	1		5	.59
314		VE-158-1 Control rod yoke	1		1	.48
315		VE-273-B-1 Control rod	1		1	.32
316		XH-2 Pin—#0 x 7/8" long, taper	2		1	.03
317		XH-9 Pin—#2 x 1 1/4" long, taper	1		1	.04
318		XI-33 Flyweight cotter pin	4		1	.03
320	TF-96	FUEL PUMP ADAPTER AND HAND PRIMER ASSEMBLY	1	1		3.68
		Consisting of:				
321		PM-145 Spring	1		1	.16
322		TA-111-1 Plunger (TA-116 must also be ordered) ...	1		1	.34
323		TA-114 Primer shaft	1		1	.73
324		TA-115 Handle	1		1	.09
325		TA-116 Cap	1		1	.25
326		TB-105-B ADAPTER (Beginning with engine Serial #347770)	1		13	1.72
		TB-105-B-1 (To and including engine Serial #347769) for engines without primer assembly	1		13	1.49
		NOTE: TB-105-B-1 adapter may be replaced with a complete adapter and hand primer assembly. See Ref. No. 320 Part No. TF-96.				
328	U-212	STARTING CRANK	1	1	7	1.95
329	VE-435	CONTROL—CARBURETOR CHOKE	1		4	.46
330	WD-26-A	MUFFLER—STANDARD (For 1 1/4" pipe tap)	1	2	1	1.95
331	WD-35	MUFFLER (For 1" pipe tap) used on engine with LD-226 manifolds	2		15	1.61
332	WE-182-A	SPACER—GEAR COVER (Beginning with engine Serial #137102)	1	2		1.72
		WE-182-A-1 (To and including engine Serial #137101) ..	1	2		1.72

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PARTS INTERCHANGEABLE ON MODELS VE4 AND VF4

REF. NO.	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				LBS.	OZ.	
333	Y-41-S1	MAGNETO—“FAIRBANKS-MORSE” #FM-JV4B7, with gear and ignition cables.....	1	7	8	\$37.37
		Y-37-C MAGNETO—“WICO” #J-1343, with gear and ignition cables.....	1	8		37.37
		NOTE: These engines are equipped with either a “Fairbanks-Morse” or “Wico” magneto as shown above. See magneto bulletins in back of manual for service replacement parts list.				
334	YD-12	NIPPLE—SPARK PLUG RUBBER.....	4		1	.23
335	YD-6	SPARK PLUG—CHAMPION #8 Com., 18 MM (or equivalent).....	4		2	On Req.
336	YL-100	SET OF MAGNETO IGNITION CABLES..... Consisting of:	1		8	3.40
337	YL-79	IGNITION CABLE TO NO. 1 CYLINDER.....	1		2	.73
338	YL-80	IGNITION CABLE TO NO. 2 CYLINDER.....	1		2	.82
339	YL-81	IGNITION CABLE TO NO. 3 CYLINDER.....	1		2	.87
340	YL-82	IGNITION CABLE TO NO. 4 CYLINDER.....	1		2	.98
STANDARD HARDWARE						
NOTE: The following pins, nuts, capscrews, washers and etc. are of a common hardware variety and can be purchased from local plumbing, hardware or accessory stores.						
345	LJ-280	NIPPLE, 1¼" x 2¼" long, W. I. PIPE..... For muffler mounting.	1		5	.20
346	PD-9	NUT, ¼"-28 thread, hexagon steel..... For mounting LD-226 manifold.	4		1	.03
347	PD-10	NUT, 5/16"-24 thread, hexagon steel..... 2-for oil filter mounting. 4-for inlet manifold studs. 8-for connecting rod bolts.	14		1	.03
348	PD-10-A	NUT, 5/16"-24 thread, hexagon brass..... For exhaust manifold studs.	4		1	.06
349	PD-11	NUT, 3/8"-24 thread, hexagon steel..... For magneto stud.	1		1	.03
350	PD-12	NUT, 7/16"-20 thread, hexagon steel..... For mounting cylinder block to crankcase.	12		1	.03

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**PARTS INTERCHANGEABLE ON
MODELS VE4 AND VF4 STANDARD HARDWARE**

REF. NO.	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				LBS.	OZ.	
351	PD-76	NUT, $\frac{3}{8}$ "-16 thread, hexagon steel..... For magneto mounting screw.	1		1	\$.10
352	PD-77	NUT, $\frac{1}{4}$ "-20 thread, hexagon steel..... For governor adjusting screw pin.	1		1	.03
353	PD-109	NUT, $\frac{3}{8}$ "-24 thread, hexagon brass..... For manifold to cylinder block studs.	4		1	.06
354	PD-115	NUT, #10-32 thread, hexagon steel..... 2-for governor adjusting screw. 1-for governor control rod (T-84-2 Governor).	3		1	.03
355	PD-141	NUT, $\frac{5}{16}$ "-24 thread, hexagon steel jam nut..... For valve taper adjusting screw.	8		1	.03
356	PD-155	NUT, #5-40 thread, hexagon steel..... For governor control rod—carburetor end.	1		1	.03
357	PE-3	LOCKWASHER, $\frac{1}{4}$ " POSITIVE..... 2—for mounting fuel pump adaptor. 6—for crankcase splash plates. 6—for flywheel screen. 4—for LD-226 exhaust manifold. 33—for air shrouding.	51		1	.03
358	PE-4	LOCKWASHER, $\frac{5}{16}$ " POSITIVE..... 14—for crankcase bottom cover plate. 6—for flywheel shroud to gear cover. 17—for gear cover and spacer. 4—for governor housing. 2—for fuel pump. 2—for carburetor. 2—for oil filter. 8—for lower to upper manifold.	55		1	.03
359	PE-5	LOCKWASHER, $\frac{3}{8}$ " POSITIVE..... 4—for mounting manifold to cylinder. 6—for main bearing plate—take-off end. 2—for magneto.	12		1	.03
360	PE-6	LOCKWASHER, $\frac{7}{16}$ " POSITIVE..... For cylinder block to crankcase.	12		1	.03
361	PE-7	LOCKWASHER, $\frac{1}{2}$ " POSITIVE..... For engine supports to crankcase.	4		1	.03

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**PARTS INTERCHANGEABLE ON
MODELS VE4 AND VF4 STANDARD HARDWARE**

REF. NO.	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				LBS.	OZ.	
362	PE-46	LOCKWASHER, $\frac{5}{16}$ " external "Everlock" For mounting camshaft gear.	3		1	\$.03
363	PE-49	LOCKWASHER, $\frac{5}{16}$ " countersunk "Everlock" For bearing retainer plate—flywheel end.	4		1	.03
364	PF-18	PIPE PLUG, $\frac{1}{8}$ " SLOTTED 1—for oil hole to pump. 4—for oil spray nozzles. 1—for oil pump lockscrew hole. 1—for oil header.	7		1	.06
365	PF-25	PIPE PLUG, $\frac{3}{8}$ " SLOTTED For gear cover.	1		2	.16
366	PH-14	PLAIN WASHER, $\frac{5}{16}$ " COPPER For valve inspection cover plate.	4		1	.06
367	PH-22-A	PLAIN WASHERS, $\frac{3}{8}$ " STEEL For magneto mounting screw.	1		1	.03
368	PH-77-A	PLAIN WASHER, $\frac{5}{16}$ " STEEL For mounting cylinder heads.	34		1	.03
370	PL-53	KEY, NO. 8 WOODRUFF For crankshaft gear.	1		1	.03
371	PL-83	KEY, NO. 23 WOODRUFF For mounting flywheel.	1		2	.13
372	SA-26	PLUG, $\frac{5}{8}$ " EXPANSION For camshaft bearing oil hole.	2		1	.04
373	SA-58	PLUG, $1\frac{3}{8}$ " EXPANSION For camshaft end hole.	1		1	.04
375	XA-33	SCREW, $\frac{1}{4}$ "-20 THREAD x $\frac{3}{8}$ " long, round head 6—for flywheel screen. 4—for lower cylinder shroud, L. and R. sides. 2—for cylinder heat deflector, R.H. side. 12—for cylinder head shrouds. 3—for air shroud side cover. 2—for rear shroud cover.	29		1	.03
376	XA-36	SCREW, $\frac{1}{4}$ "-20 THREAD x $\frac{3}{4}$ " long, round head For rear shroud cover, top holes.	2		1	.03

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**PARTS INTERCHANGEABLE ON
MODELS VE4 AND VF4 STANDARD HARDWARE**

REF. NO.	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				LBS.	OZ.	
377	XA-65	SCREW, #8 x 1/2" long, self tapping, sheet metal For mounting choke bracket.	3		1	\$.03
378	XA-67	SCREW, #4 x 1/4" long, self tapping, sheet metal For mounting name and instruction plate.	4		1	.03
379	XB-75	SCREW, 1/4"-20 THREAD x 3/4" long, Allen head cap-screw For mounting fuel pump adapter.	2		1	.11
380	XC-17	SCREW, 5/16"-18 THREAD x 3/4" long, flat head For bearing retainer plate—flywheel end.	4		1	.11
381	XD-3	SCREW, 1/4"-20 THREAD x 3/8" long, hexagon head For lower cylinder shrouds.	4		1	.03
382	XD-4	SCREW, 1/4"-20 THREAD x 1/2" long, hexagon head 6—for mounting splash plates. 1—for exhaust manifold, R.H. side. 4—for cylinder heat deflector.	11		1	.03
383	XD-6	SCREW, 1/4"-20 THREAD x 3/4" long, hexagon head For cylinder heat deflectors, L.H. side.	2		1	.03
384	XD-13	SCREW, 5/16"-18 THREAD x 1/2" long, hexagon head For flywheel shroud mounting.	6		1	.06
385	XD-14	SCREW, 5/16"-18 THREAD x 5/8" long, hexagon head 14—for crankcase bottom cover plate. 2—for mounting fuel pump.	16		1	.06
386	XD-15	SCREW, 5/16"-18 THREAD x 3/4" long, hexagon head 5—for mounting spacer to crankcase. 2—for mounting spacer to gear cover.	7		1	.06
387	XD-16	SCREW, 5/16"-18 THREAD x 7/8" long, hexagon head 2—for mounting carburetor. 4—for mounting governor housing.	6		1	.06
388	XD-17	SCREW, 5/16"-18 THREAD x 1" long, hexagon head For mounting camshaft gear.	3		2	.06
389	XD-19	SCREW, 5/16"-18 THREAD x 1 1/4" long, hexagon head 10—for mounting gear cover. 30—for mounting cylinder heads.	40		2	.06

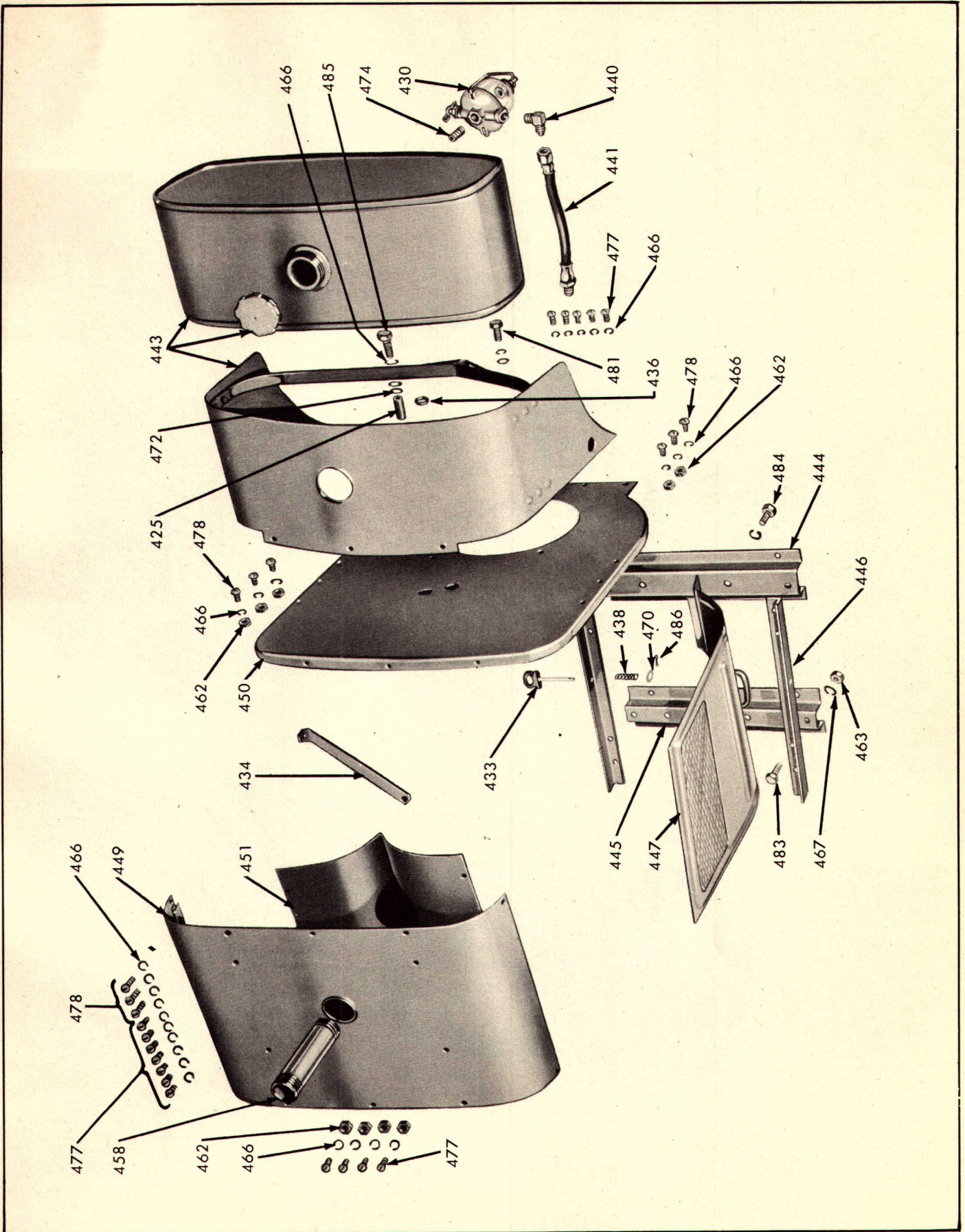
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MODELS VE4 AND VF4 STANDARD HARDWARE**

REF. NO.	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				LBS.	OZ.	
390	XD-21	SCREW, $\frac{5}{16}$"-18 THREAD x $1\frac{1}{2}$" long, hexagon head.. For mounting cylinder heads.	4		2	\$.08
391	XD-22	SCREW, $\frac{5}{16}$"-18 THREAD x $1\frac{3}{4}$" long, hexagon head.. For valve inspection cover plate.	4		2	.13
392	XD-29	SCREW, $\frac{3}{8}$"-16 THREAD x $1\frac{1}{4}$" long, hexagon head.. For main bearing plate—take-off end.	6		2	.06
393	XD-33	SCREW, $\frac{3}{8}$"-16 THREAD x $2\frac{1}{4}$" long, hexagon head.. For mounting magneto (Lower half).	1		2	.09
394	XD-43	SCREW, $\frac{1}{2}$"-13 THREAD x $1\frac{1}{2}$" long, hexagon head.. For mounting engine supports.	4		2	.09
396	XE-17	SCREW, $\frac{1}{4}$"-20 THREAD x $\frac{3}{8}$" long, headless set.... For cranking pin.	1		1	.06
397	XE-55	SCREW, $\frac{5}{16}$"-18 THREAD x $\frac{3}{8}$" long, Allen head set.. For mounting idler stud.	1		1	.11
398	XI-1	COTTER PIN, $\frac{1}{16}$" x $\frac{1}{2}$" long..... For governor yoke pin (T-84-2 governor).	1		1	.03
399	XI-32	COTTER PIN, $\frac{3}{64}$" x $\frac{3}{8}$" long..... For governor control rod.	1		1	.03
400	XK-3	PLUG, $\frac{3}{8}$" PIPE, square head..... For oil drain.	1		1	.13
401	XK-12	PLUG, 1" PIPE, countersunk head..... For LD-226 exhaust manifold.	2		2	.23

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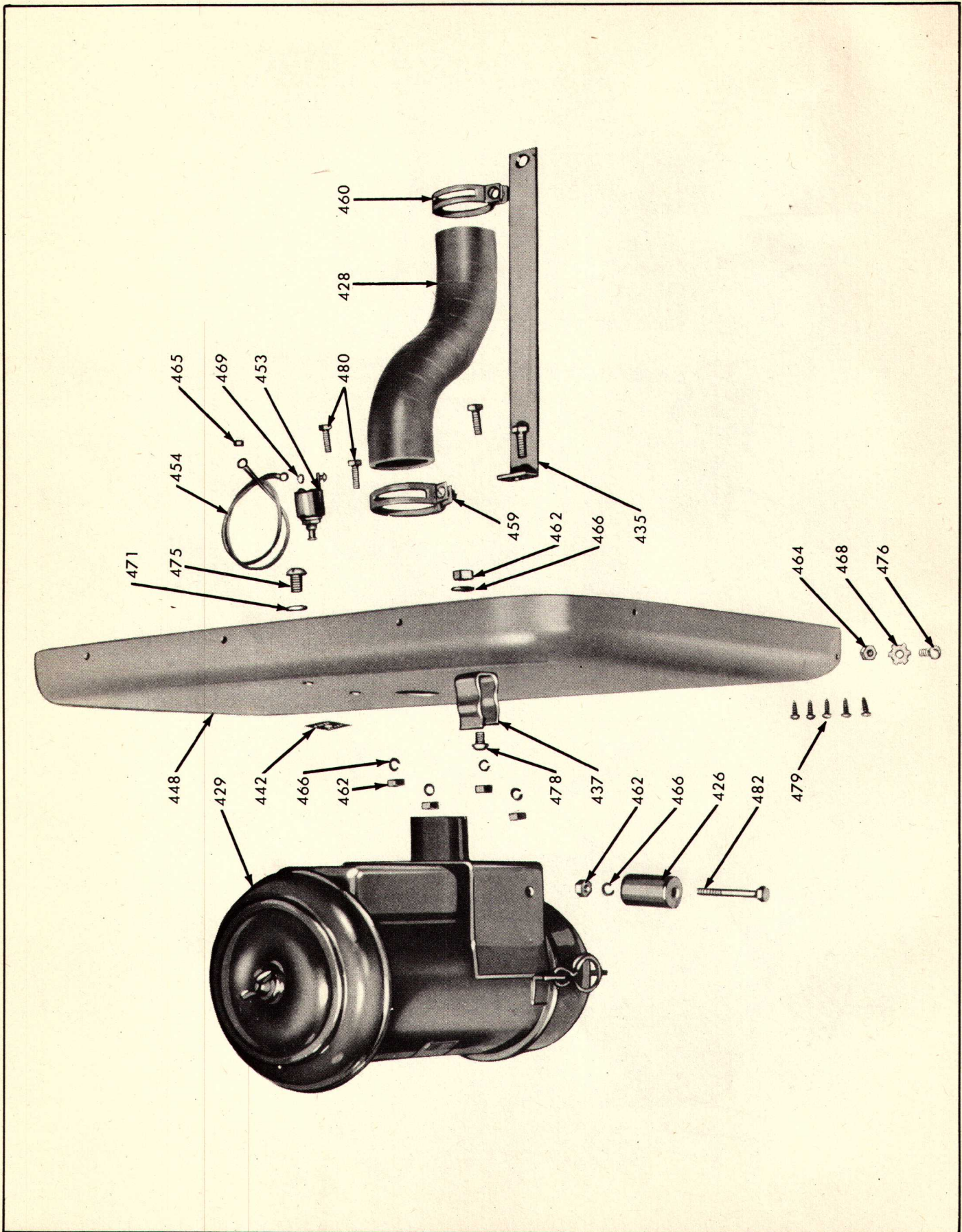
HOUSE PARTS FOR MODELS VE4 AND VF4 ENGINES



ENGINE HOUSE WITH FUEL TANK AT TAKE-OFF END

Parts are identified by reference number. See parts list for correct part number.

HOUSE PARTS FOR MODELS VE4 AND VF4 ENGINES



END PANEL AND AIR FILTER FOR ENGINE HOUSE WITH FUEL TANK AT TAKE-OFF END

Parts are identified by reference number. See parts list for correct part number.

VE4 AND VF4 ENGINE HOUSE WITH FUEL TANK AT TAKE-OFF END

REF. NO.	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				LBS.	OZ.	
425	HF-380	SPACER—rear panel to cylinder block	1	1		\$.18
426	HF-387	SPACER—crank mounting	1	3		.41
428	LL-64	RUBBER ELBOW—air filter to carburetor	1	8		.94
429	LO-66	AIR FILTER—oil bath	1	6		13.22
		United Specialties #CT50-10505.				
430	LP-19	FUEL STRAINER—Tillotson #OW-418	1	12		1.52
		NOTE: See illustration in back of manual for service parts list of fuel strainer.				
433	PG-323	CLIP-DOOR	2	3		.34
434	PG-401	HOUSE BRACE—take-off end	1	6		.41
435	PG-402	HOUSE BRACE—flywheel end	1	7		.34
436	PH-198	GROMMET—fuel line	1	1		.32
437	PK-87	SPRING CLIP—crank mounting	1	1		.23
438	PM-137	SPRING—door clip	2	1		.06
440	RF-270	ELBOW—fuel strainer outlet	1	1		.34
441	RM-1049-A	FUEL LINE—tank to carburetor	1	2		.92
442	SD-108	TAG—ignition switch	1	1		.06
443	WE-192	FUEL TANK ASSEMBLY	1	17	8	15.52
		Consisting of:				
		Support and straps (Not furnished separately)				
		RC-92-1 Cap	1		8	1.49
		WE-192-4 Tank (Furnished with cap)	1	7		13.34

(continued)

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VE4 AND VF4 ENGINE HOUSE WITH FUEL TANK AT TAKE-OFF END

REF. NO.	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				LBS.	OZ.	
444	WE-193-A	ENGINE SUPPORT—take-off end	1	3	1	\$ 1.26
445	WE-194-A	ENGINE SUPPORT—flywheel end	1	2	9	1.03
446	WE-195	SIDE RAILS	2	1	8	.52
447	WE-196	HOUSE DOORS (Standard)	2	4	8	2.76
		WE-196-A (Bumped out to clear distributor) For units with generator and distributor on left hand side of engine	1	4	8	4.02
448	WE-197	FRONT PANEL (Standard)	1	4	4	4.71
		WE-197-2 (With additional holes for switch and ammeter) For units with electric starting.	1	4	4	5.75
449	WE-198-A-1	CANOPY (Beginning with engine Serial #84249)	1	4	5	4.83.
		WE-198 canopy (To and including engine Serial #84248) ..	1	4	5	4.83
450	WE-199-A	REAR PANEL	1	7	9	7.47
451	WE-218	PARTITION PLATE (Beginning with engine Serial #84249)	1	1	14	1.84
		WE-200 plate (To and including engine Serial #84248)	1	1	14	1.49
453	YC-9-A	IGNITION SWITCH	1		2	.50
454	YL-63	IGNITION WIRE—switch to magneto	1		1	.66
STANDARD HARDWARE						
458	LJ-188	NIPPLE, 1¼" x 6" long, W.I. pipe	1		12	.58
		For muffler mounting.				
459	LK-8	HOSE CLAMP, 2½" I.D.	1		1	.10
		For air filter connection, filter end.				
460	LK-11	HOSE CLAMP, 1⅞" I.D.	1		1	.10
		For air filter connection, carburetor end.				

(continued)

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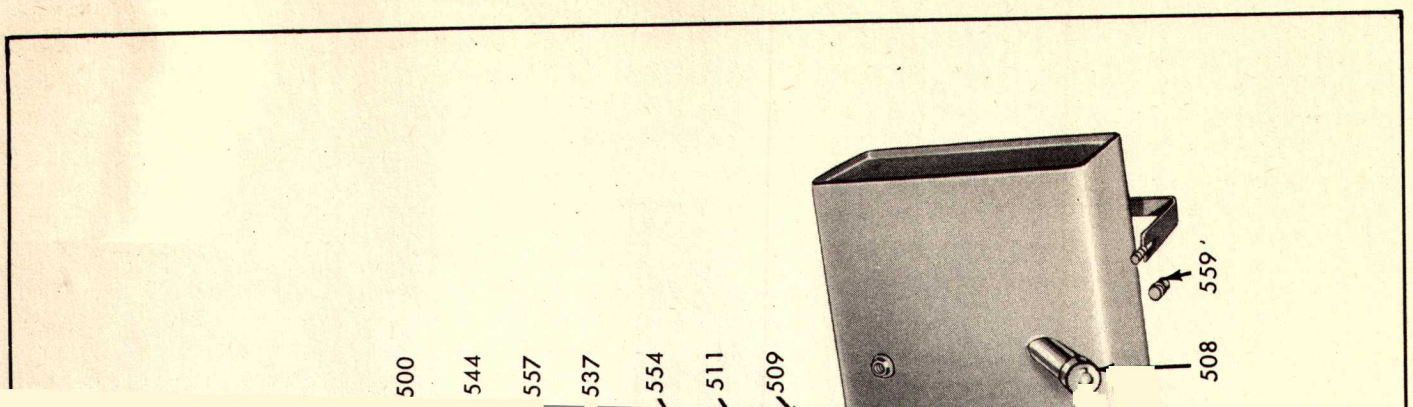
VE4 AND VF4 ENGINE HOUSE WITH FUEL TANK AT TAKE-OFF END

REF. NO.	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				LBS.	OZ.	
462	PD-77	NUT, 1/4"-20 thread, hexagon steel 5—for tank support to rear panel. 4—for air filter mounting. 4—for partition plate. 1—for crank spacer. 1—for crank spring clip.	15		1	\$.03
463	PD-79	NUT, 3/8"-16 thread, hexagon steel For side rails to engine supports.	4		1	.03
464	PD-115	NUT, #10-32 thread, hexagon steel For front panel to side of shroud.	2		1	.03
465	PD-152	NUT, #6-32 thread, hexagon steel For magneto ignition wire.	1		1	.04
466	PE-3	LOCKWASHER, 1/4" positive 10—for canopy. 5—for rear panel to engine support. 6—for fuel tank support. 4—for air filter mounting. 4—for partition plate. 1—for crank spacer. 1—for crank spring cup.	31		1	.03
467	PE-5	LOCKWASHER, 3/8" positive For side rails to engine supports.	4		1	.03
468	PE-45	LOCKWASHER, #10 external "Everlock" For front panel to side of shroud.	2		1	.03
469	PE-72	LOCKWASHER, ignition switch terminal	1		1	.03
470	PH-2	PLAIN WASHER, 7/16" I.D. x 1/16" thick steel For door clip.	2		1	.03
471	PH-77-A	PLAIN WASHER, 5/16" I.D. x 1/16" thick steel For air filter support screw.	1		1	.03
472	PH-196	PLAIN WASHER, 1/4" I.D. x 1/16" thick steel For rear panel to cylinder block mounting.	3		1	.04

(continued)

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HOUSE PARTS FOR MODELS VE4 AND VF4 ENGINES

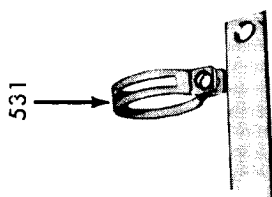


VE4 AND VF4 ENGINE HOUSE WITH FUEL TANK AT TAKE-OFF END

REF. NO.	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				LBS.	OZ.	
474	RF-794	NIPPLE, 1/8" x 3/4" long, close pipe..... For fuel strainer mounting.	1		1	\$.11
475		SCREW, 5/16"—18 thread x 1/2" long, round head..... Furnished with air filter.	1		1	.03
476	XA-8	SCREW, #10-32 thread x 1/2" long, round head..... For front panel to side of shroud.	2		1	.03
477	XA-33	SCREW, 1/4"-20 thread x 3/8" long, round head..... 7—for canopy mounting. 5—for rear panel to engine support. 4—for partition plate.	16		1	.03
478	XA-34	SCREW, 1/4"-20 thread x 1/2" long, round head..... 6—for fuel tank support. 3—for canopy and tank support. 1—for crank spring clip.	10		1	.03
479	XA-65	SCREW, #8 x 1/2" long, self tapping, sheet metal..... For front panel to shroud.	5		1	.03
480	XD-6	SCREW, 1/4"-20 thread x 3/4" long, hexagon head..... For mounting air filter.	4		1	.03
481	XD-7	SCREW, 1/4"-20 thread x 1" long, hexagon head..... For rear panel to cylinder block, R.H. side.	1		1	.04
482	XD-11	SCREW, 1/4"-20 thread x 2" long, hexagon head..... For mounting crank spacer.	1		1	.09
483	XD-25	SCREW, 3/8"-16 thread x 3/4" long, hexagon head..... For side rails to engine supports.	4		1	.06
484	XD-41	SCREW, 1/2"-13 thread x 1" long, hexagon head..... For engine supports to crankcase.	4		2	.09
485	XD-120	SCREW, 1/4"-20 thread x 3 1/4" long, hexagon head..... For rear panel to cylinder block, L.H. side.	1		2	.09
486	XI-23	COTTER PIN, 1/8" x 3/4" long..... For door clip.	2		1	.03

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HOUSE PARTS FOR MODELS VE4 AND VF4 ENGINES



VE4 AND VF4 ENGINE HOUSE WITH UNDERSLUNG FUEL TANK

REF. NO.	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				LBS.	OZ.	
500	HF-380	SPACER—rear panel to cylinder block.....	1		1	\$.18
501	LL-64	RUBBER ELBOW, air filter to carburetor.....	1		8	.94
502	LO-66	AIR FILTER—oil bath..... United Specialties #CT50-10505.	1	6		13.22
503	PG-323	CLIP—door.....	2		3	.34
504	PG-329-A	STRAP—fuel tank.....	2	1	3	1.10
505	PG-401	HOUSE BRACE—take-off end.....	1		6	.41
506	PG-402	HOUSE BRACE—flywheel end.....	1		7	.34
507	PM-137	SPRING—door clip.....	2		1	.06
508	RC-87	CAP—fuel tank.....	1		2	.55
509	RF-270	ELBOW—fuel tank outlet.....	1		1	.34
510	RF-320-3	ELBOW—fuel pump inlet.....	1		2	.44
511	RM-900	FUEL LINE—tank to pump.....	1		6	.94
512	SD-108	TAG—ignition switch.....	1		1	.06
515	WE-198A-1	CANOPY (beginning with engine Serial #84249).....	1	4	5	4.83
		WE-198 canopy (to and including engine Serial #84248) ..	1	4	5	4.83
516	WE-202-A	ENGINE SUPPORT—take-off end.....	1	4	10	1.54
517	WE-203	ENGINE SUPPORT—flywheel end.....	1	3	9	1.31

(continued)

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VE4 AND VF4 ENGINE HOUSE WITH UNDERSLUNG FUEL TANK

REF. NO.	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				LBS.	OZ.	
518	WE-204	FUEL TANK with RC-87 cap (Standard)	1	9		\$ 10.92
		WE-204-A (Filler neck relocated) for units with electric starter and generator	1	9		10.92
519	WE-206	FRONT PANEL (Standard)	1	3	10	5.98
		WE-206-6 (With additional holes for switch and ammeter) For units with electric starting	1	3	10	8.62
520	WE-207-A	REAR PANEL	1	5	10	8.62
521	WE-208	SIDE RAIL	2	1	8	.62
522	WE-209	HOUSE DOOR	2	3	11	2.99
		WE-209-A (Bumped out to clear distributor) For units with generator and distributor on left hand side of engine	1	3	11	3.95
523	WE-211	COVER—rear panel	1		12	2.53
524	WE-218	PARTITION PLATE	1	1	14	1.84
526	YC-9-A	IGNITION SWITCH	1		2	.50
527	YL-63	IGNITION WIRE—switch to magneto	1		1	.66
STANDARD HARDWARE						
530	LK-8	HOSE CLAMP, 2 $\frac{1}{8}$ " I.D. For air filter connection, filter end.	1		1	.10
531	LK-11	HOSE CLAMP, 1 $\frac{7}{8}$ " I.D. For air filter connection, carburetor end.	1		1	.10
532	PD-77	NUT, $\frac{1}{4}$ "-20 thread, hexagon steel	9		1	.03
		4—for air filter mounting.				
		4—for partition plate.				
		1—for house brace to panel, take-off end.				

(continued)

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VE4 AND VF4 ENGINE HOUSE WITH UNDERSLUNG FUEL TANK

REF. NO.	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				LBS.	OZ.	
533	PD-78	NUT, $\frac{5}{16}$ "-18 thread, hexagon steel..... For tank straps to engine supports.	4		1	\$.03
534	PD-79	NUT, $\frac{3}{8}$ "-16 thread, hexagon steel..... For side rails to engine supports.	4		1	.03
535	PD-115	NUT, #10-32 thread, hexagon steel..... For front panel to side of shroud.	2		1	.03
536	PD-152	NUT, #6-32 thread, hexagon steel..... For magneto ignition wire.	1		1	.04
537	PE-3	LOCKWASHER, $\frac{1}{4}$ " positive..... 10—for canopy. 4—for partition plate. 5—for rear panel to engine support. 2—for cover to rear panel. 4—for air filter mounting. 1—for house brace to panel, take-off end.	26		1	.03
538	PE-4	LOCKWASHER, $\frac{5}{16}$ " positive..... For tank straps to engine supports.	4		1	.03
539	PE-5	LOCKWASHER, $\frac{3}{8}$ " positive..... For side rails to engine supports.	4		1	.03
541	PE-45	LOCKWASHER, #10 external "Everlock"..... For front panel to side of shroud.	2		1	.03
542	PE-72	LOCKWASHER, ignition switch terminal.....	1		1	.03
543	PH-2	PLAIN WASHER, $\frac{7}{16}$ " I.D. x $\frac{1}{16}$ " thick steel..... For door clip.	2		1	.03
544	PH-196	PLAIN WASHER, $\frac{1}{4}$ " I.D. x $\frac{1}{16}$ " thick steel..... For rear panel to cylinder block mounting.	3		1	.04

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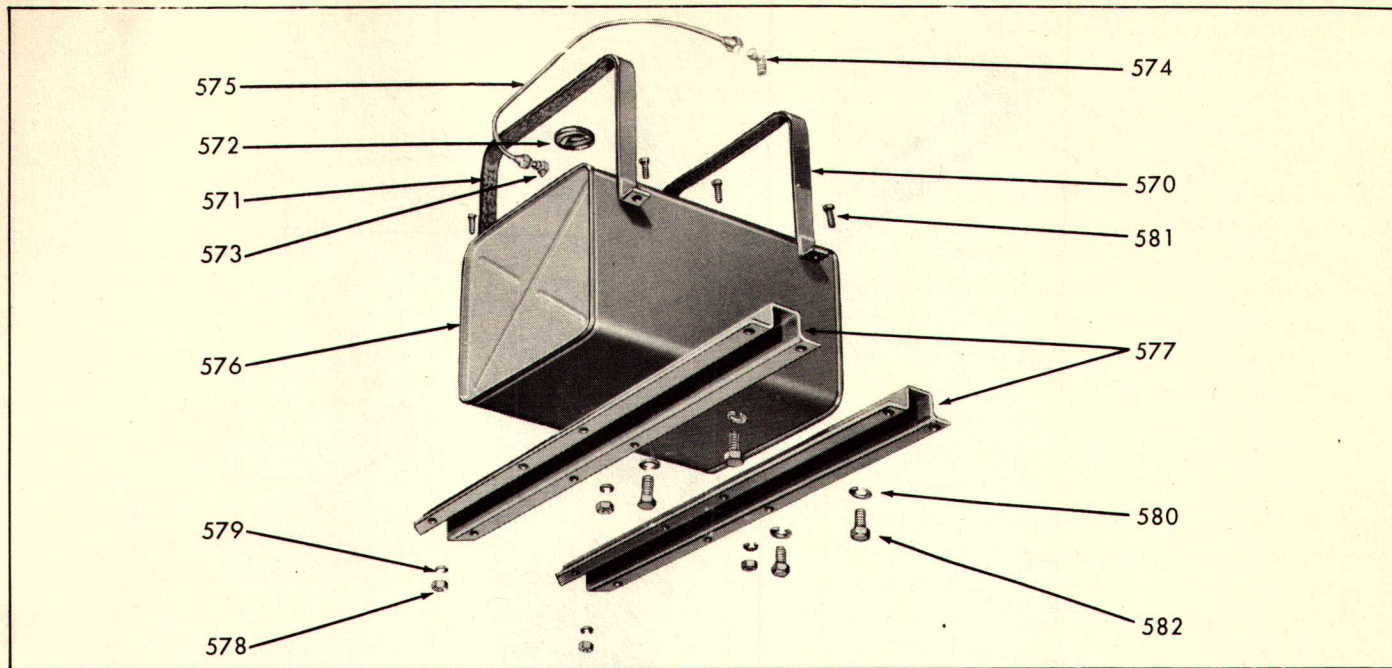
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VE4 AND VF4 ENGINE HOUSE WITH UNDERSLUNG FUEL TANK

REF. NO.	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				LBS.	OZ.	
546	RF-937	COUPLING, $\frac{3}{8}$ " W. I. pipe For oil drain pipe.	1		2	\$.17
547	RF-1086	NIPPLE, $\frac{3}{8}$ " x 4" long, W. I. pipe For oil drain.	1		4	.20
548	XA-8	SCREW, #10-32 thread x $\frac{1}{2}$ " long, round head For front panel to side of shroud.	2		1	.03
549	XA-33	SCREW, $\frac{1}{4}$ "-20 thread x $\frac{3}{8}$ " long, round head 10—for canopy. 4—for partition plate. 5—for rear panel to engine support. 2—for cover to rear panel.	21		1	.03
550	XA-34	SCREW, $\frac{1}{4}$ "-20 thread x $\frac{1}{2}$ " long, round head For house brace to panel, take-off end.	1		1	.03
551	XA-65	SCREW, #8 x $\frac{1}{2}$ " long, self-tapping, sheet metal For front panel to shroud.	5		1	.03
553	XD-6	SCREW, $\frac{1}{4}$ "-20 thread x $\frac{3}{4}$ " long, hexagon head For air filter mounting.	4		1	.03
554	XD-7	SCREW, $\frac{1}{4}$ "-20 thread x 1" long, hexagon head For rear panel to cylinder block, R.H. side.	1		1	.04
555	XD-25	SCREW, $\frac{3}{8}$ "-16 thread x $\frac{3}{4}$ " long, hexagon head For side rails to engine supports.	4		1	.06
556	XD-41	SCREW, $\frac{1}{2}$ "-13 thread x 1" long, hexagon head For engine supports to crankcase.	4		2	.09
557	XD-120	SCREW, $\frac{1}{4}$ "-20 thread x $3\frac{1}{4}$ " long, hexagon head For rear panel to cylinder block, L.H. side.	1		2	.09
558	XI-23	COTTER PIN, $\frac{1}{8}$ " x $\frac{3}{4}$ " long For door clip.	2		1	.03
559	XK-1	PLUG, $\frac{1}{8}$ " square head pipe For fuel tank drain.	1		1	.11

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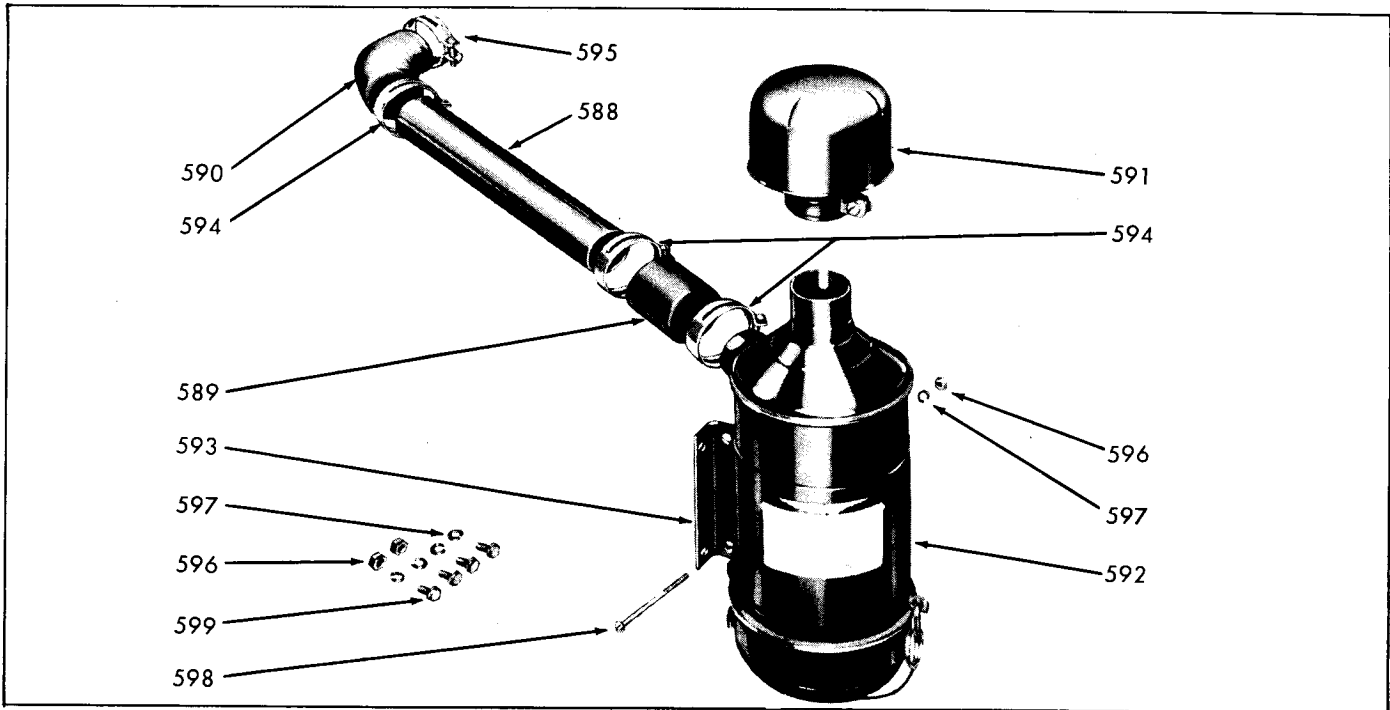
SIDE MOUNT FUEL TANK FOR VE4 AND VF4 ENGINES



REF. NO.	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				LBS.	OZ.	
570	PG-321	STRAP—fuel tank.....	2	1	1	\$ 1.33
571	PH-244-A	FELT—fuel tank strap.....	2		2	.11
572	RC-77	CAP—fuel tank.....	1		3	.59
573	RF-270	ELBOW—fuel line, in tank.....	1		1	.34
574	RF-320-3	ELBOW—fuel line, in pump.....	1		2	.44
575	RM-1161	FUEL LINE—tank to pump (23 $\frac{1}{8}$ " long).....	1		4	1.03
		RM-822 for engines with electric starter (27 $\frac{1}{3}$ " long).....	1		5	1.01
576	WE-187	FUEL TANK WITH CAP, 6 gal. capacity.....	1	7		8.51
577	WE-188	ENGINE SUPPORT.....	2	4	11	1.49
		WE-188-D for engines with electric starter.....	2	5	4	1.84
STANDARD HARDWARE						
578	PD-79	NUT, $\frac{3}{8}$ "-16 thread, hexagon steel..... For fuel tank straps to supports.	4		1	.03
579	PE-5	LOCKWASHER, $\frac{3}{8}$ " positive..... For fuel tank straps to supports.	4		1	.03
580	PE-7	LOCKWASHER, $\frac{1}{2}$ " positive..... For engine supports to crankcase.	4		1	.03
581	XD-27	SCREW, $\frac{3}{8}$ "-16 thread x 1" long, hexagon head..... For fuel tank straps to supports.	4		1	.06
582	XD-41	SCREW, $\frac{1}{2}$ "-13 thread x 1" long, hexagon head..... For engine supports to crankcase.	4		2	.09

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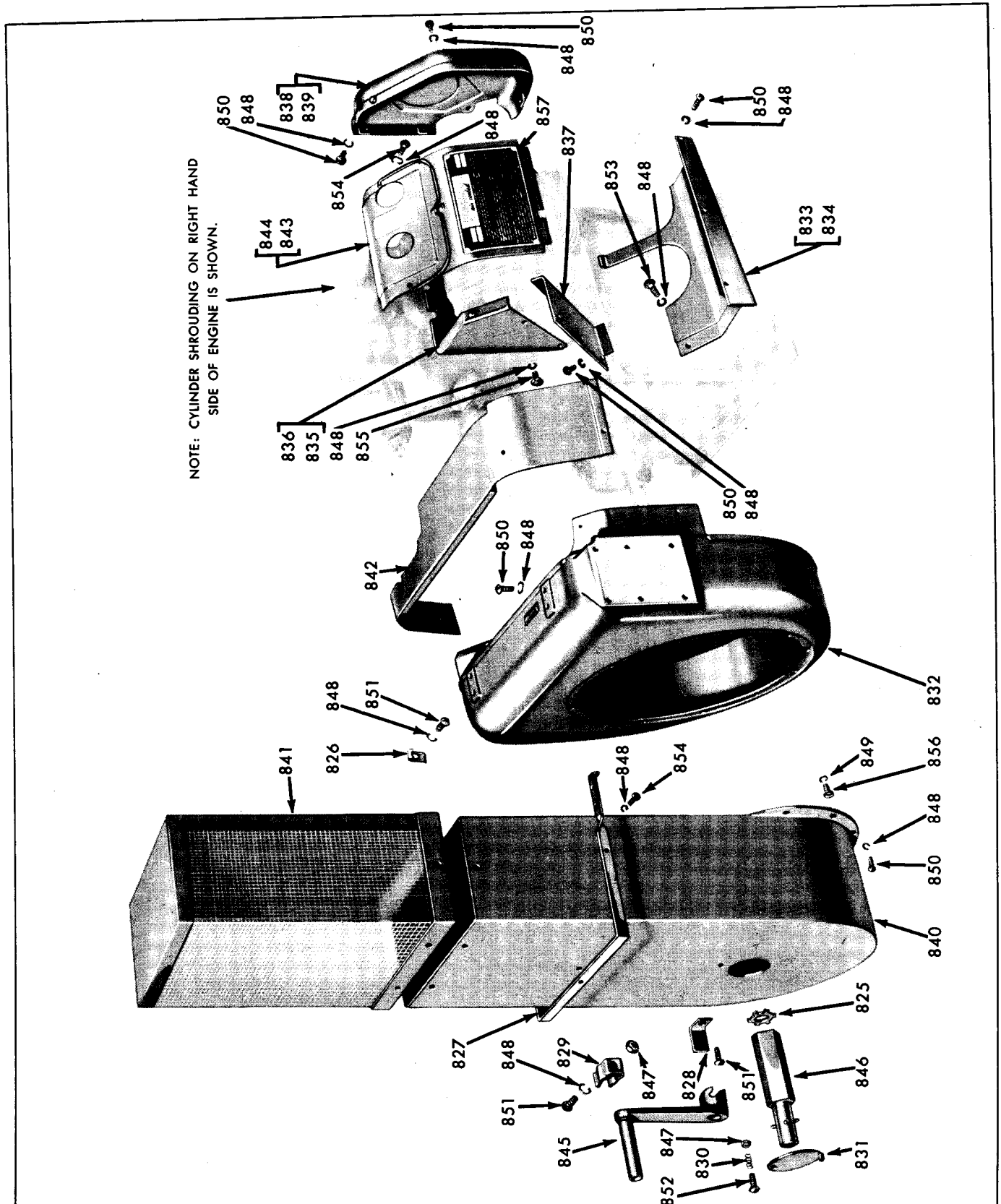
SIDE MOUNT AIR FILTER FOR VE4 AND VF4 ENGINES



REF. NO.	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				LBS.	OZ.	
588	LJ-120	TUBE, air filter to carburetor elbow	1	1	1	\$ 1.39
589	LL-27	RUBBER HOSE—air filter tube	1		2	.16
590	LL-67	RUBBER ELBOW—air filter tube	1		4	.43
591	LO-35	PRE-CLEANER—United Specialties #B-8118	1		12	1.49
592	LO-64	AIR FILTER—oil bath	1	4	7	12.19
		United Specialties #CT50-10490.				
593	PG-328	STRAP—air filter mounting	1	1	2	.52
STANDARD HARDWARE						
594	LK-8	HOSE CLAMP, 2 1/8" I.D. For air filter connections.	3		2	.10
595	LK-11	HOSE CLAMP, 1 7/8" I.D. For air filter connection, carburetor end	1		2	.10
596	PD-77	NUT, 1/4"-20 thread, hexagon steel	4		1	.03
		For air filter strap mounting.				
597	PE-3	LOCKWASHER, 1/4" positive	6		1	.03
		For air filter strap mounting.				
598	XA-74	SCREW, 1/4"-20 thread x 2 1/4" long, round head	2		1	.03
		For air filter strap clamping.				
599	XD-4	SCREW, 1/4"-20 thread x 1/2" long, hexagon head	4		1	.03
		For air filter strap to shroud.				

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UPRIGHT AIR INTAKE AND AGRICULTURAL SHROUDING FOR VE4 AND VF4 ENGINES



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UPRIGHT AIR INTAKE AND AGRICULTURAL SHROUDING FOR VE4 AND VF4 ENGINES

REF. NO.	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				LBS.	OZ.	
825	PE-62-1	LOCKWASHER for starting crank nut	1		1	\$.13
826	PG-315	CLIP for air intake screen	6		1	.03
827	PG-325-A	SUPPORT STRAP for air intake	1	1	1	.92
828	PG-481	BRACKET for crank support	1		3	.20
829	PK-87	SPRING CLIP for crank support	1		1	.23
830	PM-4	SPRING for crank hole cover	1		1	.20
831	SA-56	COVER for crank hole in air stack	1		2	.36
832	SE-74-D	FLYWHEEL SHROUD (with pads for intake support and air cleaner mounting)	1	11	8	9.54
		SE-74-H (with pads for intake support, air cleaner and electric starter mounting)	1	11	14	17.82
833	SE-75-B	LOWER CYLINDER SHROUD—right hand side	1		14	1.33
834	SE-76-B	LOWER CYLINDER SHROUD—left hand side	1		12	1.26
835	SE-77-A-2	CYLINDER HEAT DEFLECTOR Assembly—left hand side	1		12	1.35
		Consisting of:				
		SE-77-A Deflector	1			1.03
		VE-481 Spring clip pin	1			.20
836	SE-77-B-1	CYLINDER HEAT DEFLECTOR Assembly—right hand side	1		14	1.35
		Consisting of:				
		SE-77-B Deflector	1			1.03
		VE-481 Spring clip pin	1			.20
837	SE-80	SIDE COVER for flywheel shroud	1		4	.20

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UPRIGHT AIR INTAKE AND AGRICULTURAL SHROUDING FOR VE4 AND VF4 ENGINES

REF. NO.	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				LBS.	OZ.	
838	SE-82B-3	REAR SHROUD COVER Assembly—left hand side....	1	1	2	\$ 2.50
839	SE-83B-4	REAR SHROUD COVER Assembly—right hand side... The above assemblies both consist of:	1	1	2	2.50
		PA-251-1 Pin for cleanout cover.....	1			.06
		PH-84 Washer for pin.....	1			.06
		PM-128 Spring for cleanout cover.....	1			.13
		SA-76 Cleanout cover.....	1			.25
		SE- Rear shroud cover (not furnished separately)	1			
		VE-481 Spring clip pin.....	1			.20
		XI-1 Cotter pin (1/16" x 1/2" long).....	1			.03
840	SE-99	AIR INTAKE SHROUD.....	1	10	5	12.07
841	SE-100	AIR INTAKE SCREEN.....	1	6	4	8.62
842	SE-102	DUST SHIELD for flywheel shroud.....	1	1		1.15
843	SE-103-1	COVER Assembly—right hand side.....	1		14	1.38
844	SE-104-1	COVER Assembly—left hand side..... The above assemblies both consist of:	1		14	1.38
		PG-388 Clip for spring.....	1			.06
		PK-85 Spring.....	1			.11
		SD-117 Instruction decal.....	1			.09
		SE- Cover (not furnished separately).....	1			
		XJ-46 Rivets for clip mounting.....	2			.03
845	U-212-A	STARTING CRANK.....	1	2		2.30
846	UC-73G-S1	STARTING CRANK nut assembly..... Consisting of:	1	2		2.78
		PA-239 Pin.....	1			.03
		UC-73-G Nut.....	1			2.64

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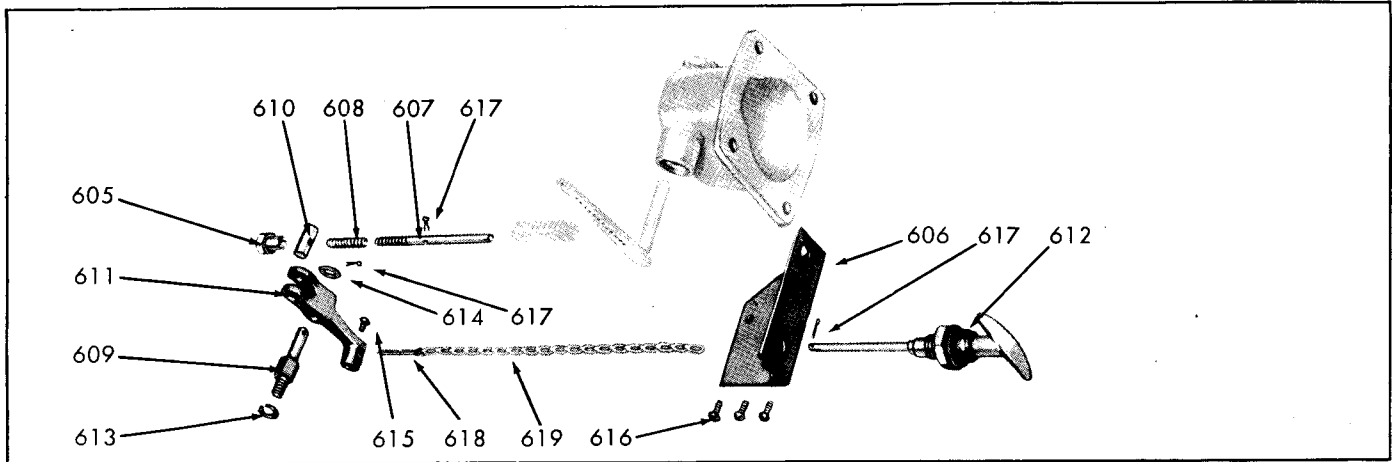
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**UPRIGHT AIR INTAKE AND AGRICULTURAL SHROUDING
FOR VE4 AND VF4 ENGINES STANDARD HARDWARE**

REF. NO.	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				LBS.	OZ.	
847	PD-77	NUT, 1/4"-20 thread, hexagon steel 1—For crank mounting spring clip. 1—For crank hole cover.	2		1	\$.03
848	PE-3	LOCKWASHER, 1/4" positive 4—For air intake shroud. 25—For air shrouding. 1—For crank support spring clip. 7—For air intake support strap. 6—For air intake screen.	43		1	.03
849	PE-4	LOCKWASHER, 5/16" positive For flywheel shroud to gear cover.	6		1	.03
850	XA-33	SCREW, 1/4"-20 thread x 3/8" long, round head 3—For air intake shroud. 4—For lower cylinder shroud, L. and R. sides. 2—For cylinder heat deflector, R.H. side. 6—For cylinder head shrouds. 3—For air shroud side cover. 2—For rear shroud cover. 4—For air intake support strap.	24		1	.03
851	XA-34	SCREW, 1/4"-20 thread x 1/2" long, round head 2—For crank bracket and spring clip. 6—For air intake screen.	8		1	.03
852	XA-35	SCREW, 1/4"-20 thread x 5/8" long, round head For crank hole cover.	1		1	.03
853	XD-3	SCREW, 1/4"-20 thread x 3/8" long, hexagon head For lower cylinder shrouds.	4		1	.03
854	XD-4	SCREW, 1/4"-20 thread x 1/2" long, hexagon head 4—For cylinder heat deflectors. 3—For intake support strap.	7		1	.03
855	XD-6	SCREW, 1/4"-20 thread x 3/4" long, hexagon head For cylinder heat deflectors.	2		1	.03
856	XD-13	SCREW, 5/16"-18 thread x 1/2" long, hexagon head For mounting flywheel shroud.	6		1	.06
857	XJ-46-A	RIVET, 9/64" dia. x 3/16" long, tubular steel For mounting instruction plate.	4		1	.03

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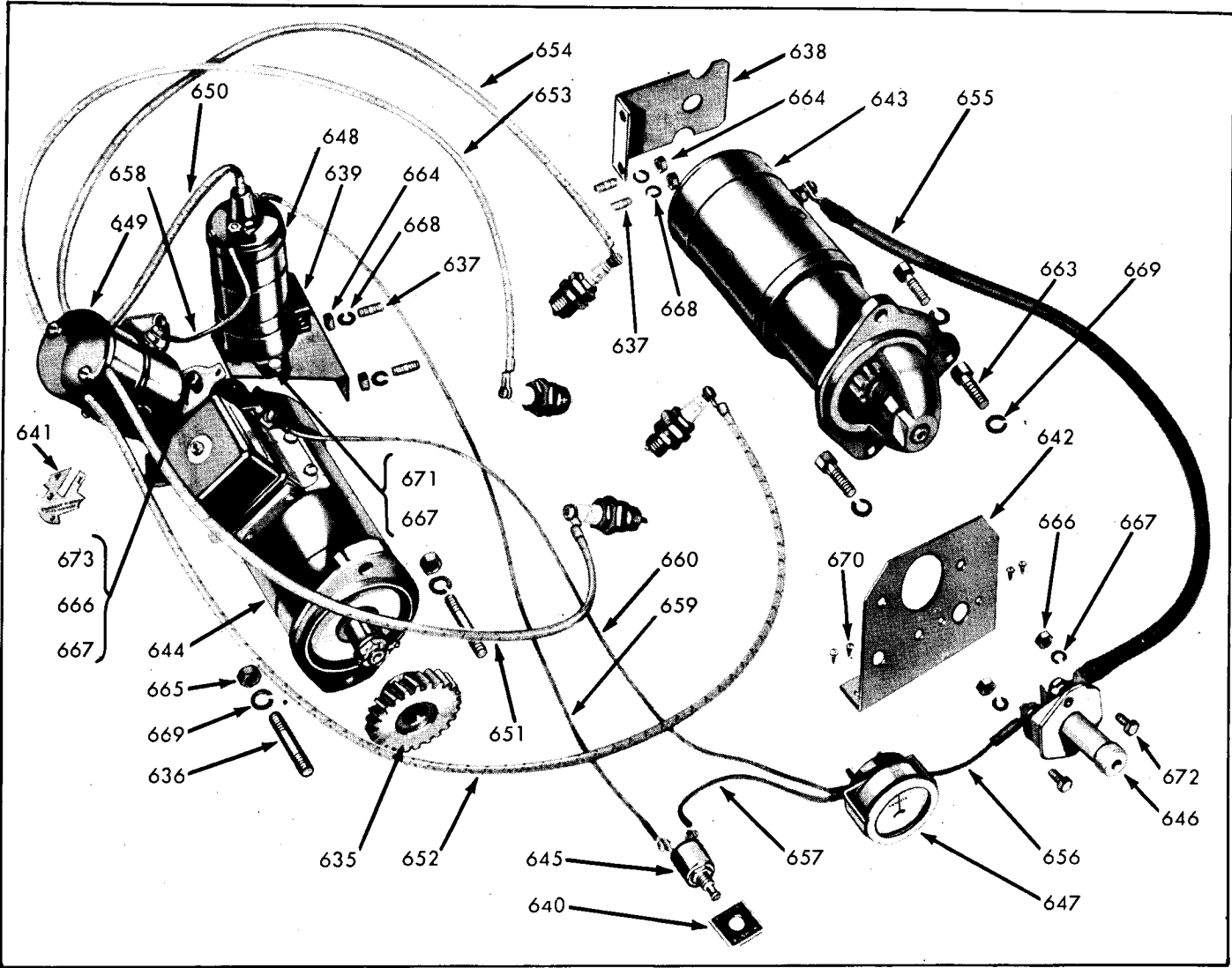
TT-45-L VARIABLE SPEED GOVERNOR CONTROL ASSEMBLY FOR VE4 AND VF4 ENGINES



REF. NO.	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				LBS.	OZ.	
	TT-45-L	VARIABLE SPEED GOVERNOR CONTROL ASS'Y.	1	1		\$ 5.72
605	PD-173-A	LOCKNUT—adjusting screw.....	1	1		.59
606	PG-342	BRACKET—governor and choke control.....	1	4		.32
607	PI-115-E	ADJUSTING SCREW.....	1	2		.64
608	PM-111-1	SPRING—adjusting screw.....	1	1		.06
609	TC-365	PIN—variable speed lever support.....	1	1		.57
610	TC-368-A	PIN—adjusting screw swivel.....	1	1		.23
611	VB-134-A	LEVER—variable speed.....	1	4		.50
612	VE-527	CONTROL—variable speed.....	1	6		2.53
STANDARD HARDWARE						
613	PE-3	LOCKWASHER, 1/4" positive..... For support pin.	1	1		.03
614	PH-77	PLAIN WASHER, 5/16 I.D. x 5/8" O.D. x 1/16" thick, steel... For variable speed lever.	1	1		.03
615	XA-62	SCREW, #8-32 thread x 1/4" long, round head..... For cotter pin on lever.	1	1		.03
616	XA-65	SCREW, #8 x 1/2" long, self-tapping, sheet metal..... For control bracket.	3	1		.03
617	XI-1	COTTER PIN, 1/16" x 1/2" long..... 1—for variable speed lever pin. 1—for adjusting screw spring. 1—for chain at control.	3	1		.03
618	XI-11	COTTER PIN, 3/32" x 1 1/4" long..... For chain at lever.	1	1		.03
619		#9100G GALVANIZED FURNACE CHAIN, 10" long... For control to lever.	1 pc	1		On Req.

Order parts from nearest SERVICE STATION shown in directory following parts list.
IMPORTANT: Always give Model, Specification and Serial Numbers shown on name plate.

ELECTRIC STARTER, GENERATOR AND DISTRIBUTOR IGNITION FOR VE4 AND VF4 ENGINES



REF. NO.	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				LBS.	OZ.	
635	GD-97-A	GEAR—generator drive.....	1		7	\$3.68
636	PC-110	STUD—generator mounting.....	2		1	.16
637	PC-396	STUD..... 2—for starter bracket. 2—for ignition coil bracket.	4		1	.11
638	PG-331	BRACKET—starter support.....	1		4	.32
639	PG-345	BRACKET—ignition coil support.....	1		6	.64
640	SD-109	TAG—ignition switch.....	1		1	.06

(continued)

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IMPORTANT: Always give Model, Specification and Serial Numbers shown on name plate.

ELECTRIC STARTER, GENERATOR AND DISTRIBUTOR IGNITION FOR VE4 AND VF4 ENGINES

REF. NO.	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				LBS.	OZ.	
641	SD-141	TAG—distributor cap.....	1		1	\$.04
642	VE-439	CONTROL PANEL.....	1		10	1.61
643	YA-4-B	ELECTRIC STARTER (6 volt), Auto-Lite #MAK-4022. NOTE: For all repairs contact the Electric Auto-Lite Co. at Toledo, Ohio, or their nearest service station.	1	15	8	29.84
644	YB-16-A	GENERATOR (6 volt), Auto-Lite #GAS-4179-2..... NOTE: For all repairs contact the Electric Auto-Lite Co. at Toledo, Ohio, or their nearest service station.	1	15	6	35.07
645	YC-9	IGNITION SWITCH.....	1		2	.41
646	YC-10	STARTING SWITCH, Auto-Lite #SW-4001.....	1		4	1.25
647	YE-2	AMMETER, Moto-Meter #5722A.....	1		6	2.50
648	YF-4	IGNITION COIL (6 volt), Auto-Lite #IG-4064.....	1	1	14	4.02
649	YF-6	DISTRIBUTOR, Auto-Lite #IGW-4159-A..... NOTE: For all repairs contact the Electric Auto-Lite Co. at Toledo, Ohio, or their nearest service station.	1	2	7	10.00
650	YL-125	IGNITION CABLE ASSEMBLY, distributor to coil.... Consisting of: 1 pc. 7MM. cable, 9" long. 1 terminal, H. B. Sherman Mfg. Co. #P-100.	1		1	.48
651	YL-126	IGNITION CABLE ASSEMBLY, distributor to No. 1 spark plug..... Consisting of: 1 pc. 7 MM. cable, 24" long. 1 spark plug terminal, Rajah T/T #11.	1		2	.80
652	YL-127	IGNITION CABLE ASSEMBLY, distributor to No. 2 spark plug..... Consisting of: 1 pc. 7 MM. cable, 33" long. 1 spark plug terminal, Rajah T/T #11.	1		3	.98

(continued)

Order parts from nearest SERVICE STATION shown in directory following parts list.
IMPORTANT: Always give Model, Specification and Serial Numbers shown on name plate.

**ELECTRIC STARTER, GENERATOR AND DISTRIBUTOR IGNITION
FOR VE4 AND VF4 ENGINES**

REF. NO.	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				LBS.	OZ.	
653	YL-128	IGNITION CABLE ASSEMBLY , distributor to No. 3 spark plug..... Consisting of: 1 pc. 7 MM cable, 32" long. 1 spark plug terminal, Rajah T/T #11.	1		3	\$.96
654	YL-129	IGNITION CABLE ASSEMBLY , distributor to No. 4 spark plug..... Consisting of: 1 pc. 7 MM. cable, 40" long. 1 spark plug terminal, Rajah T/T #11.	1		3	1.12
655	YL-130	STARTER CABLE ASSEMBLY , starter to switch.....	1		4	1.56
656	YL-131	IGNITION WIRE ASSEMBLY , switch to ammeter.... Consisting of: 1 terminal, H. B. Sherman # 15 ($1\frac{3}{32}$ " dia. hole) 1 terminal, Thomas & Betts #B-36 ($1\frac{3}{64}$ " dia. hole). 1 insulator, $\frac{3}{16}$ " I.D. x 1" long, flexible tubing. 1 insulator, $\frac{5}{32}$ " I.D. x $\frac{5}{8}$ " long, flexible tubing. 1 pc. #14 GA cable, 5" long.	1		1	.39
657	YL-132	IGNITION WIRE ASSEMBLY , ammeter to switch..... Consisting of: 2 terminals, Thomas & Betts #B-36 ($1\frac{3}{64}$ " dia. hole). 2 insulators, $\frac{5}{32}$ " I.D. x $\frac{5}{8}$ " long, flexible tubing. 1 pc. #14 GA cable, 6" long.	1		1	.40
658	YL-133	IGNITION WIRE ASSEMBLY , coil to distributor..... Consisting of: 2 terminals, Thomas & Betts #B-36 ($1\frac{3}{64}$ " dia. hole). 2 insulators, $\frac{5}{32}$ " I.D. x $\frac{5}{8}$ " long, flexible tubing. 1 pc. # 14 GA cable, 7" long.	1		1	.41
659	YL-134	IGNITION WIRE ASSEMBLY , switch to coil..... Consisting of: 2 terminals, Thomas & Betts #B-36 ($1\frac{3}{64}$ " dia. hole). 2 insulators, $\frac{5}{32}$ " I.D. x $\frac{5}{8}$ " long, flexible tubing. 1 pc. #14 GA cable, 22" long.	1		2	.50
660	YL-135	IGNITION WIRE ASSEMBLY , ammeter to generator.. Consisting of: 2 terminals, Thomas & Betts #B-36 ($1\frac{3}{64}$ " dia. hole). 2 insulators, $\frac{5}{32}$ " I.D. x $\frac{5}{8}$ " long, flexible tubing. 1 pc. #14 GA cable, 24" long.	1		2	.52

(continued)

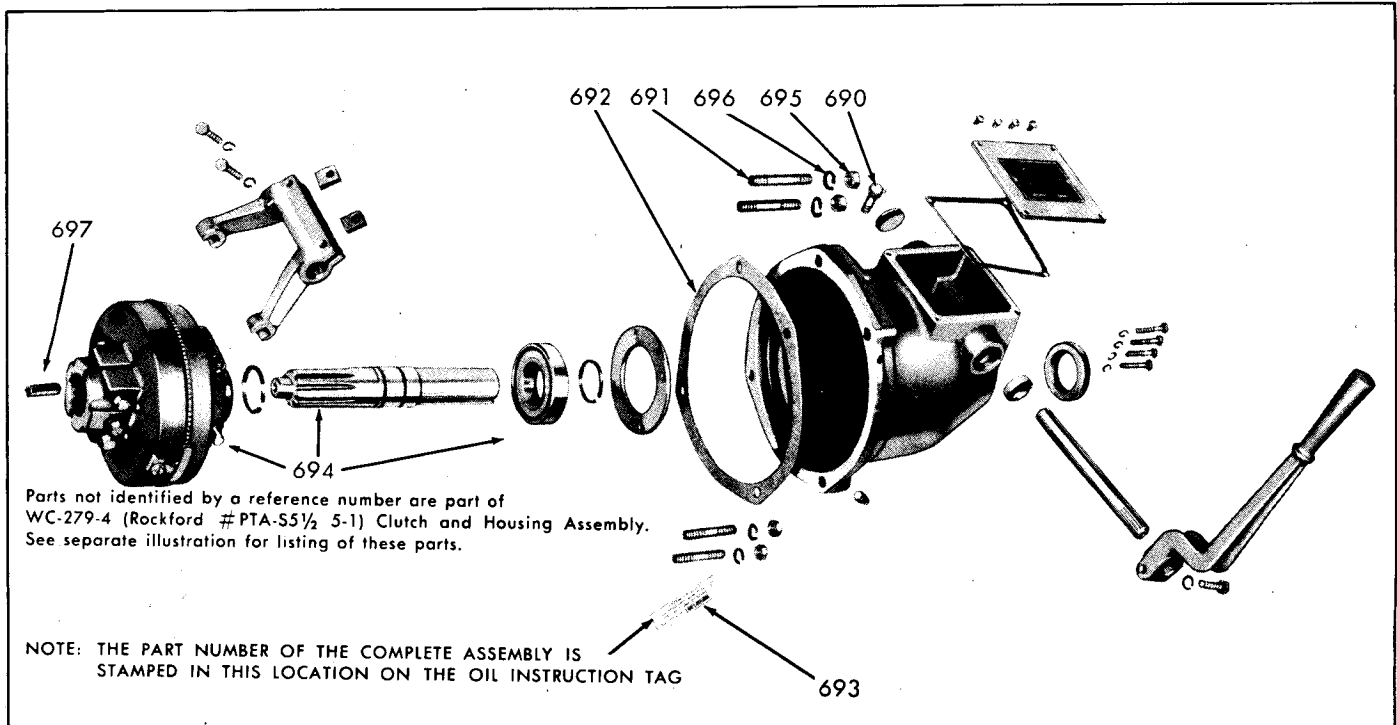
Order parts from nearest SERVICE STATION shown in directory following parts list.
IMPORTANT: Always give Model, Specification and Serial Numbers shown on name plate.

**ELECTRIC STARTER, GENERATOR AND DISTRIBUTOR IGNITION
FOR VE4 AND VF4 ENGINES**

REF. NO.	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				LBS.	OZ.	
STANDARD HARDWARE						
663	PB-24	SCREW, $\frac{3}{8}$ "-24 thread x $1\frac{1}{8}$ " long, hexagon head. For mounting electric starter.	3	2		\$.11
664	PD-10	NUT, $\frac{5}{16}$ "-24 thread, hexagon steel. 2—for mounting starter bracket. 2—for ignition coil bracket.	4	1		.03
665	PD-11	NUT, $\frac{3}{8}$ "-24 thread, hexagon steel. For mounting generator to gear cover.	2	1		.03
666	PD-77	NUT, $\frac{1}{4}$ "-20 thread, hexagon steel. 2—for starter switch mounting. 1—for distributor advance lock.	3	1		.03
667	PE-3	LOCKWASHER, $\frac{1}{4}$ " positive. 2—for starter switch mounting. 1—for distributor advance lock. 2—for ignition coil mounting.	5	1		.03
668	PE-4	LOCKWASHER, $\frac{5}{16}$ " positive. 2—for mounting starter bracket. 2—for ignition coil bracket.	4	1		.03
669	PE-5	LOCKWASHER, $\frac{3}{8}$ " positive. 2—for mounting generator to gear cover. 3—for mounting electric starter.	5	1		.03
670	XA-73	SCREW, #7 x $\frac{3}{8}$ " long, self-tapping sheet metal. For mounting control panel.	4	1		.03
671	XD-4	SCREW, $\frac{1}{4}$ "-20 thread x $\frac{1}{2}$ " long, hexagon head. For mounting ignition coil.	2	1		.03
672	XD-5	SCREW, $\frac{1}{4}$ "-20 thread x $\frac{5}{8}$ " long, hexagon head. For starter switch mounting.	2	1		.04
673	XD-6	SCREW, $\frac{1}{4}$ "-20 thread x $\frac{3}{4}$ " long, hexagon head. For distributor advance lock.	1	1		.03

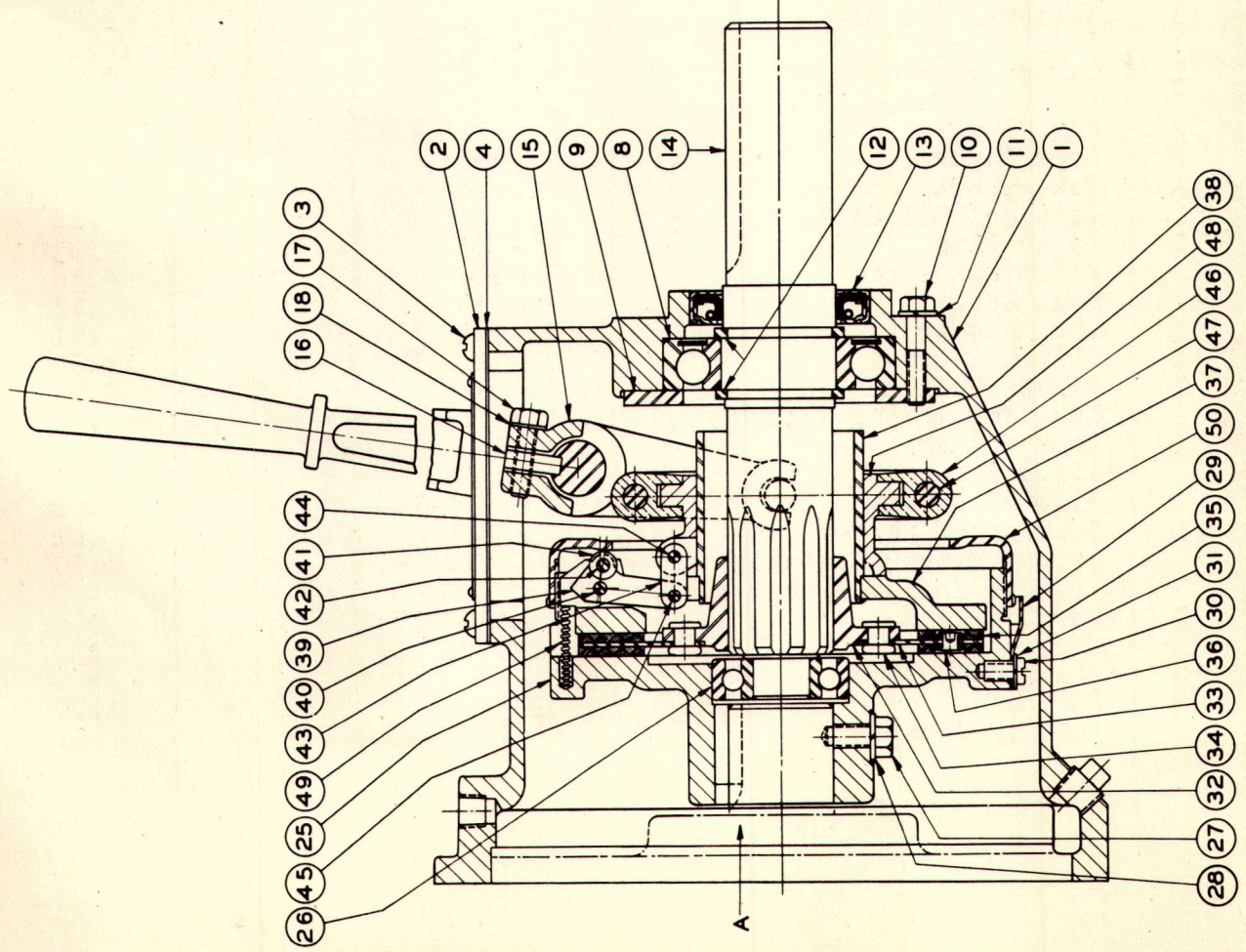
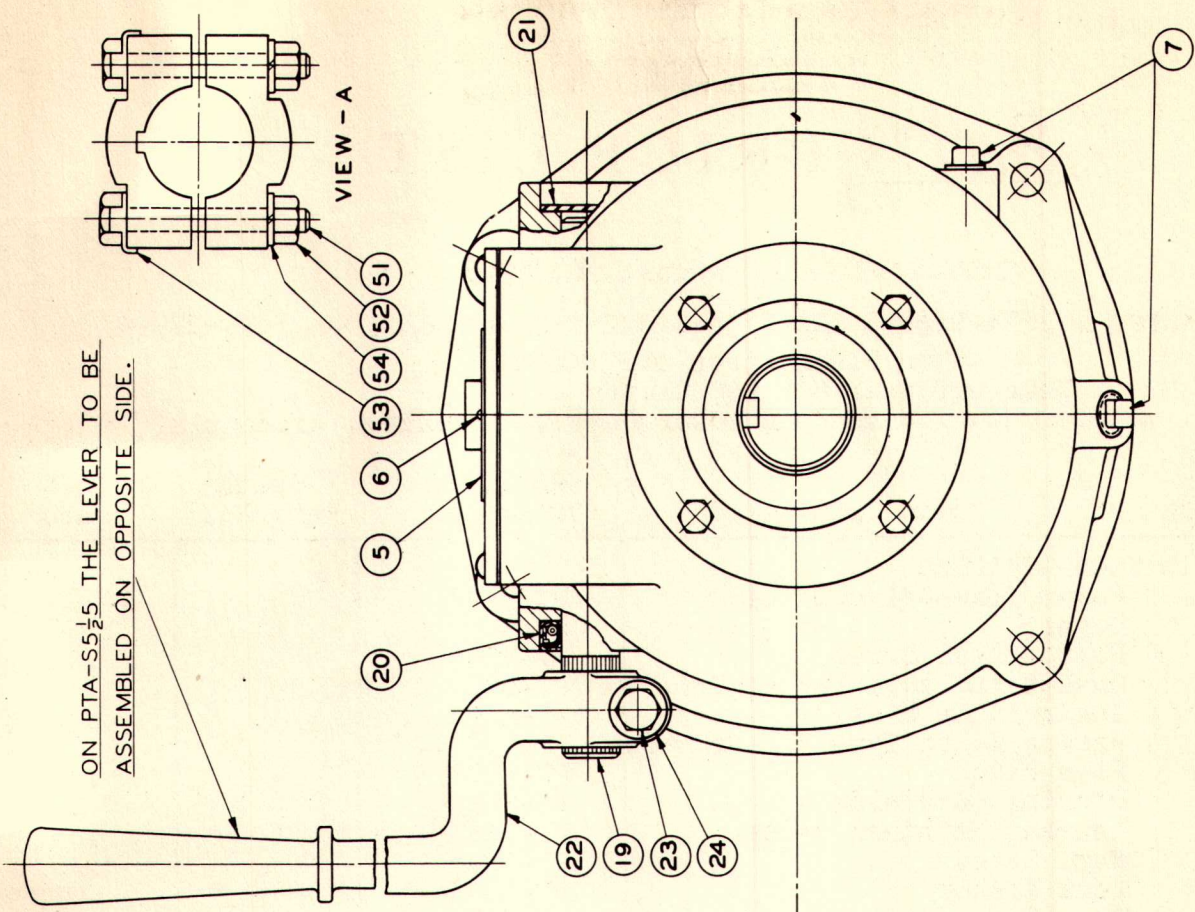
Order parts from nearest SERVICE STATION shown in directory following parts list.
IMPORTANT: Always give Model, Specification and Serial Numbers shown on name plate.

WW-58-A CLUTCH TAKE-OFF ASSEMBLY FOR VE4 AND VF4 ENGINES



REF. NO.	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				LBS.	OZ.	
	WW-58-A	CLUTCH TAKE-OFF ASSEMBLY COMPLETE	1	40		\$89.12
		Consisting of:				
690	LO-44	Breather.....	1		1	.69
691	PC-242	Studs for mounting housing to crankcase.....	4		2	.34
692	QD-618	Gasket for housing to crankcase.....	1		1	.16
693	SD-79	Oil instruction tag.....	1		1	.06
694	WC-279-4	Clutch and housing assembly..... Rockford Drilling #PTA-S5½5-1.	1	39		86.25
		NOTE: See Rockford Drilling illustration and parts price list of clutch and housing assembly.				
		STANDARD HARDWARE				
695	PD-12	NUT, 7/16"-20 thread, hexagon steel..... For mounting clutch housing.	4		1	.03
696	PE-6	LOCKWASHER, 7/16" positive..... For mounting clutch housing.	4		1	.03
697	PL-140	KEY, 5/16" square x 1 1/8" long..... For mounting clutch to crankshaft.	1		1	.18

Order parts from nearest SERVICE STATION shown in directory following parts list.
IMPORTANT: Always give Model, Specification and Serial Numbers shown on name plate.



ROCKFORD CLUTCH

PTA-S5½5 & PTA-S5½5-1 (WIS. MOTOR NO. WC-279-4)

ROCKFORD CLUTCH DIVISION

FORMERLY ROCKFORD DRILLING MACHINE DIVISION

BORG-WARNER CORPORATION

ROCKFORD, ILLINOIS

Parts PRICE LIST

EFFECTIVE DATE: August 28, 1946

ROCKFORD CLUTCH NO. PTA-S5½5 & PTA-S5½5-1 CUSTOMER'S CLUTCH NO. WC-279-4

SIZE: 5½"

TYPE: Plain Power FOR MODELS:

Take-Off with 5½" LOC Clutch

AS SOLD TO: Wisconsin Motor Corp., Milwaukee, Wisconsin

Refer. No.	Quan. per Clutch	Part Name	Rockford Part No.	Cust. Part No.	List each
SEE ILLUSTRATION ATTACHED					
1	1	Power Take-Off Housing	PT-539		24.69
2	1	Cover	PT-557		1.06
3	4	Button Head Screw	PT-576		.01
4	1	Gasket (to suit for cover)	PT-673		.53
5	1	Instruction Plate	PT-669		.38
6	2	Parker-Kalon Type "U" Dr.Screw	PT-368		.03
7	2	Pipe Plug	PT-577		.13
8	1	Bearing (Shielded)	PT-578		7.00
9	1	Bearing Retainer Plate	PT-536		.63
10	4	Hex. Screw	PT-579		.06
11	4	Lock Washer	PT-580		.01
12	2	Snap Ring	PT-535		.38
13	1	National Oil Seal	PT-581		1.73
14	1	Drive Shaft	PT-623		19.69
15	1	Clutch Yoke	PT-531		4.38
16	2	Key	PT-533		.31
17	2	Hex. Screw	PT-582		.04
18	2	Lock Washer	PT-580		.01
19	1	Yoke Shaft	PT-534		3.13
20	1	National Oil Seal	PT-583		.85
21	1	Welsh Plug	PT-584		.03
22	1	Shifting Lever	PT-564		4.38
23	1	Hex. Screw	PT-352		.08
24	1	Lock Washer	PT-353		.01
25	1	Clutch Housing	CL-5210-1		14.09
26	1	Pilot Bearing	CL-5616		2.99
27	1	Hex. Screw (Dog Point)	CL-5163		.12
28	1	Lock Washer	CL-3920		.01
29	1	Adjusting Lock	CL-4973		.12
30	1	Fil. Hd. Screw	CL-3917-1		.01
31	1	Shakeproof Washer	CL-3468		.01
	1	Driven Member Assembly (Above includes next 5 items)	UCL-1-1244-10		6.90
32	1	Splined Center	CL-1244-10		*
33	1	Clutch Plate	CL-5206		*
34	6	Flat Head Rivet	CL-486		*
35	2	Facing	CL-5321		1.09
36	6	Tubular Rivet	CL-1011		.01

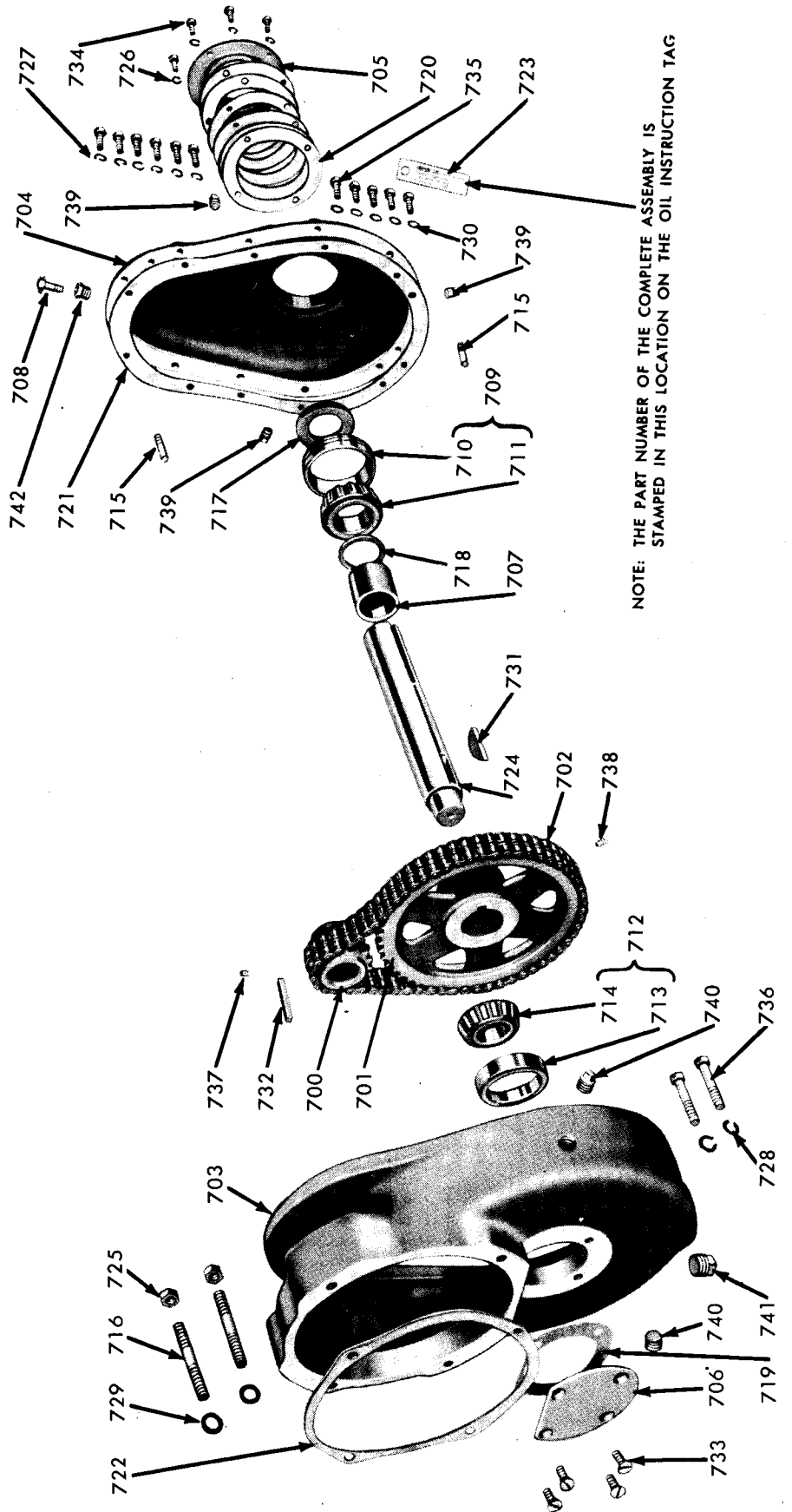
ROCKFORD CLUTCH DIVISION
BORG-WARNER CORPORATION**Parts PRICE LIST**PTA-S5¹/₂5 and
PTA-S5¹/₂5-1

of 8-28-46

Refer. No.	Quan. per Clutch	Part Name	Rockford Part No.	Cust. Part No.	List Each
	1	Pressure Plate Lever Assembly (Above includes next 8 items)	UCL-1-5146-A		10.93
	1	Pressure Plate Assembly (Above includes next 2 items)	UCL-5146		8.05
37	1	Pressure Plate	CL-5146		*
38	1	Support Sleeve	CL-5154		*
39	6	Lever	CL-5544		.12
40	3	Lever Pin	CL-5156		.06
41	3	Roller	CL-4775		.03
42	3	Roller Pin	CL-4971		.07
	3	Cotter Pin	CL-5092		.01
43	6	Connecting Link	CL-4776		.17
44	3	Link Pin (Long)	CL-5153		.05
45	3	Link Pin (Short)	CL-5152		.05
	6	Cotter Pin	CL-5092		.01
	1	Release Sleeve Assembly (Above includes next 6 items)	UCL-5145		13.80
	1	Release Bearing Assembly (Above includes next 4 items)	UCL-5144		8.63
46	2	Release Bearing	CL-5144		*
47	2	Hex. Screw	CL-3335		.06
	2	Castile Nut	CL-3336		.06
	2	Cotter Pin	CL-3923		.01
48	1	Release Sleeve	CL-5145		4.89
49	3	Return Spring	CL-5087		.07
50	1	Adjusting Ring	CL-5147		3.39
51	2	Hex. Screw	CL-5318		.12
52	2	Light Hex. Nut	CL-5319		.03
53	2	Screw Lock	CL-5211		.05
54	2	Lock Washer	PT-353		.01

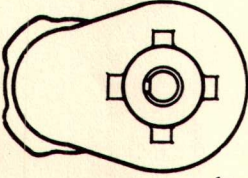
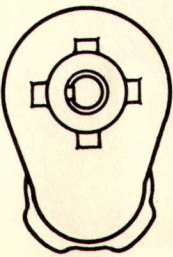
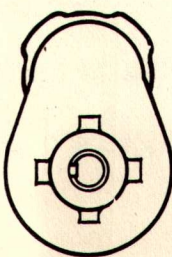
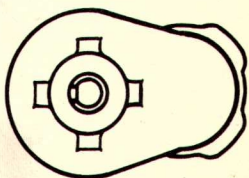
(*) Asterisk - Indicates parts not supplied separately for service. Order sub-assembly in which included.

WW-27-J ETC. REDUCTION GEAR ASSEMBLIES FOR VE4 AND VF4 ENGINES



Order parts from nearest SERVICE STATION shown in directory following parts list.
IMPORTANT: Always give Model, Specification and Serial Numbers shown on name plate.

WW-27-J ETC. REDUCTION GEAR ASSEMBLIES FOR VE4 AND VF4 ENGINES

Position of Take-off Shaft Viewing From Cranking End of Engine	Assembly Number	Reduction Ratio	Rotation of Take-off Shaft	Ref. No. 700		Ref. No. 701		Ref. No. 702		Ref. No. 703		Ref. No. 704	
				Driver Gear Part No.	Driven Gear Part No.	Chain Part No.	Housing Part No.	Housing Cover Part No.					
 TAKE-OFF SHAFT BELOW	WW-27-J	2.07 to 1	Counter Engine-Wise	GG-66-3	GG-67-1	.....	BG-149-B-6	BH-119				
	WW-27-J-1	3.00 to 1	Counter Engine-Wise	GG-79-1	GG-77-1	.....	BG-149-B-6	BH-119				
	WW-27-J-2	3.84 to 1	Counter Engine-Wise	GG-80-1	GG-69-1	.....	BG-149-B-6	BH-119				
	WW-27-J-3	2.00 to 1	Engine-Wise	GG-81	GG-71	GJ-8	BG-149-B-6	BH-119					
	WW-27-J-4	2.67 to 1	Engine-Wise	GG-82	GG-71	GJ-9	BG-149-B-6	BH-119					
WW-27-J-5	3.79 to 1	Engine-Wise	Engine-Wise	GG-83	GG-73	GJ-10	BG-149-B-6	BH-119					
 TAKE-OFF SHAFT ON LEFT HAND SIDE (as Viewed from the Cranking End)	WW-27-J-6	2.07 to 1	Counter Engine-Wise	GG-66-3	GG-67-1	.....	BG-149-B-7	BH-119-1				
	WW-27-J-7	3.00 to 1	Counter Engine-Wise	GG-79-1	GG-77-1	.....	BG-149-B-7	BH-119-1				
	WW-27-J-8	3.84 to 1	Counter Engine-Wise	GG-80-1	GG-69-1	.....	BG-149-B-7	BH-119-1				
	WW-27-J-9	2.00 to 1	Engine-Wise	GG-81	GG-71	GJ-8	BG-149-B-7	BH-119-1					
	WW-27-J-10	2.67 to 1	Engine-Wise	GG-82	GG-71	GJ-9	BG-149-B-7	BH-119-1					
WW-27-J-11	3.79 to 1	Engine-Wise	Engine-Wise	GG-83	GG-73	GJ-10	BG-149-B-7	BH-119-1					
 TAKE-OFF SHAFT ON RIGHT HAND SIDE (as Viewed from the Cranking End)	WW-27-J-12	2.07 to 1	Counter Engine-Wise	GG-66-3	GG-67-1	.....	BG-149-B-8	BH-119-2				
	WW-27-J-13	3.00 to 1	Counter Engine-Wise	GG-79-1	GG-77-1	.....	BG-149-B-8	BH-119-2				
	WW-27-J-14	3.84 to 1	Counter Engine-Wise	GG-80-1	GG-69-1	.....	BG-149-B-8	BH-119-2				
	WW-27-J-15	2.00 to 1	Engine-Wise	GG-81	GG-71	GJ-8	BG-149-B-8	BH-119-2					
	WW-27-J-16	2.67 to 1	Engine-Wise	GG-82	GG-71	GJ-9	BG-149-B-8	BH-119-2					
WW-27-J-17	3.79 to 1	Engine-Wise	Engine-Wise	GG-83	GG-73	GJ-10	BG-149-B-8	BH-119-2					
 TAKE-OFF SHAFT ON TOP	WW-27-J-18	2.07 to 1	Counter Engine-Wise	GG-66-3	GG-67-1	.....	BG-149-B-9	BH-119-6				
	WW-27-J-19	3.00 to 1	Counter Engine-Wise	GG-79-1	GG-77-1	.....	BG-149-B-9	BH-119-6				
	WW-27-J-20	3.84 to 1	Counter Engine-Wise	GG-80-1	GG-69-1	.....	BG-149-B-9	BH-119-6				
	WW-27-J-21	2.00 to 1	Engine-Wise	GG-81	GG-71	GJ-8	BG-149-B-9	BH-119-6					
	WW-27-J-22	2.67 to 1	Engine-Wise	GG-82	GG-71	GJ-9	BG-149-B-9	BH-119-6					
WW-27-J-23	3.79 to 1	Engine-Wise	Engine-Wise	GG-83	GG-73	GJ-10	BG-149-B-9	BH-119-6					

PRICES FOR PARTS SHOWN ON PRECEDING PAGE

PART NO.	NET WEIGHT		PRICE EACH	PART NO.	NET WEIGHT		PRICE EACH
	LBS.	OZ.			LBS.	OZ.	
BG-149-B-6	22		\$ 22.96	WW-27-J-1	68		\$ 89.01
BG-149-B-7	22		22.96	WW-27-J-2	67		89.35
BG-149-B-8	22		22.96	WW-27-J-3	62		106.49
BG-149-B-9	22		22.96	WW-27-J-4	61		103.50
BH-119	14		13.80	WW-27-J-5	63		110.22
BH-119-1	14		13.91	WW-27-J-6	66		93.89
BH-119-2	14		13.91	WW-27-J-7	68		89.35
BH-119-6	14		13.91	WW-27-J-8	67		89.70
GG-66-3 (30 teeth)	2	12	11.13	WW-27-J-9	62		106.77
GG-67-1 (62 teeth)	8	11	9.05	WW-27-J-10	61		103.78
GG-69-1 (73 teeth)	10	15	9.05	WW-27-J-11	63		110.57
GG-71 (40 teeth)	5	4	9.32	WW-27-J-12	66		93.89
GG-73 (53 teeth)	7	10	10.44	WW-27-J-13	68		89.35
GG-77-1 (69 teeth)	10	4	9.05	WW-27-J-14	67		89.70
GG-79-1 (23 teeth)	2		6.55	WW-27-J-15	62		106.77
GG-80-1 (19 teeth)	1	4	6.90	WW-27-J-16	61		103.78
GG-81 (20 teeth)	2		12.24	WW-27-J-17	63		110.57
GG-82 (15 teeth)	1	1	10.74	WW-27-J-18	66		94.70
GG-83 (14 teeth)		15	15.52	WW-27-J-19	68		90.16
GJ-8 (27" long)	1	13	11.47	WW-27-J-20	67		90.50
GJ-9 (26" long)	1	12	10.01	WW-27-J-21	62		107.58
GJ-10 (30" long)	2		10.85	WW-27-J-22	61		104.65
WW-27-J	66		93.61	WW-27-J-23	63		111.37

INTERCHANGEABLE PARTS FOR WW-27-J ETC. REDUCTION GEAR ASSEMBLIES FOR VE4 AND VF4 ENGINES

REF. NO.	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				LBS.	OZ.	
705	BG-150	PLATE—OUTER BEARING RETAINER	1	1		\$ 1.66
706	BG-151	PLATE—INNER BEARING RETAINER	1		6	2.36
707	HF-265	SPACER—TAKE-OFF SHAFT	1		3	.72
708	LO-44	BREATHER	1		1	.69

(continued)

Order parts from nearest SERVICE STATION shown in directory following parts list.
IMPORTANT: Always give Model, Specification and Serial Numbers shown on name plate.

**INTERCHANGEABLE PARTS FOR WW-27-J ETC. REDUCTION
GEAR ASSEMBLIES FOR VE4 AND VF4 ENGINES**

REF. NO.	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				LBS.	OZ.	
709	ME-76	OUTER BEARING ASSEMBLY	1	1	11	\$ 6.40
		Consisting of:				
710		1 ME-76-1 cup, Timken #3525			10	2.41
711		1 ME-76-2 cone, Timken #3578		1	1	3.99
712	ME-77	INNER BEARING ASSEMBLY	1		15	4.17
		Consisting of:				
713		1 ME-77-1 cup, Timken #02820			6	1.72
714		1 ME-77-2 cone, Timken #02877			9	2.45
715	PA-279	DOWEL PIN—cover to housing	2		1	.06
716	PC-425	STUD—housing to crankcase, outer holes	2		2	.20
717	PH-202	OIL SEAL—outer bearing retainer plate	1		4	.92
		Kickhaefer Mfg. Co. #A-31-106.				
718	PH-206	COLLAR—take-off shaft spacer	1		2	1.66
719	QD-543-A	GASKET—inner bearing retainer plate	1		1	.06
720	QD-544	GASKET—outer bearing retainer plate	6		1	.06
721	QD-545	GASKET—cover to housing	1		1	.16
722	QD-618	GASKET—housing to crankcase	1		1	.16
723	SD-79	OIL INSTRUCTION TAG	1		1	.06
724	WA-55	TAKE-OFF SHAFT	1	6	14	7.79
		STANDARD HARDWARE				
725	PD-12	NUT, 7/16"-20 thread, hexagon steel	2		1	.03
		For housing to crankcase mounting studs.				
726	PE-4	LOCKWASHER, 5/16" positive	4		1	.03
		For outer bearing retainer plate.				
727	PE-5	LOCKWASHER, 3/8" positive	6		1	.03
		For cover to housing mounting, above oil level.				

(continued)

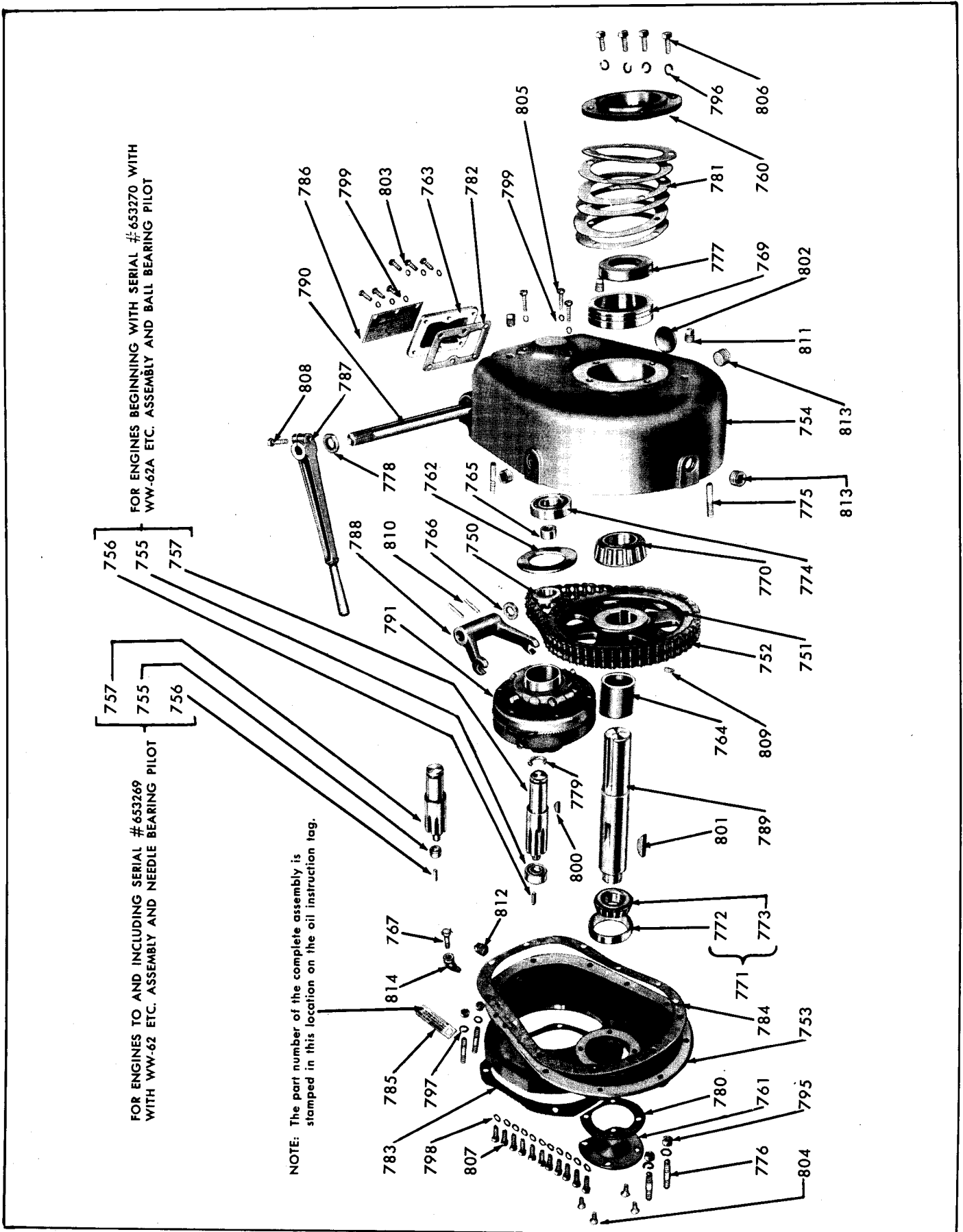
Order parts from nearest SERVICE STATION shown in directory following parts list.
IMPORTANT: Always give Model, Specification and Serial Numbers shown on name plate.

**INTERCHANGEABLE PARTS FOR WW-27-J ETC. REDUCTION
GEAR ASSEMBLIES FOR VE4 AND VF4 ENGINES**

REF. NO	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				.LBS.	OZ.	
728	PE-6	LOCKWASHER, $\frac{7}{16}$ " positive For housing to crankcase mounting, inner holes.	2		1	\$.03
729	PH-2	PLAIN WASHER, $\frac{7}{16}$ " I.D. x $\frac{1}{16}$ " thick steel For housing to crankcase mounting, outer holes.	2		1	.03
730	PH-22	PLAIN WASHER, $\frac{3}{8}$ " I.D. x $\frac{1}{16}$ " thick steel For cover to housing mounting, below oil level.	5		1	.03
731	PL-24	KEY, #29 Woodruff For driven gear mounting.	1		1	.16
732	PL-88	KEY, $\frac{1}{4}$ " square x 2" long For driver gear mounting.	1		1	.19
733	XC-17	SCREW, $\frac{5}{16}$ "-18 thread x $\frac{3}{4}$ " long, flat head For inner bearing retainer plate.	4		1	.11
734	XD-15	SCREW, $\frac{5}{16}$ "-18 thread x $\frac{3}{4}$ " long, hexagon head For outer bearing retainer plate.	4		1	.06
735	XD-27	SCREW, $\frac{3}{8}$ "-16 thread x 1" long, hexagon head For cover to housing mounting.	11		1	.06
736	XD-130	SCREW, $\frac{7}{16}$ "-14 thread x $2\frac{1}{4}$ " long, hexagon head For housing to crankcase, inner holes.	2		2	.13
737	XE-17	SCREW, $\frac{1}{4}$ "-20 thread x $\frac{3}{8}$ " long, headless set For driver gear mounting.	1		1	.06
738	XE-44	SCREW, $\frac{5}{16}$ "-18 thread x $\frac{5}{8}$ " long, headless set For driven gear mounting.	1		1	.11
739	XK-2	PLUG, $\frac{1}{4}$ " pipe, square head For oil level.	3		1	.11
740	XK-3	PLUG, $\frac{3}{8}$ " pipe, square head For oil level—when take-off shaft is in horizontal position.	2		2	.13
741	XK-4	PLUG, $\frac{1}{2}$ " pipe, square head For oil drain.	1		2	.13
742	XK-88	REDUCER BUSHING, $\frac{3}{8}$ " to $\frac{1}{8}$ " pipe For mounting breather.	1		1	.13

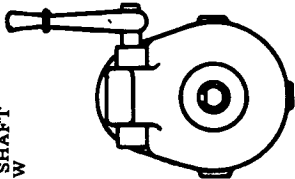
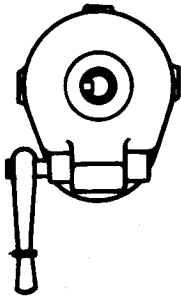
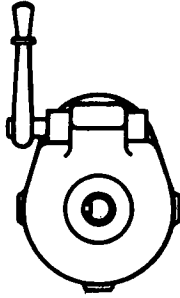
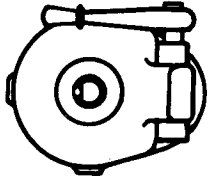
Order parts from nearest SERVICE STATION shown in directory following parts list.
IMPORTANT: Always give Model, Specification and Serial Numbers shown on name plate.

WW-62 ETC. AND WW-62-A ETC. CLUTCH REDUCTION GEAR ASSEMBLIES FOR MODELS VE4 AND VF4 ENGINES



Order parts from nearest SERVICE STATION shown in directory following parts list.
IMPORTANT: Always give Model, Specification and Serial Numbers shown on name plate.

WW-62 ETC. AND WW-62-A ETC. CLUTCH REDUCTION GEAR ASSEMBLIES FOR VE4 AND VF4 ENGINES

Position Of Take-off Shaft Viewing from Cranking End of Engine	Assembly Number	Reduction Ratio	Rotation of Take-off Shaft	Ref. No. 750		Ref. No. 751		Ref. No. 752		Ref. No. 753		Ref. No. 754		Ref. No. 755		Ref. No. 756		Ref. No. 757
				Driver Gear Part No.	Driven Gear Part No.	Chain Part No.	Housing Part No.	Cover Part No.	Pilot Bearing	Key	Drive Shaft							
TAKE-OFF SHAFT BELOW 	WW-62 WW-62-A WW-62-1 WW-62A-1 WW-62-2 WW-62A-2 WW-62-3 WW-62A-3 WW-62-4 WW-62A-4 WW-62-5 WW-62A-5 WW-62-24 WW-62A-24	2.07 to 1 3.00 to 1 3.84 to 1 2.00 to 1 2.67 to 1 3.79 to 1 2.32 to 1	Ctr. Eng. Wise Ctr. Eng. Wise Ctr. Eng. Wise Engine-Wise Engine-Wise Engine-Wise Ctr. Eng. Wise	GG-116 GG-117 GG-118 GG-113 GG-114 GG-115 GG-131	GG-67-1 GG-77-1 GG-69-1 GG-71 GG-71 GG-73 GG-67-A	..... ..... ..... GJ-8 GJ-9 GJ-10	BG-215 BG-215 BG-215 BG-215 BG-215 BG-215 BG-215	BH-143 BH-143 BH-143 BH-143 BH-143 BH-143 BH-143	ME-115-B ME-115 ME-15-B ME-15-B ME-15-B ME-15-B ME-115 ME-15-B ME-15-B ME-115 ME-15-B ME-115 ME-15-B	PL-103 PL-140 PL-103 PL-140 PL-103 PL-140 PL-103 PL-140 PL-103 PL-140 PL-103 PL-140	WA-87 WA-87-A WA-87 WA-87-A WA-87 WA-87-A WA-87 WA-87-A WA-87 WA-87-A WA-87 WA-87-A						
	TAKE-OFF SHAFT ON LEFT HAND SIDE (as Viewed from the Cranking End) 	WW-62-6 WW-62A-6 WW-62-7 WW-62A-7 WW-62-8 WW-62A-8 WW-62-9 WW-62A-9 WW-62-10 WW-62A-10 WW-62-11 WW-62A-11 WW-62-25 WW-62A-25	2.07 to 1 3.00 to 1 3.84 to 1 2.00 to 1 2.67 to 1 3.79 to 1 2.32 to 1	Ctr. Eng. Wise Ctr. Eng. Wise Ctr. Eng. Wise Engine-Wise Engine-Wise Engine-Wise Ctr. Eng. Wise	GG-116 GG-117 GG-118 GG-113 GG-114 GG-115 GG-131	GG-67-1 GG-77-1 GG-69-1 GG-71 GG-71 GG-73 GG-67-A GJ-8 GJ-9 GJ-10	BG-215-1 BG-215-1 BG-215-1 BG-215-1 BG-215-1 BG-215-1 BG-215-1	BH-143 BH-143 BH-143 BH-143 BH-143 BH-143 BH-143	ME-115 ME-15-B ME-115 ME-15-B ME-15-B ME-15-B ME-115 ME-15-B ME-15-B ME-115 ME-15-B ME-115 ME-15-B	PL-103 PL-140 PL-103 PL-140 PL-103 PL-140 PL-103 PL-140 PL-103 PL-140 PL-103 PL-140	WA-87 WA-87-A WA-87 WA-87-A WA-87 WA-87-A WA-87 WA-87-A WA-87 WA-87-A WA-87 WA-87-A						
		TAKE-OFF SHAFT ON RIGHT HAND SIDE (as Viewed from the Cranking End) 	WW-62-12 WW-62A-12 WW-62-13 WW-62A-13 WW-62-14 WW-62A-14 WW-62-15 WW-62A-15 WW-62-16 WW-62A-16 WW-62-17 WW-62A-17 WW-62-26 WW-62A-26	2.07 to 1 3.00 to 1 3.84 to 1 2.00 to 1 2.67 to 1 3.79 to 1 2.32 to 1	Ctr. Eng. Wise Ctr. Eng. Wise Ctr. Eng. Wise Engine-Wise Engine-Wise Engine-Wise Ctr. Eng. Wise	GG-116 GG-117 GG-118 GG-113 GG-114 GG-115 GG-131	GG-67-1 GG-77-1 GG-69-1 GG-71 GG-71 GG-73 GG-67-A GJ-8 GJ-9 GJ-10	BG-215-2 BG-215-2 BG-215-2 BG-215-2 BG-215-2 BG-215-2 BG-215-2	BH-143 BH-143 BH-143 BH-143 BH-143 BH-143 BH-143	ME-115 ME-15-B ME-115 ME-15-B ME-15-B ME-15-B ME-115 ME-15-B ME-15-B ME-115 ME-15-B ME-115 ME-15-B	PL-103 PL-140 PL-103 PL-140 PL-103 PL-140 PL-103 PL-140 PL-103 PL-140 PL-103 PL-140	WA-87 WA-87-A WA-87 WA-87-A WA-87 WA-87-A WA-87 WA-87-A WA-87 WA-87-A WA-87 WA-87-A					
			TAKE-OFF SHAFT ON TOP 	WW-62-18 WW-62A-18 WW-62-19 WW-62A-19 WW-62-20 WW-62A-20 WW-62-21 WW-62A-21 WW-62-22 WW-62A-22 WW-62-23 WW-62A-23 WW-62-27 WW-62A-27	2.07 to 1 3.00 to 1 3.84 to 1 2.00 to 1 2.67 to 1 3.79 to 1 2.32 to 1	Ctr. Eng. Wise Ctr. Eng. Wise Ctr. Eng. Wise Engine-Wise Engine-Wise Engine-Wise Ctr. Eng. Wise	GG-116 GG-117 GG-118 GG-113 GG-114 GG-115 GG-131	GG-67-1 GG-77-1 GG-69-1 GG-71 GG-71 GG-73 GG-67-A GJ-8 GJ-9 GJ-10	BG-215-3 BG-215-3 BG-215-3 BG-215-3 BG-215-3 BG-215-3 BG-215-3	BH-143-1 BH-143-1 BH-143-1 BH-143-1 BH-143-1 BH-143-1 BH-143-1	ME-115 ME-15-B ME-115 ME-15-B ME-15-B ME-15-B ME-115 ME-15-B ME-15-B ME-115 ME-15-B ME-115 ME-15-B	PL-103 PL-140 PL-103 PL-140 PL-103 PL-140 PL-103 PL-140 PL-103 PL-140 PL-103 PL-140	WA-87 WA-87-A WA-87 WA-87-A WA-87 WA-87-A WA-87 WA-87-A WA-87 WA-87-A WA-87 WA-87-A				

See following page for prices.

**PRICES FOR PARTS SHOWN ON PRECEDING PAGE FOR WW-62 ETC. AND WW-62-A ETC.
CLUTCH REDUCTION GEAR ASSEMBLIES FOR VE4 AND VF4 ENGINES**

PART NO.	NET WEIGHT		PRICE EACH	PART NO.	NET WEIGHT		PRICE EACH
	LBS.	OZ.			LBS.	OZ.	
BG-215	19	8	\$ 14.95	WW-62-7	89	8	\$133.40
BG-215-1	19	8	14.95	WW-62-8	89		132.82
BG-215-2	19	8	14.95	WW-62-9	86		148.63
BG-215-3	19	8	14.95	WW-62-10	85		146.56
BH-143	20		21.85	WW-62-11	87		148.35
BH-143-1	20		21.85	WW-62-12	89		135.24
GG-67-1 (62 teeth)	8	11	9.05	WW-62-13	89	8	134.37
GG-67-A (65 teeth)	9		9.05	WW-62-14	89		133.80
GG-69-1 (73 teeth)	10	15	9.05	WW-62-15	86		148.17
GG-71 (40 teeth)	5	4	9.32	WW-62-16	85		146.05
GG-73 (53 teeth)	7	10	10.44	WW-62-17	87		148.06
GG-77-1 (69 teeth)	10	4	9.05	WW-62-18	89		134.83
GG-113 (20 teeth)	1	14	7.47	WW-62-19	87	8	132.53
GG-114 (15 teeth)		14	6.90	WW-62-20	89		131.96
GG-115 (14 teeth)		11	6.90	WW-62-21	86		147.71
GG-116 (30 teeth)	2	10	6.32	WW-62-22	85		145.70
GG-117 (23 teeth)	2	1	4.02	WW-62-23	87		149.50
GG-118 (19 teeth)	1	12	3.45	WW-62-24	89		142.48
GG-131 (28 teeth)	3		4.48	WW-62-25	89		133.86
GJ-8 (27" long)	1	13	11.47	WW-62-26	89		133.40
GJ-9 (26" long)	1	12	10.01	WW-62-27	89		132.99
GJ-10 (30" long)	2		10.85				
ME-15-B ball (pilot) bearing For engines beginning with Serial #653270 (furnished by Rockford with clutch, their No. CL-5616).		8	See Rock- ford Price List	The following assemblies are for engines beginning with Serial #653270 (with ball bearing pilot).			
ME-115 Needle (pilot) bearing For engines to and including Serial #653269.		3	.82	WW-62A	89		\$146.62
PL-103, 5/16" x 1 5/8" long		1	.21	WW-62A-1	89	8	134.55
SQUARE KEY (For engines to and including Serial #653269)				WW-62A-2	89		136.10
PL-140, 5/16" x 1 1/8" long		1	.18	WW-62A-3	86		149.78
SQUARE KEY (For engines beginning with Serial #653270).				WW-62A-4	85		147.77
WA-87 DRIVE SHAFT (For engines to and including Serial #653269).	2	8	5.40	WW-62A-5	87		151.80
WA-87-A DRIVE SHAFT (For engines beginning with Serial #653270).	2	8	5.40	WW-62A-6	89		138.00
				WW-62A-7	89	8	135.70
				WW-62A-8	89		135.12
				WW-62A-9	86		150.93
				WW-62A-10	85		148.86
				WW-62A-11	87		150.65
				WW-62A-12	89		137.54
				WW-62A-13	89	8	136.67
				WW-62A-14	89		136.10
				WW-62A-15	86		150.47
				WW-62A-16	85		148.35
				WW-62A-17	87		150.36
				WW-62A-18	89		137.13
				WW-62A-19	89	8	134.83
				WW-62A-20	89		134.26
				WW-62A-21	86		150.01
				WW-62A-22	85		148.00
				WW-62A-23	87		151.80
				WW-62A-24	89		144.78
				WW-62A-25	89		136.16
				WW-62A-26	89		135.70
				WW-62A-27	89		135.29

(continued)

Order parts from nearest SERVICE STATION shown in directory following parts list.
IMPORTANT: Always give Model, Specification and Serial Numbers shown on name plate.

**INTERCHANGEABLE PARTS FOR WW-62 ETC. AND WW-62-A ETC CLUTCH
REDUCTION GEAR ASSEMBLIES FOR VE4 AND VF4 ENGINES**

REF. NO.	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				LBS.	OZ.	
760	BG-150	PLATE—OUTER BEARING RETAINER.....	1	1		\$ 1.66
761	BG-151	PLATE—INNER BEARING RETAINER.....	1		6	2.36
762	BG-216	PLATE—CLUTCH BEARING RETAINER.....	1		8	.78
763	BH-127	PLATE—INSPECTION HOLE COVER.....	1		12	1.26
764	HF-265-A	SPACER—TAKE-OFF SHAFT.....	1		6	.72
765	HF-372	SPACER—BALL BEARING.....	1		3	.39
766	HF-392	SPACER—SHIFTER YOKE (Used only when take-off shaft is on the right or left hand side).....	4		2	.23
767	LO-44	BREATHER.....	1		1	.69
768	ME-76	OUTER BEARING ASSEMBLY.....	1	1	11	6.40
		Consisting of:				
769		1 ME-76-1 Cup, Timken #3525.....			10	2.41
770		1 ME-76-2 Cone, Timken #3578.....		1	1	3.99
771	ME-77	INNER BEARING ASSEMBLY.....	1		15	4.17
		Consisting of:				
772		1 ME-77-1 Cup, Timken #02820.....			6	1.72
773		1 ME-77-2 Cone, Timken #02877.....			9	2.45
774	ME-119	BALL BEARING—CLUTCH SHAFT..... New Departure #3206.	1		6	5.40
775	PA-279	DOWEL PIN—Cover to housing.....	2		1	.13
776	PC-419	STUD—HOUSING TO CRANKCASE.....	4		2	.25
777	PH-202	OIL SEAL—outer bearing retainer plate..... Kickhaefer Mfg. Co. #A-31-106.	1		4	.92
778	PH-234-A	OIL SEAL—SHIFTER LEVER SHAFT.....	1		3	1.25
779	PK-82	RING—CLUTCH SHAFT BEARING RETAINING...	1		1	.03
780	QD-543-A	GASKET—INNER BEARING RETAINER PLATE...	1		1	.06

(continued)

Order parts from nearest SERVICE STATION shown in directory following parts list.
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**INTERCHANGEABLE PARTS FOR WW-62 ETC. AND WW-62-A ETC CLUTCH
REDUCTION GEAR ASSEMBLIES FOR VE4 AND VF4 ENGINES**

REF. NO.	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				LBS.	OZ.	
781	QD-544	GASKET—OUTER BEARING RETAINER PLATE..	6		1	\$.06
782	QD-592	GASKET—INSPECTION HOLE COVER PLATE....	1		1	.09
783	QD-618	GASKET—HOUSING TO CRANKCASE.....	1		1	.16
784	QD-619	GASKET—COVER TO HOUSING.....	1		1	.29
785	SD-79	OIL INSTRUCTION TAG.....	1		1	.06
786	SD-125	CLUTCH ADJUSTING INSTRUCTION PLATE.....	1		1	.09
787	VB-55-1	LEVER—CLUTCH SHIFTER.....	1	2		2.09
788	VB-64-A	YOKE—CLUTCH SHIFTER.....	1	1	8	2.99
789	WA-55-H	TAKE-OFF SHAFT.....	1	6	10	7.79
790	WA-61-D	SHAFT—CLUTCH SHIFTER.....	1	1	12	1.31
791	WC-288-A	CLUTCH ASSEMBLY..... Rockford Drilling Model 5½ L.O.C. #CLA-1467-AD... NOTE: For engines to and including Serial #653269 with needle bearing pilot in crankshaft, use WC-288-A clutch but remove ball bearing pilot in clutch drive hub. See Rockford illustration and parts Price List of clutch.	1	12		34.78
STANDARD HARDWARE						
795	PD-12	NUT, ¼"-20 thread, hexagon steel..... For housing to crankcase mounting studs.	4		1	.03
796	PE-4	LOCKWASHER, ⅝" positive..... For outer bearing retainer plate.	4		1	.03
797	PE-6	LOCKWASHER, ⅞" positive..... For housing to crankcase mounting.	4		1	.03
798	PH-22	PLAIN WASHER, ⅜" I.D. x ⅛" thick steel..... For cover to housing mounting.	11		1	.03
799	PH-30-A	PLAIN WASHER, ¼" I.D. x ⅛" thick steel..... 6—for inspection hole cover plate. 3—for bearing retainer plate.	9		1	.03

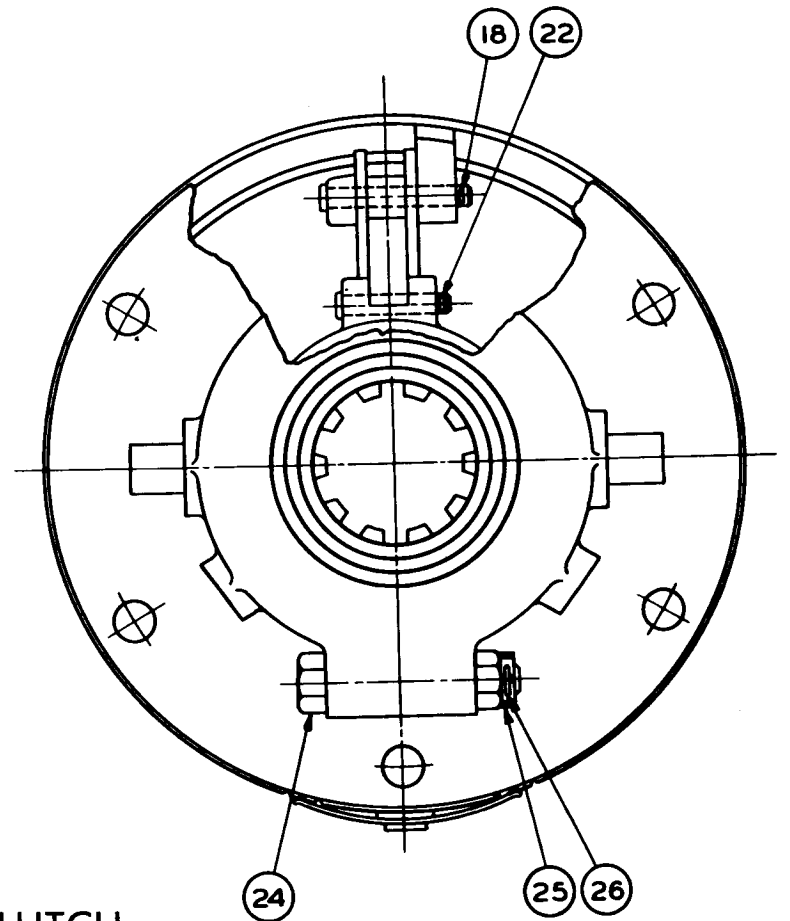
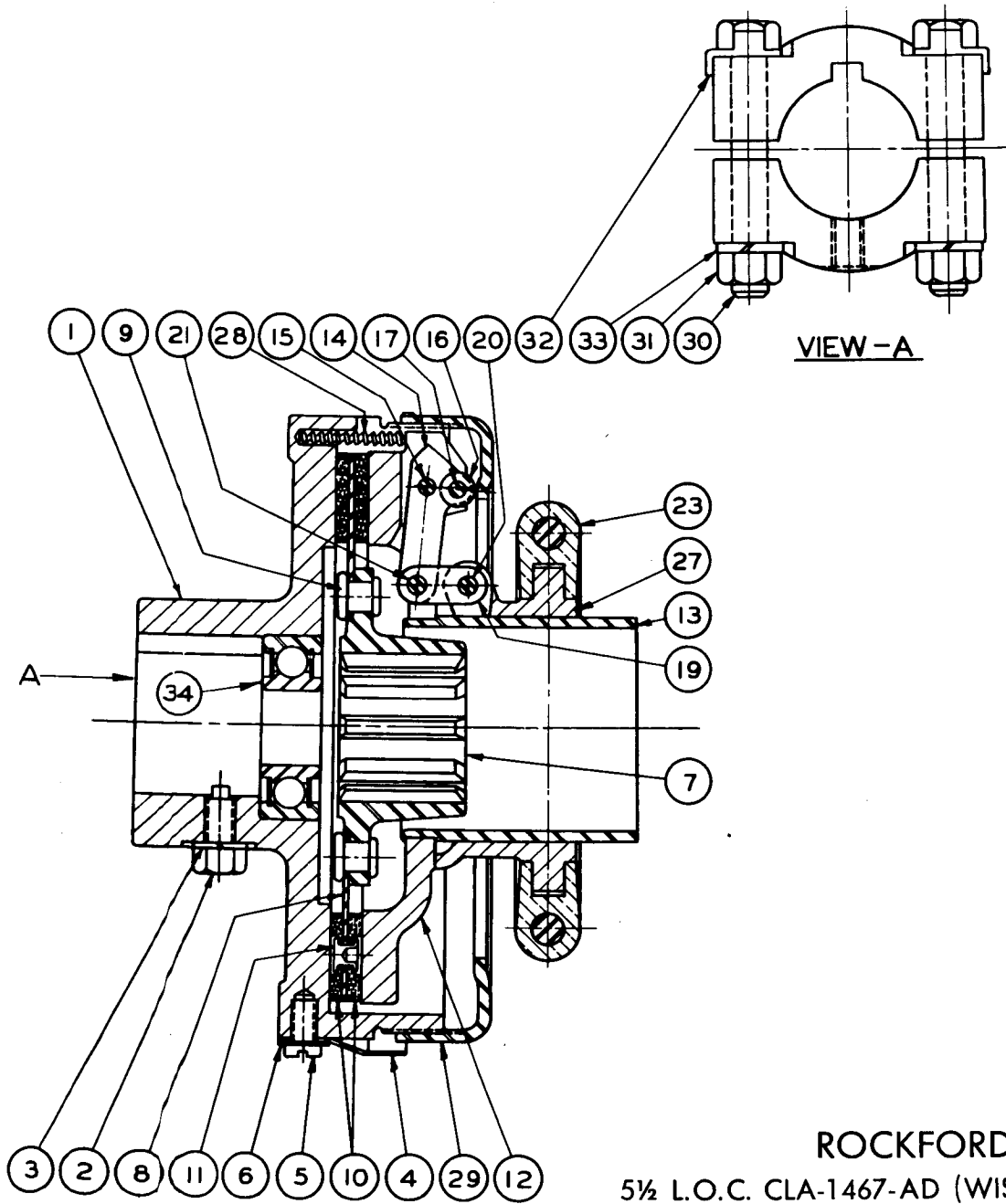
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Order parts from nearest SERVICE STATION shown in directory following parts list.
IMPORTANT: Always give Model, Specification and Serial Numbers shown on name plate.

INTERCHANGEABLE PARTS FOR WW-62 ETC. AND WW-62-A ETC CLUTCH REDUCTION GEAR ASSEMBLIES FOR VE4 AND VF4 ENGINES

REF. NO.	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				LBS.	OZ.	
800	PL-17	KEY, #13 Woodruff..... For drive gear.	1		1	\$.04
801	PL-24	KEY, #29 Woodruff..... For driven gear.	1		1	.16
802	SA-58	PLUG, 1 $\frac{3}{8}$ " expansion..... For shifter shaft hole.	1		1	.04
803	XA-36	SCREW, $\frac{1}{4}$ "-20 thread x $\frac{3}{4}$ " long, round head..... For inspection hole cover plate.	6		1	.03
804	XC-17	SCREW, $\frac{5}{16}$ "-18 thread x $\frac{3}{4}$ " long, flat head..... For inner bearing retainer plate.	4		1	.11
805	XD-7	SCREW, $\frac{1}{4}$ "-20 thread x 1" long, hexagon head..... For clutch bearing retainer plate.	3		1	.09
806	XD-15	SCREW, $\frac{5}{16}$ "-18 thread x $\frac{3}{4}$ " long, hexagon head..... For outer bearing retainer plate.	4		1	.06
807	XD-27	SCREW, $\frac{3}{8}$ "-16 thread x 1" long, hexagon head..... For cover to housing mounting.	11		1	.06
808	XD-30	SCREW, $\frac{3}{8}$ "-16 thread x 1 $\frac{1}{2}$ " long, hexagon head..... For shifter lever clamp.	1		2	.06
809	XE-44	SCREW, $\frac{5}{16}$ "-18 thread x $\frac{5}{8}$ " long, headless set..... For driven gear mounting.	1		1	.11
810	XH-26	TAPER PIN, #4 x 1 $\frac{3}{8}$ " long..... For shifter yoke.	2		1	.06
811	XK-2	PLUG, $\frac{1}{4}$ " pipe, square head..... For oil level.	3		1	.11
812	XK-4	PLUG, $\frac{1}{2}$ " pipe, square head..... For oil filler.	1		2	.13
813	XK-6	PLUG, $\frac{1}{2}$ " pipe, countersunk head..... For oil drain.	3		2	.18
814	XK-77	STREET ELL, $\frac{1}{8}$ " pipe x 45°..... For breather mounting.	1		1	.25

Order parts from nearest SERVICE STATION shown in directory following parts list.
IMPORTANT: Always give Model, Specification and Serial Numbers shown on name plate.



ROCKFORD CLUTCH

5½ L.O.C. CLA-1467-AD (WIS. MOTOR NO. WC-288-A)

ROCKFORD CLUTCH DIVISION

FORMERLY ROCKFORD DRILLING MACHINE DIVISION

BORG-WARNER CORPORATION

ROCKFORD, ILLINOIS

Parts PRICE LIST

EFFECTIVE DATE: August 28, 1946

ROCKFORD CLUTCH NO. CLA-1467-AD

CUSTOMER'S CLUTCH NO. WC-288-A

SIZE: 5½"

TYPE: LOC

FOR MODELS:

AS SOLD TO: Wisconsin Motor Corporation, Milwaukee, Wisconsin.

Refer. No.	Quan. per Clutch	Part Name	Rockford Part No.	Cust. Part No.	List each
SEE ILLUSTRATION ATTACHED.					
1	1	Clutch Housing	CL-5210-1		14.09
2	1	Hex. Screw (Dog Point)	CL-5163		.12
3	1	Lock Washer	CL-3920		.01
4	1	Adjusting Lock	CL-4973		.12
5	1	Fil. Hd. Screw	CL-3917-1		.01
6	1	Shakeproof Washer	CL-3468		.01
	1	Driven Member Assembly (Above includes next 5 items)	UCL-1-1244-10		6.90
7	1	Splined Center	CL-1244-10		*
8	1	Clutch Plate	CL-5206		*
9	6	Flat Hd. Rivet	CL-486		*
10	2	Facing	CL-5321		1.09
11	6	Tubular Rivet	CL-1011		.01
	1	Pressure Plate Lever Assembly (Above includes next 8 items)	UCL-1-5146-A		10.93
	1	Pressure Plate Assembly (Above includes next 2 items)	UCL-5146		8.05
12	1	Pressure Plate	CL-5146		*
13	1	Support Sleeve	CL-5154		*
14	6	Lever	CL-5544		.12
15	3	Lever Pin	CL-5156		.06
16	3	Roller	CL-4775		.03
17	3	Roller Pin	CL-4971		.07
18	3	Cotter Pin	CL-5092		.01
19	6	Connecting Link	CL-4776		.17
20	3	Link Pin (Long)	CL-5153		.05
21	3	Link Pin (Short)	CL-5152		.05
22	6	Cotter Pin	CL-5092		.01
	1	Release Sleeve Assembly (Above includes next 6 items)	UCL-5145		13.80
	1	Release Bearing Assembly (Above includes next 4 items)	UCL-5144		8.63
23	2	Release Bearing	CL-5144		*
24	2	Hex. Screw	CL-3335		.06
25	2	Castile Nut	CL-3336		.06
26	2	Cotter Pin	CL-3923		.01
27	2	Release Sleeve	CL-5145		4.89
28	1	Return Spring	CL-5087		.07
29	3	Adjusting Ring	CL-5147		3.39
30	1	Hex. Screw	CL-5318		.12
31	2	Light Hex. Nut	CL-5319		.03
32	2	Screw Lock	CL-5211		.05
33	2	Lock Washer	PT-353		.01
34	1	Pilot Bearing	CL-5616		2.99

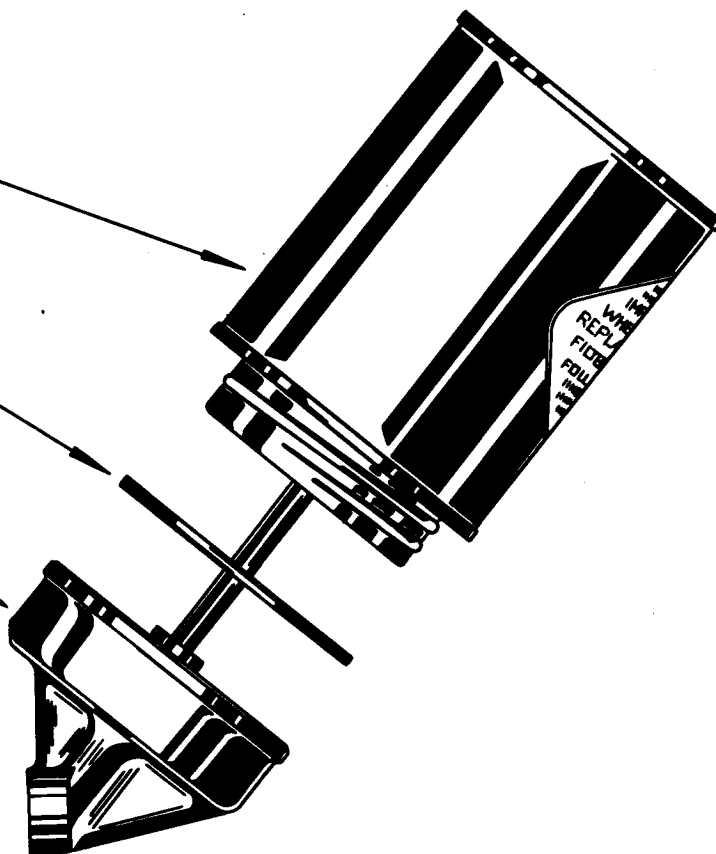
(*) Asterisk - Indicates parts not supplied separately for service. Order sub-assembly in which included.

**OIL FILTER
FOR VE4, VF4, VM4 AND VP4 ENGINES**

SA-18667
ELEMENT

18404
GASKET

SA-18201
BASE



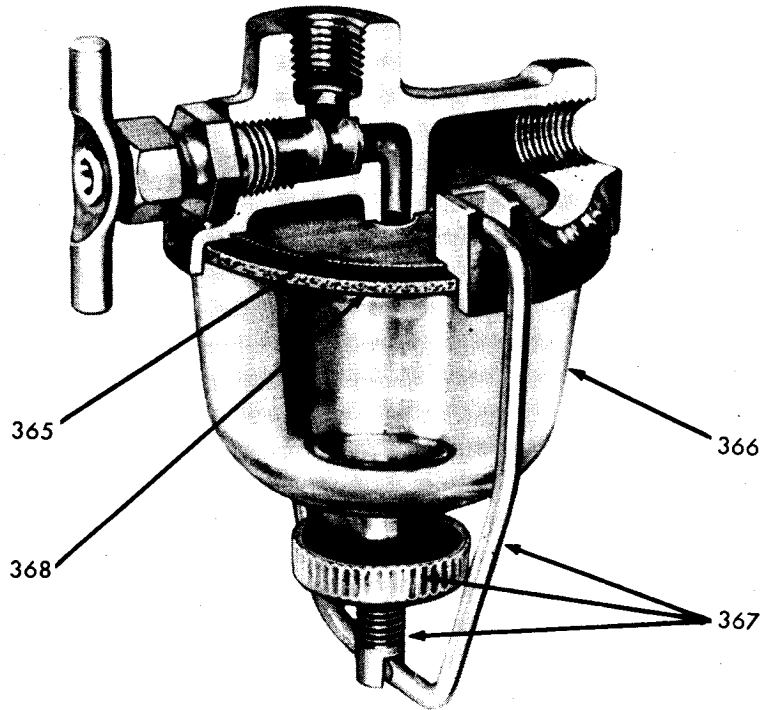
OIL FILTER

MICHIANA PRODUCTS CORPORATION N° 18200
WISCONSIN MOTOR N° RV-27-A

MICHIANA PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
			LBS.	OZ.	
18200	OIL FILTER COMPLETE.....	1	1	13	\$ 4.37
18404	GASKET.....	1		1	Net .08
SA-18667	FILTER ELEMENT.....	1		7	1.15
SA-18201	BASE CASTING WITH CENTER TUBE AND RESTRICTION.....	1	1	6	3.22

Order parts from nearest SERVICE STATION shown in directory following parts list.
IMPORTANT: Always give Model, Specification and Serial Numbers shown on name plate.

LP-19 FUEL STRAINER ASSEMBLY



REF. NO.	PART NO.	DESCRIPTION	NO. REQ.	NET WEIGHT		PRICE EACH
				LBS.	OZ.	
	LP-19	FUEL STRAINER ASSEMBLY, Tillotson #OW-418...			12	\$ 1.52
365	OW-352	FILTER SCREEN.....	1		1	.11 net
366	OW-363	GLASS BOWL.....	1		2	.11 net
367	OW-447	CLAMP WIRE AND THUMB NUT ASSEMBLY.....	1		2	.23 net
368	QD-653	BOWL GASKET.....	1		1	.11

Order parts from nearest SERVICE STATION shown in directory following parts list.
IMPORTANT: Always give Model, Specification and Serial Numbers shown on name plate.

WISCONSIN MOTOR CORPORATION

APPROVED SERVICE STATIONS

The following concerns have service part stocks, facilities and trained personnel to render complete service on Wisconsin Air-Cooled Engines. We recommend you work through these service stations on your Wisconsin engine service requirements.

*DISTRIBUTORS

ALABAMA

Abbeville	Abbeville Tractor & Implement Company
Albertville	Birdsong Farm Supply
Andalusia	McGraw Truck & Tractor Company
Anniston	East Alabama Auto Parts, 102 W. 10th St.
Athens	C. W. Spencer
Atmore	Watson Hardware Company
Bay Minette	Wilson Equipment Company
Bayou La Batre	Zewen Marine Service
Birmingham	Mine & Contractors' Supply Tractor & Equipment Company Moore-Handley Hardware Co., 27 S. 20th St.
Brewton	Watson Hardware Company
Brundidge	Carter Bros. Manufacturing Company
Clanton	Chilton Truck & Implement Company
Clayton	Beaty Motor Company
Clio	W. A. Jackson & Sons
Darlington	R. E. Lambert & Sons
Decatur	J. D. Pittman Implement Company, Inc., Lee & Line Streets
Dothan	Dean Mfg. Company Walker Farm Equipment Company
Enterprise	Bryson Implement & Truck Company
Eufaula	Duncan Chevrolet Company George Peake
Evergreen	Evergreen Equipment Company
Fayette	Kimbrell Tractor & Implement Company
Flomaton	Watson Hardware Company
Floral	Royce Hooten Equipment Company
Florence	Rice & England Rice Implement Company
Foley	Foley Hardware Company
Fort Deposit	Edwards Implement Company
Frisco City	Hendrix Motor Company
Gadsden	Alabama Farm Supply Co., 230 S. 2nd St.
Geneva	Andrews Truck & Tractor Company
Greenville	Edwards Implement Company Greenville Motor Company Kierce Auto & Implement Company Stabler Truck & Tractor Company
Guntersville	Barnett Auto Supply
Gurley	Phillips Motor Company
Hartford	Holman Bros. Implement Company
Headland	Walden Motor Company
Jackson	McKee Truck & Tractor Company
Jacksonville	Edwards Implement Company
Leighton	Rice & England
Louisville	A. J. Lee Hardware Company
Luverne	Luverne Implement Company Frank Sikes Auto Company
Mobile	International Paper Co., Southern Kraft Div. Mobile Cylinder Grinding Company Southern Service Co., 260 St. Michael St. Turner Supply Company
Montgomery	Alabama Farm Equipment Company 324 N. Perry Street Alabama Mchry. & Supply Company Frick Company

* Parts Service Corporation, 408 Bibb St.
Ray Brooks Truck & Tractor Company

Opelika	Opelika Truck & Tractor Company
Opp	Dee Implement Company
Peterman	Peterman Agricultural Company
Phenix City	The Mullin Company
Roanoke	W. T. Belcher & Company
Russellville	Felton Hardware & Implement Company
Sanson	T. J. Brooks & Son
Selma	Henderson & Allan Implement Company Selma Parts Service Co., 1313 Water St.
Troy	Troy Auto & Implement Company
Tuscaloosa	Cain Machine Co., 1509 Queen City Avenue Tuscaloosa Truck & Tractor Company
Tuskegee	Dyson Farm Supply Company
Union Springs	E. B. Chancey Lumber Company

ARIZONA

Phoenix * Pratt-Gilbert Hardware Company

ARKANSAS

Augusta	E. H. Connors Mercantile Company
Batesville	Barnett & Landers
Berryville	Earl Hailey Mercantile Company
Blytheville	Sixty One Implement Company
Brinkley	Brinkley Farm Equipment Company
Calico Rock	Brunmitt & Kerr
Carlisle	Birdsong Motor Company
Eldorado	Magneto Service & Supply Company
England	Wood Machinery Company
Fayetteville	Andrews Implement Company
Fisher	Wilson Bros. Equipment Company
Forrest City	Shearin Implement Company
Fort Smith	Powers Brothers
Harrisburg	Tarrant Machine Company
Harrison	Watkins Buick & Equipment Company
Joiner	Bowden Equipment Company
Jonesboro	Bridger Supply Company
Little Rock	Lyons Machinery Company
Magnolia	Cox Supply Company
Malvern	Malvern Supply & Equipment Company
Marianna	W. S. McClintock & Sons
McCrary	M. D. Thompson & Son
Morrilton	Love Supply Company
Newark	C. C. Norris & Sons
Newport	W. P. Davis
North Little Rock	Standard Equipment & Supply Company
Osceola	Missco Implement & Hardware Company
Paragould	Green Implement Company
Pine Bluff	Lewis Engine & Supply Company
Pocahontas	Sallee Implement Company
Prescott	Prescott Implement Company
Rector	Hurst Equipment Company
Rogers	Huenefeld Implement Company
Searcy	Abboud Tractor Company
Stuttgart	Waggoner & Wortman Service Company
Waldenburg	W. K. Neeley
Wynne	Rolfe Implement Company

CALIFORNIA

Alhambra Ja. R. Machine Shop, 820 S. Date Avenue

Arvin Mitchells
 Bakersfield Janco Pump & Engine Co., 2309 Chester Ave.
 Barstow J. C. Myers
 Brentwood Peterson Tractor & Equipment Company
 Chico Butte Pump & Motor Works
 9th St. & Oroville
 Jeffery Bros., 2400 Park Avenue
 Corcoran Cole Tractor & Equipment Co. Whitley Ave.
 Corcoran Machine Works
 Delano Central California Implement Company
 918 Main Street
 Emeryville * E. E. Richter & Son, 5725 Hollis Street
 Industrial Equip. Co., 1301 59th Street
 Escondido Agricultural Supply Co. 201 N. Broadway
 Ferndale Olsen Implement Company
 Fresno Hoeffler Mchry. & Tools
 2192 Railroad Avenue
 Peerless Pump Div. Food Mchry. Corp.
 1755 Broadway
 J. E. Schuman, 1776 "H" Street
 Gilroy G. A. Chappell & Sons
 Farm Supply Co., 60 N. Monterey Street
 Glendora Foothill Supply Co., P. O. Box 218
 Gustine Avevedo & Company
 Half Moon Bay Peterson Tractor & Equipment Company
 Hanford Hanford Farm Supply Co., 309 E. 7th St.
 Hayward Arthur C. Day Impl. Co., 645 Watkins St.
 Peterson Tractor & Equipment Company
 685 "A" Street
 King City Barry R. Scott, 428 Broadway
 Lindsay Stansfield & McKnight, Inc.
 Lodi Thompson-Sage, Inc., 126 S. Main Street
 Los Angeles * Essick Mfg. Co., 1950 Santa Fe Avenue
 Marysville Hust Bros., 3rd & "E" Sts.
 The Oliver Equipment Co., 2nd & "B" Sts.
 Merced Shannon Tractor & Pump Co., 345 16th St.
 Modesto Stanislaus Impl. & Hardware Company
 10th & "F" Streets
 Moorpark Ranch Equipment Company
 Murrieta Murrieta Machine Shop
 Oakland Ricker & Williams Co., 302 Fourth St.
 Red Bluff Minch Farm Implement Store
 Redding Gerlinger Steel & Supply Company
 1527 Sacramento
 Sierra Tractor & Equipment Company
 Reedley Growers' Supply Company
 Riverside Skip Fordyce, 3698 14th Street
 Sacramento Munz Bros., 301 N. 12th Street
 N. Sacramento Sacramento Pump & Supply House
 1711 Del Paso Boulevard
 Salinas Farmers' Mercantile Company
 San Diego Ed Caseman, Ltd., 533 3rd Avenue
 Farm Machine Co., 353 11th Avenue
 San Francisco Geo. C. Boardman Co., 122 Battery St.
 H. V. Carter Co., Inc., 52 Beale
 Coast Equipment Company, 948 Bryant Street
 Kerr Equipment Company, 160 10th St.
 Pacific Pumping Co., 954 Howard Street
 Peterson Tractor & Equipment Company
 923 Harrison Street
 Valley Equipment Co., 250 Seventh St.
 San Jose Garden City Sales & Service Company
 447 S. First Street
 Valley Equipment Co., 1178 W San Carlos
 San Lorenzo Faria Brothers
 San Luis Obispo Farmers' Hardware & Equipment Company
 581 Higuera Street
 Fred H. Johnson, 1119 Garden Street
 Santa Maria Farmers' Implement & Hardware Company
 209 North Broadway
 Santa Rosa Crown Parts & Machine Works
 435 Mendocino Avenue

Stockton Harris Manufacturing Company
 702 N. Wilson Way
 Stevenson Farm Equip. Co., 104 Main St.
 Stockton Armature & Motor Works
 646 S. California
 Thompson-Sage, Inc., 821 S. Wilson Way
 Tracy Thompson-Sage, Inc., 208 E. 11th St.
 Tulare Central California Implement Company
 320 E. Tulare Street
 Van Nuys So-Cal Implement Co., 7227 Van Nuys Blvd.
 Ventura Ranch Equipment Company
 Watsonville Farmers' Mercantile Co. Wall & Van Ness
 Whittier Edward Keasbey & Son, 234 S. Greenleaf
 Yreka Floyd A. Boyd Company
 Yuba City Schmidt Pump House & Machine Shop

COLORADO

Denver * Central Supply Co., 12th & Lincoln
 Grand Junction Dunn & Knight Appliance Company

CONNECTICUT

Bridgeport The Arnold Company
 Hartford McCallum Motor Service
 New Haven W. I. Clark Company
 New Milford New Milford Tractor
 Torrington Knight's Farm Machinery
 Waterbury Contractors Supply Company Inc.
 15 East Aurora Street
 Willimantic Wright's Garage, Star Route
 Windsor Locks The F. S. Bidwell Company

DELAWARE

Milford Taylor Auto Supply Company
 Wilmington Taylor Auto Supply Company
 12th & French Street

DISTRICT OF COLUMBIA

Washington, D. C. * Phillips Machinery & Tractor Company
 P. O. Box 549, Alexandria, Virginia

FLORIDA

Florence Villa Growers Service Company
 Jacksonville * M. D. Moody
 Lakeland Polk Machine Works
 Mariana * West Florida Equipment Company
 Miami * Llewellyn Machinery Corp.
 1030 N. Miami Avenue
 Orlando * Highway Equipment Service
 Punta Gorda Cerny's Machine Shop
 St. Petersburg J. W. Appley & Son
 Tampa * Dave Gordon & Co., 1800 2nd Avenue

GEORGIA

Albany Clark Tractor Company
 Gregory Welding Company
 James Equipment Company
 Atlanta * R. S. Armstrong & Bro. Company
 676 Marietta Street, N. W.
 W. L. Holbrook, 523 Stewart Avenue
 Augusta Reel Seed & Feed Company
 Bainbridge Harold Tractor Company
 Blakely W. A. Fuqua Live Stock Company
 Brunswick Coastal Chevrolet Company
 Kut Kwick Tool Company
 1927-29 New Castle Street
 Tidewater Equipment Company

Columbus	Columbus Tractor & Mchry. Company McDowell Motor & Implement Company
Cordele	Cordele Implement Company
Dawson	Terrell Implement Company
Doerun	J. T. Hortman
Donalsonville	Harvey Implement Company
Gainesville	W. H. Slack, Jr.
Louisville	Wigham & Beall
Moultrie	Bynum Implement Company
Perry	George C. Nunn & Son
Sandersville	Jesse Newsom
Shellman	D. K. Bynum
Statesboro	Bullock Tractor Company Statesboro Motor & Equipment Company
Sylvania	Stubbs Implement Company
Thomasville	Tuck Implement Company
Valdosta	Schroer Implement Company
Waycross	Tractor & Equipment Company

IDAHO

American Falls	American Falls Implement
Blackfoot	J. R. Meyers Company
Boise	Olson Manufacturing Company 2223 Fairview Avenue
Caldwell	Farmers' Supply Company
Downey	Morgan's Inc.
Idaho Falls	Eastern Idaho Equip. Co., 686 Shoup Ave.
Preston	Homer Tractor Service
Rupert	Rupert Implement Company
Twin Falls	Self Manufacturing Co., Tractor Division 214 Shoshone Street - E. Williams Tractor Company
Wendell	Gates Bros. Machine Shop

ILLINOIS

Bloomington	Turley Farm Equipment Company
Bridgeport	Abel Bros.
Cambridge	James P. Vinckel
Chestnut	Neuschaefer Hardware & Implements
Chicago	* Industrial Engine & Parts Company 2446 Prairie Avenue
Decatur	Bruce Implement Co., 929 E. William St.
DeKalb	Lee & Halverson
Forreston	Gruenewold Farm Store
Freeport	Sukenberz Implement Sales
Garrett	Horton Bros. & Harder
Geneseo	Frank G. Ward
Grafton	Marshall Equipment Company
Jacksonville	Perbix & Anderson
Kansas	Gough Motor Company
Kirkwood	Smith Implement Service
Milton	Frank Ball
Momence	Fieleke Implement Company
Morris	A. C. Varland, Inc., 216 W. Washington St.
Mt. Carroll	H. P. Hostetter
Niantic	Bruce Implement Company
Olney	Farmers Equipment & Supply Company
Paris	Walter Hodge Farm Equipment
Quincy	E. M. Chaten Implement Company
Ramsy	Hoffman Implement Company
Ridgeway	Ellis Implement Company
Rockford	Eighmy Equipment Company
Sterling	Mylin's Agricultural Store
Virginia	Hiermans
Winchester	Taylor Implement Company
Windsor	Harry E. Wallace

INDIANA

Advance	Jones & Rader
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Ambia	Ambia Fuel & Implement Company
Amboy	Mallott Farm & Supply Company
Angola	Covell Implement Store
Bippus	Horning-Raichart
Booneville	Rudolph Bros.
Brazil	Floderman Chevrolet
Brownsburg	North Side Garage
Burlington	Burlington Hardware Company
Cicero	Cicero Implement Company
Clayton	Stanley Implement Company
Covington	Gaub Implement Store
Crawfordsville	O. E. Straub
Danville	Danville Implement Company
Donaldson	Newberg's Farm Machinery Company
Earl Park	Benton County Implement Company
Etna Greene	Ed Heisler
Evansville	Lamey Implement Company
Farmland	Farmland Implement Company
Foraker	Hess Bros. Garage
Fort Branch	Meny & Company
Fowler	V. H. Hunter
Franklin	S. C. Myers Implement Company
Goshen	Elkhart Co. Farm Bureau Co-op. Ass'n.
Greencastle	H. & M. Sales Company
Greenfield	Custom Service
Greensburg	Ziegler Implement Company
Huntingburg	Nelta Simpson
Indianapolis	Bock Equipment Company A. F. Deary * Eagle Machine Co., Inc., 635 E. Market St. Farm Equipment Service Indiana Tractor Sales McAllister Tractor Company Papec Machine Company Stover-Winstead Company H. A. Waterman
Jasper	Hoffman Bros.
Kentland	Kentland Tractor & Implement Company
Kokomo	Pring Wilson Implement Company
Lafayette	Lafayette Co-operative Elevator Company Lyman Coal Company
Liberty	Brier Implement Company
Ligonier	Nrghsonger Farm Equipment
Logansport	Hendrickson Motor Sales
Mishawaka	C. C. Kelley & Sons
Morgantown	W. L. Bratton
Muncie	Ray L. Miller
Nappanee	Fletcher Motor Company
New Carlisle	C. C. Kelley & Sons
New Castle	Wilson Grain & Implement
New Haven	Farm Implement Store
Peru	Peru Feed & Farm Equipment Company
Remington	J. F. Schwersick & Son
Rensselaer	Hoover Garage
Richmond	Ridenour Motors
Rockville	Ray Bolsley C. C. Cottrell
Rossville	Ralph Rodkey
Rushville	Rushville Implement Company
Russellville	McGaughy Hardware
Russiaville	Martin's Service Station
Shelbyville	Shelby Tractor & Implement Company
South Bend	Gadbury Garage
Stroh	Stroh Implement Company
Swayzee	Oliver Sales & Service
Sweetzer	Quick Service Garage
Switz City	Switz City Garage
Terre Haute	Woodall Motors
Twelve Mile	Grable Implement Company
Vincennes	Wabash Implement Sales
Wanatah	Stassen Equipment Company
Warren	Daugherty's Farm Equipment Company

Washington Seirp Implement Sales
 Westfield Harry Sheets
 Williamsport R. F. Freeland
 Keen Tractor & Implement Company
 Wyatt Geo. Gilmer & Son

IOWA

Algona Bradley Brothers
 Alta Russell W. Peterson
 Atlantic Sothman Motor Company
 Carroll Juergens & Son
 Cedar Falls Al Matson
 Cherokee F. D. Booth
 Des Moines * Port Huron Mchry. Co., 301 E. Court
 Eldon Thomas Implement Company
 Ft. Dodge Ft. Dodge Implement Company
 Garner Garner Motor Sales
 Homestead Anana Society
 Iowa City Mann Auto Market
 Iowa Falls Rosene Implement Company
 Lenox Barker Implement Company
 Marion Marion Machinery Company
 Mason City Farm Equipment & Supply Company
 Miles Kunau Implement Company
 Mt. Pleasant Lloyd Peterson
 Oskaloosa Roy Lytle
 Renwick S. H. Klassie
 Rock Rapids Geo. Holliday & Son
 Sanborn Geo. C. Getting
 Spencer Sievers Farm Equipment
 Thompson Thompson Machinery Company
 Webster City Roy Lee Sales & Service Company

KANSAS

Atwood Deering Repair Shop
 Burlington Coolidge Implement Company
 Chanute Frank F. Young, 17 S. Ashby Street
 Coffeyville The Acme Foundry & Machine Company
 Colby Gunnels Tractor Company
 Council Grove Coolidge Implement Company
 Ellsworth Murphy Implement Company
 Emporia Coolidge Implement Co., 616 Mechanic St.
 Fredonia Homer Neill
 Garden City Scheufler Supply Company
 Goddard C. J. Linnebur Service
 Goodland Sherman County Oil Company
 Great Bend Scheufler Supply Company
 Hoxie Patmon Machinery Company
 Independence Stewart & Viets, 307 E. Main Street
 Junction City Wilcoxon Auto Company
 Kanorado Mack's Motor Company
 Kinsley Maytag Appliance Shop
 Lakin Service Oil Company
 Lawrence Anderson Implement Co., 520 W. 23rd St.
 Manhattan O. M. Jorgensen Implement Company
 Mulvane Mulvane Implement & Home Appliance Co.
 Neodesha Neodesha Tractor & Implement Company
 Osawatomie F. W. Black
 Oswege John Sprecher Repair Shop
 Ottawa Ottawa Tractor & Implement Company
 Pittsburg W. A. Thomas
 Sedan Chautauqua County Machine Company
 Syracuse Kaesler Motor & Implement Company
 Topeka M. B. Salisbury Co., Inc., 114 Quincy
 Wellington Knight Machine Shop

KENTUCKY

Corbin Harkleroad Motor Supply Company
 Crittenden T. T. Elliott
 Danville Crook Motor Company

Frankfort Danville Hardware Supply
 Georgetown Capital Super Service
 Lexington Robey Farm Supply Company
 Mountain Dew Coal Company
 * Wombwell Automotive Parts Company
 151 E. Short Street
 Van B. Smith
 * Atlas Auto Parts & Grinding Company
 1326-30 W. Jefferson Street
 Manchester Manchester Sales & Service
 Midway Booth Implement Company
 Paris Bobbitt & Hudson Implement Company
 Somers Green Leaf Welding Shop
 Williamsburg Shaw Motor Parts Company
 Williamstown Pettitt Machinery Company
 Winchester Stephenson Farm Supply

LOUISIANA

New Orleans * Wm. F. Surgi Equip. Co., 1017 Magazine St.

MAINE

Augusta Parker Danner Co., Riverside Drive
 Houlton James S. Peabody Co., Bangor Street
 Portland Portland Tractor Co., 803 Forest Avenue
 Presque Isle Roy C. Thompson Co., 253 Stae Street

MARYLAND

Baltimore L. A. Benson Company, Inc., 6 E. Lombard
 Loane Machinery Company, Inc.
 208 S. Hanover Street
 * Phillips Mchry. & Tractor Co., 325 W. 23rd
 Salisbury Taylor Auto Supply Company

MASSACHUSETTS

Boston * Diesel Engine Sales & Engineering Corp.
 Fish Pier Road
 Greenfield Center & Whitlock, Inc., 12 Deerfield St.
 Holyoke Holyoke Farm Machinery Co., 115-111 High

MICHIGAN

Baroda Myron Miller
 Battle Creek Farm Equipment Co., 1210 E. Columbia
 Bay City Sam Wieland, 801 N. Euclid Street
 Buchanan George C. Horst
 Clinton Clinton Farm Specialties
 Coldwater Endicott Implement Company
 Detroit * R. G. Moeller Co., 14415 Meyers Road
 Flatrock Hamilton Appliance, 24416 Telegraph Road
 Frankenmuth H. J. Schluckebier
 Grand Rapids Contractors Machinery Company
 Hartford Hilltop Orchards
 Inlay City Inlay City Implement Company
 Kalamazoo Howard Hopkins, Inc., 513 E. Kalamazoo Ave.
 Lansing Bert Howard Company, 1419 Turner Avenue
 Marlette Henry Diem
 Millburg L. Gelder & Sons
 Mio Herold Hebestrait
 Muskegon Lakeshore Machinery & Supply
 Richmond J. C. Ernst
 Rochester Houghton & Sons
 Scotts White Sales Company
 South Haven Michigan Orchard Supply
 Traverse City Mapleton Garage, RFD #1
 Union City Knauss Implement Company

MINNESOTA

Amboy Lehar Implement Company

Ashby
 Brooten
 Campbell
 Comfrey
 Crockston
 Detroit Lakes
 Duluth
 Elbow Lake
 Fairfax
 Fergus Falls
 Floodwood
 Forest Lake
 Fosston
 Fulda
 Grand Meadow
 Grand Rapids
 Grygla
 Hallock
 Hamburg
 Hampton
 Hawley
 Hendrum
 Humboldt
 Hutchinson
 Isle
 Karlstad
 Lake City
 Lamberton
 Little Fork
 McGregor
 Madelia
 Madison
 Mankato
 Marshall
 Maynard
 Minnesota
 Montevideo
 New York Mills
 Nielsville
 Owatonna
 Perham
 Pipestone
 Red Wing
 Redwood Falls
 Rochester
 Roseau
 Ross
 Rothsay
 Sacred Heart
 St. Cloud
 St. Paul
 Slayton
 Spring Grove
 Staples
 Triumph
 Wabasso
 Warren
 Wendall
 Wheaton
 Winnebago
 Wood Lake
 Worthington

R. J. Nelson, Farm Implements
 Farmers' Equity
 Philipsen Implement Company
 Johnson Implement Company
 Reinhart Hatchery & Produce
 Espe Machine Company, (Industrial)
 L. W. Wentzel, Farm Implements
 A & B Supply Company
 Kenneth M. Sutton Co., 230 Lake St., So.
 934 Garfield Ave.
 Christianson-Shervey Company
 Farmers' Supply Store
 National Bushing & Parts Company
 118 E. Washington Avenue
 Gran Implement Company
 Ray Jeans, Implement Dealer
 Wynn & Tagland, Farm Implements
 J. B. Janssen, Farm Implements
 Myre & Seim
 Hein Implements Company
 Henry Holte
 Frank Bryden, Farm Implements
 Thoele Garage
 A. T. Daleiden, Farm Implements
 Thyseil Bros., Farm Implements
 J. H. Canning, Farm Implements
 Bockwitz Machine Shop
 C. H. Stocking, Farm Implements
 Isle Farmers' Store
 Johnson Motors
 Herron Chevrolet Company
 Lamberton Implement Company
 E. E. Polkinghorne & Son
 McGregor Motor Company
 James Brothers
 Schmidt Bros. Motor Company
 Cutkosky & Jones, 202 6 N. Front Street
 National Bushing & Parts Company
 619-21 S. Front Street
 Matt's Carburetor & Electric Service
 Farmers' Implement & Hardware Company
 Geiwitz & Company
 Campbell Implement Company
 Ed. Hintsala, Implements
 B. M. Svendson, Farm Implements
 E. J. Ost Implement Company
 Schiller's Repair Shop (Industrial)
 Graff Implement Company
 Walkup, Farm Implements
 National Bushing & Parts Co., 317 3rd St.
 Louis Hunerlock
 National Bushing & Parts Company
 306 1st Avenue, S. W.
 O. K. Machine Company
 Cedarholm Machine Shop
 Lindberg Motor Company
 Bengt Olson, Farm Implements
 National Bushing & Parts Company
 106 6th Avenue, South
 National Bushing & Parts Company
 134-140 W. 7th Street
 Meaden Machine Works (Industrial)
 Foss Motor Sales
 H. C. Piper, Farm Implements
 Regenhagen Motor Company
 S. O. Baltes, Farm Machinery
 Erickson & Carlson
 Christianson-Shervey Company
 Christianson-Carlson Company
 Fred P. Hicks Company
 Markgraf Brothers Garage
 Martin Auto & Implement Company

Western Implement Company

MISSISSIPPI

Aberdeen
 Ackerman
 Amory
 Booneville
 Clarksdale
 Cleveland
 Greenville
 Greenwood
 Grenada
 Houston
 Kosciusko
 Leland
 Louisville
 Philadelphia
 Senatobia
 Tupelo
 West Point
 Winona
 Yazoo City

Lann & Carter Hardware Company
 Covington's Garage & Tractor Service
 Dalrymple Equipment Company
 Browns Feed Store
 Wilson Tractor Company
 Cleveland Machine Company
 Thompson Battery & Electric Company
 R. M. Brown Implement Company
 J. H. Biddy & Son
 O. E. Baird & Son
 Wambles Machine Shop
 Ayres Company
 Taylor Machine Company
 Moore Hardware & Implement Company
 E. E. Moore & Company
 Coley-Johnston Implement Company
 Moseley Implement Company
 Ellis Motor Company
 Saxton Gardner Hardware Company

MISSOURI

Kansas City * Ann Arbor-Klughartt Company
 1205 Woodswether Road
 St. Louis * Allied Construction Equipment Company
 4025 Forest Park Avenue

MONTANA

Billings * Industrial Equip. Co., 415 N. 27th St.
 * Midland Implement Company, Inc.
 Cascade Implement Company
 Great Falls * Midland Implement Company, Inc.
 Steffek Equipment Company
 Helena Garey Motors
 Kalispell Miles & Ulmer Company
 Miles City H. O. Bell Company
 Missoula * Industrial Equip. Co., 626 S. Higgins

NEBRASKA

Lincoln * Fort Huron Machinery & Supply Company
 801-813 "Q" Street

NEVADA

Elko Bellinger Repair Shop
 Ely Ely Lumber & Coal Company
 Lund Reid & Carter
 Reno Air Service Co., 241 S. Virginia Street
 Sierra Machinery Co., 1025 E. 4th Street

NEW HAMPSHIRE

Manchester Parker Danner Co., 48 S. Willow Street
 Walpole R. N. Johnson

NEW JERSEY

Atlantic City Ploettner Machine Works
 Blawenberg J. Percy Van Zandt
 Bridgeton J. L. Danzenbaker
 Camden New Jersey Marine Service & Supply Company
 510 No. 5th Street
 Cape May Congress Auto Supply
 Delanco Evans Auto Parts, P. O. Box 359
 Egg Harbor J. S. Thorpe
 Freehold Sidney W. Reid, Rt. 4 - State Highway

Great Meadows B & J Farm Service
Hainesport Paul's Motor Service
Hillside H. J. Zoubek Co., Ramsey Avenue & Bley St.
Manahawkin Walker-Tanger, Inc.
Neshanic Station J. S. Covert & Son
Newark Dale & Rankin Inc., 23 Sussex Avenue
Palmyra Delaware Boat Works
Plainsboro Isaac Barlow & Son
Salem Pearson Supply Company
Vineland Pagano Bros.
Westfield Storr Tractor & Equip. Co., 469 South Ave.
Wicatunk Conover Bros.

NEW MEXICO

Albuquerque Bud Fisher Company
Contractors' Equipment & Supply Company
Clovis Bline Machinery Company

NEW YORK

Amsterdam Shelp & Warner Co., 24 River Street
Avon Mark J. Davin
Bolivar T. & C. Magneto
Buffalo R. G. Fox, 242 Hopkins Street
Canandaigua Donald Howard
Collins Collin Service Agency
Cooperstown Earl C. Chase & Sons
Coram Municipal Machinery Company
Delevan John L. Waring
Deposit Deposit Farm Supply, 147 Second Street
Endicott Newing Motor Company
Highland Schmidt Brothers
Homer A. B. Brown & Son
Horseheads Horseheads Tractor & Implement Company
Hudson Burnett Implement Company
Route 9, Slottsville Road
Ithaca Allen Tractor & Equipment Service
901 West Buffalo Street
Johnson Creek Clayton & Dickinson
LeRoy Bickford Brothers
Liberty Clinton P. Tompkins
New York City * John Reiner & Company
12-12 - 37th Ave., Long Island City
Pine Island Ed. Murtha
Poughkeepsie J. E. Andrews Hardware Co., 279 Main St.
Rensselaer Van's Equipment Sales, Inc., Route 9
Rochester Keystone Builders & Supply Co., 85 Palm St.
Sherburne R. R. Jones, North State Street
Syracuse Atlantic Tug & Equip. Co., 441 S. Salina
Warwick Harry Van Duynhover, 30 Welling Place
Walden Orange Tractor & Equipment Company
Waterloo Finger Lakes Equipment Company
Webster Earl D. Wright, 178 Phillips Road

NORTH CAROLINA

Greensboro * E. F. Craven Company

NORTH DAKOTA

Bismark * Western Auto Parts Company
Devils Lake * Western Auto Parts Company
Fargo * Western Auto Parts Company
Jamestown * Western Auto Parts Company
Mandan * Western Auto Parts Company
Minot * Western Auto Parts Co., 308 - 2nd St., S.W.
Williston * Western Auto Parts Company

OHIO

Youngstown * McCune & Company, 3721 Mahoning Avenue

OKLAHOMA

Alva Bloyd Implement Company
Blackwell Chermack Farm Equip. Co., 809 S. Main St.
Carnegie L-H Farm Service
Clinton Lester Babione Implement Company
Durant Creamer's Machine & Supply Co., 405 Main
El Reno Vieth Bros.
Enid Enid Implement Company
Frederick Whittler Implement Company
Kingfisher Vieth Bros., 106 E. Miles Street
Lawton Lawton Machine Shop
Nowata Keystone Supply Company
Standard Parts Company
Oklahoma City Wylie-Stewart Machinery Company, Inc.
1400 Exchange Avenue
Pauls Valley McGee Implement Company
Perry Houser & McClure
Sapulpa Sapulpa Motors, Inc., 215 S. Main Street
Sayre Buckley's Hardware & Furniture
Tonkawa Charles Jueschke Agricultural Equipment
Tulsa * Harley Sales Company, 420 N. Main Street
Webbers Falls Conley Service Station

OREGON

Albany Barrett Brothers, 103 W. First Street
Canby Elmer Anderson
Corvallis Corvallis Implement Company
The Dalles Mid Columbia Supply & Equipment Company
Eugene Ed Jensen Company, Elmira Road
Hillsboro J. T. Foster Company
Klamath Falls Brown Equipment Co., 3049 S. 6th Street
Lakeview Brown Equipment Company
Medford Eatherton Farm Stores, 8085 Riverside
Ontario Nicholson Service & Supply Company
Portland * Andrews Equipment Service
N. W. Broadway & Flanders
Salem A. C. Haag & Co., 40 Silverton Road
Tillamook Tillamook Implement Co., 1 East First St.
Woodburn Norman's Service Station

PENNSYLVANIA

Anselma Howard White
Aliquippa Walters Farm Service, R. D. #1
Arendtsville Cameron L. Hoffman
Blue Ball Snavely's Farm Supply Company
Brookville Oran E. Mohney
Carlisle Shorrer Brothers
Catawissa Evon Abraczinskas, R. D. #1
Chambersburg Paul Byers
Connellsville Back Creek Lumber Company
Corry Paul's Hardware, 109 E. Main Street
Doylestown Paul W. Histand
Elizabethville Swab Wagon Company
Ephrata Ivan Nolt, R. D. #2
Simon Snyder, R. R. #1
Fair View Ernest Bendure
Franklin Beers Tractor & Farm Equipment Company
Galeton Devling Bros.
Gap Geo. Sellers & Sons
Gilbert A. E. Krome
Green Castle Harry Friedly
Harrisburg State Equipment Company
Hazleton Hazleton Machinery & Equipment Company
Honesdale Geo. W. Kinsman, Main Street
Hughesville Hughesville Machine Tool Company
Hunlock Creek Williard Bencotter
Jerseytown W. O. Diehl
Jonestown Leroy Fake
Kingston State Equipment Company

Kittanning
Kutztown
Lancaster

Liberty
Lititz
Macungie
Martindale
McEwensville
Media
Mendenhall
Mercer
Mifflinburg
Millway
Mount Joy
New Berlinville
New Holland
New Providence
Norristown
Parkersburg
Philadelphia

Pittsburgh

Portland
Reading
Sanatoga
Shartelsville
Shippensburg
Spring Grove
Stewartstown
Waynesboro
Waynesburg
Wescosville
Wysox

White's Farm Supply
Harry Knittle
John L. Brubaker
L. H. Brubaker, R. R. #4
* Lancaster Engineering Corp.
Liberty Garage
D. L. Diem
Macungie Supply Company
A. W. Stauffer
H. R. Shearer
Media Lawn Mower & Equipment Company
Mendenhall Supply Company
Mercer County Implement Company
Merrill Kratzer, R. D. #2
J. H. Reitz
J. B. Hostetter & Son
Erb & Henry
A. B. C. Groff
Walter McVey
Edgar E. Stem, Germantown Pike, RD#2
Farm City Equipment Company
Emco Service, 1508 Fairmount Avenue
Marine Equipment & Supply Company
116 Walnut Street
* Service Supply Corporation
20th & Venango Streets
* Contractors Equipment Service Company
1415 Brighton Road
Brands Motor Company
Geo. D. Lessig & Son
Carl Dunmire, Route 422
Joe Kauffman
John Heberling
Carl Beasley
Robert Sweeney
Paul H. Stauffer, 45 E. 2nd Street
Long Tractor Sales, Porter Street
B. W. Clauser, R.F.D. #1
Robert Kneller

SOUTH CAROLINA

Columbia * Green Distributing Company
Spartanburg * Hall & Company

SOUTH DAKOTA

Aberdeen Aberdeen Implement Company
Bridgewater Sievers Sales & Service
Brookings Eugene Beckman
Bryant Matt Kruse
Corsica Bordewyk Implement Company
Humboldt Drake & Son
Selby Rabenberg Implements
Sioux Falls * Pecaut Industrial Supply Company
900 E. 8th Street
West Sioux Falls Hardware
Wagner Sipes Tractor & Implement Company
Watertown Hubbard's
Webster Day County Motor Service
Yankton Cowman & Hicks

TENNESSEE

Alamo Byrd Implement Company
Athens Dixie Motor Company
* Hart's Automotive Parts Company
Bristol Maden Motors, Inc., Cumberland & Lee Sts.
Chattanooga Brooks Equipment & Mfg. Company
Brooks Welding Supply Co., 1201 Chestnut St.
Hailey Chevrolet Company
* Hart's Automotive Parts Company
1250 Market Street

Clarksville
Cleveland
Copperhill
Covington
Cowan
Crossville
Dayton
Dunlap
Dyersburg
Erwin
Etowah
Fayetteville

Franklin
Harriman

Henderson
Jackson
Jamestown
Johnson City
Knoxville

LaFollette
Lawrenceburg
Manchester
Maryville

Memphis

Murfreesboro
Nashville

Newport
Ooltewah
Oliver Springs
Paris
Pulaski
Ripley
Rockwood
Selmer
Shelbyville
Somerville
Sunbright
Tiptonville
Tullahoma
Union City
Winchester

Nixon Machinery & Supply
Osborne Equipment Company
Williams Motor Company
* Hart's Automotive Parts Company
Copperhill Auto Supply Company
M. A. Walker Hardware Company
R. H. Brock & Company
Plateau Truck & Equipment Company
Fritts & Garrison Motor Company
Barker's Service Station
Ozment Motor Company
Erwin Auto Parts Company
Etowah Welding Company
Rambo Motor Company
Yearwood Motor Company
Warren Farm Service
Christmas Lumber Company
* Hart's Automotive Parts Company
Western Auto Associate Store
Gardner Motor Company
Wilson Welding Company
Beatty Motor Company
Automotive Electric Co., 214 W. Market St.
Brooks Equipment & Mfg. Company
Iddins Machinery Company
Osborne Equipment Company
Campbell County Sales Company
Niedergergesis Bros.
Coffee County Implement Company
* Hart's Automotive Parts Company
Veal Motor Company, E. Broadway
Choctaw Inc.
Clarkkey Company
Hawkins Equipment Company
Hurley Tractor Company
* Lewis Diesel Engine Co., Main at Butler
Tri-State Equipment Company
Weakley Equipment Company
McFarland's Farm Implement Company
Industrial Supply Co., 420 LaFayette St.
McCarthy, Jones & Woodland
Nashville Warehousing Company
Nixon Machine & Supply Company
Wilson-Weesner-Wilkinson Company
W. R. Neas & Company
Fred Robinson
Oliver Springs Auto Supply
Chenoweth Implement Company
Abernathy Grain & Feed Company
Morris Farm Equipment & Supply Company
White's Auto Parts
Selmer Implement Company
Farm Service Supply Company
Hammer & Woody
England Motor Company
Haynes Appliance Company
England Motors
Jackson Implement Company
Franklin County Motor Company

TEXAS

Abilene Malcom Manufacturing & Supply Company
Alice Casting Repair Shop
Austin Austin Machine & Grinding Company
219 East 5th Street
Balmorhea Sprague's Auto, Truck & Tractor Service
Beaumont Simmonds Motor & Machine Company
Borger Childs & Kimball, 219 S. Main Street
Brenham Brentex Tractor Company
Corpus Christi C. E. Russell, Jr., 104 S. Chaparral St.
Corsicana Heifner Bros. Garage

Dallas Conley-Lott-Nichols Machinery Company
1311 S. Ervay Street
Overton & Ross

El Paso Tri-State Equipment Company
Francis Wagner Co., 1225 Texas Street
The Jno. Muller Co., 312 Throckmorton St.

Fort Worth Fredericksburg Machine Shop

Fredericksburg R. H. King Supply Company

Harrold Waller County Implement Company

Hempstead * Harley Sales Company, M & M Building

Houston The Jno. Muller Company

Kilgore Sabine Machine & Supply Company
Janssen Bros.

La Grange Laredo Implement Company

Laredo Fred Berryhill Equip. Co., 710 Avenue "Q"
Crow Machine & Equipment Company

Lubbock J. E. Morgan Co., 501 East Hiway
Fry & Cox Bros.

McAllen Davenport Engine & Equipment Company

Muleshoe Motor Inn Auto Supply, 300 N. Cuyler

Odessa North Plains Implement Company

Pampa Connor Matches Company

Perryton Sabine Propeller & Marine Service Company

Plainview Scheirton-Delong Motor Shop

Port Arthur Finch-Oliver Company, P.O. Box 686

Richland Springs City Auto Supply Company

Rosenberg Richards Equipment Company

Vernon

Waco

UTAH

Brigham City Anderson Auto Company
H. R. Bott, 132 N. Main Street

Cedar City Chas. Hunter - Cedar Furniture & Hdwe. Co.
Kenz Service

Circleville Judd Mercantile Company

Hurricane Golden F. Layton Farm Implements

Layton L. O. Peterson Implement Company

Lehi Homer Tractor Company, 36 S. Main Street

Logan Kowallis Hardware & Implement
Peterson Tractor Service, 503 N. Main

Salina Sevier County Tractor Company

Salt Lake City * Arnold Machinery Company, Inc.
433 West Second South Street

Springville G. Lowry Anderson, Inc.

VIRGINIA

Alexandria * Phillips Machinery & Tractor Company
P. O. Box 549

Buena Vista E. W. McCormick & Son

Cambria Farm Equipment Company

Charlottesville H. M. Gleason & Company

Chase City Spaulding Hardware Company

Christiansburg Farm Supply Center, Inc.

Culpeper J. A. Swan, Jr. & Company

Daleville Ikenberry & Garst

Emporia Cato Bros. Inc.

Farmville R. W. Mottley Hardware Store

Franklin G. H. Steinhardt & Company
2nd Avenue & Mechanics Street

Fredericksburg A.W. Mitchell, Prince Edward & Wolf Sts.

Front Royal Wall Motor Company

Galax Felts Pontiac Sales, 121 W. Grayson St.

Gate City Farmers Supply Company

Gretna Gretna Tractor & Implement Company

Harrisonburg Whitesel Brothers

Hillsville Hillsville Hardware Company

Hopewell Broadus Hardware Company

Jonesville Farmers Supply Company

Kilmarnock D. H. Pitman & Sons

Lynchburg Farm Service Company, 1213 Church Street
Lynchburg Truck & Equipment Company

Madison Farm & Home Service

Martinsville The Country Store, R.F.D. #2

Mt. Jackson Triplett & Vehrencaup, P.O. Box 95

Newport News W.L. Gleason Co. Inc., 3515 Jefferson Ave.

Norfolk Bell Equipment Company, 919 W. 21st St.
A. L. Guille Co., 716 Boush Street
A. Wrenn & Sons, Inc., 420 Union Street

Norton Norton Motor Inn

Pendleton Walton & Wood, Inc.

Petersburg Ritchie's Hardware Company

Portsmouth Robertson Hardware Co., 700 Crawford St.
General Mills, Inc., 7th & Canal Sts.

Richmond * Phillips Machinery Co., 9th & Cary Sts.
Baker Bros., 3213 Williams Rd.
R. D. Hunt, 935 - 3/4 Street
Shackleford Cox Truck & Machinery Company

Roanoke Wilborn's Hardware Company

South Boston South Hill Machy. & Supply Company

South Hill S. Chester Slade, Farm Machinery Dealer

Staunton Suffolk Equipment Company, 1525 Main St.

Suffolk Tazewell Equipment & Motor Corp.

Tazewell Waverley Feed & Seed Co., P. O. Box 3

Waverley Gill Implement Company

Warrenton R. P. Johnson

Wytheville Tri-County Farmers Supply Company

WASHINGTON

Seattle * Star Machinery Co., 1741 First Ave., S.

Spokane Andrews Equipment Service

Yakima Intervalley Equipment Company

WEST VIRGINIA

Charleston * West Virginia Tractor & Equipment Company

Clarksburg * West Virginia Tractor & Equipment Company

WISCONSIN

Alma Center Adam Stutz Implement Company

Antigo Gresch Implement Company

Augusta Farmer's Union Co-Operative Oil Company

Bayfield Marine Equipment Sales

Beaver Dam Mullen & Smith Implement Company

Benton Ed. Weber, Jr.

Black Earth Fesenfeld Chevrolet Sales

Black River Falls/Jackson County Implement Company

Blair Eyvind Peterson, Farm Implement

Bloomer Farmers' Store Company

Bruce Kovacevich Bros. Implements

Burlington L. J. Wanasek, Farm Implements

Byron Byron Oil Company

Colby Harmony Co-Operative Produce

Cumberland Wm. G. Talbot, Farm Implements

Deerfield Cole Implement Company

Denmark Kriwanek Brothers

Drummond Stuart Bergson, Farm Implements

Elkhorn Opitz Implement Company

Fond du Lac Fond du Lac Implement Co., S. Main Street
Charles Knoch

Footville Footville Implement Company

Forest Junction John Keller

Forestville Mark Schlise Repair Shop

Fountain City Kochenderfer & Sons Company

Francis Creek Ed. Neuser, Farm Implements

Franksville Marsch Motor & Implement Company
R. F. Schumann

Grafton Clausing & Liebau

Green Bay Limberg's, 1046 Valp Avenue

Hartford Leach-Christiansen Company

Hayward Northern Lakes Co-Operative

Hortonville Harp Implement Company

Hurley Iron Co-Operative Oil
 Juda Carter & Ruef Implement Company
 Kaukauna Van Zeeland Implement Company
 Kenosha Evans Implement Company, Rt. #2
 La Crosse McKenzie Chevrolet Company
 Van's Farm & Home Service
 Lake Beulah Ellis Bros. Farm Implement
 Lancaster DeBuhr Implement Company
 Lena A. Mathey & Sons Company
 Lomira Lomira Implement Company
 London Carpenter's Garage
 Manitowoc Lambert & Zinda Implement Company
 Maplewood M. F. Reince, Farm Implements
 Markesan Markesan Implement Co. (E. R. McKnight)
 Mattoon Mattoon Hardware & Implement Company
 Menominee Linsmeier Bros.
 Menominee Implement Company
 Merrill A. F. Lueck & Sons Company
 Middleton Pick Implement Company
 Milwaukee * Engine Power, Inc., 4320 N. 35th Street
 Humble Equipment Sales & Service
 3448 S. 27th Street
 Marty Chevrolet Sales
 Monroe Shilling Implement Company
 Mosinee Stelloh Implement Company
 Neillsville John C. Erb, Farm Implements
 New Glarus Tohm Implement Company
 New London Bakkom & Oksman Farm Implement Company
 Oconomowoc Lappley Fuel & Implement Company
 Oregon Farmington Implement Company
 Osceola McCarty Implement Company
 Bohn Implement Company
 Oshkosh Will Implement Company
 Owen Tony's Implement Company
 Phillips Ludwig Hardware Company
 Pittsville Woodward Implement Company
 Plainfield Laszewski Brothers Implement Company
 Plover Harry Hill, Farm Implements
 Plymouth Firari Machine Company
 Portage Andrew Bode
 Potosi Jos. Brooks & Sons Company
 Pound L. W. Smith
 Randolph Risse Implement Company
 Random Lake Hudson Texaco Super Service
 Rice Lake Annear Implements
 Richland Center A. A. Templeman Implements
 Roberts Ray Raschein Sales Company
 Sauk City Hembel Bros.
 Sawyer Shawano Implement Company
 Shawano Wm. A. Langenecker Implement Company
 Slinger Lee Krueger
 Sturgeon Bay Gilbert Gaugert Garage
 Sullivan Hanley Implement Company
 Sun Prairie Nettessheim-Otto, Inc.
 Sussex Arno Schmechel & Son, Inc.
 Thiensville Geo. Schubert & Sons (Industrial)
 Tomah F & W Implement Company
 Valders Wm. F. Christel, Inc.
 Lawrence Seibold
 Viroqua Jackson & Erickson Implement Company
 Jackson Implement Company
 Mueller Garage & Implement Company
 Watertown Hornburg Motors, Inc.
 Wausaukee Consumers Supply Company
 Withee Withee Implement Sales & Service

FOREIGN

CANADA

Calgary, Alberta * Bruce Robinson Electric Ltd.
 9th Avenue & 4th Street, West
 Edmonton, Alberta The Bruce Robinson Electric, Ltd.
 10123, 102nd Street
 Vancouver, B. C. Pumps & Power Ltd., 40 E. Cordova St.
 Winnipeg, Manitoba * Mumford-Medland, Ltd. 576 Wall St.
 Fort William, Ontario The Northland Machy. Sup. Co. Ltd.,
 203 Hardisty Street
 New Toronto, Ontario * Consolidated Engines & Machy. Co.
 Ltd., 14th & Birmingham Streets
 Port Arthur, Ontario Thornes-Sargent, Jobbers-
 Distributors, - Violet Street
 Montreal, Quebec * Consolidated Engines & Mchry. Co.
 Ltd., 420 Legauchetiere St., W.
 Regina, Saskatchewan Gregg's Machy. Exchange
 6th Avenue at Halifax Street
 The Saskatchewan Federated Co-
 Operatives, Ltd., 1150 Rose St.
 Saskatoon, Saskatchewan * Mumford-Medland, Ltd.
 6 Cobbold Block
 The Saskatchewan Federated Co-
 Operatives, Ltd., 12, 23rd St. E.

MEXICO

Mexico, D. F. * General Supply Company
 C. Vallarta No. 1

ZENITH CARBURETOR SERVICE

61 and 161 Series Carburetors

To properly repair the Zenith 61 and 161 series carburetors we suggest the following routine:

1. Loosen lever clamp screw and remove lever.
2. Remove idling adjusting screw (6 Figure 1) and spring.
3. Remove throttle body to bowl assembly screws with a screwdriver. (There are four assembly screws and lockwashers.)
4. Raise the throttle body slightly and loosen the gasket from the bowl assembly so you may
5. Lift the throttle body and gasket clear of the bowl assembly, being careful to avoid damaging the float.
6. Remove the venturi (1 Figure 1).
7. Remove the float axle using a screwdriver to push the axle from the slotted end of the bracket, and the fingers to remove it the rest of the way.
8. Remove the float assembly and the fuel valve needle.
9. Remove the throttle body to bowl gasket.
10. Remove the fuel valve seat and gasket using C161-85 Service Tool.
11. Remove idling jet (5) using a small screwdriver ($\frac{3}{16}$ " blade).
12. BEFORE removing the throttle plate READ NOTE A following section "Parts to be Replaced," then proceed to remove the throttle plate screws, plate and shaft assembly.
13. Remove stop lever taper pin using a small punch and a hammer.
14. Remove the throttle shaft packing retainers and packings using a screwdriver or a small pair of pliers to lift out the retainers. (Some models use a shaft hole plug which can be removed with a small drift and a light hammer.)

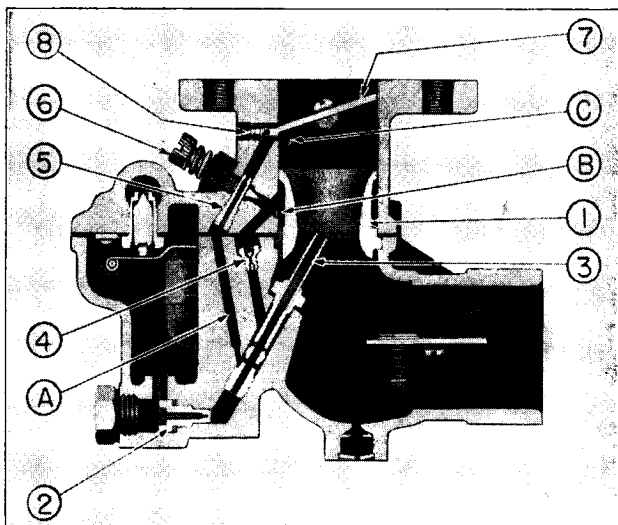


Figure 1

NOTE: Do not remove the identification disc which is riveted to the bowl cover (See note B) the priming plug (8), the throttle stop pin, the float hinge bracket, or the brass channel plugs.

15. Remove the well vent (4 Figure 1) using a small screwdriver ($\frac{3}{16}$ " blade).
16. Remove main discharge jet (3) and gasket using C161-25 Service Tool.
17. Remove main jet adjustment assembly (or plug) and gasket using a $\frac{1}{2}$ " open-end wrench.

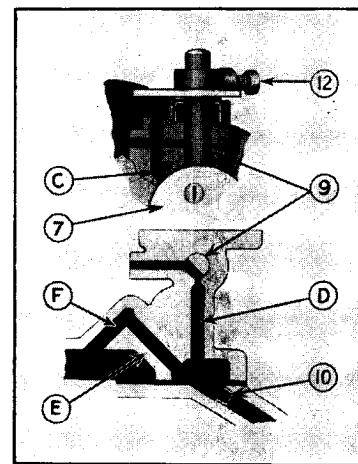


Figure 2

18. Remove main jet (2) and gasket using C161-1 Service Tool (or a suitable screwdriver).
19. Remove air shutter lever retainer nut and lockwasher using C161-25 Service Tool (or a $\frac{5}{16}$ " wrench). (For marine model, use $\frac{11}{32}$ " wrench.)
20. Remove air shutter lever assembly. (See Note F.)
21. Remove air shutter bracket retainer screw and bracket using a $\frac{1}{2}$ " wrench.
22. Remove air shutter shaft hole plug and gasket using a $\frac{1}{2}$ " wrench.
23. Remove air shutter screws and lockwashers to
24. Remove air shutter plate and shaft.

NOTE: Do not remove air vent channel bushing (10, Fig. 2), air shutter stop pin, air shutter bracket locating pin, or drip plug. (For marine carburetors—do not remove pick-up tube shown at 11 in Figure 4.)

25. Clean the bowl and throttle body casting in gasoline or other solvent and blow through each channel with compressed air to make sure that all channels are clean.
26. Refer to section titled "Parts to be Replaced" for list of parts which we recommend replacing when overhauling this type of carburetor. (See note G.)

RE-ASSEMBLE CARBURETOR AS FOLLOWS:

1. Place air shutter shaft in position and
2. Install air shutter plate screws and lockwashers. Be sure air shutter valve is in correct position as shown in Figure 1 and that the air shutter plate is properly centered before tightening the screws securely.
3. Install air shutter shaft hole plug and gasket using a $\frac{1}{2}$ " wrench.
4. Hold air shutter bracket in position and
5. Install retainer screw using a $\frac{1}{2}$ " wrench.
6. Install air shutter lever assembly as follows:
 - (a) Hold the air shutter in wide-open position.
 - (b) Place the lever on the shaft and against the stop pin in the direction to open.
 - (c) Install retainer nut and lockwasher using C161-25 Service Tool (or a $\frac{5}{16}$ " wrench). (For Marine models use $\frac{11}{32}$ " wrench.)
 - (d) Check operation to make sure the air shutter opens and closes fully.
7. Replace main jet (2) and new gasket using C161-1 Service Tool.
8. Install main jet adjustment (or plug) and new gasket using a $\frac{1}{2}$ " open-end wrench.
9. Replace main discharge jet (3) and new gasket using C161-25 Service Tool.
10. Replace well vent (4) using a small screwdriver (no gasket required).
11. Place new throttle shaft packing in new packing retainer ring and
12. Install packing retainer ring (with packing) in both throttle shaft bosses using a light hammer.
13. Place new throttle shaft in position and
14. Install throttle plate (See Note A). The throttle plate should be properly centered before tightening the screws and lockwashers securely.
15. Install stop lever assembly on the throttle shaft.

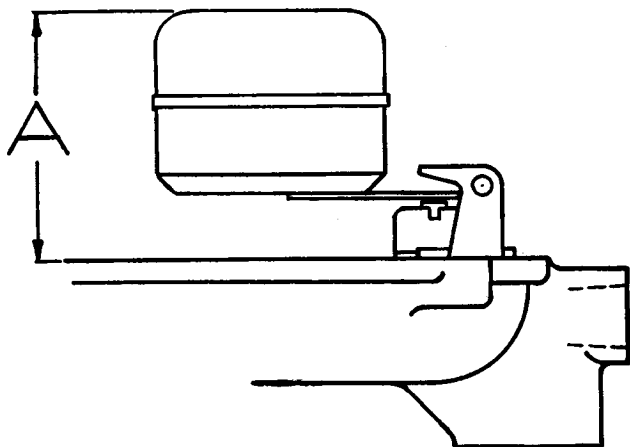


Figure 3

NOTE: When the throttle plate is straight up and down in the barrel (wide open) the stop lever should be against the stop pin, then

16. Drill and pin the stop lever assembly and shaft using a #45 drill and CT63-2 taper pin.
 17. Replace idling jet (5) using a small screwdriver (no gasket required).
 18. Replace fuel valve seat and new gasket using C161-85 Service Tool.
 19. Place new throttle body to bowl gasket in position.
 20. Place fuel valve needle in position followed by the float assembly and
 21. Install float axle using the handle end of a screwdriver to strike the end of the axle to force it into the slotted end of the bracket. The float should move freely on the axle.
 22. Check position of float to obtain correct fuel level, as shown in Figure 3. The A dimension should be $1\frac{1}{2}$ " plus or minus $\frac{3}{4}$ ". (Move the gasket to one side while making the measurement.)
 23. Place the venturi (1) in position in the throttle body. **NOTE:** 161 Series venturi has a locating boss that fits into a groove in the throttle body.
 24. Place the bowl assembly in position on the throttle body being careful to avoid damaging the float.
 25. Install assembly screws and lockwashers. Be sure to tighten the screws evenly and securely.
 26. Install idling adjusting screw (6) and spring.
- NOTE:** As a preliminary adjustment, set the idling adjustment (6) and the main jet adjustment at one full turn open and adjust the throttle stop screw to hold the throttle just slightly open.
27. Install throttle lever and tighten the clamp screw using a C161-25 Service Tool.

TOOL LIST

To properly service the 61 and 161 series carburetor we recommend the following Service Tools (See Form 2021-C for prices and complete tool listing):

- C161-1 Main Jet Wrench.
- C161-25 Main Discharge Jet Wrench.
- C161-85 Fuel Valve Seat Wrench.

PARTS TO BE REPLACED

In most cases the following parts should be replaced when overhauling this type of carburetor. All Gaskets, C181-66 gasket kit contains them; C81-17 Fuel Valve and Seat Assembly, (use same size as was removed); Main Jet (See Note C); C55-6 Idling Jet; Main Discharge Jet (See Note D); C52-2 Well Vent; C85-28 Float Assembly; C120-4 Float Axle; Throttle Shaft (See Note E); Air Shutter Shaft (See Note F); CR37-1x1 Throttle Shaft Hole Plug; C131-4-2 Packing Cap (2 required); CT57-4 Packing Washer (2 required); CT62-1 Cotter; CT63-2 Taper Pin; T15B5-3 Plate Screw (4 required).

The THROTTLE PLATE for the 61 Series 5 size is C21-99, for the 7 size is C21-47, and for 161 Series 7 size is C21-88.

The VENTURI for the 61 Series 5 size is C38-35 and for the 7 size is C38-21; for 161 Series 7 size is C38-51 except where venturi and tube assembly C38-50A is used, as in Divco-Twin O-9676 and J. I. Case O-9667.

NOTE A: The location of the priming hole plug in relation to the throttle plate is extremely important for uniform idling and part throttle operation. To maintain a uniform relation between the priming hole plug and the throttle plate, our factory assembles the throttle shaft and plate in the throttle body before drilling the body for the priming hole plug, locating the hole in a definite relation to the throttle plate in each case. It is readily apparent from the above that throttle plates and throttle bodies cannot be interchanged indiscriminately. When it becomes necessary to replace the throttle shaft or throttle plate, we suggest the following routine:

1. Unscrew the throttle stop screw to permit complete closing of the throttle plate.
2. Hold throttle in tightly closed position and mark the inside of the throttle body close to the throttle plate with a steel scriber.
3. Using this scribed line as a guide, replace the throttle shaft or plate. If new plate used shows a noticeable variation from old one, select another new plate to get one that fits very close to the scribed line when installed.
4. If throttle body has to be replaced, we recommend obtaining a complete throttle body assembly including shaft, plate, priming hole plug, etc., built to the outline number which appears on the identification disc on the bowl cover.

NOTE B: A round aluminum identification disc riveted to the carburetor bowl cover specifies the assembly outline number to which the carburetor was originally built. When ordering special parts such as throttle bodies, throttle lever and stop lever assemblies, etc., be sure to specify outline number of the carburetor to prevent errors in selecting parts required.

NOTE C: C52-6 Main Jet (sizes #23 and up) or C52-6-1 Main Jet (sizes up to #22) is used except on Massey-Harris outlines 8757 and 8759 and Fate-Root-Heath O-8933, which use C52-7 Main Jet. C52-7 is a short-type jet and should not be replaced by the longer type jet. When ordering jets be sure to specify the size required.

NOTE D: C66-26-1, C66-26-2, and C66-26-3 Main Discharge Jets are used in the 61 series. The dash (—) number and the size are stamped on the jet body. Be sure to use same type as removed.

C66-46 and C66-47 Main Discharge Jets are used in the 161 series and are not interchangeable with C66-26— as the assembly threads are located in the central section, while the C66-26— threads are at the lower end.

C66-46 has a restriction at the lower end while C66-47 has no restriction. C66-46 is used in Divco Twin O-9676 and J. I. Case O-9667.

NOTE E: C23-203 Throttle Shaft is for the standard 5 size 61 Series carburetor. C23-211 Shaft is special for the American Bantam O-9321 and Gravelly Motor Plow O-9572 but can be made from C23-203 shaft.

C23-113 shaft is for the standard 7 and X7 sizes which do not have the economizer feature built in; C23-193 shaft is special for Wood Bros. O-9136; C23-205 shaft assembly is for Continental Motors O-9280; C23-212 shaft is for Hercules Motors O-9322 and John Deere O-9519; all other special shafts for these models can be made from C23-113.

C23-130 shaft is for the standard J7 and JX7 sizes (with economizer). C23-116 shaft is special for Oliver Farm O-8627; C23-144 shaft is for Spang Baking Co. O-8739; all other special shafts for these models can be made from C23-130.

NOTE F: C105-60 Air Shutter Shaft, which has a threaded end to hold the lever in place, is used except as follows: C105-135 Air Shutter Shaft which is longer on the threaded end than C105-60 is used on standard replacement outlines O-9673 and O-9674; C105-69 shaft is used on Massey-Harris outlines 8757 and 8759, Hercules O-9246 and Ready Power O-9544; C105-71 shaft is used on LeRoi replacement outlines 8794 and 8861; C105-88 is used on Avery O-9088, John Deere outlines 9519 and 9532, J. I. Case O-9667 and Waukesha O-9623.

The following air shutter shaft and lever assemblies are riveted together and should be replaced as an assembly; C108-36 air shutter shaft and lever assembly is used on Pioneer O-8619, Buffalo Springfield outlines 8629 and 9320, U. S. Motors O-8900 and Fate-Root-Heath O-8933; C108-36-1 shaft and lever assembly is used on Novo outlines 8895, 8935, 9179 and 9186; C108-42 assembly is used on Allis-Chalmers outlines 8561, 8691, 8781 and I.H.C. 8808; C108-73 assembly is used on Allis-Chalmers outlines 8979, 9492, 9507 and 9707; C108-72 assembly is used on Allis-Chalmers outlines 9535, 9636, 9705 and 9706; C108-57 assembly is used on I.H.C. outlines 8928, 9167, 9318, 9567, 9748, 9749, 9750, 9751 and 9752; C108-61 assembly is used on J.I. Case outline 9667.

NOTE G: REBUSHING THE THROTTLE SHAFT BEARINGS is an operation that should not be attempted unless the shop is properly equipped for such work.

We suggest consulting the nearest Zenith Distributor regarding special tool equipment for this operation, or replacing the throttle body assembly with a new one built to the outline number shown on the identification disc.

61 Series—Marine

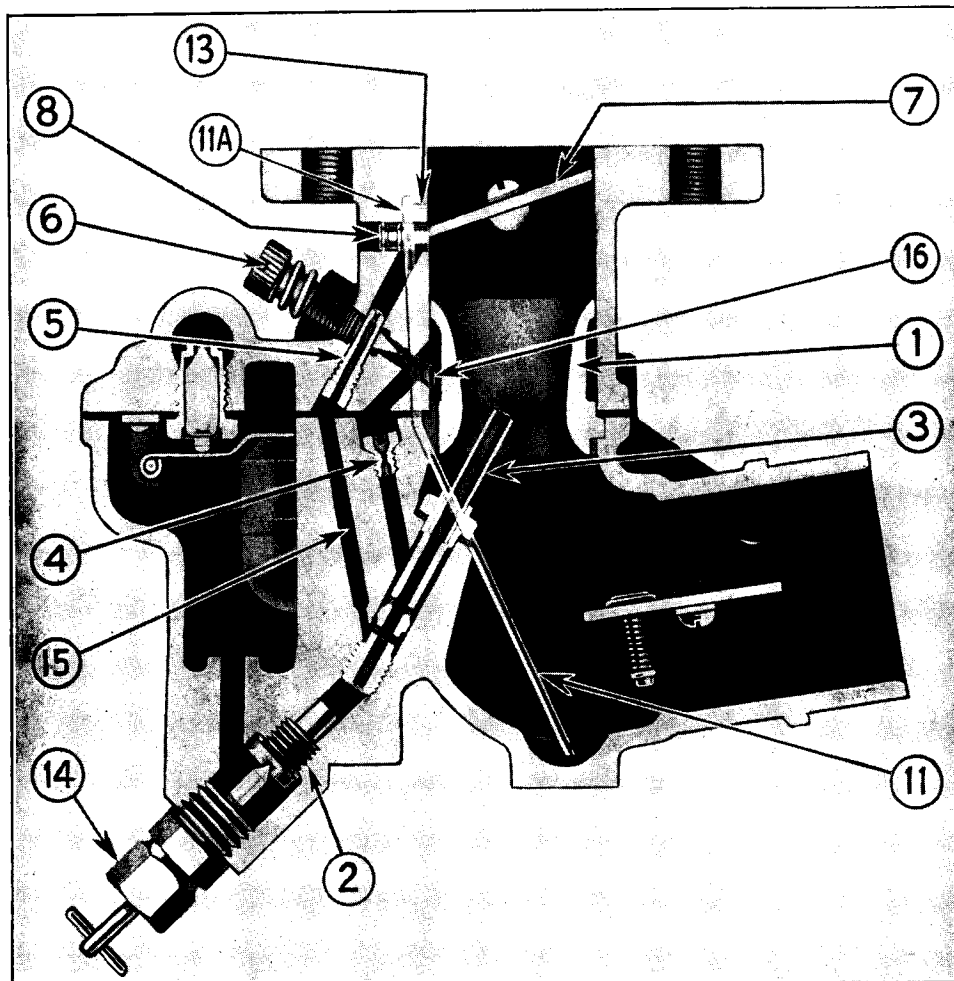


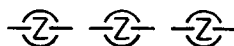
Figure 4

Parts indicated in illustration above are as follows:

- *1. Venturi
- *2. Main Jet
- *3. Main Dis. Jet
- *4. Well Vent
- *5. Idling Jet
- 6. Idling Needle Valve
- 7. Throttle Plate
- *8. Idle Discharge Plug

- 9. Throttle shaft
- 10. Restriction Bushing
- 11. & 11A. Pick-up Tube
- 12. Throttle Stop Screw (not illustrated)
- 13. Pick-up Tube Metering Orifice
- 14. Main Jet Adjustment
- 15. Idle Fuel Channel
- 16. Idle Air Channel

*IMPORTANT: When ordering parts marked with asterisk *, specify the size which is stamped on each of these parts, also give number on identification tag located on float chamber, and make and model of your engine.



ZENITH CARBURETOR DIVISION

696 HART AVENUE



DETROIT 14, MICHIGAN

Manufacturers of Zenith Carburetors and Filters

Ref. No.	Part No.	Part Name	List Price Each
15	†T41-5	Throttle Plate Screw Lockwasher.....	\$.05
16	†C46-25	Idle Adjusting Screw.....	.33
17	C111-9	Idle Adjusting Screw Spring.....	.11
18	CT91-3	Fuel Inlet Plug, 1/8".....	.11
19	C85-28	Float Assembly.....	1.11
20	†C120-4	Float Axle.....	.11
21	†C142-16	Bowl to Body Gasket.....	.11
22	†T1S10-10	Bowl to Body Assembly Screw.....	.05
23	†T41-10	Assembly Screw Lockwasher.....	.05
24	B3-85A	Fuel Bowl Assembly.....	5.55
25	C101-17	Air Shutter Assembly.....	.55
26	C106-104	Air Shutter Lever Assembly.....	.33
27	C112-6	Return Spring.....	.11
29	T8S8-7	Air Shutter Lever Swivel Screw.....	.05
30	C109-2	Air Shutter Bracket.....	.39
31	C110-1	Bracket Wire Clamp.....	.05
32	T1S8-10	Bracket Wire Clamp Screw.....	.05
33	T21S8	Clamp Screw Nut.....	.05
34	†T15B5-3	Air Shutter Retaining Screw.....	.05
35	†T41-5	Retaining Screw Lockwasher.....	.05
36	C105-60	Air Shutter Shaft.....	.94
37	T22S8	Air Shutter Shaft Nut.....	.05
38	T45-8	Shaft Nut Lockwasher.....	.05
39	C140-2	Bracket Assembly Screw.....	.05
40	C138-24	Air Shutter Shaft Plug.....	.39
41	T56-23	Shaft Plug Washer.....	.05
42	CT91-3	Bowl Drain Plug.....	.11
43	C138-23	Lower Plug.....	.39
44	†T56-23	Lower Plug Washer.....	.05
45	C38-51	Venturi (specify size #19).....	1.22
46	C52-6	Main Jet (specify size #22 for L-48; #24 for L-48-1; #26 for L-48-2; #28 for L-48-3 & L-48-B).....	.83
47	†T56-24	Main Jet Washer.....	.05
48	†C55-6	Idle Jet (specify size #12).....	.55
49	†C66-47	Main Discharge Jet (specify size #60 for L-48 & L-48-1; #50 for L-48-2 & L-48-3 & L-48-B).....	.66
50	†T56-52	Discharge Tube Washer.....	.05
51	C77-18	Well Vent (specify size #13 for L-48 & L-48-1; #22 for L-48-2 & L-48-3 & L-48-B).....	.28
52	†C81-17	Fuel Valve and Seat Assembly (specify size #35).....	.83
53	†T56-20	Fuel Valve Seat Washer.....	.05
54	C71-21	Main Jet Adjustment (Replaces Item 43 on L-48-1 and L-48-3).....	1.00
	†C141-4-5	Flange Gasket (not illustrated).....	.11
	K560	Repair Parts Kit (For L-48 & L-48-1).....	3.85
	K562	Repair Parts Kit (For L-48-2, L-48-3 & L-48-B).....	3.85
		*Part of C29-491 Throttle Lever and Shaft Assembly.....	1.44
		†Part of K560 & K562 Repair Parts Kit.....	3.85



ZENITH CARBURETOR DIVISON

696 HART AVENUE



DETROIT 14, MICHIGAN

Manufacturers of Zenith Carburetors and Filters

March, 1947

Prices subject to change without notice

Printed in U. S. A.

SERVICE INSTRUCTIONS
FOR
WICO MODEL XH-4 MAGNETOS

AS USED ON
WISCONSIN V-SERIES ENGINES

WICO MAGNETOS DEPENDABLE IGNITION

Wico Electric Company
WEST SPRINGFIELD, MASSACHUSETTS

The Wico magneto is an important and vital part of your Wisconsin engine. Its function is to generate high tension electricity to produce the spark at the spark plug. The magneto has a built-in impulse coupling mechanism that enables it to furnish a hot, fat spark at cranking speed. This makes starting very easy.

Wico magnetos are made from quality materials and are constructed by skilled workmen. Each magneto is individually inspected and test-run before leaving the factory and is fully guaranteed as explained in the warranty on page 3.

This booklet has been prepared so that accurate servicing information will be available to the user. **Do not attempt to make any repairs to the magneto other than those outlined in this booklet.** Major repairs should be taken to the nearest authorized Wico Service Station, as shown in pages 6 thru 8 . All parts should also be ordered from the nearest Service Station, **not** from the Wico Electric Company nor from the Wisconsin Motor Corp.

WICO WARRANTY

We warrant each piece of apparatus manufactured by us to be free from defects in material and workmanship under normal use and service. Our obligation under this warranty is limited to the furnishing of any part of said apparatus which shall within a period of ninety (90) days after delivery to the original consumer, be returned to one of our authorized service stations, or to one of our authorized Distributors, or to the factory, transportation charges prepaid, and which, upon examination by one of our authorized representatives, shall disclose to our satisfaction to have been thus defective.

Any magneto or other piece of apparatus shall not be considered to have been under nor-

mal use and service if it appears to have been subjected to misuse, abuse, neglect or accident, or if it has been repaired or altered outside of our factory so as, in our judgment, to affect its stability or reliability, or if any part not of Wico manufacture has been substituted for a part of Wico manufacture.

This warranty is in lieu of all other warranties, either expressed or implied, and we do not authorize any person or persons to assume for us any other liability in connection with the sale of our equipment; nor are we responsible for any liability for any damage or injury to any person or part resulting directly or indirectly from design, material, workmanship or installation of any of our apparatus.

WARRANTY ADJUSTMENT PROCEDURE

Apparatus assumed to come within the terms of the warranty should be submitted to the nearest authorized Wico Distributor or Wico Service Station with a formal request for adjustment.

If upon examination by such an authorized representative the apparatus is found actually defective and within the warranty period, he will place it in proper operating condition and no charge made either for labor or material. The term labor does not refer to that involving the removing or installing the apparatus, nor for transportation, duty or tax thereon, but only refers to the actual bench labor on the apparatus itself. Any labor charge other than for such bench labor, is to be borne by the owner, who will be required to sign a warranty Service Report form at the time a warranty adjustment is made. If the Service Station or Distributor sends a properly filled out warranty Service Report form to the Company, and if in the case of a Service Station a copy thereof is sent to the Distributor, and if the parts returned are tagged with the Company's tag, and if examination of the returned material and claim by the Company indicates that in the opinion of the Company, which shall be final, the claim comes within the warranty, the Company will make such adjust-

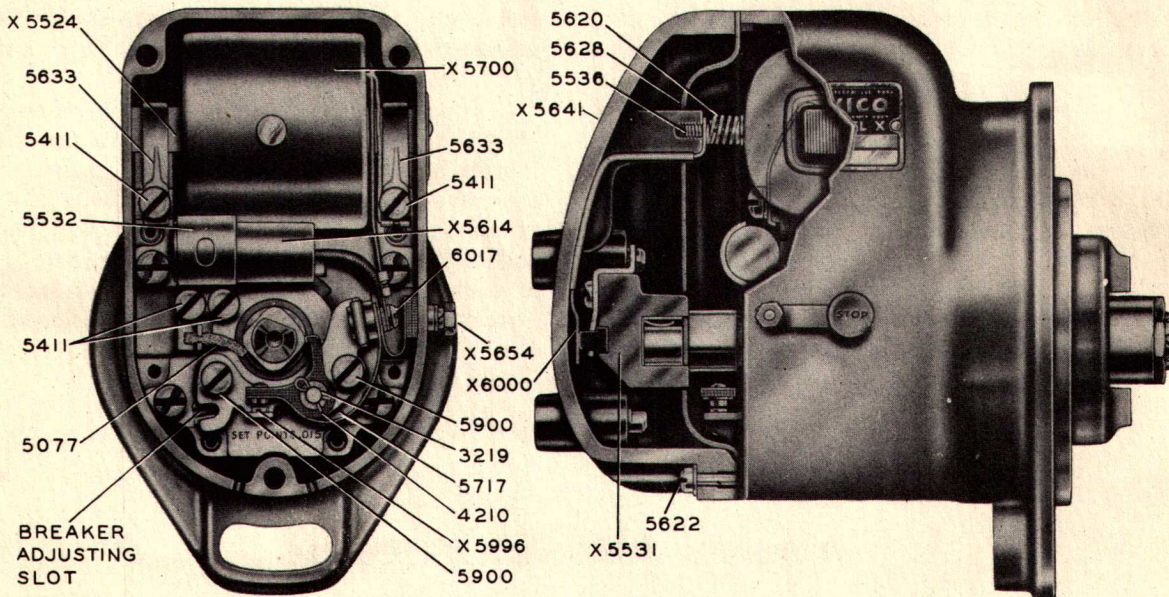
ment for the Distributor either by the giving of credit or by replacing the defective apparatus covered by the warranty, and the Distributor shall in turn forward such adjustment to his Service Station or customer. All adjustments shall be made in accordance with the regulations of the Company made from time to time.

When the Service Station or Distributor is in doubt as to the cause of the apparatus being inoperative, the owner should pay the Service Station or Distributor for the material and labor charges, who will forward the units or parts claimed defective to the Company, together with a signed warranty Service Report form. Upon receipt and examination by the Company of the units or parts and the warranty Service Report form, the claim will be carefully considered and if in the opinion of the Company, which shall be final, the units or parts are found to have been defective, credit will be issued to the Distributor for both labor and material and the Distributor will reimburse the Service Station, who will reimburse the owner the amount paid for material and labor. If apparatus is submitted directly by the Service Station to the Company a copy of the warranty Service Report forms should be furnished to the Distributor by the Service Station.

WICO ELECTRIC COMPANY

WEST SPRINGFIELD, MASSACHUSETTS, U. S. A.

WICO MODEL XH-4 MAGNETO



SERVICE PART LIST

<i>Part No.</i>	<i>Part Name</i>	<i>List Price</i>	<i>Part No.</i>	<i>Part Name</i>	<i>List Price</i>
3219	Breaker arm pivot washer	. \$.05	5628	Distributor cap gasket	. . . . . .20
4210	Breaker arm lock	. . . . . .05	5633	Coil core clamp	. . . . . .05
5077	Cam wiper felt	. . . . . .05	X5641	Distributor cap group	. . . . . 2.40
5411	Condenser clamp screw	. . . . . .05	X5654	Ground connection unit	. . . . . .10
5411	Coil core clamp screw	. . . . . .05	X5700	Coil group	. . . . . 4.50
X5524	Coil core group	. . . . . .50	5717	Breaker contact aligning washer	. . . . . .05
X5531	Distributor arm group	. . . . . .60	5900	Fixed contact clamp screw	. . . . . .05
5532	Condenser bracket	. . . . . .10	X5996	Breaker contact set (Includes fixed contacts, breaker arm)	. . . . . 1.30
5536	Coil contact screw	. . . . . .05	X6000	Secondary interlead group	. . . . . .25
X5614	Condenser group	. . . . . 1.25	6017	Breaker spring clamp screw	. . . . . .05
5620	Coil contact spring	. . . . . .05			
5622	Distributor cap screw	. . . . . .05			

Prices shown are subject to increase without notice.

TIMING

The magneto is properly timed to the engine at the factory. If it becomes necessary to retime the magneto to the engine, refer to the diagram and instructions in the engine instruction book.

LUBRICATION

The only lubricating point in the magneto is the cam wiper felt, 5077. This felt, which lubricates the breaker arm at point of contact with the cam, should be replaced whenever it is necessary to replace the breaker contacts.

IMPORTANT

Incorrectly adjusted spark plug gaps cause magneto failure more frequently than any other condition.

Spark plugs should be inspected at frequent intervals, the size of the gap should be carefully checked and adjusted and the plugs thoroughly cleaned.

All oil, grease, and dirt should frequently be wiped off the magneto, lead wires, and spark plug insulators. Keeping these parts clean and the spark plugs properly adjusted will improve the engine performance and at the same time will prolong the life of the magneto.

DISTRIBUTOR CAP AND ARM

The distributor cap, X5641, may be removed by loosening the 3 screws, 5622, which hold it in place. The distributor arm, X5331, can then be removed from the shaft. When replacing the distributor arm be sure that the flat inside of the arm is lined up with the flat on the cam.

BREAKER CONTACTS—REPLACEMENT AND ADJUSTMENT

The breaker compartment is separated from the distributor compartment by a composition breaker cover, 5628. Removing this cover exposes the breaker contacts.

The breaker contacts should be adjusted to .015" when fully opened. To adjust the contacts, loosen the two clamp screws, 5900, enough so that the contact plate can be moved.

Insert the end of a small screw driver in the adjusting slot and open or close the contacts by moving the plate until the opening is .015", measuring with a feeler gauge of that thickness, tighten the two clamp screws.

To replace the contacts remove the breaker, the spring clamp screw, 6017, the breaker arm lock and washer, 3219, and 4210, then lift the breaker arm from its pivot. Remove the spacing washer, 5717, and the two breaker plate clamp screws, 5900. The breaker plate can then be removed.

If the contacts need replacing it is recommended that both the fixed contact and the breaker arm be replaced at the same time, using replacement breaker set X5996.

After assembly the contacts should be adjusted as described above. The contacts should be kept clean at all times. Lacquer thinner is an ideal cleaner for this purpose. Use WICO tool S-5449, to adjust the alignment of the contacts so that both surfaces meet squarely.

CONDENSER

To remove the condenser, X5614, first disconnect the condenser lead by removing the breaker arm spring screw, 6017, then remove the two condenser clamp screws, 5411, and the condenser clamp 5532. When replacing the condenser make sure it is properly placed between the two locating bosses and that the clamp screws are securely tightened.

COIL AND COIL CORE

The coil and coil core must be removed from the magneto housing as a unit. After the distributor cap, distributor arm, and breaker shield have been removed and the primary wire disconnected from the breaker arm spring terminal by removing screw 6017, take out the two coil core clamp screws, 5411, and remove the clamps 5633. The coil and core can then be pulled from the housing. When replacing this group make sure that the bare primary wire is connected under the core clamp screw and that the insulated wire is connected to the breaker arm spring terminal.

REMOVAL OF COIL FROM CORE

The coil X5700, is held tight on the core, X5524, by two wedges, 10383. It will be necessary to press against the coil core with considerable force to remove it from the coil. The coil should be supported in such a way that there is no danger of the primary of the coil being pushed out of the secondary.

When replacing the coil on the coil core, slide it on then press in the two coil wedges, one on each end, until they are flush with the primary of the coil.

DIRECTORY OF OFFICIAL SALES AND SERVICE STATIONS

UNITED STATES

ALABAMA
Aniston Cain and Blue Electric Co., 201 West 10th St.
Birmingham Birmingham Electric Battery, Ave. B and 23rd St., S.
Birmingham Auto Electric & Carburator Co., 2100 2nd Ave., S.
Birmingham Carburator and Ignition Co., 2114 Third Ave., S.
Decatur Whiddon Implement & Truck Co., 202 S. Oates St.
Dothan Jacobs Battery Co.
Mobile Mobile Electric Garage
Montgomery Auto Electric Service Co., 231 Molton St.
Montgomery Parts Service Corp., 307 Molton St.
Selma Selma Electric Battery Co.
Tuscaloosa Warrior Auto Parts Co.

ARIZONA

Coolidge Slater Auto Supply
Mesa March Auto Electric Co.
Nogales Universal Electric Co., 331 Morley Ave.
Phoenix Jones Battery & Electric Co., 318 W. Jefferson St.
Phoenix H. M. Jones, 6th Ave. & Jefferson
Phoenix Motor Supply Co., 315 N. Central Ave.
Safford Safford Auto Supply Co., 720 Main St.
Tucson Southwest Auto Electric Co., 247 North Stone Ave.
Yuma Harris Auto Parts, 217 First St.
Yuma Mentzer & Wilsey

ARKANSAS

Batesville Row Auto Parts Co.
Clarksville L. H. King Motor & Equip. Co.
DaWitt Graves Magneto & Elec. Serv.
El Dorado Auto Electrical Supply Co., 208 N. Cleveland
El Dorado Magneto Service & Supply Co., 416 E. Main St., P.O. 300
England J. M. Johnson Co.
Fort Smith Keaton Sewall Mfr. Service
Harrison Hickenbottom Mir. & Impl. Co.
Harrison E. Stephenson & Olive Sts.
Helena Delta Magneto Co., 424 Walnut St.
Hosie Riley Henry
Little Rock 555 1/2 Inc.
Pine Bluff Smith Battery & Elec. Service
Russellville Hilliard Tractor Impl. Co., 108 W. 8th St.
Springdale Bear Cat Service, Spring St.
Stuttgart Waggoner & Wortman
Texarkana Wadel-Connolly Co., 5th & State Line
Truman Melton Bros. Co., Highway 63

CALIFORNIA

Bakersfield Automotive Service Co., 2111 Chester Ave.
Bakersfield H. E. Jaynes & Son, 2301 Chester Ave.
Brawley Imperial Valley Auto Electricians, N. 5th & Plaza Sts.
Chico O. J. Forberg, 1221 West 6th St., P. O. Box 432
Compton Curtis & Christensen, 745 East Compton Blvd.
Dixon Ed. Lawrence Elec. Service
Dixon Electrical Service Co., 119 S. 8th St.
Eureka Wm. E. Cookson, 7th & G. Sts.
Fillmore Tom Walsh, 224 Central Ave.
Fresno Electric Laboratories, Inc., 1422 Van Ness Ave.
Fullerton Don V. Eicht, 114 N. Malden St.
Gilroy Gilroy Auto Electric, 22 So. Monterey St.
Glendale Psenner-Pauff, Inc., 620 S. Brand Blvd.
Gridley Ambrose
Headburr Tanner Bros.
Hollister Hollister Battery Co., 4th & East Sts.
Huntington Beach Oilwell Engine Service, 517 16th St.
Huntington Park Auto Electric Service, 2570 Randolph King City
King City George Bridges Battery & Electric Serv., Box 487
Lancaster Chas. F. Siebenhall
Lancaster H. S. Webb, 1055 Sierra Way
Lancaster Pickus Bros. Repair Serv., Box 702
Long Beach Auto Elec. & Speedometer Co., 516 E. Anaheim
Los Angeles Brachman Ignition Works, 1450 Long Beach Ave.
Los Angeles Carburator Electric Service, 1928 East 7th St.
Los Angeles Carburator Equip. Co., 15th & Hill Sts.
Los Angeles Jones & Company, 1314 Newton St.
Los Angeles Electric Equipment Co., 1611 S. Hope St.
Los Angeles Southern Cal. Motor Parts, 1201 Santa Fe Ave.
Marysville Electric Hospital, 5th & G. Sts.
Merced Harris Automotive Service, 843 17th St.
Modesto Willinger's Automotive Clinic, 717 J. St.
Monrovia L. O'Connor, 123 S. Myrtle St.
Napa Joe Drapsnik, 1153 Main St.
Oakland Downtown Battery & Elec. Co., Inc., 1954 Webster St.
Ontario McCarter & Leininger, 301 W. 'A' St.
Oxnard Oxnard Auto Electric Co., 318 A St.
Pasadena C. E. Pennock-Earl Autom. Serv., 240 N. Hill Ave.
Paso Robles Hibbard & Hibbard, 1233 Spring St.
Petaluma J. H. Stone, 940 Main St.
Petaluma Pedranti Autom. Serv., 326 Main St.
Pomona Frank W. Loney, 144-148 West 4th St.
Porterville Porterville Battery Works, 2nd & Oak Sts., Box 1030
Red Bluff Tehama County Battery & Electric, 535 Main St.
Redding Valentine's Electromotive Service, 1715 Calif. St.
Riverside Albright's, 3889 8th St.
Riverside "Bick" Wilson, 4380 Market St.
Salisbury Langner & Rifkin, 1116 15th St.
Sacramento Dillard Electric Service, 247 Monterey St.
San Bernardino Harmon & Marshall, 416 5th St.
San Bernardino Palace Auto Electricians
San Bernardino Place Auto Electric, Court & G. Sts.
San Diego Carlson & Simpson, State & 3th Sts.
San Francisco Auto Elec. Sup. Co., 543 Van Ness Ave.
San Gabriel Long & Kaestner, 1523 S. San Gabriel Blvd.
San Jose Ralph Berggren Elec. Ser., 296 W. Santa Clara St.
San Jose Cook's Auto Service, 6th & Santa Clara Sts.
San Luis Obispo Loper & Anderson, Nipomo & Higuera Sts.

TEXAS

San Rafael Parts Auto Elec.
Santa Ana United Auto Service, 100 So. Main St.
Santa Ana Fresno & Fresno, 530 Chapala St.
Santa Barbara Krippatrick's, 1020 Chapala St.
Santa Barbara Martin DeFazzi, 914 Chapala St.
Santa Cruz
Santa Cruz Alfred C. Handley Battery & Elec., 335 Front St.
Santa Maria Magneto & Electrical Service, 320 N. Broadway
Santa Rosa H. B. Trembley, 3rd & 8th Sts.
Shafter Neufeld's Automotive Parts, Central & Leado Sts.
Soguel A. O. Graham
Stockton Auto Electric Co., 233 N. Hunter St.
Stockton Magneto Supply Co., 745 S. Aurora St.
Taft Burfin & Clark, 528 Main St.
Taft McCarty Brothers, Seventh & Main Sts.
Taft Gary's Auto Service, 505 Kern St.
Tulare Rockwell Electric Shop, Rt. #3 Box 54

Tulare Peterson Auto Electric, 154 N. J. St.
Turlock Heckendorf Battery & Electric Service
Van Nuys Van Nuys Carburator & Ign. Serv., 6212 Van Nuys Blvd.
Ventura Anderson Auto Electric, 79 S. California St.
Visalia Steve Gagnos, 607 Main St.
Visalia Seney & Leeper, 203 N. Locust
Watsonville Townsend's Auto Electric, 14 E. Lake Ave.
Whittier Daniel's Goodyear Service, 402 Philadelphia (East)
Whittier Frisford Auto Sup. & Ser. Stores, Hadley & Comstock Sts.
Whittier Whittier Auto Electric, 121 N. Milton Ave.
Willows Dean Battery & Electric Co.
Wilmington Central Garage, 127 W. "B" St.

COLORADO

Akron Fassler Machine Shop
Burlington Pralle Electric Shop
Colorado Springs Grandell-Bryan Co., 120 N. Weber St.
Cortez Jims Auto Parts
Denver Auto Electric Appliance Co., 1290 Acoma St.
Denver Brown Battery & Electric Co., 1343 Acoma St.
Denver Central Supply Co., 1171 Lincoln St.
Denver Magneto Specialty Co., 2224 Walton St.
Denver Pils Bros., Inc., 748 Broadway
Denver Spitzer Electric Co., 43 W. Ninth St.
Durango Rocky Mountain Electric Station
Durango Simpson Automotive, 1075 Main St.
Englewood Colorado Auto Service, 16 W. Hampden Ave.
Fort Morgan Williams Auto Elec. Serv., 420 W. Plate
 Greeley Roy L. Smith
Holyoke C. H. Schmidt Garage, 411 Denver Ave.
Julesburg A. R. Sapp
LaMar Motor Supply Co., 207 N. Main St.
Limon E. Yarian Repair Shop
Longmont John L. Brogan, 117 Main St.
Lowland Parter E. Glassow, 518 Cleveland Ave.
Monte Vista Joe Riggenbach, 134 Washington St.
Montrose Hartman Brothers, Inc.
Ouray Raschel & Beal
Pueblo Martin-MacEvein Service
Pueblo R. W. T. Motor Service, 727 N. Santa Fe Ave.
Rocky Ford Rocky Ford Auto Parts
Steamboat Marsau Automotive Service
Trinidad Trinidad Battery Co.
Wray Tri-State Distributors

CONNECTICUT

Bridgeport D'Elia Elec. Co., 1330 Fairfield Ave.
Danbury Humphrey Brothers, Inc., 143 White St.
Hartford Hartford Automotive Service, 118 Albany Ave.
Hartford McCulum Motor Service, 78 Maple Ave.
Manchester Norton Electrical Instrumental Co., Hilliard St.
New Haven Auto Electric Sales & Service Co., 120 Goffe St.
New London Cream Autom. Service, 20 Truman St.
Norwich Cream Automotive Service, 47 North Main St.
Stamford Auto Elec. & Battery, Inc., 746 Main St.
Torrington Bartram Auto Electric Co., 176 East Main St.

DELAWARE

Dover Auto Battery Service
Wilmington The Magneto & Auto. Elec. Co., 607 French St.

DISTRICT OF COLUMBIA

Washington Creel Bros., 1814 14th St.
Washington Miller Dudley Co., 1716 14th St., N. W.

FLORIDA

Arcadia Arcadia Battery & Elec., 100 S. Polk Ave.
Clearwater Auto Electric
Coconut Grove Castleberry Repairs, 2954 Oak St.
Daytona Beach P. & M. Carburator Ignition, 404 N. Beach St.
Daytona Beach Robertson Electric Service, 412 N. Beach St.
Eustis A. O. Jeffaris Batt'y & Elec. Serv., 19 Orange Ave.
Fort Lauderdale Rowley Batt'y & Elec., 615 N. E. 1st St.
 Ft. Meyers Jack Beater Auto & Marine Elec. Serv., 16 Bayview Ct.
Fort Pierce Auto Parts & Serv. Co., N. 4th & Cedar Pl.
Gainesville White Electric & Battery Service, 722-728 West University Ave.
Jacksonville Gilbert's Magneto Exchange, 22 E. Beaver
Jacksonville Magneto Battery & Electric Co., 14 Union St., W.
Jacksonville Spencer Electric, Inc., 40 W. Beaver St.
Lakeland Gable Auto Elec., 316 N. Kentucky
Marianna Hudnall's West Florida Equip. Co.
Miami Electrical Equipment Co. of Florida, 42 W. N. 4th St.
Miami Florida Diesel Serv. Co., 1930 N. Miami Ave.
Miami Mosley Elec'l Service, 571 N. W. 5th St.
Miami
Outboard Motor Sales & Service, 6011 N. W. 7th Ave.
Ocala Rupert Caviness, Inc., S. Magnolia Ave.
Ocala Rush's Truck & Tractor Co., 1327 N. Magnolia St.
Orlando Al Huppel, 443 W. Central
Pensacola Pensacola Electric Garage
Pensacola Petree Bros.
Plant City Super Service Station
Petersburg Frank & Murray, 7th St. & 1st Ave., So.
Sanford Electrical Service Co., 207 Magnolia St.
Tallahassee Bater Alford Co., 209 E. Canal St.
Tampa
Tampa Reeves Batt'y & Electrical Mfg. Co., 1109 Tampa St.
Tampa Spencer Auto Electric Co., 607 E. Cass St.
West Palm Beach Sutcliffe's Electric Co., Cor. 2nd & Olive Sts.

GEORGIA

Albany Keenan Auto Parts Co., 112 Front St.
Americus Carburator & Ign. Service
Americus Peacock's Garage, 325 W. Lamar St.
Atlanta Auto Electric & Magneto Co., 477 Spring St., N. W.
Atlanta Magneto Sales & Service Co., 18 Pine St., N. W.
Augusta Auto Electric & Carburator Service, 608 Ellis St.
Augusta Magneto & Electric Co., 527 Broad St.
Brunswick Flanders Auto Elec. Co., 2030 Newhall St.
Cairo Walker's Garage, 1206 Newcastle St.
Columbus Motor Parts & Service, Inc., 1235-39 Third Ave.
Macon Carburator & Electric Service, 706 First St.
Savannah
Savannah Savannah Electric & Mag. Co., 411 E. Liberty St.
Valdosta R. H. Bassford, Autom. Co., 301 N. Patterson St.

IDAHO

Boise Oakley Automotive, 1105 Idaho St.
Burley Goodlet Motor Tuning, 299 E. Main St.
Idaho Falls Idaho Falls Battery Co., 220 C Street
Lawston Magneto & Electric Co., 134 9th St.
Lawston Osterman Diesel & Electric Co., 114 9th St.
Moscow Kenby Auto & Tractor Etc.
Moscow Nelson Auto Electric, 618 S. Main St.
Pocatello Bilymer's, 240-46 S. Arthur
Pocatello Electric Service Co., 333 N. Main
Twin Falls Kyle M. Waite, Electrician, 221 Main St.

ILLINOIS

Anna Mowery Electric Shop, 120 West Davis St.
Aurora United Auto Service, 47 S. Lake St.
Belleville Blinn Bros. Batt'y & Elec. Serv., 404 E. Main St.
Belvidere Burt's Auto Electric, 116 East Pleasant St.
Bloomington Bloomington Battery Service, 207-209 S. East St.
Cairo E. & E. Auto Supply, 21st & Sycamore Sts.
Canon Krock Battery & Elec. Co., 227 N. First Ave.
Carthage Francis J. Adams, 250 S. Grove Avenue
Centralia Holtkamp Electric Service, 203 N. Poplar St.
Champaign Fred Swanson Mch. Shop, 24 E. Columbia Ave.
Chicago Crawford Ignition Co., 3916 Fullerton Ave.
Chicago Snilson Auto Electric Co., 2101 Indiana Ave.
Clinton Lowe's Garage, 309 W. South St.
Crossville Holtkamp Electric Service
Danville Honor Auto Electric Service, 209 W. Main St.
Decatur Decatur Battery Service, Inc., 343 E. Main St.
Dixon Garage Supply, 205 E. First St.
Effingham R. and B. Electrical Shop, 108 South 4th St.
Eggs Francis J. Adams, 250 S. Grove Avenue
Fairfield Flaming's Magneto Serv., R.F.D. #3
Freeport Freeport Battery Ser. Garage, 111 No. Adams Ave.
Galesburg Galesburg Machine Works, 260 S. Seminary St.
Greenville Illinois & Supply Co., 305 S. 3rd St.
Harbin Al Reter
Harvard Leach Auto Parts, 17 N. Ayers St.
Joliet Walborn Electric Co., 232 W. Court St.
Joliet Zinsler Backstrom Co., 4 N. Michigan St.
Kankakee Electrical Equipment Co., 231-35 N. Dearborn Ave.
Lincoln Frank Salski
Macon Slusher Battery & Elec., 341 N. Lafayette St.
Mattoon Auto Electric Co., 1905 Charleston Ave.
Mendota Snyder Auto Electric Service, 911 Sixth Ave.
Merida Varland Implement Co., 164 W. Washington St.
Met. Carmel Deck Hill Battery Co.
Mt. Vernon National Auto Supply, 10th & Jordan Sts.
Murphysboro Jackson County Batt. Co., 215 S. 10th St.
Oley Polar Ignition Service, 104 Lincoln St.
Ottawa Ross Electric Co., 313 West Madison
Paxton Johnson's Elec. Shop, 107 Pall St. (East)
Peoria Automotive Ignition Ser. Co., Inc., 522 Franklin St.
Peoria Electric Auto Electric, 300 Knoxville Ave.
Peoria Wolf's Battery & Elec. Serv., 309 N. Oak St.
Princeton Geo. M. Bower Tractor Service, 436 S. Main St.
Quincy Abbott Battery & Electric Co., 113 N. 10th St.
Rockford Eric J. Gustafson, 413 S. Winnebago St.
Rockford Peterson Battery & Elec. Serv., 207 S. Winnebago St.
Rock Island Lohse Automotive Service, 430 17th St.
Salem Oil Field Engine Works, R. R. No. 2
Springfield Chapin Service Co., 407 E. Jackson St.
Sterling Mylin's Agricultural Store, 221 East 3rd St.
Sycamore Butow's Garage, 325 Elm St.
Taylorville R. B. Reams Elec. Serv., Park & Webster
Watsela Watsela Mac & Elec. Serv., 500 Walnut St.

INDIANA

Anderson Brown Electric Co., 1219 Main St.
Bloomington Full-o-Pep Batt. & Elec. Stn., 220 So. College
Brazil Hudson Battery & Electric Serv., 517 E. National Ave.
Crawfordsville
Delphi Synder Battery & Elec. Serv., 107 E. Market St.
Elkhart Kaller's Electric Serv., State Rd. #39
Elkhart Auto Specialties Co., 216 Tyler Ave.
Elkhart Long Auto Service, 116 Jefferson St.
Evansville Turner Bros. Electric Service, Inc., 300 Ingle St.
Greenville Moutoux Auto & Mch. Co., 511 Locust St.
Fort Wayne Auto Electric Service, Inc. Baker at Harrison St.
Fort Wayne McCormick Ignition Corp., 1117 S. Barr St.
Fort Wayne Martin's Electric Service, 223 N. Washington St.
Gary Pelka Auto Batt. & Elec., 2157 Broadway
Goshen
Goshen Goshen Auto Elec. & Brake Serv., 122 E. Washington St.
Hammond Quinn Electric, Inc., 257 Douglas St.
Huntington Harry's Tire Shop, Inc., 39 W. Washington St.
Indianapolis Gulling Auto Elec. Co., 450 N. Capitol St.
Indianapolis Equipment Service Co., 727 No. Illinois St.
Indianapolis Ryan Auto Parts Co., 602 E. Washington St.
Kokomo Gilbreath Impl. Co., 2501 N. Washington St.
LaCrosse Sommerville & Zimmerman
Lafayette The Glenn Elec., 117 S. 1st St.
LaPorte Borgardt's Auto Electric Service, 610 Indiana Ave.
Logansport Excel Auto Parts, 611 North St.
Marion The Glasser Electric Co., 1005 S. Washington St.
Monicello Barton Auto Supply, 208 N. Main St.
Monicello Auto Electric Service, 213 W. Walnut St.
New Castle Earl S. Harlan Elec. Co., 1529 Broad St.
Rensselaer McCormack Battery Co., 21st & Van Rensselaer
Richmond Auto Elec. & Carburator Serv., 111 S. 9th St.
Shelbyville Auto Electric Service, 21 E. Broadway
South Bend McCormack Battery Co., 431 S. Main St.
Terre Haute Smith & Decker Auto Electric Serv., 1027 Washburn
Terre Haute Terre Haute Battery & Elec., 22 N. 5th St.
Valparaiso Stephens Grand's Elec. Lincolnton
Vincennes
Vincennes Ace Auto Electric Service, 11 S. Fourth St., Box 36
Vincennes Auto Elec. Corp., 14 S. 6th St.
Washington Auto Electric Service, 208 E. S. St.

IOWA

Algona Thompson Distributing Co., E. State & N. Lantry
Armstrong Pape's Garage & Electric Service
Atlantic Jobs Tire & Electric Service
Belle Plaine F. L. Sankat Auto Supply Co., 807 13th St.
Boone Erickson Auto Elec. Serv., 7th & Keeler Sts.
Burlington Meacham's Electric Service, 500 N. Main St.
Carroll Automotive Electric Service, Inc.
Charler Rapids Auto Electric Shop, 407 2nd St. S. E.
Council Bluffs Kimesh Batt. & Elec. Co., 712 E. Clark St.
Council Bluffs Ballenger Automotive Service, 113-117 E. Broadway
Cresco Cresco Machine Co., Box 324
Creston Stearns Electric Co., 314 W. Montgomery
Davenport Emis Electrical Service, 218-224 Iowa St.
Denison Lester Willey, 32 S. 14th St.
Des Moines Electrical Serv. & Sales Co., 131 Walnut St.
Des Moines Mag. Carb. & Elec. Co., 1308 Grand Ave.
DeWitt Dobbler Battery & Electric
Dubuque Central Battery & Elec. Co., 65-73 Main St.
Esterville Electric Motor Service, 51 1st Ave., S.
Fairfield Kusk Garage
Fairfield Electric Service, 806 1st Ave., North
Fort Madison Wright Motor Co., 913-15 Ave. "G"
Grinnell Hunter's Electrical Service, 809 5th Ave.
Hampton Auto Electric Service Station
Hampton Petersen Battery Service
Iowa City Pyramid Services, 220 Clinton St.
Iowa Falls
Iowa Falls Anderson's Mag. Carburator & Elec. Serv., 424 Hamilton
Jefferson Hamilton Electric Service, 108 Chestnut St.
Lake City Condon's Auto Electric Service
Lakemars Lakemars Tire Hospital
Lakemars Kusk Garage
Marshalltown U. S. Battery & Elec. Co., 101 S. 3rd Ave.

Mason City Central Auto Elec. Co., 25 1st St., S. W.
Muscatine
Muscatine Harry A. Timm Elec. Serv., Front & Sycamore Sts.
Oelwein Oelwein Battery & Elec. Co., 133 S. Frederick St.
Oskaloosa Everett's Mag. Serv., 212 No. A. St.
Othumwa Friday's, 115 S. Washington St.
Red Oak Looker Bros. Garage
Secy City Zimmerman Battery & Elec.
Shenandoah Bird's Auto Elec'l Ser., 415 W. Sheridan Ave.
Sigourney Y's Magneto, Carburator & Electric Serv., 324 Ringgold
Sioux City Charles S. Wilson, 327 Water St.
Spencer Dickinson Electric Co.
Storm Lake Auto Electric Service
Washington Loveless Implement Co., 523 N. 7th Ave.
Waterloo Central Batt'y & Electric Co., 718 Sycamore St.
West Union West Union Oil & Parts Co.

KANSAS

Abilene Meade Battery & Elec. Co., 315 N. Spruce St.
Anthony Bohmert Elec. Shop
Arkansas City Exide Service Station, 407 So. Summit St.
Ashland Blakeley Electric Co., 811 S. Main St.
Atchison Emil Kautz Electric Service, 920 Commercial
Atwood Fry Auto-Electric
Beloit Beloit Battery & Elec. Co.
Brewster Osborn Auto & Electric Co.
Caldwell Overman Electric Co.
Clay Center H. N. Juggle Motor Clinic
Coffeyville Ovid W. Carter, 805 Union St.
Colby Dougherty Auto Electric, 450 N. Lake St.
Colwich Stockemer Bros.
Concordia C. C. Anderson Co., 715 Lincoln St.
Conway Springs Frank Salski's Garage
Dighton Farmer's Coop. Oil & Supply Co.
Dodge City Davis Electric Co., 403 W. Chestnut St.
El Dorado Hudson Battery & Elec. Co., 417 Main St.
Emporia Cheatum Machine Shop
Emporia Bebermyer Electric Co., 11 E. Fourth
Emporia Emporia Magneto & Electric
Eureka Eureka Magneto Company
Fort Scott Johnson Electric Co., Market St.
Freeport Freeport Garage
Garden City Kemper Auto Electric Co.
Garnett Logan Electric & Magneto Service
Gouldland Zechler Bros.
Gouldland Clawson Electric Co.
Great Bend Turner Battery & Electric Co.
Greensburg Tucker & Bradley
Grinnell Grinnell Electric Co.
Harper A. W. Mohr Garage
Harder Auto Electric Co.
Hays Basgall & Sysma, 121 East 8th St.
Harlingen F. M. Emerson Garage, 824 Oregon St.
Hiawatha F. M. Emerson Garage, 824 Oregon St.
Hutchinson Hilton Electric Co., 122 E. Sherman St.
Independence Ben Lundrigan Electric Service
Jola H. Davis Electric Co., 202 N. Washington Ave.
Junction City Meade Battery & Electric Company, 114 E. 7th St.
Kennington Ed. Norden Mch. Shop
Lawrence N. E. Hobson & Son, 211 Broadway St.
Larned Smith & Kennedy
Lawrence Darnall Electric, 615 Main St.
Lenora Smith's Electric Service
Liberal Cheatum Electric Co.
Linn Pronski Oil Company
Lyons Turner Battery & Electric
Madison Madison Service Station
Madison C. E. Rinker Garage, 211 S. Penn. St.
Manhattan Seger Electric Co., 117 N. 3rd Ave.
Manito The Hanna Hardware Co., Inc.
Marion Nelson Super Service, 115 E. Main St.
Marysville Wall Auto Supply, 918 Broadway
McCracken McCracken Implement Co.
McCracken G. O. Swanson Elec. Service, 310 N. Maple
Milan Milan Garage
Mt. Hope John Scott Garage
Newton Bonesteel Magneto Service, 115 West Broadway
Norton Hutcherson Battery & Electric Co.
Oakley Jenik Auto Electric Service
Oberlin Oberlin Auto Electric, 211 S. Penn. St.
Olathe J. O. Weber Electric Co.
Osborne H. E. Sharpe Co.
Ottawa Carpenter Super Service
Parsons Walterscheid Farm Equip. Co., 201 Broadway St.
Pratt Wilson Electric Co.
Russell Turner Battery & Electric Co., 218 West Hwy 40
Salina E. S. Cowie Co., 216 W. Ache
Scott City Storm Machine Shop
Smith Centre Hardie Electric Service
Stafford Cole Machine Shop
Stafford Click's Electric Service, 400 S. Main St.
St. Francis Manson Electric Co.
St. John Al's Elec. Serv., 318 N. Main St.
Topoka Burkhardt Battery & Elec. Co., 112 W. 4th St.
Topoka Lester Automotive Battery & Elec. Co., 214 E. 6th St.
Turon Turon Magneto Service
Wakeno Turon Magneto Service
Wellington Jack Lane Chevrolet Co., 310 N. Washington
Wichita E. S. Cowie Electric Co., 230 S. Topoka Ave.
Winfield Barker Magneto Electric, 214 W. 9th St.

KENTUCKY

Ashland Wurts Bros. Specialized Service, 222 17th St.
Bowling Green Motor & Elec. Supply Co., 523 10th St.
Frankfort Capitul Super Service, 116 W. Main St.
Lexington Kentucky Ignition Co., 805 St. at Vine
Lexington Chain Battery Serv., 211 S. Penn. St.
Lexington Fulton Conkey & Co., Ross W., Main St.
Louisville "Kentucky Ignition Co.", 737-739 S. 3rd St.
Louisville Schaaf Auto Electric Co., 439 E. Broadway
Owensboro Collatt Bros., 118 St. Ann St.
Owensboro Owensboro Storage Battery Co., 117 W. 4th St.
Paducah Story Electric & Battery Co., 615 Jefferson St.

LOUISIANA

Alexandria Auto Parts & Battery Service Co., Fifth & Jackson Sts.
Baton Rouge United Service, Inc., 1202 Main St.
Lafayette Auto Parts Station, 122 E. 4th St.
Lafayette Auto Parts House, 119 W. Vermilion St.
Lake Charles Lake Charles Battery & Elec. Co., 211 S. Penn. St.
Lake Charles Dunn's Radiator Service, 318 Ryan St.
Monroe United Elec. Service, Inc., 907 Louisville Ave.
Morgan City
Morgan City Guidroy Sales & Service, Brashear & First St.
Morgan City John Di Maggio, Brashear & First St.
New Orleans J. M. Walton, 1009 St. Charles St.
New Iberia D. H. Castille
Rochelle H. P. DePriest & Son

SERVICE DIRECTORY

Gardner Bailey's Auto Elec. Serv., 165 Bridge St.
Houlton Inglish's, 4145 Benson St.
Leviston Palmer King Motor Co., Inc., 171 Middle St.
Portland LaRoa Electric Co., 290 Forest Ave.
Presque Isle Garland's Auto Elec. Serv., 5 Church St.
Saco Knight-Hall Co., 538 Main St.
Van Buren Gerald's Tune-Up Service, Main St.
Waterville Grover D. Lovejoy, 20 Charles St.

MARYLAND

Baltimore *Parks & Hull Auto Corp., 1033 Cathedral St.
Easton Electric Service & Supply Co.
Hagerstown Auto Electric Service Co., 33 E. Baltimore St.
Salisbury Salisbury Battery Co.

MASSACHUSETTS

Boston *A. & J. Auto Ignition Co., 55 Brighton Ave.
Greenfield Williston Auto Electric Serv., 81-85 Troy St.
Fitchburg Fitchburg Auto Electric Co., 214 Lunsburg St.
Framingham W. H. Barr Battery & Service Station, 245 Howard St.
Greenfield Krohn's Automotive Serv., 151 Federal St.
Haverhill Mark Medocati, 23 Emerson St.
Lawrence Connor Battery Ignition Service, 636 Essex St.
Lowell Markus Motor Service, Inc. John & French Sts.
New Bedford C. E. Beckman Co., 11-35 Commercial St.
Newburyport Davis Electric Serv., 209 Derby St.
N. Adams Noel, Inc., 218 Ashland St.
Norwood Kleps Auto Elec. Service, 12 Guild St.
Pittsfield Arthur E. Smith Auto Electric, 75 Tyler St.
Salem George D. Grant, 259 Derby St.
Salem C. F. Hallin Co., of Salem, 274 Derby St.
Springfield L. W. Jaeger Ign. Co., 2040 Columbus Ave.
Worcester Jenkins & Robinson, 69 Central St.

MICHIGAN

Alma Brown's Garage, 230 W. Superior St.
Alpena Electric Service & Supply Co.
Ann Arbor, A. & L. Battery & Elec. Serv., 529 S. Main St.
Battle Creek Haddock Brothers, 19 Green St.
Bay City Valley Elec. Serv. Co., 1011 N. Washington St.
Benton Harbor Auto Elec. Serv., 246 W. Main St.
Coldwater Corson Auto Elec. Serv., 46 E. Chicago St.
Detroit *Auto Electric & Service Corp., 90 Selden Ave.
Detroit Dix Auto Elec. Serv., 3923 W. Vernor Highway
Detroit Greenleaf, Inc., 2272 Jefferson Ave.
Detroit Klann Auto Elec., 10350 Harper Avenue
Detroit Knorr Maynard, Inc., 5743 Woodward Ave.
Detroit Magneto Service Co., 1230 W. Fort St.
Detroit, M. & M. Elec. Co., 915 W. Warren Ave.
Eastland Richie Electric Co., 111 N. 11th St.
Escanaba Gates & Graves, 1600 Detroit St.
Flint Kennedy Motor Parts, 1208 N. Saginaw St.
Grand Rapids Auto Clinic, 13-15 Market Ave.
Grand Rapids Rowerdink, Inc., 62-68 Commerce Ave., S. W.

Houghton O. K. Auto Parts, 407 Memorial Ave.
Ironwood O. K. Auto Parts, 216 W. Aurora St.
Ishpeming Andriachic Magneto Serv., 312 W. Division St.
Jackson Hill Piston Service Co., 622 E. Michigan Ave.
Kalamazoo, M. & W. Auto Electric, 202 Clinton St.
Kalamazoo, M. & T. Battery & Elec., 131 W. Kalamazoo St.
Kalamazoo Ralph M. Ralston Co., 201 N. Park St.
Lansing Alfredson & Smith, 104 E. Lenawee
Lansing General Parts & Serv., Inc., 511 N. Grand Ave.
Lansing Paul Automotive Parts Co., 520 E. Michigan Ave.
Manistee Automotive & Appliance Service Co., River & Smith Sts.
Mt. Clemens Auto Electric Shop, 165 N. Gratiot
Mt. Pleasant Roy's Magneto Service, 201 1/2 W. Broadway
Muskegon Reliable Tire & Accessories Co., 438 W. Western
Pontiac Auto Electric Shop, 286 S. Saginaw St.
Port Huron Sparling's Battery & Electric, 611 W. Huron St.
Royal Oak Rolfs Battery Service, 511 S. Main St.
Saginaw Russell Electric Co., 1915 N. Michigan
Sault Ste. Marie Electric Equip. Co., 129 W. Spruce St.
St. James Ouran's Electric Service
Traverse City Mac's Garage, Case & State Sts.
Traverse City Northwestern Elec. Serv., 441 E. Front St.

MINNESOTA

Albert Lea Smith Tire & Electric, 216 S. Washington St.
Alexandria Friday's Auto Electric Co., 110 5th Ave., S.
Austin Austin Carburetor & Electric Co., 211 E. Maple St.
Benson Gray Electric & Magneto Service Co.
Blue Earth City Gray Electric & Magneto Service Co.
Brainerd Electric Garage, 7th & Maple Sts.
Crookston Crookston Mfg. Co., 411 N. Main St.
Crookston Joe E. Schroeder, 217 N. Park St.
Detroit Lakes A. & B. Supply Co.
Duluth United Electric Service Co., 301 E. Superior St.
Fergus Falls Olson Auto Electric Service, 121 Cavour Ave.
Glencoe Walter Benz Garage, 712 W. 10th St.
Grand Rapids Butler's Garage, 200 Potters Ave., N.
Hancock Kithson County Implement Co., Main Street
Hibbing W. E. Horn Auto Elec. Serv., 122 Second St.
Kennedy Kruger's Garage, 117 W. 2nd St.
Litchfield Larson Mtr. Serv., First St., N. E.
Little Falls Spile Garage, Box 162
Madison Spile Garage, Box 162
Mankato Mankato Service Co., 628 S. Front St.
Marshall Matt's Carburetor & Electric Service, 412 West Main
Matt's Carburetor & Electric Service, 412 West Main
Minneapolis Fowler Electric Co., 2901 North Ave.
Minneapolis *Reinhard Bros., Inc., 112 9th St.
Minneapolis W. E. Lahr Co., 30 S. 10th St.
Montevideo Wagan Auto Electric, 208 1st St.
Morris Highland Brothers, 703 Atlanta Ave.
New Ulm Auto Electric Service, 110 N. Broadway
Parkers Prairie Fortwangler Electric Shop
Pipestone Sturdevant Auto Elec., 112 2nd St., N. W.
Red Wing Red Wing Auto Electric
Redwood Falls Carburetor & Elec. Co., 108 East 3rd St.
Rochester Alexander Auto Electric, 320 1st Ave., S. W.
St. James Stevenson's, 22 North 5th Ave.
St. Cloud Ouran's Electric Service
St. Cloud Gruber Auto Electric, 243 W. Kellogg Blvd.
Spring Valley Merchant Super Service, 121 Main St.
Thief River Falls Wilson Bros. Auto Elec. Co., 221 First St., E.
Virginia Saranen Auto Elec. Serv., 112 North 2nd Ave.
Virginia Vitanko Auto Electric
Wesaca Christenson Battery & Elec. Co., 313 2nd Ave., N. W.
Wells Wells' Garage, Carlson's
Westbrook Wells' Garage, Carlson's
Willmar Nelson Auto Electric Co.
Winona Auto Elec. Serv. Co., 118 Main St.
Worthington Fellenner & Haggie Motor Sales, 220 Main St.

MISSISSIPPI

Clarksdale Delta Welding Shop
Greenville Thomson's Battery & Elec. St., 217 Main St.
Greenwood D. & N. Auto Parts Co., 420 Howard St.
Hattiesburg Serphie Service Co., Inc.
Hattiesburg Carburetor & Ign. Co., 306 Hardy St.
McComb Balentine's Service, 112 S. Broadway
Meridian Motor Service Co., Inc.
Yacksburg Morrissey's Storage Garage, Inc.

MISSOURI

Capri Girardeau Wagner Electric Serv., Rear 815 Broadway
Chillicothe Industrial Equipment Co., 614 Elm St.
Columbia Tom Funk's Automotive Serv., 112 S. 8th St.

Hannibal Whitney Automotive Serv., 4th & Church Sts.
Joplin Dave's Magneto Service, 622 Wall St.
Kansas City *The E. S. Cowie Electric Co., 1819-23 Wyandotte St.
Kansas City Herb Battery & Electric Co., 3011 McGee St.
Leawood Miller Battery & Electric, 216 West Liberty St.
St. Joseph Electrical & Magneto Serv., 7th & Main St.
St. Louis *Medart Auto Elec. Co., 3134 Washington Blvd.
Sedalia Brown's Automotive Clinic, 2nd & Montauque
Springfield Wheel's Electric Service, 2048 Parkersburg St.
Washington Washington Battery Co., 110 Lafayette St.

MONTANA

Baker Radiske Radio Electric
Billings *Pasley & Spritzer, 20 North 33rd St.
Bozeman Auto Electric Station, 106 W. Main St.
Billings Carburetor & Elec. Co., 3107-09 First Ave., North
Butte Beery's Auto Supply, 114 East Broadway
Circle The Inland Motor Co.
Conrad Whitney Motors Service
Curtain Fischer & Son, 106 N. Central Ave.
Fairview Farm & Home Serv.
Glaconda Harper Autom. Electric, 120 W. Benham
Great Falls Art & Ross Serv., Co., 320 1st Ave., S.
Great Falls Starter & Battery Co., 512 First Ave.
Helena Miles & Ulmer Co.
Heavly 7-0-5 Auto Electric, 201 1st St.
Hogeland Hogeland Motor Inn
Kalispell Sunset Auto Co.
Leviston Electric Service Corp., 214 Montana Ave.
Miles City Harold's Elec., 711 7th St.
Missoula Ped's Repair Shop
Plentywood Peterson Company
Poplar Andy's Repair Shop
Shelby Kingler's Garage, 212 Lloyd-Middler, Front St.

NEBRASKA

Alliance Schaefer Auto Supply
Auburn Grovenburg Electric Service
Berlin Sprague Elec. Service Co., 304 Court St.
Chadron Tschamber Bros., 224 East Second
Fall City Joy's Machine Shop
Fermont Auto Elec. & Battery Co.
Galveston Ted B. Miller Co.
Grand Island Reitan Co.
Hastings Hastings's Battery & Electric, 212 N. Lexington
Holdrege Bierman's Auto Electric & Radio Service
Keamsy Bierman's Auto Electric, 9 East 25th St.
Lincoln Carl A. Anderson, 1711 P. St.
McCook McCook Equity Exchange
Nebraska City Guy J. Lock, 1200 Central St.
Omaha Looker Bros., 5th & Madison
North Platte Reitan Service Co., 502 S. Jeffers St.
Norfolk *Carl A. Anderson, 16th & Jones Sts.
Oxford West's Machine & Electric
Scarsbluff Auto Electric Service, 1410 First Ave.
Sidney Heshbath Battery
Superior B. C. Robinson
York Murphy Auto Electric, 411 11th Pl.

NEVADA

Las Vegas Motor Supply Co., 121 S. Main St.
Reno A-T Service Co., 241 S. Virginia St.
Reno Auto & Electrical Supply Co., 322 Sierra St.

NEW HAMPSHIRE

Concord Merrill & Cole, 151 North Main St.
Dover Avery Auto Electric Serv., 101 Pierce St.
Keene Wilcox Battery Service, Rear 34 Washington St.
Laconia J. H. Chase Co., 25 Water St.
Manchester Gilman & Kime, 519 Elm St.
Nashua Nashua Battery Shop, 2 Otiserson
Portsmouth James L. Welch Auto Elec. Serv., 68 State St.
West Lebanon Hamilton's Automotive Service, Bridge St.

NEW JERSEY

Atlantic City Irwin's Auto Elec. Co., 2772 Atlantic Ave.
Bridgeport J. L. Danzenbaker & Son, 145 S. Laurel St.
Camden Harry K. Pope & Sons, 1429 Haddon Ave.
Caldwellsville J. L. Danzenbaker & Son, Main St. & Market Ave.
Dover H. Lantermann Auto Electric, 260 E. Blackwell St.
Hackensack Bergen Magneto Co., 58 First St.
Hackensack Hackensack Mack & Bat. Station, Inc., 17 Main St.
Hackettstown Warren Motor Service, 246 Main St.
Jersey City Sparrow Hill Service, 854 Communipaw Ave.
Newark Dix Magneto Co., 176 Central Ave.
Newark *Henry's, Inc., 374 8th St.
Newark Tire Trading Co., 237-241 Albany St.
New Brunswick Cal's Auto Service, Inc., 29 Halsey St.
Paterson Reliable Magneto Repair Co., 20 Prince St.
Perth Amboy Wargyle's Ltd., 154 New Brunswick Ave.
Plainfield F. W. Hutterbach, 347 Watchung Ave.
Raritan Carburetor & Ignition Service, 31 E. 3rd Ave.
Red Bank Douglas Electric Co., 35 E. Front St.
Sommerville Battery & Electric Serv., 102 Madison St.
Trenton Trenton Auto Electric, 36 Penn St.
Vineland Pagano Bros., Inc., 718 Landis Ave.
Washington Washington Auto Parts, Route 30
Wildwood Allard Bat. & Elec. Serv., 134 E. Schellenger Ave.

NEW MEXICO

Albuquerque Fryer Auto Elec. Serv., 415 W. Marquette St.
Albuquerque Hill's Auto Electric, 523 N. 4th St.
Albuquerque *Spitzer Electrical Co.
Artesia Industrial Machine Supply & Mtr. Works
Carlsbad Hall Mach. & Welding Co., 102 West Mermod
Clovis Closser Auto Service, 321 West 7th St.
Hobbs Barnes Electric Co.
Las Cruces Cruces Motor Parts, 115 W. Bowman St.
Parales Battery & Electric Serv., 214-8 S. 2nd St.
Raton Nixon's Specialized Service, 214-8 S. 2nd St.
Roswell Auto Service Co., 224 W. Second
Silver City Silver City Bat'y & Ign. Co., 103 E. College Ave.
Tucumcari A-I Auto Electric Co., 113 E. Center St.

NEW YORK

Albany J. M. Steinhart, Inc., 340 Central Ave.
Amityville, L. I. Amityville Battery & Ign. Serv., Broadway & Avon Place
Arden Mark J. Davin, Between Avon & E. Avon
Batavia Hull Electric Service, 228 W. Main St.
Binghamton Wakeman & Brinard, 362 State St.
Bolivar Bolivar Magneto Co., 60 Wellsville St.
Bolivar J. & C. Magneto Serv., 85 Boss St.
Bolivar Magneto Repair & Belling Co., 60 Wellsville St.
Brooklyn Madison Magneto Co., Inc., 1147 Bedford Ave.
Bronx Bronx Johnson Motors, 3395 E. Tremont Ave.
Buffalo *Peter Hettrich Elec. Serv., 1032 Elliott St.
Buffalo Key Electric Service, 22 Summer St.
Cortland Booth's Elec. Serv., 21 Other Creek Pl.
Endicott Naving Motor Co., Inc., Main St., at Garfield Ave.
Flushing George Smith, 1425 Far Rockaway Blvd.
Freshburg J. & A. Brennis, Inc., 35-23 Leavitt St.
Fredonia Peter Zebarsky, R. D. No. 20
Glen Cove Auto Electric Service, Lake St.
Glen Cove Cavalieri Motor Service, Inc., 112 Glen Cove Ave.
Glen Falls Ehrlich Glens Falls, Inc., 149 Bay St.
Glen Falls Holmes & Bates Electric Serv., Park St.
Hempstead, L. I. Oman Bros. & Co., Inc., 236 Main St.
Hicksville Nassau Center Auto Electric, 30-34 Jericho Rd.
Hornell Hornell Auto Supply, 58 Broadway

Hudson Auto Electric Repair
Hudson Falls Percy E. Carpenter, 7 Martindale Ave.
Jamestown Service Station Sup. Co., 2nd & Lafayette Sts.
Jamestown Strum Bat. & Elec. Serv., 114 E. 4th St.
Lockport Holland Electric Shop, 67 South South St.
Lockport Pils Service, Niagara & Church St.
Long Land City *Steiner Bros., Inc., North Blvd. at 34th St.
Minneapolis, L. I. Henry Nelson, Jericho Turnpike
Newburgh J. G. Mezger, Inc., 99 Broadway
New York City National Ignition Co., 2361 Jerome Ave.
New York Quality Electric Products Co., 311 W. 59th St.
Niagara Falls Main Auto Electric Service, 319 Main St.
N.Tonawanda Pinson Auto Parts Inc., 110 Sweeney St.
N.Yack Yack Carburetor Sales & Serv., 258 Main St.
Ogdensburg Ogdensburg Bat. Co., 209-213 Catherine St.
Olean Henry H. Hill, Inc., 434 N. Union St.
Oneonta Oneonta Tire & Auto Parts, Inc., 116 Main St.
Pasay Wesley R. Turner, Auto Electrician, 22 Maiden Lane
Port Richmond, L. I. William S. Archer, 1960 Richmond Ter.
Rochester Harmon Automotive Corp., 16 Charlotte St.
Rochester Jerome's Ignition Serv., 110 Washburn Ave.
Rochester Rochester Mag. & Starter, 265 Hayward Ave.
Schenectady Ehrlich Electric Service, Inc., 928 State St.
Schenectady C. L. Wuebler, 1015 Erie Blvd.
Sodus De Hart Bros., Balden Ave.
Syracuse Beragoff Electric Co., 111 Temple
Troy Ehrlich Electric Service, 200 Fourth
Utica Lee Electrical Co., Inc., 225 Pearl St.
Utica Sheveller Electric, 320 Lafayette St.
Watertown North County Battery Sales, 621 State St.
Westbury, L. I. Bater Auto Electric Service, Butler St.
White Plains Allison, Gordon, 174-186 Grove St.

NORTH CAROLINA

Albemarle H. P. Efrid Company
Ashville Battery & Ignition Co.
Charlotte Carolina Rim & Wheel Co., 306 N. Graham St.
Charlotte Hill's Auto Elec. & Carburetor Service, 632 Dowd Rd.
Durham Clerk & Sorrell, Inc.
Durham Greensboro Auto Elec. Co., 509 S. Spring St.
Hendersonville Hendersonville Battery & Electric Service, 107 So. Main St.
Hickory The Flowers Co.
Lenoir Sharp's Auto Repair, 416 W. Market St.
Raleigh Carolina Rim & Wheel Co., 321-325 S. Blount St.
Raleigh A. M. Turner Co., 126 E. Morgan St.
Winston-Salem United Auto Serv., Inc., 118-124 N. Main St.

NORTH DAKOTA

Bismark Wilson Electric Service, 300 S. 3rd
Cando Knick Electric Service
Dickinson West Motor Parts, 205 4th St.
Devils Lake Paul Mann Garage, 208 1st Ave., W.
Fargo Howard B. Tilden Co., 109 N. 5th St.
Fargo *Reinhard Bros.
Fargo United Elec. Service, Inc., 312 First Ave., North
Glenburn Reiquem Garage
Grand Forks Lyons Auto Supply, 210-18 N. 4th St.
Hazen Whiffell Elec. Co.
Langdon Wm. E. Porter Motor Service Co.
Minot Wagnick's
Mohr Oates Electric Shop
Olney Sullivan Magneto Service
Rolla Morris Auto Electric, 518 W. Main St.
Valley City Morris Auto Electric, 518 W. Main St.
Williston Klukan Auto Electric Service, 121 E. Broadway

OHIO

Alon Austin Ignition Co., 56 North Union St.
Alon Automotive Elec. Serv., 65 Glendale Ave.
Alon Hopkins & Kipp Auto Electric, 359 Bowery St.
Alon Valley Auto & Machine Shop, 39 N. Valley St.
Ashabula Ashabula Ign. & Carburetor Serv., 4137 Main St.
Ashabula Larson Auto Electric, 1819 E. 44th St.
Bellefontaine Brenner Auto Elec. Serv., 112 N. Detroit Ave.
Bowling Green Gem Electric Co., 328 S. Main St.
Bryan Dick's Auto Electric, 848 S. Main St.
Bucyrus Hoala's Bat. & Ign. Serv., 234 N. Sandusky Ave.
Cambridge Driggs Auto Parts Co., 700 Tander Ave.
Centon Carburetor Sales & Serv., 328 Walnut Ave., N. E.
Canton Ohio Battery & Ign. Serv., 81 N. Market St.
Celina Bater Electric, 121 W. Market St.
Centerville Fred Heiser
Chillicothe Oil & Battery Serv. Sta., 2nd & Market Sts.
Cincinnati J. W. Harris, 433-435 W. Ninth Ave.
Cincinnati W. R. Holly Co., 7219 Vine St.
Cincinnati Tri-State Ignition, Inc., 8th & Broadway
Cincinnati Bower Service Center, 131 S. 6th St.
Cincinnati Valley Autom. Parts, 371 Madison
Cleveland The Cleveland Ignition Co., 1301 Superior Ave.
Cleveland Melin & Co., 4211 Mayfield Rd., P. O. Box 96
Columbus Meinert Magneto Co., 1759 E. 21st St.
Columbus The G. W. W. Co., 108 S. High St.
Columbus Brooks Ignition Co., 201 E. Spring St.
Columbus The Columbus Ignition Co., 211 Neilston St.
Coshocton Auto Supply Co., 115 N. Second St.
Coshocton Bower Service Center, 131 S. 6th St.
Coshocton Central Auto Parts Co., 614 Walnut St.
Cygnut Cliff Implement Serv.
Dayton Auto Electric Equip. Co., 19 N. St. Clair St.
Dayton Ludlow Battery & Ign. Co., 421 W. Ludlow St.
Defiance The Willey & Garman Co.
Delphos Max Magneto Service, Box 108
Dunkirk Harry M. Steiner
East Liverpool Wilson Bat'y & Ign. Co., 730 Dresden Ave.
Edgerton Upp Electric Shop
Findlay Bairs Elec. Service, 129 W. Main Cross St.
Fostoria Kinman Electrical Service, 107 S. Wood St.
Fremont Dodson Service Station, 300 W. State St.
Fremont Mohler Auto Supply Co., 402 E. State St.
Greenfield Batten's Elec. & Mag. Serv., 241 Fairview Ave.
Hamilton Cain Farm Imp. & Auto Repair, Walnut St. & B. & O. R.
Hillsboro Automotive Service & Supply Co.
Hume Yoakam Garage
Jackson Kiener & Diger, 101 W.inding St.
Lancaster Blodgett Armature Co., 110-112 W. Wayne St.
Lima Lima Storage Battery Co., 220 W. Elm St.
Logan The Melrind St. Clair Co., 51 So. Mulberry St.
London London Parts Co.
Lorain Moore & Myers, 275 Broadway St.
Malinta Heckler & Sons
Mansfield Forts Auto Electric Service, 65 N. Franklin
Mansfield Rex Gilbert Auto Elec. Serv., 355 Marion Ave.
Marietta Marietta Electric Co., 181 Front St.
Marion W. Don Davis Co., 137 W. Church St.
Marysville Howard Supply Co.
Medina George Laurenz, 111 West Smith Rd.
Middletown Walter S. Gammack, 1405 Woodland Ave.
Millsburg Calhoun Electric & Mch. Shop, W. Jackson St.
Newark Airsman Electric Co., 56 W. Main St.
New Philadelphia Electric Garage, Rear 240 W. High Ave.
N. Baltimore Troutner Electric Serv., 222 Main St.
Norwalk Bennett Electric Service, 21 Mill St.
Norwood Haus & Company, 2075 Mills
Oak Harbor Oak Harbor Implement Co.
Painesville Sanborn Motor Equip. Co., 54 N. State St.

Port Clinton Black Machine Shop, 80 Madison Ave.
Port Clinton Budd's Autom. Service, Jefferson St.
Portsmouth M. P. Battery Co., 921 4th St.
Sandusky Asher Bros. Company, First at Erie Sts.
Sandusky Howard Cowie Parts & Ser. Garage, R. D. No. 2
Sidney Dunson Supply Co., 328 N. Main St.
Springfield Elaw Battery Co.
Staubenville Autom. Eng. & Sales Co., 25 W. Washington St.
Tiffin Tobin Auto Electric Service, Market St.
Toledo Rogers Auto Electric Service, 77 Jefferson St.
Toledo *The Electric Power Maintenance Co., 26-30 17th St.
Toledo Toledo Auto Elec. Co., 26-17th St.
Toledo Hugo E. Walker, 416 London St.

OKLAHOMA

Ada Martin Clats Implement Co., 213 W. 12th St.
Alfus Bill Lacey Elec. Serv., 207 S. 12th St.
Alva Alva Brake & Electric
Alva Lee's Battery & Electric, 617 Barnes
Anadarko McDufty Auto Supply, 224 West Main St.
Ardmore Auto Elec. Sales & Ser. Co., 521 West Main St.
Bartlesville Enteline Auto Supply, 325 Osage Ave.
Bartlesville Weiss Ignition Co., 214 East 4th St.
Blackwell Blackwell Auto Parts Co.
Britton Brace Battery & Electric Co., 107 W. 5th St.
Carmen Dave & Dales Garage
Chickasha R. E. Allen Serv., P. O. Box 113
Chickasha Barton Motor Supply, 704 Chocoma
Clinton Clinton Electric Co.
Cordell Bartel Parts & Machine Co., 215 E. Main
Cushing DeJarnett Electric Auto Ser., Inc.
Drumright Wallman Battery Co., 313 E. Broadway
Duncan Duncan Elec. Co., 104-108 N. 10th St.
Elk City City Electric Co., 108 N. Jefferson
Elk City Southwest Mtr. Supply Co.
El Reno Turner Auto Elec. Co.
Enid E. S. Cowie Electric, 127 E. Main St.
Enid Garfield Electric Co., 220 W. Broadway
Fairview Young Hardware Co.
Frederick Motor Supply Co., 111 South 7th St. Box 722
Guymon Pal Breedlove Garage
Hinton Wesley Reckard
Hobart Morgan Battery Shop, 119 W. 3rd St.
Hummer Waller's Oil Well Service, #710 S. Regan
Idabel Griffith Hardware Co.
Kingfisher Auto Elec. & Ign. Service
Lawton Stephens Bros. Elec. Co., 310 S. 5th St.
McAlester M. L. Tubert Co.
Medford Hule's Service
Muskogee Eager Auto Elec. & Magneto, 526 Okmulgee St. W.
Nowata Stanley L. Moore
Oklahoma City *American Elec. Ign. 725 N. Broadway
Oklahoma City Oil Field Ign. Parts Co., 325 N. W. Second St.
Oklahoma City Auto Elec. Co., Inc.
Okmulgee Wurtz & Douglas
Pauls Valley Witten & Jackson Co.
Perry Wood & Riggs
Ponca Auto Electric Co., 118 West Grand Ave.
Seminole Magneto Ignition Corp., Box 208
Shawnee J. S. Malahy, 206 W. Main St.
Thornburg East Elec. & Appliance Co.
Tulsa Electrical & Magneto Co., 717 South Main St.
Tulsa *Magneto Ignition Co., 701 7th Ave. S.
Tulsa Mathews Auto Electric Co., 402 East 2nd St.
Wickliffe Tractor Service Station
Walters Kwick Way Service Station
Watonga Joe Still Battery & Electric Co.
Waurika Waurika Bat'y Co., 317 S. Main
Weatherford Clair Robbier & Sons, 214 Muskogee
Woodward Big T Electric Co., 724 Eighth St.
Woodward Bosch Electric Co., 1120 W. Main St.

PENNSYLVANIA

Baker Clark Auto Electric Co., 1720 Resort St.
Baldwin Schuman Auto Elec. Co., 1183 Wall St.
Eugene Clark Battery & Electric, 1591 Oak St.
Eugene G. A. Halton Co., 72 East 11th Ave.
Grants Falls Wimer's Service, 619 So. 6th St.
Klamath Falls Specialized Service, 1434 Main St.
LaGrange Wimer's Service, 619 So. 6th St.
McMinnville Gene Wagner, 1114 North Baker
Medford Dawson Filing & Grinding Wks., 32 N. Front St.
Pandleton *Magneto Equipment Co., 1111 S. E. Grand Ave.
Portland E. H. Burrell, 464 Liberty St. N.
The Dalles

WICO ELECTRIC CO.

Potsville Battery Service Co., 5th & Arch Sts.
Reading Berk's Auto-Ignition Co., 315 N. Fourth St.
Reynolds Raw Machine Co.
Scranton Don Reel, 415 Green Ridge St.
Shamokin Shamokin Battery Ser. Sta., 832 North 6th St.
Shunbury Green Battery Ser., 55 Wolverson St.
Tyone H. L. Frantz, 113 West 16th St.
Uniontown Mitchell-Long, Inc., 26 E. Fayette St.
Warren Parish Battery & Elec. Serv., 6 Market St.
Waynesburg Elec. Ser. Co., N. Washington & Franklin Sts.
Wills-Barre, Rudolph's Elec. Service, 3335 E. Jackson St.
Williamsport Wentzler's, Inc., 3rd & Walnut Sts.
Yeagertown W. B. Wagner Electric Service
York Frank A. Duff, 228 West Market St.

RHODE ISLAND

Providence *A. & J. Auto Ignition Co., 43 Broadway
Westerly Auto Electric Service

SOUTH CAROLINA

Anderson Progressive Machine Works, 125 Murray Ave., Opp. P. & N. Frt. Depot
Beresford Ole Wivick Magneto Shop
Charleston Cravens Auto Elec. Rep. Co., 176 Meeting St.
Clinton Chandler & Cooper
Columbia *Mag. Sales & Ser., 1432 Taylor St.
Greenville *Battery & Elec. Co., 300 Combsite St.
Spartanburg Spartan Automotive Serv., P. O. Box 789
Sumter Sumter Auto Serv.

SOUTH DAKOTA

Aberdeen Nelson Auto Elec. Co., 309 S. 1st St.
Aberdeen *Reinhard Bros.
Belle Fourche Henderson Bros., 605 1st St., N.
Bensford Ole Wivick Magneto Shop
Big Spring Magneto Service Co.
Brookings Sturdevant Auto Elec., 520 Main St.
Coleman Jimmy Cox Magneto Service, 111 E. Pecan St.
Deadwood J. F. Foston Electric Co., P. O. Box 294
Gettysburg Nagel's Welding & Mfr. Serv., Box 294
Huron Gen'l Auto Elec. Co., 324 Wisconsin St.
Leimon Jousand Auto Elec., 34 Main St.
Mitchell Mitchell & Swiler
Odessa Verner Electric Co.
Rapid City Hoshov Auto Electric, 324 So. 10th
Sioux Falls Locks Auto Elec. Serv., 320 S. J. Ave.
Sioux Falls Sioux Falls Magneto Shop
Valley City Morris Auto Electric
Watertown Marquardt's Serv., 12 N. Maple St.
Yankton L. J. Larson Elec. Serv., 220 Capitol St.

TENNESSEE

Chattanooga Auto Elec. & Mag. Co., 522 Broad St.
Dyersburg M. Collins Co.
Jackson Frankland's, Inc.
Johnson City Automotive Electric Co., 210 W. Market St.
Knoxville Clapp Co., 403 N. Broadway
Knoxville McNutt & Burke, Inc., 307-11 N. Central St.
Memphis *Automotive Elec. Serv. Co., 982 Linden Ave.
Murfreesboro Murfreesboro Batt. Co., 315 W. College St.
Nashville Charles B. Wright Co., 513 McGovick St.

TEXAS

Ablene Hoppel Auto Electric Serv., 1060-70 N. 4th St.
Albany Masters Electric
Alice Model Machine & Repair Shop, 110 Front St.
Amarillo *E. S. Cowie Electric Co., 700 Van Buren St.
Amarillo Wilson Battery & Electric Co., 210 E. 4th St.
Anson Anson Electric, Anson Elec. Co.
Arp Sun Electric Co., P. O. Box 292
Austin Constant Service
Austin Cross-Alan Co., 202 S. 5th St.
Austin Nieman Electric Service, 107 S. 5th St.
Balinger Mansel Bros. Mag. Serv. & Serv.
Beaumont Fred D. Turner, 310 Wall St.
Big Springs Fred D. Turner, 310 Wall St.
Borger Borger Gas Engine & Mach. Works
Borger Hatcher Carburetor & Elec. Co., 713 N. Main St.
Breckenridge Oil Field Ignition Co., 222 E. Walker St.
Brownsville Clark Auto Electric Shop
Brownwood Carlson Batt. & Elec. Co., Clark & Anderson St.

Childress Childress Batt. & Elec. Co., 220 Commerce St.
Cisco Watton Tucker, 200 E. 5th St.
Clarendon Homer Bros., Box 585
Coleman Clarke Auto Supply Co.
Coleman Jimmy Cox Magneto Service, 111 E. Pecan St.
Coppell Corpus Christi, Auto Electric Serv., 315 Chaparral St.
Corsicana Herod's Radiator & Elec., 108 W. 3rd Ave.
Dalhart Woolwine Supply Co., 1st & Denrock
Dallas *Beard & Stone Elec., Inc., 2101 Bryan
Dallas The Electromotive Co., 3209 Commerce St.
Dallas J. J. Gibson Co., 2016 Canton St.
Dallas Hargrett Elec. Co., Inc., 1811 N. Harwood
Denver City Denver City Electric Co.
Edan Duncan Magneto Service
Electra Dave Eakin Electrical Service, Box 83
El Paso *Oates Battery & Elec., 423 Texas St.
Fort Worth *Generator Service Co., 622 Commerce St.
Freer Electric Service Co.
Frona Fred White
Gaineville Schad & Pulte
Graham Fore Bros., 617 Elm St.
Grainger Hrn & Bohac Garage
Harlingen Grindle Sales Co.
Hereford Fullwood Battery & Electric Co., 404 N. Main St.
Houston *Beard & Stone Elec., Inc., Milam at Polk St.
Kilgore *Magneto Sales & Service Co., Box 887
Kilgore Wadal Connally Co., 218 E. North St., Box 1078
Kingsville Burris Motor Service
Lamesa Painter & Mayfield
Lamesa Walker's Battery & Elec. Co.
Laredo Yeary Battery Company
Lavelland Gerlach Battery & Elec.
Littlefield Fred Gerlach Battery & Electric Co.
Longview Wadal-Connally Hardware Co.
Lubbock Automotive Electric Co., 1414 Broadway
Mckinney City Auto Parts
Mammoth Gerlach Battery & Elec. Co.
Messia Ingram Elec. Shop
Monahans B. & R. Electric Service
Nocona Walker's Magneto Ign. Co., Box 282
Odessa Electric Serv. & Supply Co.
Odessa Verner Electric Co.
Paducah Paducah Parts Co., P. O. Box 27
Pampa Radcliffe Bros. Elec. Co., Box 151
Pecos Pecos Cylinders Gas Co.
Perryton Patton Motor Supply Co., 103 S. Main St.
Plainview Shook Battery Co., 622 Austin St.
Rosco Kollar & Co.
Rotan Harrison Electric Co.
San Antonio Electric Service Co.
San Antonio Allen Auto Elec. Service, 537 S. St. Marys St.
San Antonio *S. X. Callahan, 425 N. Flores St.
Salinas City Salinas City Electric Co.
Shamrock Shamrock Auto Supply
Sherman Shipp Motor Co., 307 S. Travis St.
Spearman Delon Kirk Battery & Electric
Stamford J. R. Billington Elec. Co.
Stephenville A. B. C. Elec. Co., Box 675
Tulsa Carruth Battery & Elec. Co.
Turley Turkey Hardware Co.
Turnertown Sun Elec. Co., Box 292, Apr. (Mailing Address)
Tyler Wadal-Connally Hardware Co., 116 E. Line St.
Victoria Mansfield Electric Co.
Victoria Bernhard Electric Co.

Waco Beard & Stone, Electric Co., 925 Washington Ave.
Weathersford Ward D. Barber Mag. & Motor Serv.
Wichita Falls Wichita Falls Battery Co., 708 8th St.

UTAH

Logan J. J. Edwards Service, 96 W. Center St.
Ogden Auto Service Co., 201 Kinross St.
Provo Bradshaw Auto Parts, 33 W. Center St.
Salt Lake City *Frank Edwards's Co., Motor Equip. Div., 601 S. State St.

VERMONT

Burlington Herberg Auto Service, Inc., 204 Main St.
Montpelier Herberg Auto Service, Inc., 20 State St.
Rutland Le Francois & Chamberlain, Inc., 37 Strongs Ave.

VIRGINIA

Charlottesville Microfield Battery & Parts Co., 214 W. Water St.
Harrisburg Central Service Co., 517 S. Mason St.
Newport News Watson-Gies & Co., 34th St., Virginia Ave.
Lynchburg H. T. Overstreet, 409 Court St.
Norfolk Chas. H. Wallace & Co., 821 Granby St.
Petersburg Virginia Battery & Ignition, 35 B. Bank St.
Richmond Chas. H. Woodward Elec. Co., 709 W. Broad St.

Richmond Havens & Martin, Inc., 3301 W. Broad St., P. O. Box 5229
Richmond *Richmond Battery & Ignition Corp., 1319 W. Broad St.
Roanoke W. B. Clements, Inc., 464 W. Campbell Ave.
Staunton Johnson Electric Co., 331 N. Central Ave.
Winchester Valley Service Station, Inc., 22 Amherst St.

WASHINGTON

Aberdeen Hugh Bailey Service, 111 N. Broadway
Bellingham Northwest Auto Elec.
Bremerton Sheets Auto Motive Electric
Centralia Centralia Auto Electric, 408 West Main St.
Chehalis Enterprise Electric Co.
Colfax Dave Burns Auto Elec., 303 N. Main St.
Ellensburg Heinrich Auto Electric
Everett Cordz Auto Elec., 2911 Rucker Ave.
Everett Helms Auto Elec., 1413 California Ave.
Everett Sunset Electric Co., 2917 Rucker Ave.
Olympia Bateman's Garage, 621 State St.
Pomroy Held's Auto Electric, 802 Grand St.
Pullman Held's Auto Electric, 802 Grand St.
Seattle C & V Magneto & Electric Co., 319 2nd Ave. S.
Seattle *Pacific Magneto Service, 2719 First Ave. S.
Spokane Chase Engineering Co., 2221 Monroe St.
Spokane Fred Paul Magneto Elec., 1212 2nd Ave. S.
Spokane Sunset Elec. Co.
Sunnyside Walker's Auto Electric
Tacoma Puget Sound Auto Elec. Co., 705 Pacific Ave.
Tacoma Wright Motor Service, 2201 Pacific Ave.
Walla Walla Johnson Electric Co., 35 S. Spokane St.
Washougal Seth Davidson Sales & Serv., Rt. #1 Box #21
Yakima Frank Dennis Auto Electric, 222 S. Wanatchee Ave.
Yakima Lay & Nord, 112 So. 2nd St.
Yakima Traub Bros., Inc., 122 S. 3rd St.

WEST VIRGINIA

Bluefield McCloskey Auto Elec. Ser., Mercer & McCulloch Sts.
Cameron Cameron Tool & Supply Co.
Charleston *MacFadden Ignition, 108 Broad St.
Clarksburg White Elec. Co., 903 W. Pike St.
Huntington Hoffsted Mag. & Elec., 605 Fourth Ave.
Partsborg Harries Auto Elec. Co., 822 Mary St. at 7th
Wheeling Ohio Valley Batt. & Ign. Co., 2231-35 Main St.

WISCONSIN

Antigo Kast Brothers, 613 Superior St.
Appleton Schreiner Auto Supply Co., 605 College Ave.
Babcock Magneto Service, Inc., 840 Pleasant St.
Black River Falls Pugh's Batt. & Elec. Shop, 201 Main St.
Burlington Batt. Service Station, 566 N. Pine St.
Chippewa Falls Charles Henneman Co., 32 W. Maple St.
Eau Claire Rogness Battery & Electric
Fond du Lac Erickson Electric Co., 108 S. Macy St.
Frankville Hilbert A. Paep
Green Bay Van's Battery & Electric Co., 317 N. Monroe St.
Jenewa Weber Battery & Electric, 18 N. Bluff St.
Lacrosse Auto Parts Service, 123-127 N. Third St.
Lacrosse The Lacrosse Auto Supply Co., 125 6th St.
Lancaster Harris Auto Supply, 142 E. Maple St.
Monroe Auto Carb. & Electric Co., 311 N. Bassett St.
Madison Autom. Electric Sales Co., 644 E. Main St.
Madison Madison Armature & Parts, 610-612 University Ave.
Marshfield Auto Electric Service Co., 428 S. Central Ave.
Menasha Auto Electric Co., 132 Nicolet Blvd.
Menomonie Hugh Seares Auto Elec.
Milwaukee Gestner Batt. & Electric Service, 416 W. Kilbourn Ave.
Milwaukee *Wisconsin Magneto Co., 918 N. Broadway
Milwaukee United Auto Service, 1005 N. Edison
Monroe Burhard Elec. Co., 1715 12th St.
Oshkosh Storage Batt. Service Co., 82 Jackson Drive
Racine Central Batt. & Electrical Serv., Inc., 1541 Douglas Ave.
Reedsburg Electric Motor Service, 147 S. Walnut St.
Sheboygan Sheboygan Auto Supply Co., Inc., 1125 Michigan Ave.
Superior Neuman Automotive Service, 1111 Ogden Ave.
Wausau Brecher Batt. Serv., 57n. 363 W. Main St.
Wausau Wausau Elec. & Battery Co., Inc., 112-14 3rd St.
Wisconsin Rapids The Auto Electric Co., 311 Oak St.

WYOMING

Casper Casper Battery & Electric, 119 East 5th St.
Cheyenne Frank Smith Auto Parts, 321 W. 18th St.
Riverton Barton Battery & Tire Co., 102 Grinnell St.
Sheridan Barton Battery & Tire Co., 102 Grinnell St.
Torrington Durham & Scheiding Electric
Wheatland Griff's Repair Shop

AUSTRALIA

Adelaide Hannan Brothers, Ltd., 58-62 Flinders St.
Brisbane Exide Battery Service, Ltd., 381 Adelaide St.
Melbourne A. P. Sutherland, Market St.
Perth M. J. Bateman, Ltd., 12 Milligan St.
Sydney *Carr & Elliott, 13 Marfay St.
Sydney Smith Sons & Rees, Ltd., 30 Wentworth Ave.

BERMUDA

Hamilton Master's Ltd. Front St.
Hamilton Mr. T. M. Du. G. Godet, P. O. Box 69

CANADA

Calgary *R. Hurton, 137 Eleventh St.
Coronation Zingler's Radio Elec. Serv., P. O. Box 59
Drumheller Foxon's Auto Elec.
Edmonton B & C Auto Elec. & Mag. Serv., 10109-106th St.
Edmonton Lovesth Ltd., Jasper Ave. & 106th St.
Edmonton *Smith Battery & Auto-Electric
Grand Prairie Auto Elec. Serv.
Innisfail Robertson's Machine Shop
Red Deer Ted Stauffer
Saltford D. B. & Services
Saltford Filipetto Bros.

BRITISH COLUMBIA

Chilliwack Brett's Ltd.
Courtenay G. A. Kirk
Duncan Wilson & Cabellu, Ltd.

Nanaimo Gen. Auto Sales, Ltd.
New Westminster R. G. Henderson, 831 Carnarvon St.
Penikese Penikese Tire Hospital & Garage
Prince Rupert W. R. Lowe Electric Co.
Vancouver Boulthée, Ltd., 999 Seymour St.
Vancouver *Jeffree & Jeffree, Ltd., 775 Homer St.
Vancouver Edward Lipssett, Ltd., 68 Water St.
Vernon Bloom & Sigaleit, Ltd.

MANITOBA

Brandon Brown & Murray, Ltd., 130 9th St.
Brandon S. H. Brown, 144 12th St.
Dauphin Kemp & Moberley
Le Prairie Dillon Electric, Fortage
Swan River Don Johansen
Winnipeg *Beattie Auto Elec., 176 Fort St.
Winnipeg Brown & Murray, Ltd., 241 Fort St.
Winnipeg Wilson Auto Elec., 224 Main St.

NEW BRUNSWICK

Moncton Robert K. Buzzell, 21 Bonaccord
Saint John Battery & Electric Service, Ltd., 90 Duke St.

NOVA SCOTIA

Halifax Halifax Ignition, Ltd., 35 Grafton St.

ONTARIO

Barrie W. L. Brennan, Bayfield St.
Bellefleur Quintet Batt. & Serv., Station, 4-6 Dundas St. E.
Belleville Dally's Automotive, 6 King St.
Brockville Henry's Machine Shop, 46 George St.
Brockville Welch & Johnston, Ltd.
Chatham Edmondson Automotive Elec.
Chatham Labombard Auto Electric, 7 Dover St.
Cornwall F. W. Merkle
Et. William Dow's Auto Electric, 112 N. Bay St.
Galt Brewer's Automotive Specialized Service Company
Guelph City Battery & Elec. Service, 169 Woolwich St.
Hamilton Dell's Automotive, York & Bay Sts.
Ingersoll Ingersoll Auto Elec., Thames St.
Kingston Frontenac Auto Elec. Service, 19 Bank St.
Kitchener Hart Battery & Ignition Ser., 124 Queen St. S.
London Price Auto Electric, 358 Ridout St. North
London Universal Ignition & Battery Co., 154 Fullerton St.
New Liskeard Bell's Auto Electric Service, 100 Fraser St.
North Bay North Bay Auto Elec. Co., 100 Fraser St.
Oshawa W. R. Chapman, 16 Church St.
Oshawa Stewart & Hoey, 39 Bank St.
Oshawa Welch & Johnston, Ltd., 474 Bank St.
Owen Sound Frank Slater, 801 2nd Ave. East
Peterborough Cliff Towle Auto Elec. Ser., 392 Water St.
Samia Chalmers Auto Electric, 246 N. Front St.
Sault Ste. Marie Battery Service, 305 Queen St. E.
St. Catharines Saddlers Auto Electric, Ltd.
Sudbury Duncan Bros., Ltd., 84 Cedar St.
Toronto *A. Cross & Co., Ltd., 45 Elm St.
Woodstock Woodstock Auto Electric Co.
Windsor Howitt Batt. & Elec. Serv. Co., Ltd., 221 Sandwich St. W.
Windsor Prince Edward Island
Windsor Batt. & MacRae, 171 Grafton St.

CHARLOTTETOWN

Charlottetown Quebec
Montreal *International Elec. Co., 1037 Bleury St.
Quebec Marcal Rochette, 80 St. Francois St.

SASKATCHEWAN

Assiniboia Assiniboia Auto Supply
Estevan Holman Motors
Humboldt W. B. Falton
Lloydminster Radio & Magneto Service
Moose Jaw Great West Batt. & Elec. Co., Ltd., 48 High St.
North Battleford Radio Elec. Shop, 63 Second Ave.
Prince Albert Stan's Magneto Service, 125 River St. W.
Regina Auto Elec. Serv., Ltd., 2536 Victoria Ave.
Regina *Electric Motor Service Co.
Saskatoon Gardner Electric
Saskatoon Davies Electric Co.
Saskatoon Lambart Electric Co.
Tisdale G & B Electric Serv.
Wadena M. H. Lochhart
Wawak M. S. Redl & Son
Weyburn A. H. Electric
Yorkton Mills Magneto Serv.
Yorkton Culver & Blommoert

CUBA

Habana *Elec. Equip. Co. of Cuba, Avenida de Italia 29

DENMARK

Copenhagen A. B. C. Hansen Comp., Industribygningen

GUATEMALA, C. A.

Guatemala R. Zabala, 9 Calle Poniente No. 8

EL SALVADOR, C. A.

San Salvador, J. A. Miran & Cia., La Calle Poniente No. 2y4

ENGLAND

Birmingham Universal Magneto Repairs, 15-15A Aston Rd. N.
Bournemouth, Hants A. E. Ranton & Sons, Ltd., 21-25 Shelbourne Road
Bury Saint Edmunds, Suffolk Boxmoor Motors, Ltd., 499 London Rd., Boxmoor
Chelmsford, Essex Launson, Ltd., Andrews St. (South)
Chelmsford, Essex W. H. Smith & Co., 118 New London Road
Clay Cross, Derbys Messrs. Kennings, Ltd., The Motor Depot
Cowbridge, Glam Messrs. B. S. Bird & Co. (South Wales), Ltd.
Dorchester, Dorset Messrs. Tilleys, 45 South Street
Exeter, Devon Exeter Ignition Co., Summerland Street
Hemel Hempstead, Herts. Ruggles, Ltd., 51 Kingsway
Hitchin, Herts. Boxmoor Motors, Ltd., 499 London Rd., Boxmoor
Hitchin, Herts. R. A. Morgan, Florence St.
Ipswich, Suffolk Messrs. Boddie, Page & Co., St. Margaret's St.
Kendall Messrs. Hoogarth's, Sandos Ave.
Lancaster, Lancs. Messrs. Park Bros., Ltd., The Ramparts
Leicester Messrs. Th. Wathes & Co., Ltd., 85 High St.
Lewes, Sussex Ruggles, Ltd., 51 Kingsway
London, N.W. *Euston Ignition Co., 329 Euston Rd.
London, N.W. 5 Messrs. Steeles Ign. Ca., 175 Hampstead Rd.
London, W. 6 *Phenix Auto Elec. Co., 8 & 10 Ravenscourt Ave.
Manchester, 3 Messrs. John Roberts (Manchester) Ltd.
Manchester, 3 376, Deansgate, Knott Mfg.
Newcastle-upon-Tyne Garbutt Bros., High Street
Newcastle-upon-Tyne Bridges Auto Elec. Works, Ltd., 10, Carlisle Place
Newport, Isle of Wight Frank Chiverton, Lower St. James St.
Newtown, Mont. Searn Motors, Ltd., Hendiclar Rd., Garage
Norwich, Norfolk A. Park & Son, Ltd., Car Hill
Oxford, Berks Hants' Car Elec., Ltd., 37 Park End Street
Peterborough Burchnell's Battery Service, Ltd., London Road
Preston, Lancs. Norman Harrison & Co., Kendall St. Wks.
Rotherham Robert H. C. Harry, 1 Sheffield Road
Southport H. C. Taylor & Sons, Southport, Southampton
Southport Taylors Magneto Service, 13 King Street
Stafford William Gwynnapp, Wolverhampton Rd. Garage
Staines, Middlesex Messrs. V. & D. Keale, 156 High Street
Torquay Messrs. Battery Maintenance, Ltd., New Rd.
Trumpton, Cambridge E. F. Whybro, Magneto Works

Tunbridge Wells, Kent The Car Electrical Service
Warrington (Faulner), Ltd., 24 St. John's Road
Warrington Irons and Dean, Winderpool Causeway
Warwick Messrs. G. Orton & Co., Magnat Home, Emcote Rd.
Whitchurch, Salop. G. H. Hatton, Mill Street
Wigan, Lancs. Taylors (Wigan) Ltd., Powell Street
Winchester, Hants Hampshire Ignition Ltd., 9 Cheeshill St.

Wrexham Mr. Chas. R. Eames, King Street Parking Ground

USA

Wasa Broder, Wickstroms, Motorfabriks, A/B

CHANNEL ISLANDS

Channel Islands *Auto & Electrical Supply Co., Ltd.

TERRITORY OF HAWAII

Honolulu *Automotive Ser. Co., South and Kawaiahoo Sts.

HOLLAND

Rotterdam Mr. Jan Gast, Tunderstraat 60

INDIA

Bombay *Batifoo & Co.

IRELAND

Belfast Messrs. John Robertson (Belfast) Ltd., 46 May St.
Dublin, C. I. Traders Mag. & Dynamo Co., 35 S. William St.

BRITISH WEST INDIES

Matthewien, Inagua West Indian General Store, Ltd.
Jamaica Clarence H. Stephens, 136d. Orange St.
Port of Spain Trinidad
F. J. Miller & Co., 30 Richmond St.

LATVIA

Riga Arvid Ehlert, Nordaku, Iela No. 8

LITHUANIA

Kaunas Lietukis (Lietuvos Zemas Uloj Koop pratyva Sa-jungis) Vytauto Pr. 33

MEXICO

Mexico City Anahuac Mach. Co., S. A. Bucarelli No. 12
Mexico City Equipos Mecanicos, Pasco De La Reforma 157
Monterrey, Nuevo Leon Casa Gram S. A. Apartado Postal No. 79 (P. O. B.) Cal-za Victoria y Chauthemco
San Luis Potosi, S. L. P. Deutz Hnos. S. A., Venustiano Carranza No. 25
Sonora L. M. Byrly y Cia., Ciudad Obregon
Veracruz Iridosa de Ochoa y Cia. Sucs., De R. L. Miguel Lerdo 39

NEW ZEALAND

Wellington *H. E. W. Silver Mag. & Ign. Co., 457 Lower Cuba St.

PALESTINE

Tel-Aviv Auerbach Bros., 71 Herzl St.

PHILIPPINE ISLANDS

Manila *Rancam, Inc., 110 Padre Faurs

PORTO RICO

San Juan *Ricardo Davila, P. O. Box 475

PORTUGAL

Lisbon *Auto-Lustania Alfredo Duarte, Lda., Avenida de Liber-dade, 75-77-79

ROUMANIA

Bucaresti *Progresul Mecanic

SCOTLAND

Aberdeen Messrs. Bon-Accord Elec'l Repairs, Ltd., 97 Holburn St.
Dunfermline Messrs. J. H. Melville & Co., Ltd., 26 Yeaman Shore
Glasgow C-2 *Messrs. Turner & Co., 65-69 Brown St.
Inverness Auto & Gen'l Elec. Services (Inverness Ltd.) Friars St.

SIAM

Bangkok Prachand Engineering Co., P. O. Box 70

SOUTH AFRICA

FAIRBANKS-MORSE

TYPES FM-JV4B & FM-JVE4B MAGNETOS

Adapted Only to Wisconsin Engines—Models VD-4, VD-4I, VE-4, VE-4I, VF-4 & VF-4I

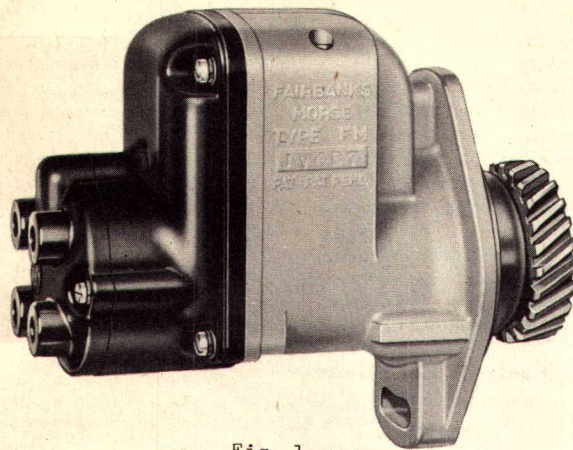


Fig. 1
Type FM-JV4B7 Magneto
Standard Unit

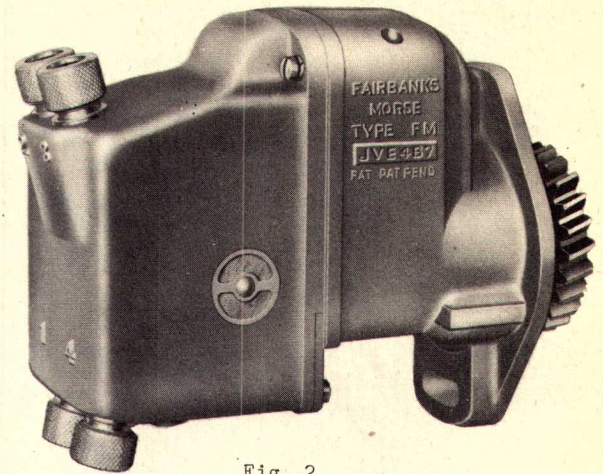


Fig. 2
Type FM-JVE4B7 Magneto
Radio-Shielded Unit

Field Service and Adjustment Information

1. General Description

Modern ignition systems are carefully engineered to provide quick, easy starting and maximum dependability of operation without adjustment or service. Through advanced design and sturdy, simple construction Fairbanks-Morse Type FM-J magnetos have become field performance leaders. Especially compact in assembly, the powerful Alnico rotor assures an intensely hot ignition spark under the most difficult of operating conditions.

2. Application

The Type FM-JV4 magnetos are designed and built for use with Wisconsin Models VD-4, VD-4I, VE-4, VE-4I, VF-4, and VF-4I four cylinder engines. These engines are of the air-cooled "V" type and have a firing interval of 180-270-180-90°. To provide this timing the Type FM-JV4 magnetos have a four pole magnetic rotor with a four lobe cam. Four sparks are produced per revolution of the rotor, which runs at crankshaft speed; in a complete cycle (two revolutions) four sparks are used for ignition and four fire in the exhaust. Type FM-JV4B magnetos have the standard SAE flange mounting, but have a special coupling and gear drive arrangement which requires an extended rotor shaft.

3. Service Procedure

A logically arranged service outline to be followed when engines fail to start, are hard to start, or miss in operation is tabulated below. Since the use of this

chart locates the engine trouble in many cases before the magneto is reached, it prevents too common misadjustment of parts in good condition. In general it is recommended that Type FM-JV4 magnetos are not dismantled until it has been positively ascertained that the ignition spark produced is unsatisfactory. This condition may be determined through ignition spark tests which are easily made in the field.

4. Testing the Ignition Spark

With properly adjusted spark plugs in good condition the ignition spark should be strong enough to bridge a short gap in addition to the actual spark plug discharge; this may be determined by holding the ignition cable end not more than 1/16" away from the spark plug terminal. The engine should not miss fire when this is done. Ignition tests made while any part of the system is wet are useless.

5. Testing the Magneto Spark

Pull the ignition cables out of the end cap sockets and insert a short, stiff wire. Bend this wire to within 1/8" of the engine block. Turn the engine over slowly and watch carefully for the spark discharge which should occur at the instant the impulse coupling releases. The test should then be repeated for each of the remaining terminals. It is highly recommended that, when a strong spark is observed, no dismantling of the magneto take place and that cables, terminals and spark

TROUBLE	POSSIBLE CAUSE	SUGGESTED REMEDY
A. Flooding	Hot or cold engine; over-rich fuel mixture.	Dry out cylinders: crank engine slowly, fuel shut off; or let engine stand idle for short interval.
B. Insufficient Fuel or Air	Empty fuel tanks; clogged fuel supply lines; clogged air intake.	Replenish fuel; clean fuel supply system and check carburetor; clean air intake system.
C. Ignition Connections	Loose or corroded terminals; broken cables; short circuited switch.	Clean or replace cable terminals; inspect soldered or clamped joints, test and replace cables; check ignition switch.
D. Spark Plug	Corroded, worn or damaged points; cracked or carbonized insulators.	New plugs; clean points and insulators, adjust points to recommended opening; never attempt to adjust center electrode.
E. Magneto	Brush, points, impulse coupling.	See instructions beginning Paragraph #4.

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plugs e thoroughly inspected. If no spark is observed, the ignition switch should first be carefully examined.

6. Distributor Cover Removal

The distributor housing cover should be removed, care being taken not to damage the gasket attached to the cover side of the joint. The distributor compartment should be thoroughly cleaned and the air inlet and outlet passages opened. Examine the high tension lead brush; replace, if noticeably worn or damaged. This brush should move freely in its holder and should have a slight spring pressure.

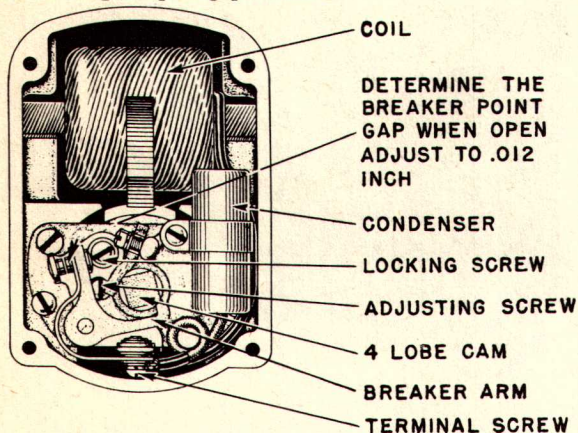


Fig. 3 - Open End View - Point Adjustment

7. Service of Breaker Contact Points

Contact point adjustment necessitates removal of the distributor housing which has a sealed gasket joint with the metal housing. The contact points should be examined for evidences of pitting or pyramiding. A small tungsten file or fine stone may be used to resurface the points. If the points are worn or badly pitted, they should be replaced. Points are to be adjusted to have a .012 inch gap at full separation. Adjustment is made by loosening the round head locking screw at the upper end of the stationary point bracket (Fig. 3) then turning the eccentric head adjusting screw until the proper gap is obtained, and locking the assembly by tightening the round head screw.

8. Reassembly of Magneto

Do not oil or grease the bearings or cam of the Type FM-JV4 magneto as the design eliminates the necessity of field lubrication. The cam felt wick should be replaced by a new factory-impregnated wick if dry or hard. Coil and condenser replacements, while simple, are not recommended unless test equipment is available. Under no circumstance should any attempt be made to remove

the magnetic rotor from the housing as it is locked in a special drive end thrust bearing and specific instructions must be carefully followed in releasing the shaft. When replacing the distributor housing a new gasket should be provided, the joint cleaned thoroughly and the new seal coated with FMCO2 Sealing Varnish.

9. Impulse Coupling

The impulse coupling is used to facilitate starting of the engine and at the same time to automatically retard the ignition spark while starting. Through this device the rotor of the magneto is held back while the engine is turned over to its firing position at which instant the pawls of the coupling release and the rotor is snapped forward at high speed, thereby producing an intense, hot spark, automatically retarded to prevent backfiring. Since the ignition spark of the Type FM-JV4 must occur each 90° of its rotation, two stop pins are required to engage the coupling pawls at proper intervals. To provide positive pawl action over the cranking speed range, individual torsion type pawl springs have been provided, with the result that a certain amount of impulse action may be expected up to 500 RPM (normal idling speed of engine is 700 RPM).

10. Radio-Shielded Units

Complete radio-shielding of the ignition system is required in numerous applications, the necessary modification of the magneto being designated as the Type FM-JVE4. On this unit the plastic distributor cap and cover are replaced by an all metal housing in which an insulated distributor block is mounted. Special outlets are provided for the high tension leads so that connection can be made to the shielded cables. The primary ground terminal is located on the lower side of the end cap and is arranged for connection with a radio-shielded ground cable.

11. Special Drive Gear

The Types FM-JV4B7 and FM-JVE4B7 magnetos, as adapted to Wisconsin Motor Corp.'s engines, are equipped with special drive gears, mounted directly on the impulse coupling. The gear is a slip fit on the extended coupling nut, since movement of the gear with respect to the coupling nut (and rotor shaft) occurs during the impulse period. If it is necessary at any time to remove the drive gear, special care must be exercised in reassembly. First remove the distributor compartment cover (on radio-shielded units the entire end cap must be taken off) and turn the rotor until the contact segment is in firing position for #1 cylinder (Fig. 4). Note 180° difference in position for standard and radio-shielded units. With the rotor in this position fit the gear to the coupling lugs so that the prick punch mark on the rim of the gear is in the position shown (Fig. 4).

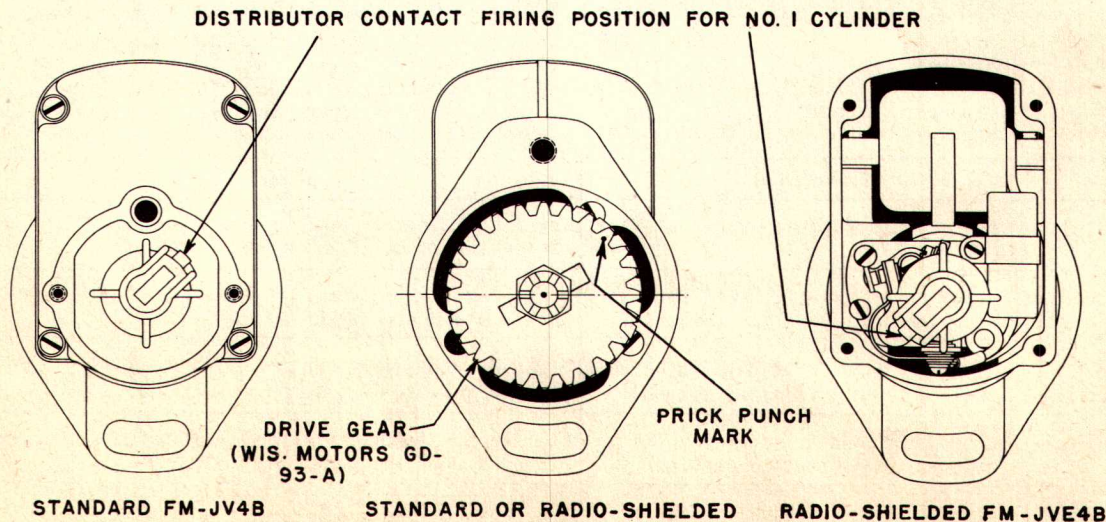


Fig. 4 - Drive Gear Marking & Assembly