

**Instructions  
for Operating**

**MODEL "VE-4"  
FOUR CYLINDER  
AIR-COOLED ENGINE**

**J. I. CASE COMPANY  
Racine - Wisconsin - U. S. A.**

# INSTRUCTIONS FOR OPERATING FOUR CYLINDER AIR-COOLED ENGINE

Model VE-4—3" bore—3 $\frac{1}{4}$ " stroke

The proper combustible mixture of gasoline and air is furnished by a carburetor bolted to the inlet manifold.

The spark for ignition of the mixture is furnished by a high tension magneto fitted with an impulse coupling which makes starting very easy.

The firing order of the cylinders 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. 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°.

## TIMING OF MAGNETO

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

First remove the air intake duct or the screen over the flywheel air intake opening. This will expose the mark on shroud for timing magneto. See Timing Diagram.

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 letter DC near one of the air circulating vanes. This vane is further identified by a cast mark on the end. See Diagram. When the air blows out of the #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 #1 and #4 cranks are at the top center. The key-way 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. The distributor cap on the magneto is numbered from 1 to 4. The leads from the magneto should be connected to spark plugs of like numbers.

The numbers from 1 to 4 inclusive, are stamped on the distributor cap of the magneto and on the air shroud near the spark plugs for convenience in connecting the wiring, and it is not necessary to give consideration to anything else, except to see that like numbers are connected by each wire.

Lubrication is by a combination of splash and forced feed. The oil is forced by a gear type pump into a header extending the full length of the crankcase. Four nozzles in this header direct oil streams against the fins on the connecting rods, and the spray thus formed lubricates all internal parts of the engine.

Cooling is accomplished by a flow of air circulated over the cylinders and heads by a combination fan-flywheel, encased in a sheet metal shroud, the air being directed by ducts and baffle plates to insure uniform cooling of all parts.



## STARTING INSTRUCTIONS

Condensed operating instructions may be found on the metal instruction plates on the engines.

In starting the engine, first fill the oil base to the mark on the oil gauge sabre. The oil is filled through the breather pipe after the breather cover has been removed. Always replace the breather cover immediately so no dirt will enter the crankcase at this point. The breather cover should be kept clean by washing in gasoline or kerosene. If the breather cover becomes plugged with dirt, the crankcase cannot be properly ventilated and oil leaks may develop at various points on the engine.

## LUBRICATION

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 below 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 only the best grade of well refined oil of the proper body should be used. The best assurance of getting this quality oil is to purchase it from a reliable oil dealer in your home community or from a reputable oil company.

## OIL RECOMMENDATIONS

Summer—Heavy Duty (Full loads for long periods)	S. A. E. No. 40
Summer—Average Duty (Intermittent Full Load or sustained partial load)	S. A. E. No. 30
Winter (Below 32° F.) (Engine exposed to freezing temperatures during shutdown period)	S. A. E. No. 20
Winter (Extremely cold weather)	No. 10W.

**NOTE:** Follow summer recommendation in winter if engine is housed in warm building.

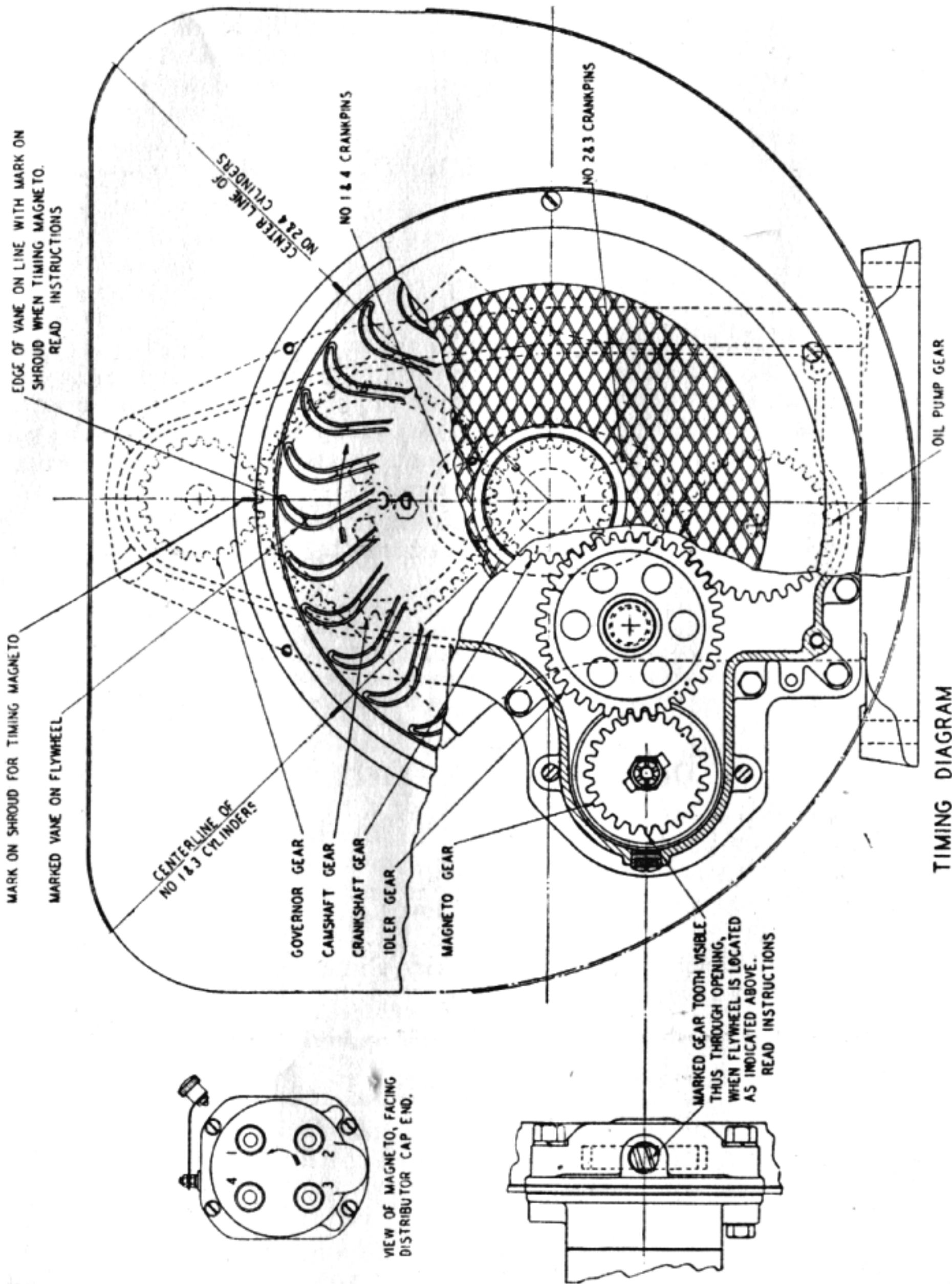
The standard oil reservoir holds approximately 4 quarts of oil.

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

## FUEL

THE GASOLINE TANK SHOULD BE FILLED WITH A GOOD QUALITY OF GASOLINE FREE FROM DIRT AND WATER. REGULAR GRADE GASOLINE SHOULD BE USED. THIS HAS AN OCTANE RATING OF ABOUT 70.

**DO NOT USE GASOLINE WITH AN OCTANE RATING OF LESS THAN 67.**



TIMING DIAGRAM  
Fig. A



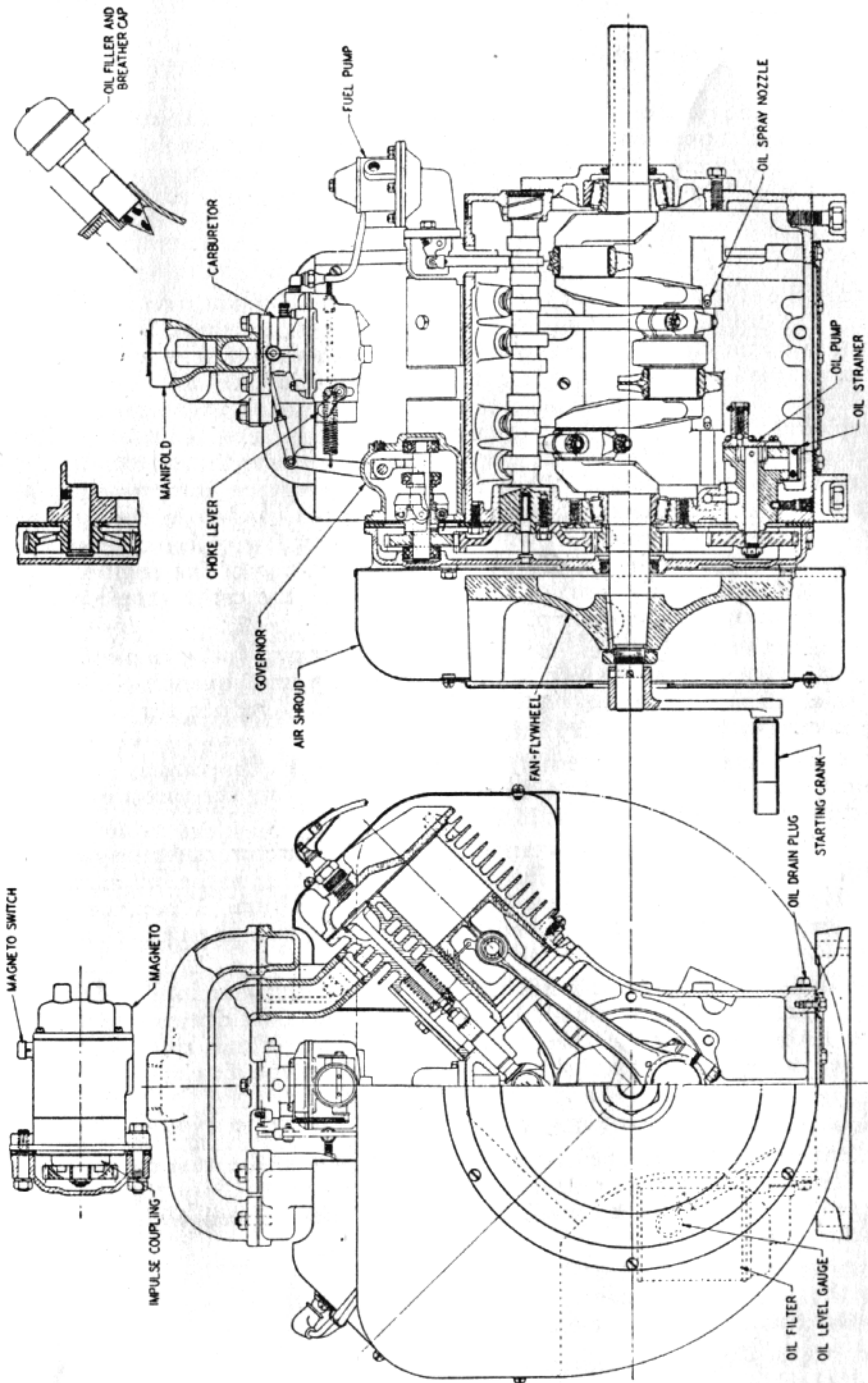


Fig. B

Next close the choke on the carburetor by pulling out the choke button. After the engine is started, the choke button should be pushed in to open the choke. In cold weather the choke should be opened gradually as the engine warms up.

The carburetor on this engine is fitted with fixed jets and requires no adjustments.

The magneto is fitted with the push button type of switch which is always in the "on" or running position. To stop engine, the push button should be depressed and held down until engine stops. For further instructions on magnetos, refer to magneto bulletin. The proper spark advance for these engines is 27°.

## CRANKING ENGINE

Engage the starting crank at the flywheel and crank engine over in clockwise direction. The cranking should always be done by engaging the starting crank in such position that it may be turned over by pulling on the crank, not by pushing against it, as this latter procedure might be dangerous in case of a possible kick-back. Neither is it advisable to spin the engine in starting. Simply pull crank over compression briskly. This operation may have to be repeated a few times as it is necessary to have the fuel mixture drawn into the cylinders through the carburetor and inlet manifold. Then the mixture must be compressed in the cylinders before the engine can be started. If there is gas left in the cylinders from previous running of engine, it will start on the first few pulls on the starting crank. If the carburetor is run dry at previous operation of the engine, it will take sufficient turning of the starting crank to again fill the carburetor float bowl with gasoline through the fuel pump.

To facilitate starting the engine, if the carburetor and fuel pump are dry, a priming cup is provided on the inlet manifold, so that a small quantity of gasoline may be injected at that point. This will considerably reduce the amount of cranking necessary to prime a dry intake system.

The centrifugal flyball governor, which is bolted to the timing gear case, automatically controls the engine after it is started, varying the throttle opening through suitable linkage to suit the load.

The linkage between the governor and the carburetor must be properly connected. The governor lever has just sufficient travel to give the full movement to the carburetor throttle lever from open to closed position. When the engine is at rest, the governor lever position corresponds to the wide open position of the carburetor throttle lever.

**AN AIR CLEANER MUST BE USED** on the carburetor intake if there is any dust where the engine is operated, as otherwise this dust drawn into the engine through the carburetor will wear out the cylinders, pistons, rings and other parts of the engine in a few weeks' time. An oil bath type air cleaner is recommended.

### **AIR CLEANERS MUST BE CLEANED AT LEAST ONCE A DAY.**

Air cleaners must be cleaned frequently depending on the dust conditions in the air. If an oil bath type air cleaner is used, the oil in the cup together with the collected dust should be emptied and the cup then refilled with oil to the level indicated on the cup.

Never operate the engine with any part of the air shroud removed as this will allow the engine to overheat and score. The air shroud is absolutely necessary to direct the air flow so the engine may be properly cooled.

**CAUTION:** When operating the combine do not permit cooling air intake screen at the flywheel to become clogged to the extent of choking the air flow. Keep the screen clean. Do not permit trash to collect between the cylinders or on the cooling fins of the cylinders to the extent of destroying cooling efficiency.



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**CAUTION:** The cylinder shroud covers should be removed frequently from each bank of cylinders (these are the covers that have the spark plug holes through them) and clean out all straw, dust and chaff that might have accumulated in the air passages. If water pressure is available the fine dust can be very easily washed out by directing the stream of water from the manifold side of the cylinders. Be sure to replace the cylinder shroud covers as the engine will not cool with any of the air shroud removed. A frequent check and cleaning of the air passages should be made to insure proper cooling of the engine.

## GENERAL CONSTRUCTION

The **CRANKSHAFT** is carried on two Timken bearings. The cones are a tight press fit on the crankshaft. The outer race or cup of the Timken bearings at the power take-off end of the engine is carried in a plate bolted to the crankcase. Under this plate several shims are fitted for adjusting the bearings. The bearings are properly fitted at the factory with no end play when the engine is cold. It is very seldom necessary to change this adjustment for wear, and then the work should only be done by an experienced man.

The **CONNECTING ROD** big ends are direct Babbitted and fitted with laminated shims. The upper ends of the rods are fitted with hard bronze bushings. The oil streams from the nozzles strike the fins on the connecting rod caps about 3/16" from the end. If these oil streams strike the fins or connecting rods higher up, the cylinders will receive too much oil.

In case a connecting rod bearing is burned out the rod may be replaced on an exchange basis, if the original rod is returned in good condition (other than being burned out) to the branch house in charge of sales in the vicinity where the tractor was sold.

The **PISTONS** are heavy duty Lynite Aluminum alloy castings. Four rings are fitted to each piston, three compression and one oil regulating ring.

The **PISTON PIN** is a light press fit in the piston, and steel wire snap rings in the piston bosses prevent end movement of the pin.

The **CAMSHAFT** is made of a special metal known as Gunitite which wears exceptionally well. The cams and fuel pump eccentric are formed integral with the shaft. The driving gear is bolted to a flange by three bolts, and the camshaft is carried by two babbitted bearings.

The **VALVES** are located in the side pockets in the cylinders. The exhaust valves are type XB silchrome steel and the inlets are chrome nickel steel. Special molybdenum alloy valve seat insert rings are pressed into the cylinders. The valves are operated through mushroom type tappers.

Adjusting screws are provided in the tappers, and these should be adjusted to give a clearance of ten thousandths (.010) of an inch at the inlet stems, and fourteen thousandths (.014) of an inch at the exhaust valve stems when the engine is cold.

The **OIL PUMP** is of the gear type located in the crankcase and extending down into the oil pan. The pump is driven by helical gears from the crankshaft through an idler gear. The suction opening in the oil pump is protected by an oil screen.

The **SPARK PLUGS** are located in the cylinder heads. The spark plug gap should be held at .025 inch.

The **CRANKCASE** is made of iron. The cylinders are cast in pairs of a special alloy iron. Two cylinder heads are fitted. The heads are made of an aluminum alloy especially suited to this kind of service. Both heads and cylinders are provided with ample cooling fins so the engine will not overheat when operating at full load in the hottest weather. They have been operated for hours at a time at full load and high speed in the laboratory, where the room temperature was held at 140° F.